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Marguerite K. Kennedy
MARGUERITE K. KENNEDY
Chief, Archives Branch
The Albert F. Simpson Historical
Research Center

Billie H. Hix
BILLIE H. HIX
Chief, Technical Systems Branch
The Albert F. Simpson Historical
Research Center

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Combined Economic Warfare Agencies
Report — Germany — Balkans

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049

COMBINED ECONOMIC WARFARE AGENCIES

Economic Advisory Branch (Foreign Office and Ministry of Economic Warfare (U.K.) Foreign Economic Administration (U.S.).

(Headquarters)
A.F.H.Q., A.P.O. 512

11th November 1944.

To: Major Garland Hayes, Target Analysis Section, M.A.A.F., A.F.H.Q.

From: Lt.-Col. J.P.S. Ross, C.E.W.A./A.F.H.Q.

Following our discussion last Sunday evening on the subject of transit trade through Switzerland to Northern Italy and Germany, I sent a telegram to Economic Advisory Branch (Foreign Office and Ministry of Economic Warfare), London, asking for such figures of transit trade and I have now received a reply.-

Total Northbound traffic.

July	5,473	metric tons
August	5,1,8?6	" "
September	5?,190	" "
For September: Via Chiasso	99.2%	
Trino	30.67%	
Domodossola	0.13%	

Principal commodities, September:

Iron and Steel (raw)	7,410	metric tons
" " " (finished)	9,176	" "
Pyrites	12,078	" "
Yarns	2,579	" "
Clothing	1,167	" "
Tissues	1,605	" "
Woodwork (furniture)	1,463	" "
Rice and cereals	[illegible]	" "
Iron Ore	6,842	" "

Total/

Total Southbound Traffic.

July	299,827	metric tons
August	199,063	" "
September	151,620	" "
For September, Via Chiasso	56.87%	
Trino	42.5%	
Domodossola	0.63%	

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Principal commodities, September:

Coal	133,504 metric tons
Scrap iron	4,773 " "
Rock salt	6089 " "
Timber	1,813 " "
Chrome ore	988 " "

The Swiss agreement to restrict transit trade in certain goods including "Italian loot" does not include Italian railway rolling stock. Such a restriction would be practically impossible to operate owing to the use of both Italian and German railway stock to convey transit goods generally.

London hopes soon to hear the result of their latest demarche to the Swiss Government on the subject of transit traffic but they have no objection to military action being taken since they anticipate an unsatisfactory reply from the Swiss.

I hope that this will give you sufficient information for your purposes.

J.P.B. ROSS, Lt.-Col.
Deputy Director, C.E.W.A.

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Targets in Stage 2 within 550 miles of Rome, but other side of the Alps.
This band covers for the most part a heavily populated and fairly level terrain.
There are many alternative rail routes so that pin pointing becomes difficult.
and the suggested targets are mainly marshalling yards and large junctions through
which it is known that in peace time large flows of commercial traffic were handled.

France, 1. Miramas, bottleneck of main line routes from Rhone valley into Marseilles.

2. Givors, network of junctions south of Lyons, would cut railways for both banks of Rhone, also Lyon avoiding line and Lyon-St. Etienne main line.

3. Bourg, Junction lines Macon to Chamberry and Chalons sur Soane to Lyons.

4. Belfort. On main routes Paris to Basle, via Nancy and Ruhr (via French bank of Rhine) to Lyons.

5. Mulhouse. Junction of lines from Ruhr and Paris to Basle.

Germany 1. Freibourg. On Ruhr via German bank of Rhine. Route to Basle.
Austria

Cutting of 1, 2 and 3 affects traffic north France to Marseilles and Italy via Mont Cenis. Cutting of 4, 5 and 1 affects all traffic from Germany and France to Italy via Basle and Simplon or St. Gothard tunnels.

2. Stuttgart. Possible bottleneck north of city where lines diverge to Karlsruhe and Heilbronn.

3. Ulm. An alternative route from Nuremberg to Innsbruck via Garmisch also Nuremburg-Basle.

4. Augsburg. Rail junction of Nuremburg-Munich and Stuttgart-Munich lines. Possibly both electrified.

5. Munich. On Brenner Pass Route from Ruhr, central and northern Germany. also some traffic from Prague and Pilsen, also on lateral line Stuttgart-Vienna. East of the junctions on west side of city. Several routes electrified., including that to Innsbruck via Garmisch.

Cutting of routes 2, 3 and 4, has indirect effect on Italian traffic through Switzerland from Ruhr and north Germany. Point 5 is ideal point for Brenner Pass traffic from Germany proper and has large marshalling yards.

~~Cutting of Rote No 5~~

6 Innsbruck- both routes from Munich, via here toward Italy via Brenner also lateral line from Tierrasee via Switzerland. see sketch below. Alternative pin point objective to Munich.

Munich via Garmisch

Arlberg and Lateral

7 Braunau-Hitler's birthplace, on Passau-Villach line.

8 Linz- coal mining, iron and steel. Possible pin point junction southeast of town, on the Vienna-Linz line | Linz line from Prague.

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ermany-Austria Continued:

9. Vienna, strategic nodal point for supplies and coal from Silesia and Czechoslovakia. Also link between NW and southern Germany with Hungary and Romania. Facilities for rail yards, as there are many function, marshalling yards and arsenals lined. An obvious target for south and southeast Europe is Vienna-Wiener Neustadt about 20 miles south.

Following targets in Taranto area can be reached from Rome

1. Danube crossings as far south as Belgrade and inclusive

2. High junction of Belgrade-Bulgaria and Belgrade-Greece lines.

Targets within 400 miles of Taranto. All objectives from Rome, Area 1, except Cerignola and Foggia routes plus the following.

1. Belgrade. Important junction lines from Vienna and Budapest to Fiume, Sylasia and Salonika.

2. Belgrade, marshalling yards, main supply route for troops to Bulgaria.

and/or

3. Nish, See above.

4. Nish, See above.

Athens

Ploesti

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MEDITERRANEAN ALLIED AIR FORCES
APO 650,

26 November 1944.

SUBJECT: Sabotage of Enemy Communications in S. Austria

TO : Group Captain Leard

1. On 25 November 1944 Major McKenney of G-3 (Special Ops) AFHQ approached MAAF Target Analysis Section with the idea of coordinating the activities of sabotage parties in Southern Austria with Allied air attacks against enemy communications.

2. Major McKenney pointed out that these parties would shortly be operating in Southern Austria in the Innsbruck-Villach-Klagenfurt area against enemy rail, road, tele-communications and electrical facilities. He suggested that we should provide him with a list of those sections of rail line and roads and the general areas in which sabotage would best tie in with the air attack on communications. He did not want a list of specific targets, as his groups had to attack when and where they could and were better equipped to make a number of small scale demolitions along secluded stretches of rail line or roads, rather than to attack large and important works, which would probably be guarded and be beyond their capabilities of damaging seriously.

3. It is proposed to submit to Major McKenney the following list of railroad sections for attack by sabotage:

a. Innsbruck - Brenner (Brenner route)

b. Innsbruck - Mittenwald (Line to München)

c. Innsbruck - Mittenwald (Line to München)

d. Innsbruck - Landeck (Arlberg line)

e. Villach - St. Veit (This is known as the Tauern line and runs northwest from Villach. Interruptions would be most effective on the southern section between Villach and Spittal.)

f. St. Veit - Mittelfeld (On the Klagenfurt to Vienna line. This St. Veit must not be confused with the St. Veit in Pg. They are two distinct places with the same name.

Any interruptions on these lines will hinder the movement of enemy supplies into Italy and Yugoslavia. The railways in this area are electrified, and the transmission lines and transformer sub-stations would make profitable targets, as well as the rails and roads themselves.

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4. Sabotage should not be discontinued on any rail section because it is being regularly attacked from the air. Sabotage can be particularly valuable in increasing the duration of cuts made by bombing, by delaying the bringing up of repair material and blocking roads which might be used for trans-shipment round the rail cuts.

5. During periods of bad weather, when air action is impossible, any successful sabotage activities on enemy rail communications are of the greatest value. This refers particularly to the Innsbruck-Brenner route.

6. Major McConnay pointed out that if, at a later date, any changes were required in our list of sabotage objectives, such information could be transmitted to the groups in the field through his organisation.

H. P. CLOUGH, F/Lt.
Communications Section
Target Analysis.

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HEADQUARTERS
MEDITERRANEAN ALLIED AIR FORCES
APO 650

D-I-PC-iw

MAAF/3.6665/Int.

29 January 1945

MEMORANDUM

TO : Air Commodore Woolley.

SUBJECT: Trisanna River Viaduct.

1. Ground source reports indicate that the Germans are intending to make greater use of the Arlberg railway line.

2. The Arlberg line runs west from Innsbruck up the valley of the river Inn. It is single track, and after passing through the Arlberg tunnel turns north at Feldkirch and enters southwestern Germany at the eastern end of the Lake of Constance.

3. Attention is drawn to the weak link in this line, the Trisanna river viaduct, also known as the Strengen viaduct (G.S.G.S. 4416, Sheet Z.5. V-33&49). This viaduct consists of an exceptionally long steel lattice girder center span, with two stone arch spans, and five stone arch spans forming the east and west approaches respectively.

Length of center span	396 feet
Total length of viaduct	735 "
Width of viaduct	18 "
Height of viaduct	282 "

4. The viaduct carries the rail line over a deep ravine, and the destruction of the long center span would present a very formidable repair problem. In fact, it is possible that no temporary repair could be effected.

5. Trans-shipment at this point also appears to be impracticable, as the road runs on the opposite side of the stream in the main valley and the line enters a tunnel immediately to the west of the viaduct.

H. P. CLOUGH, F/Lt.,
Communications Section
Target Analysis

Copies to:
15th Air Force
MAAF

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HEADQUARTERS
MEDITERRANEAN ALLIED AIR FORCES
APO 650

D-HIPC-am

15 November 1944

SPECIAL INTELLIGENCE REPORT

AXIS ELECTRIC POWER TARGETS

PART I - General Principles Involved

1. An electric power system in a highly industrialized region may be broken down into two fundamental categories, generation and transmission. An electrical transmission network is essentially similar in principle to a rail network, and calls for a similar approach in the planning of a target pattern. This pattern is analogous to a real interdiction of a rail system. Generating centers, on the other hand, may be likened to rail centers in that they must be evaluated individually in relation to the general network.

2. As in the case of a rail network, so with an electrical network, each region must be considered and evaluated individually, in judging the feasibility of destruction and in assessing the amount of effort required. Certain regions possess too dense a network and too large a number of individual plants to be reduced by any reasonable amount of bombing effort. Others, including several highly important industrial areas of "Greater Germany" appear to be capable of reduction beyond the critical point by attacks on a relatively few targets. These targets are carefully selected and constitute a system designed, first, to isolate the area from outside sources of power, and then, to destroy the principal sources of power within the area so isolated. In many cases, the same target serves as an important local source of power and as a keypoint on the power transmission network.

3. The primary purpose of a power network is to maintain a balance against such factors as peak load and seasonal fluctuation (in the case of hydroelectric plants). In many areas, this balance is extremely delicate and its disruption would have an extremely adverse effect on the industrial, municipal and rail requirements of the region.

4. It is not necessary, nor is it feasible, to destroy all power units, great and small, within the region in question, any more than it is necessary or possible to stop all enemy movement by attacking and cutting his rail lines of communication. The desired results are achieved when the enemy's capability of movement or requirements of power, are reduced below a certain critical point. With respect to any area, whether from the standpoint of power or from that of transport, the exact point at which this will take place cannot be determined beforehand. Often secondary factors, unforeseen in advance, arise to abet the breaking point. It is possible, however, to determine within reasonable limits the zone in which the breaking point may lie and to assess within the same reasonable limits the amount of aerial effort required to accomplish significant results

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PART II - Vulnerability and Recovery of Power Targets:

5. Electric generation plants are generally large, heavily built buildings, the destruction of which would require one or more direct hits by a heavy bomb. Far more vulnerable, however, are the large transformer units, which in many cases are located outside of and close to the power plants. These units are both highly sensitive and highly inflammable. The cutting of only a few wires within the units by bomb fragments has a high possibility of setting up short circuits which would blow out the entire unit (and possible also cause a destructive fire). Transformer units rest permanently in a bath of oil, highly susceptible to fire either from hot bomb splinters or from incendiaries. The use of fragmentation or incendiary bombs would further increase the probability of hits over the probability when heavier bombs are used.

6. Minimum repair time in the event of the total destruction by fire of a transformer unit (a reasonable expectation) is, according to competent authority, about four months, if prefabricated replacements are available.

7. At hydroelectric power plants another feasible target is the water conduit from the reservoir to the power house. The conduits are of considerable size, conspicuous from the air, and highly vulnerable not only to direct hits, but, due to being under heavy internal pressure, also to fragmentation or to near misses. A sudden disruption of the conduits, up-setting the pressure head, is most likely to jam and destroy the turbines. Even without such secondary effects, considerable repair time would be required to repair the conduit itself. There is also a good possibility of flooding the power house as a result of the disruption of the conduits.

PART III - Assessment of Probable Effects in Selected German Areas:

8. Within Germany, certain areas, such as Bavaria and Saxony, have their power requirements already strained by the shift of war industries to these relatively remote sections and away from highly bombed regions like the Ruhr. The winter, moreover, is the critical season from the standpoint of municipal requirements and is also the season in which conversion from electric to steam traction on the railroads would be the least satisfactory. Winter, moreover, is a season of reduced power supply, due to the freeze-up, so far as hydro-thermal generation is concerned. Any serious electric disruption in such areas, accordingly will mean the robbing of one or more of the three categories, industry, rail or municipal, and finally a critical reduction of all three.

9. Since no comprehensive program of attack on an electrical system has previously been carried out in this theatre, it is highly important that all ground sources of information be organized in advance, in order to submit at the earliest possible moment, both specific effect as to target, and above all, the general effect on industry, railroad power, and urban life. This is important not only from the standpoint of the assessment of a current operation, but also from that of the wider application of this type of operation in other theaters, for example, the Japanese home islands. In the respect, this operation would be analogous to "Operation Strangle" in north central Italy, which was currently watched and immediately applied in principle in Normandy, and in Mediterranean France.

10. A specific proposal with selected targets follows below. Of the ten principal targets selected, target material prepared by Air Ministry or MAAF is now available on five. It is of course important, if this present proposal

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should be favorably considered, whether for immediate or for possible future operation, that target material be prepared on the remaining targets.

11. It is, moreover, imperative, once such a proposal is adopted, that the targets be attacked as a system, and that the maximum number of targets in this system be attacked in a minimum span of time. In this respect the targets of a power system must receive the same consistent attention as the targets of a railway system.

PART IV - Isolation and Reduction of Power Facilities in Bavaria

12. The following list of targets comprises the minimum number of targets that would have to be destroyed in order to isolate, and subsequently to reduce below the critical point, the power resources of Bavaria. The critical point is conceded by several authorities to lie between 35 and 50 percent of normal capacity. It is not to be expected, however, that the enemy will "take this operation lying down", but rather that as in the case of attacks on his rail systems, he will resort to various expedients to offset the success of our initial program. Accordingly a primary and a supplementary list of targets is submitted. The primary list should all be attacked as close to simultaneously as weather permits. Some delay is permissible between the operation against the primary system and the supplementary. Targets in connection with the latter might be effected by current intelligence.

Primary List of Targets

13. To isolate the Bavarian Power area from outside connections, the following power targets are recommended:

a. Aschaffenburg transformer and switching station - 48.59N-9.9E.

b. Bamberg transformer and switching station - 49.55N-10.54E.

c. Gerbersdorf power station (Nuremberg) - 49.30N-11.02E.

d. Landshut transformer and switching station - 48.32N-12.09E.

e. Walchensee (Kochel) hydroelectric plant - 47.38N-11.21E.

f. Nabeneak transformer and switching station.

14. To reduce local sources of power within the Bavarian Power System, the following targets are recommended:

a. Niederstetteingen transformer and switching station - 48.32N-10.13E.

b. Meitingen transformer and switching station - 48.33N-10.91E.

c. Karlsfeld (Allach) transformer and switching station - 48.12N-11.28E.

d. Frambach Power Plant.

15. The above primary targets number ten; in addition the following are suggested as supplementary targets to further reduce the power resources if

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this seems necessary to insure significant results:

a. Ulm Power station - 48.14N-9.59E.

b. Munich power station - 48.08N-11.33E.

c. Gersthofen power station - 48.25N-10.52E. (particularly for its effect on industries in Augsburg.)

d. Schwandorf power plant - 49.20N-12.06E. (particularly for its effect on Regensburg)

e. Amberg transformer and switching station (primarily to prevent building of by-pass lines around Amberg and Bamberg) - 50.03N-12.12E.

f. Achensee hydroelectric power plant - 47.25N-11.45E (Primarily for its effect on Tyrolean railway power)

g. Herbertingen power and transformer station - 48.04N-9.26E.

16. A 320 KV high tension line has been projected, running from Waldsee (Kochel) to Ellwangen, thence to Gerberesdorf (near Nuremberg) and northeasterly. A second proposed high tension was to have run from Gerberdorf southeasterly to Regensburg and onward to contact the Austrian power system. It is recommended that photo reconnaissance be laid on to determine the status, if any, of these projects. This could be determined by study of coverage in the vicinity of Ellwangen, Gerberedorf, and Regensburg.

C.O. HAASE
Captain, AC
for
Air Commodore
Chief Intelligence Officer
HQs. RAAF

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Air Tech Intelligence

54

December 4, 1944

I. Study on Munchen Electrical Targets.

In previous notes we have described and studied the electric power system of Germany, especially in the general note "New Study on Electric Power System Targets for Germany (Nov. 1944)". Referring to the description of the electric system in these notes, we intended to give a full set of studies about blockading supplies of energy both for regional and local areas. Since this time we have given studies for the general areas as follows:

(1) General interconnection for South and West Germany.

(2) Ruhr area.

(3) Bayerwerk area.

(4) Saxe-Thuringe area.

(5) Arlberg-Tyrol-Bavarian railroad system.

We are going to do studies about smaller areas, the first one being the Munchen area. (Use the special map attached to this study.) In speaking of the Munchen area we mean a 20-mile circle all around the town.

Munchen Industrial Center

As we do not intend to give a complete list of all the industries in the Munchen area, the following are only the most important. It is said that we have only second-hand information about industry and that we have only careful knowledge as regards the transportation system (railways, roads and waterways) and electric power system.

However, we can say that Munchen is a good secondary center as regards aeronautical and mechanical industries, due to the energy coming from the Alp hydroelectric power stations. Chemical and textile industries are not represented in the Munchen area.

(a) Aeronautical Works

Domier Oberpfaffenhofen - West of Munchen (Cellulose)
Domier Neu-Auburg - West of Munchen
Junkers Albach (Laboratory)
Kraus and Muffei Albach
Bayerische Motowerke A.G. (Munchen) (Motors)
Junker Motorbau Albach (Pieces for motors)
Friedrich Deeker - South of Munchen
Junkers Motorbau - Munchen
Karl Hirth - Munchen
Suddeutsche Bremen A.G. Schleissheim (Motors)
Kabshoff A.G. Mimsberg Special steel
Steinbruck A.G. - Moorsburg - Airdrome tools

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Uher and Gesellshaft fur apparatus - Munchen
Photogrammetire - Munchen
Flugzeubau Bresinger Munchen (Phanema)
Neifa Auto and Mottorad Armaturen (Munchen)

(b) Mechanical Works

Kraus Maffei Lokomotiv Fabrik - Munchen
Freimann A.G. (railway materials)
Bayerische Motorwerke A.G. (cars and moters)
Maffeiwerke - Munchen (tanks)
Arsenal - Munchen (tanks)
Suddeutsche Wagen und Forduanlangen Fabrik (Munchen) - tools

(c) Miscellaneous

Oil tanks in Allach wood (50 tanks probably)

Railways System

As said previously, Munchen is a great center for electric railways, but it has also steam locomotives. All the main lines and some of the secondary lines are electrified.

Main lines - (a) Augsburg for Ulm and Nurnberg
(b) Landshut for Regensburg
(c) Rosenheim for Salzburg and Innsbruck
(d) Murnau for Innsbruck

Secondary Lines - (e) Dachau
(f) Ismaning
(g) Hallguinchwald
(h) Gemering

There is also a most complete tramway system with many suburbs going to Passing, Moosach, Milbertshofen, Freimann, Guinwald, Holzapfelkreuth. This system is not represented on the map.

The railway system is based on a wide and complete buckle with the main center of the Hauptbahnhof, and its annexes chiefly Ostbahnhof. The main workshops both for electrical and steam engines are near the Hauptbahnhof, especially on the north side of the lines. There is also a central workshop southwest of Passing along the steam Gemering line.

Electric Power System

As often said before, electric supplies for general purposes comes

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(1) From local steam power stations: the most important being Isartalstrasse (100 MW), then the old Schwabing (11 MW).

Also local hydroelectric stations (Sudwerk I, II and III) on the Isar River.

(2) From the upper and Isar System, that is to say:

Upper Isar System:

Muhltal - 15 MW - 80 million kwh.
Hollriegelkreutz - 10 MW & 8 MW) By Isartalstrasse and Passing
Pullach - 3 MW) transformer station and emergency by Schwabing

Middle Isar System:

Finsing - 11 MW)
Aufkuchen - 36 MW) By Karlsfeld transformer station
Fittong - 32 MW) 500 million kwh
Prombach - 28 MW)
Oppenbom - (old (5 MW) and New (28 MW) I and II (18 MW)) -- 200 million kwh

(3) From farsway connections:

Walchensee (130 MW-180 million KWH) and Arlberg System (133 MW-374 million kwh) by Karlsfeld Transformer Station.
Kachlet (20 MW-275 million kwh) and Low Austria System by Karlsfeld Transformer Station.
RWE and PEA System (By Karlsfeld Transformer System)
Leitzach-Vagen (26 MW-120 million kwh) power station by Isartalstrasse Transformer Station.

For the special electric railway grid supplies come first from the Middle Isar System by Passing and Munchen Transformer station, by Achensee (and Tyrol) and Walchensee power stations by Passing, and possibly from Stuttgart always by Passing.

Thus the key points are only four and appear immediately:

Isartalstrasse Power Station
Finsing Power Station
Karlsfeld Transformer Station
Passing Transformer Station (electric and general grid).

Isartalstrasse Power Station and Transformer Station destruction cut all supplies from

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Isarwalstrasse itself	-	100 MW
Sudwerk I	-	3 MW
Pullach	-	3 MW
Muhltal	-	15 MW
Hollriegelskreuts	-	18 MW
Leitzach	-	26 MW
		165 MW

Finsing Power Station and Transfer Station destruction cut all supplies from:

Fromabach	-	28 MW
Fitting	-	32 MW
Aufkirchen	-	36 MW
Finsing	-	11 MW
		107 MW

Karlsfeld Transformer Station destruction cut all supplies from:

Uppenborn	-	51 MW
Kachlet and Austrian System	-	100 MW
Walchensee and Arlberg Systems	-	263 MW
Preussisches E.A.G. and Rhein Westfalisches A.G.	-	200 MW
		614 MW

Passing Transformer Station destruction cut no new supplies but all emergency by-pass possibilities. There remain only supplies from:

Schwabing	-	11 MW
Sudwerk II and III	-	5 MW
		16 MW

That is to say, of the whole supply possibilities 902 MW, there remain only 16; there still remains a feeble connection with Uppenborn by Schwabing.

The above data are given both for general purposes and electric railway grid, but it is to be noted that for electric railways, all supplies are cut (Middle Isar by Finsing and Passing)-(Walchensee and Augsburg by Passing).

Of course, if we make a choice of a fifth target, it will be Schwabing; it is not a key point, but if the four primary targets are destroyed, it is the only emergency supply and so it may also be destroyed.

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9

NEW STUDY ON ELECTRIC POWER SYSTEM TARGETS FOR GERMANY

Blockading the Arlberg-Tyrol-Bavarian Railroad System

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SECOND PART: ELECTRIC POWER SYSTEM TARGETS

In this present study we intend to develop and explain the choice of targets proposed in a previous note referring to the blockading of the Arlberg-Tyrol-Bavarian railroad system (November 1944).

We intend also to develop part of another study about war against the whole German electric power system (September 1944). In order to have in one paper only the complete description of the area chosen as an application of the general intelligence of this note, we will put together everything which had been said in other notes (in French language).

Railroad system between Bavarian-Tyrol-Venetia (August 1943)
Electric power system of South and West Germany (October 1943)

We will begin by a short explanation about the whole electric power system of Germany, then we will describe the connection system for South and West Germany, then a full description of the Bavarian Electric System (Bayernwerk) and the special railroad electric system in the same area.

After these descriptions we will explain the choice of the sets of targets previously proposed:

Targets referring to Bavarian railroad system (November 1944).

I. German Electric Power System.

At first Germany, which is very rich in coal and lignite, and poor as regards hydroelectric power before Tchecoslovaquia conquest, was conducted to develop chiefly steam electric stations.

But since 1936 and moreover 1939, great development has been given to hydroelectric plants in Tyrol and Sudets; this development is always in full work; similarly, lignite electric power has been developed in central area (Saxe Thuringe).

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So in 1940 the production of electricity for Germany (Austria and Bohemia together) was chiefly from steam electric stations.

Steam electric stations (coal)	40%
Steam electric stations (lignite)	30%
Hydroelectric stations	20%

The total amount of Kwh increased since 1932; it was

50 billions of Kwh in 1937
60 billions of Kwh in 1938

probably now of 75 billions of Kwh, according to new hydroelectric stations but also to bombardment destructions.

Germany was and still is after U.S.A. second in the world for electric power.

This production is used chiefly for industrial purposes.

Industry	84%
Railroad	4.5%
Light, agriculture, etc.	8%
Miscellaneous and losses	3.5%

Geographical Location of Power

Central Germany produces almost 50% of the whole country (Brandeburg, Saxe, Thuringe, Anhalt). There were in 1938, 138 steam electric stations.

Ruhr and Rhenanie	30	(coal chiefly)
Sarre, Palatinat, South Hesse	12	
Bade and Wurtemberg	10	
Bavaria	5	
Saxe and Thuringe	27	(lignite chiefly)
Hanovre, Oldenburg, Hesse-Hanau	11	
Brandebourg and Berliner Area	26	
Austria	3	
Tchecoslovaquia (Boheme and Moravie)	14	

As regards production:

Ruhr and Rhenanie	37.8%	of the total steam electric production
Saxe and Thuringe	26.6%	
Brandeburg and Berlin	15.1%	

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(These data were exact in 1938; probably in 1944 the proportion for Saxe and Thuringe is equal to that of Ruhr and Rhenanie, which decreases according to bombardments.)

The most important steam electric stations are as follows:

Ruhr and Rhenanie	Gerstein-Stockum	120,000 Kw
	Hattingen	120,000
	Goldenberg	400,000
	Fortuna II	110,000
Saxe-Thuringe	Trattendorf	130,000
	Lauta	
Brandeburg and Berlin	Bohlen	128,000
	Golpa-Zschornewitz	400,000
	Finkenheerd	176,000
	Klingenberg	270,000
	Charlottenburg	104,000
	Berlin West	224,000
	Neuhof	170,000
	Simmering	160,000

Austria

For hydroelectric power they are chiefly along the Alps, except for special accumulations of electric plants by pumping in the central area. There are 95 main hydroelectric power stations (1938):

Ruhr and Rhenanie	6
Sarre, Palatinat, South Hesse	2
Bade Wurtemberg	25
Bavaria	16
Saxe and Thuringe	4
Hanovre-Oldenburg-Hesse-Nassau	5
Brandeburg Berlin	1
Austria	32
Tchecoslovaquia (Boheme Moravie)	4

The most important hydroelectric stations are as follows:

Ruhr and Rhenanie	Herdecke	140,000 Kw (Accumulation)
Bade and Wurtemberg	Albruck-Dogern	71,000 Kw
	Laufenburg	82,000
	Ryburg-Schworstadt	119,000
	Hausern	120,000

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Bavaria	Walchensee	130,000 Kw
	Toging	88,000
Saxe and Thuringe	Niederwartha	75,000 (accumulation)
Hanovre-Oldenburg-Hesse-Nassau	Waldeck	120,000 (accumulation)
Brandeburg-Berlin	Bober (or Deichow)	65,000
Austria	Vermunt	90,000
	Achensee	90,000

According to such data, the data for dams are as follows:

		Total Capacity in Millions of M³
Ruhr and Rhenanie	9	345.
Sarre-Palatinat-South Hesse	5	28.8
Bade Wurtemberg	3	124.
Bavaria	7	117.1
Saxe Thuringe	10	486.6
Hanovre-Oldenburg-Hesse-Nassau	7	283.8
Brandeburg-Berlin	2	6.4
Austria	16	170.3
Tchecoslovaquie	2	171.

The most important are:

Ruhr	Sorpe (Ruhr River)
	Mohne (Rifel River)
	Schlammenauel (Bever River)
Bade	Schluchsee
Bavaria	Walchensee
	Finsing
Thuringe	Bleiloch
	Hohenwarte
Hesse	Eder
	Diemel
	Sose
	Oder
Austria	Lunersee
	Achensee
	Tauernmoss
Western Moravia	Frain

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As regards electric nets, we can say that Germany is fully interconnected. A good example shall be studied for South and West Germany. The main transformer stations are as follows:

Ruhr and Rhenanie	Brauweiler (or Goldenberg), the most important in the world
Palatinat and South Hesse	Rheinau
	Kelsterbach
	Coblence
Bade and Wurtemberg	Tiengen
	Herbertingen
	Hohenseck
Bavaria	Méitingen
	Karlsfeld
	Regensburg
Saxe and Thuringe	Niederwartha
	Bohlen
	Golpa-Zschornewitz
	Gross-Kayna
	Bleiloch
	Breitungen
Hanovre-Oldenburg-Hesse-Nassau	Lehrte
	Bocken
	Bielefeld
	Ibbenburen
Brandeburg and Berlin	Finkenheerd
	Strausberg
	Finow
	Hennigsdorf
	Spandau
	Friedrichsfelde
	Rummelsburg
	Wibdau
	Magdeburg
	Forderstedt
	Nachterstedt
	Harbke
Austria	Burs I
	Burs II
	Willem
	Murzzuschbag
	Gratz-Nord
	Wegscheid
	St.Polten
	Creslen
	Wien-North
	Wien-South

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Bohemia and Moravia — Dluhomitz
Prague

NOTE: In a previous note (September 1944), we have given three complete maps of electric power systems for the following areas:

Ruhr and Rhenania
Bavaria
Saxe and Thuringe

II. Interconnection for South and West Germany.

The electric net studied covers the following area:

Rhenania
Southwest of Westphalie
Sarre
Palatinat
Hesse
Bade and Wurtemberg
Tyrol

Four provincial nets:

N.E. Preussische Elektrizitats A.G. (For Hesse and Brunswick)
N.W. Rheinische-Westfalisches Elektrizitatswerk (Rhenanie, Ruhr and Westphalie)
S.W. Badenwerk A.G. (Bade and Wurtemberg)
S.E. Bayernwerk.

These four nets are close together and powerfully connected and make one great net, the north side being exclusively on steam electric power with great accumulation of hydroelectric power, the south side being on hydroelectric station all along Rhin Valley and the Alp without accumulation.

A special powerful electric line of 380,000/220,000 volts connects north and south. The signification of such a line is connection and stabilization of production and consummation in the whole area.

Each Kwh produced in hydroelectric stations along the Rhine Valley or the Alps has its place in North Industry, and owing to this interconnection, steam electric stations are working very constantly and easily.

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We described the way of regulation of each of the four provincial nets and the meaning of the main electric line.

Bayernwerk and Reichbahnnetz

Bayernwerk net is realized by 110,000 volt lines connecting power plants and the other nets.

For regulation of Bayernwerk, it is specified that part of the hydroelectric station of Walchensee and three of Middle Isar hydroelectric stations as specialized. Control for frequency is located on charge distributor at Karlsfeld transformer station.

Bayernwerk is connected fully with Preussische Elecktrizitats A.G. (P.E.A.), with Badenwerk, with Rheinisch-Westfalisches Elektrizitatswerk A.G. (R.W.E.), and with Tyrol. Also with Central Germany by a line on Dresde, and Lower Austria nets by a line connecting [illegible] hydroelectric stations.

Interconnection with P.E.A. is at Aschaffenburg I transformer station; interconnection with R.W.E. at Aschaffenburg II transformer station.

Interconnection with Badenwerk is at Oberturkheim transformer station, with Tyrol at Wilten. (For location, see Map No. 2).)

Special notice for the interconnection with the Reichbahnnetz: It is well known, first, that the Bavarian railroad electric system is single phase 16.6 periods, 15,000 volts, the general electric system being three phases, 50 periods. It is said also that the Italian railroad system for the Brenner line is three phases 16.6 periods, 3,700 volts.

So there are no connections between Italian and Bavarian Tyrol special railroad electric nets; at the Brenner Pass there was in 1940 a complete change, and triangle for turning of locomotives.

Connection between Bayernwerk and Reichbahnnetz is made at Pfrombach hydroelectric station by a "convertisseur à glissement" (sliding rotating transformer). This special transformer is used on both sides; that is to say, on one side as a frequency stabilizator for railroad system, and in order to furnish from Bayernwerk what needs the railway requires during the most important hours of traffic; on the other side, Reichbahnnetz may furnish to Bayernwerk.

Both these two systems will be studied in detail.

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Badenwerk

This net is contributed by 110 Kv lines coming from Black Wood and Upper Rhine and going to the Mannheim-Karlsruhe area.

Specialized for regulation are the following hydroelectric stations:

Schluhsee (North of Waldshut)
Ryburg Schworstadt (on the Rhine)
Murg Schwarzenbach (near Forbach)

This net is connected, as previously said, with Bayernwerk at OberturReim transformer station. Interconnection with R.W.E. is at Rheinau transformer station.

It has also some connections with the Suisse system by way of some of the Upper Rhine hydroelectric stations.

First at Eglisau, which produces at 150 Kv for Suisse and at 50 Kv by Schaffouse for Singen (Badenwerk).

Secondly. Klingnau (Aar River) and Albruck Doggern (Rhin) are connected with R.W.E. 220 Kv line and 150 Kv Suisse line.

Laufenburg and Ryburg-Schworstadt are connected with Badenwerk and Suisse system.

Then Ahgst Whylen also.

There were connections by the French hydroelectric station of Kembs (now destroyed) with the French electric system, also by means of a 70 Kv line between Ile Napoleon (near Muhlhouse) and Neurnburg, Rheinweiler, and also 100 Kv line between Offenburg and the Strasbourg Harbcure steam electric station.

Preussische Elecktrizitats A.G.

This system is contributed by 220 Kv and 110 Kv lines connecting steam electric stations like Brunschwig and accumulation hydroelectric stations like Waldeck and ordinarily hydroelectric stations like Bohlen.

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Bohlen and Waldeck are in charge of regulation for the whole P.E.A. system.

Interconnection with Bayernwerk is at Aschaffenburg II transformer station, with R.W.E. at Lehrte by a 220 Kv line between Bielefeld and Lehrte with Brandeburg and Berlin area system by 220 Kv line at Harbke.

Reinische-Westfalische E.A.G.

One of the most powerful electric systems of the world.

In the beginning there were only steam electric stations in the Ruhr area, then this system was obliged to look for hydrauiic supplies coming from the south. These supplies were provided both by connections with other systems and new constructions along the Rhine Valley or the Alps Valley.

Then R.W.E. realized a powerful line 380/220 Kv from Vermunt in Voralberg to Paderborn north of the Ruhr.

The whole system is regulated first by the steam electric station of Goldenberg, secondly by the accumulation hydroelectric station of Herdecke, them part of the hydroelectric station of Schluhsee and the whole hydroelectric station of Vermunt.

The 380/220 Kv line between Vermunt and Braunweiler.

(1) This line begins at Burs I; at this point comes the line from Vermunt.

(2) The line continues to Herbertingen, where another 220 Kv line comes from Upper Rhine, Suisse System, and Schluchsee.

(3) Then at Hoheneck, S.W. of Stuttgart, where there are connections with Badenwerk and by Oberturkein transformer station with Bayernwerk.

(4) Then at Rheinau near Mannheim with Badenwerk and Suisse and French system through Badenwerk.

(5) Then at Kostelbach near Frankfort with Badenwerk and PEA by Aschaffenburg I and Aschaffenburg II (also Bayernwerk).

(6) Then at Koblenz Junction with Trier line (120 Kv).

(7) Finally at Braunweiler, near Goldenberg, powerful steam electric stations; this most important transformer station is the greatest in the world, 1,000,000 KVA, center of ten important lines. KEY POINT OF THE RUHR.

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III. Detailed description of Bayernwerk and Reichbahnnets.

Reference to Map No. 2 of the general note about electric power (September 1944).

The Bayernwerk is chiefly provided by hydroelectric stations belonging to itself. It is also supplied from Tyrol by two-thirds of the energy produced by Achensee (70,000 KW) and Borsdemau (10,000 Kw); that is to say, 80 millions and 45 millions annually KWH. It also receives energy from hydroelectric stations of Untereichen and Au on Iller River (60 millions annually KWH) and little hydroelectric stations on Main River between Wursburg and Aschaffenburg (Obernau, Kleinwallerstadt, Klingenberg, Grosshenbach, Frendenberg) for 102 millions annually KWH.

With Reichbahnnets by Pfrombach exchanges and supplies about 250 millions annually KWH.

The total amount of production is about 5 billions of KWH (8.5% of German total production)). (Data of 1938).

It is known that since the beginning of the war German endeavor to construct in the Alps and Tyrol new hydroelectric station. Location and specification may be easily known both by ordinary intelligence service and by photography cover.

We give now a most complete list of main electric stations, dams and transformer stations. This list will be followed by special notice on the most important electric stations.

(a) Steam electric stations.

Arzberg	100 Km NE of Nurnberg	Point station for Northern Bavaria.
Gebersdorf	20 Km SE of Nurnberg	Reserve station for Nurnberg
Schwandorf (or) Else	49° 10' 12° 05' 30 Km N of Regensburg	550,000 KW 180,000,000 KWH/220 millions KWH for whole Bayernwerk
Gersthofen	48° 25' 10° 55' 10 Km E Augsburg	Reserve station for Augsburg and Sonabe
Isartalstrasse	48° 10' 11° 25' München	Reserve station for München

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(b) Hydroelectric Stations.

Walchensee	47° 35' 11° 20' Between Walchensee and Kochelsee on Isar River - 60 Km S Munchen	130,000 KW 180,000,000 KWH Point station for Bayernwerk and Reichsbahnnetz
Muhltal	48° 00' 11° 50' On Isar River - 15 Km SW Munchen	13,000 KW 80,000,000 KWH SW of Bayernwerk
Pinsing	48° 12' 11° 50' On Isar River - 25 Km NE Munchen	14,200 KW 62,000,000 KWH Reichbahnnetz
Aufkirchen	48° 19' 11° 52' Isar River - 40Km NE Munchen	24,000 KW 150,000,000 KWH Reichbahnnetz
Eitting	48° 22' 11° 53' Isar River - 45 Km NE Munchen	24,000 KW 142,000,000 KWH Reichbahnnetz
Pfrombach	48° 26' 12° 00' Isar River - 60 Km NE Munchen	23,800 Kw 140,000,000 KWH Reichbahnnetz
Uppenborn I or Eching	48° 30' 12° 00' Moosburg, Isar River - 60 Km NE Munchen	27,500 Kw 110,000,000 Kwh for Munchen
Gersthofen	48° 25' 10° 55' Lech River - 10 Km E Augsburg	8,000 Kw 50,000,000 Kwh for Augsburg and Sonabe
Meitingen	48° 30' 10° 55' Lech River - 20 Km NE Augsburg	12,500 Kw 70,000,000 KWH for Augsburg and Sonabe
Kachlet	48° 30' 13° 20' Donau - near Passau	46,000 Kw 220,000,000 KWH for Nurnberg and Eastern Bayernwerk
Leitzach or Vagen	47° 50' 11° 55' Leitzach River 30SE of & Mangfull River Munchen	26,000 Kw 120,000,000 Kwh Point station for Munchen

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Saalach	47° 44' Bad Reichenhall Saalach River	12° 54'	6,500 Kw 40,000,000 Kwh Reichbahnnetz and chemical plants
Toging	48° 15' Muhldorf On Inn River	12° 35' 60 Km E. of Munchen	88,000 Kw 540,000,000 Kwh for aluminum plant of Toging and carbon plant.
Tacherting	47° 55' Alz River	12° 40' 70 Km E of Munchen	8,500 Kw 55,000,000 Kwh Azote plants and carbide calcium plants
Margarethenberg or Carowerk	48° 00' Histen-Alz River	12° 40' 70 Km E of Munchen	12,000 Kw 110,000,000 KWH Carbide calcium plants
Holzfeld	48° 05' Salzach and Alz Rivers	12° 50' 80 Km E of Munchen	37,000 Kw 215,000,000 Kwh Carbide calcium plants
(3) Dams.			
Walchensee	47° 35' Walchensee	11° 20' Uppeg Isar 50 Kms of Munchen	78,000,000 M³ for Walchenseewerk
Pinsing	48° 15' Middle Isar	11° 52' 20 Km NE of Munchen	27,400,000 M³ for Pinsing, Aufrischen, Bitting and Pfrombach Stations
Upperborn	48° 30' Middle Isar	12° 00' 50 Km NE of Munchen	3,000,000 M³ Stabilizating basin for Middle Isar stations used also by Upperborn I
Seehammersee	47h 48' Leitzach	11° 37' 30 Km SE of Munchen	5,000,000 M³ for Leitzachwerk
Vagen	47° 50' Leitzach	11° 58' 30 Km SE of Munchen	1,300,000 M³ Stabilizating basin for Leitzachwerk

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Saalach	47° 28' Saalach	12° 55' near Bad Reichenhall	1,000,000 M³ for Saalachwerk
Hollenstein	48° 15' Viechtach	16° 13' 50 Km N of Passau	1,400,000 M³ for Hollensteinwerk (3,000 Kw) and Straubing

(4) Transformer Stations.

Aschaffenburg II and I	49° 59' 30 Km SE of Frankfurt	9° 9'	220 Kv/110Kv Ruhr, Westphalie, West Germany and Bayernwerk
Wurzburg	49° 45'	9° 56'	110 Kv Connection (1) Nuremberg-Wurzburg-Dettingen (2) Bamberg-Main Station Wurzburg
Bamberg	49° 54'	10° 54'	110 Kv (1) Nurnberg-Main Station-Bamberg (2) Wurzburg-Bamberg (3) Kuhnbach Station-Bamberg
Erlanger	49° 36' near Erlabuinn	11° 00'	110 Kv/15 Kv for Northern Bayernwerk
Nuremberg	49° 28'	11° 00'	110 Kv (1) Meitingen-Nurnberg (2) Amberg-Nurnberg (3) Bamberg-Nurnberg (4) Dettingen-Aschaffenburg-Nurnberg
Amberg	49° 46'	11° 52'	110 Kv (1) Hof Arsberg-Amberg (2) Nurnberg-Amberg (3) Regensburg-Amberg
Regensburg	48° 58'	12° 10'	110 Kv (1) Amberg-Schwandorf-Regensburg (2) Kachlet-Regensburg (3) Munchen-Ffrombach-Regensburg

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Meitingen	48° 30'	10° 55'	110 Kv (1) München-Meitingen-Stuttgart-Hoheneck (220 Kv) (2) München-Meitingen-Ellwangen-Hoheneck (3) Nurnberg-Meitingen (4) Gersthofen-Meitingen
	20 Km NE Augsburg		
Karlsfeld	48° 12'	11° 27'	110 Kv/60Kv from Middle and Upper Isar, for Meitingen and München
	15 Km NO	München	
Landshut	48° 34'	12° 10'	110 Kv/60 Kv (1) Middle Isar (2) München-Landshut-Regensburg
	60 Km NE	München	
Pfrombach	48° 25'	12° 00'	110 Kv 50 V 110 Kv 16.6 V Connection between Bayernwerk and Reichbahnnetz
	60 Km NE	München	
Passing	48° 10'	11° 27'	110 Kv/15 Kv for Reichbahnnetz
	5 Km W München		
München East	48° 7'	11° 37'	110 Kv/15 Kv For Reichbahnnetz
	5 Km E München		
Augsburg	48° 22'	10° 56'	Mobile substation 110 KW/15 KW for Reichbahnnetz München-Stuttgart Line
Gronhart	49° 00'	10° 56'	110 Kv/15 Kv Reichbahnnetz Augsburg-Nurnberg Line
	40 Km S Nurnberg		
Landshut	48° 34'	12° 10'	110 Kv/15 Kv Reichbahnnetz München-Regensburg Line
	60 Km NE München		
Murnau	47° 42'		110 Kv/15 Kv Reichbahnnetz München-Garmisch-Innsbruck Line
	50 Km SW München		

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Rosenheim	47° 52' 40 Km Se	12° 7' Munchen	110 Kv/15 Kv Reichbahnnetz Munchen-Rosenheim-Innsbruck Line
Traustein	47° 52' 30 Km W Salzburg	12° 39'	110 Kv/15 Kv Reichbahnnetz Rosenheim-Berchtesgaden Line Rosenheim-Salsberg Line

Note 1. On the General Map No. 2 of this present study, which is a most complete one, that Map No. 2 joined to a previous note (September 1944), Bayernwerk nets (hydroelectric stations and transformer stations are in black), Reichbahn nets, special hydroelectric stations, transformer stations are in red.

Note 2. It is now fully evident that Bayernwerk system and electric Reichbahn system are two separate things with only one point of exchange Pfrombach transformer station, and also that there are no connections between Bavarian and Tyrol electric net railroad system and Italian electric net railroad system.

IV. Detailed Description of Tyrol Electric System.

Austria is provided chiefly by means of hydroelectric stations (85% of the whole production). This electric system was very early constructed for railways.

There are four separate nets: (1) Voralberg; (2) Tyrol for one side; (3) High and low Austria and Styrie for the other side; and (4) the Austrian railroad electric system. It has been spoken of as the Voralberg net, since it is the south end of the RBE system, the 380/220 Kv lines. This country, which is a very poor one, has no local consummation. Also for the Tyrol system, which is connected directly with Bayernwerk by a 110 Kv line (Bosdornau-Achensee-Walchensee-Munchen, and 30/60 Kv lines coming from Reutte.

We do not speak here of the High and Low Austria nets, which are not connected with the Tyrol and Arlberg systems.

The Austrian railroad electric system is completely isolated from the first; like the Bavarian railroad, it is single phase 16,6 periods 15,000 volts. A single 55 Kv line connects the power station and transformer station from Voralberg Tyrol to Salzburg and Tsuern lines with a close connection with the Bavarian railroad system at Achensee electric power station and Hall transformer station. It has been said before there are no connections with the Italian railroad electric system.

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NOTE: Maybe since 1942 German endeavored to help the Italian side of the Brenner Line by Austrian energy. Skillful study of photography covers of the Brenner Pass is sufficient to know exactly if such a thing was realized.

We now give the data for power stations, dams and transformer stations for Vorarlberg, Tyrol and Austrian railroad system only:

(1) Hydroelectric power stations.
(No steam electric power stations in this area)

Vorarlberg			
Vermunt	46° 58' Parthenen, Ill River (Verminethal)	10° 04' 30 Km S.E. of Bludenz	90,000 Kw 140,000,000 Kwh for RWE
Andelsbuch	47° 08' Ach River	13° 03' 15 Km E. Bludenz	18,000 Kw 25,000,000 Kwh for Vorarlberg
Gempadels I and II	47° -4' Ill River	9° 57' 10 Km SE Bludenz	(?) 14,500 Kw for Vorarlberg
Tyrol			
Bosdornau (or Zillerthalwerk)	47° 25' Mayshofen in Zillertal Valley	11° 46' 30 Km S.E. Innsbruck	20,000 Kw 100,000,000 Kwh for Tyrol
Sill	47° 02' Sill River	11° 31' 10 Km S. Innsbruck	18,000 Kw 70,000,000 Kwh for Innsbruck
Wiesberg	47° 08	10° 30'	19,000 Kw 43,000,000 Kwh
Reutte	47° 29'	10° 45' 50 Km N.W. Innsbruck	5,000 Kw 25,000,000 Kwh for Southern Bavaria
Deutsch-Matrei	47° 15' Sill River	10° 30' 15 Km S. Innsbruck	5,000 Kw 34,000,000 Kwh for Tyrol and chemical industry

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Salzburg				
	Lend	47° 09'	13° 4' 60 Km S.Salzburg	20,000 Kw 65,000,000 Kwh for aluminum industry
	Baren	Fusch River	80 Km S.Salzburg	8,000 Kw 45,000,000 Kwh for Salzburg
	Strubklamm	Almbach	15 Km S.E.Salzburg	8,000 Kw 24,000,000 Kwh Point station for Salzburg and Bayernwerk
	Taxenbach	47o 27' Taxenbach	12° 57' 40 Km S.Salzburg	6,000 Kw 35,000,000 Kwh Aluminum industry
	Wiestal	47° 40' Almbach	13° 10' 15 Km S.E.Salzburg	8,000 Kw 25,000,000 Kw for Salzburg and Bayernwerk
Austrian Railroad System				
Voralberg	Spullersee	47° 08' Danofen on Alfenz River	13° 03' 15 Km E. of Bludenz	18,000 Kw 25,000,000 Kwh
Tyrol	Achensee	47° 27' Jenbach	11° 40' 30 Km E of Innsbruck	90,000 Kw 169,000,000 Kwh
	Ruetz	47° 06' Ruetzbach	11° 15' 10 Km E of Innsbruck	12,000 Kw 39,000,000 Kwh
Salzburg	Stubach	47° 15' Stubach	12° 34' 80 Km S.W. of Salzburg	24,000 Kw 44,000,000 Kwh
High Austria	Steeg	47° 35'	13° 41' 50 Km E of Salzburg	10,000 Kw 50,000,000 Kwh
Carintnie	Mallnitz	46° 59'	13° 10' 15 Km N of Spittal	12,000 Kw 50,000,000 Kwh

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(2) Dams.

Voralberg	Vermunt	46° 55' Ill River	10° 05' 30 Km S.E. Bludenz	5,400,000 M³ for Vermunt P.S.
	Lake Lüner	47° 05' Alvier	9° 45' 10 Km S of Bludenz	40,000,000 M³ In 1939 prepared for Lunerseewerk (90,000 Kw) not finished
	Lake Spüller	47° 12' Alfrenz	9° 59' 20 Km E of Bludenz	12,000,000 M³ for Spullersee P.S.
Tyrol	Lake Achen	47° 27' Lake Achen	11° 40' 30 Km N.E. of Innsbruck	36,000,000 M³ for Achensee P.S.
	Lake Plan	Lake Plan	50 Km N.W.of Innsbruck	15,400,000 M³ in 1939 for a new power station
Salzburg	Tauernmoos	47° 5' Stubach	13° 10' 0° S.E.of Salzburg	22,000,000 M³ for Stubach P.S.
	Strubklamm	47° 38' Almbach	13° 05' 15° S.E.of Salzburg	2,500,000 M³ for Strubklamm P.S.
	Wiestal	47° 40' Almbach	13° 10' 15° S.E.of Salzburg	8,500,000 M³ for Wiestal P.S.
High Austria	Gosanschnied	47° 35'	13° 42' 50 Km S.E.of Salzburg	3,000,000 M³ for Steeg P.S.

(3) Transformer Stations.
(a) For General Electric System

Burs I	47° 06' Burs	9° 47' 5 Km S.W.of Bludenz	380 Kv/220 Kv RMS
Burs II	47° 10'	9° 48' 1.5 Km N.E. of Burs I	110 Kv (1) Vermunt-Campadels Burs (2) Burs I - Burs II (3) Bregenz-Feldkirch-Burs

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Wilten	47° 20'	11° 25' N.E. of Innsbruck	115 Kv/125 V-V/25 Kv (1) Bosdornau-Achensee-Wilten (2) Munchen-Wilten (3) Hall-Innsbruck-Tefla and Infeld

(b) For Austrian Railroad Only

Feldkirch	47° 15'	9° 38'	55 Kv/15 Kv Electric line coming from Spullersee
Warl or Dalaofen	47° 09'	10° 03' 90 Km E of Bludenz	55 Kv/15 Kv Electric line coming from Spullersee
Flirsch	47° 08'	10° 25' 40 Km E of Bludenz	Arlberg Railroad Line
Zoppen	47° 14'	10° 49' 40 Km W of Innsbruck	
Zirl	47° 20'	11° 17' 15 Km W of Innsbruck	
Matrei	47° 15'	11° 26' 20 Km S of Innsbruck	Electric line from Huetz P.S. for Brenner R.R.Line
Hall in Tyrol	47° 21'	11° 30' 10 Km E of Innsbruck	Electric line from Huetz P.S. For Innsbruck-Worgl Railroad Line
Worgl	47° 27'	12° 05' 60 Km E of Innsbruck	For Innsbruck Salzburg Railroad Line
Kitzbuhel	47° 28'	12° 24'	Electric line from Stubach For Worgl Salsburg Railroad Line

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Saalfelden	47° 27'	12° 50' 50 Km S.W. of Salzburg	Electric line from Stubach for Worgl-Salzburg R.R. Line
Schwarzbad-St.Veit	47° 21'	13° 09' 60 Km S. of Salzburg	Electric line from Mallnitz for Worgl Salzburg R.R. Line
Golling-Abtenau	47° 36'	13° 12' 30 Km S. of Salzburg	For Worgl-Salzburg R.R.Line
Mallnitz	47° 00'	13° 11'	Electric line from Mallnitz for Tauern R.R.Line

Choice of Targets

In a note (September-October 1943) studying the whole interconnection for Southern and Western Germany we proposed the following targets:

(1) Braunweiler transformer station.
(2) Kestelbach and Herbertingen transformer stations.
(3) Koblenz, Hoheneck, Rheinau, Aschaffenburg I and II Oberturkeim, transformer stations.
(4) Herdecke regulation electric power station.
(5) Goldenbergwerk steam power station, Waldeck regulation hydroelectric power station, Walchensee hydroelectric power station, Vermunt hydroelectric power station.

Targets underlined are those which are of special interest for the special area studied; that is, Bayernwerk.

In a note (September 1944) studying the principles of war against electric power in Germany, we selected the following targets for one of three areas studied.

Southern Bavaria
Hoheneck - Niederstetten-Weitingen
Karlsfeld-Landshut transformer stations
Walchensee and Pfrombach electric power stations

In a note (September-November 1944) studying the blockading of the Arlberg Tyrol Bavarian railroad system, we selected the following targets:

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Tauern Line - Mallnitzbach electric power station
Schwarzbad St.Veit transformer station

Arlberg Line - Spullersee, Stubach, Achensee electric power station
Zirl, Hall transformer station

Brenner Line (Austrian Side) - Matrei transformer station

Bavarian System- Walchensee and Pfrombach power station
Landshut-Rosenheim-Gronhart-Augsburg
Passing transformer station

Explanation of the Choice as Regards Railroad System

It is said first that for the railroad the electric targets can be used alone or together with the bridge and junction set of targets (first part of the study about Arlberg-Tyrol Bavarian railroad system).

Used alone all electric traffic is cut, and, as it has been said very often before, traffic decreases in a very heavy proportion, especially for mountain lines. Together with the other set of targets which intelligence is to cut into separate pieces the whole system, it is a complete stop inside each piece.

For the Bavarian system the main production centers are Walchensee, Middle Isar (by Pfrombach), and the whole Bayernwerk system (always by Pfrombach).

Destroying Walchensee and Pfrombach power stations, and for the last also the transformer station, we cut all supplies of energy.

Further, if Hoheneck and Oberturkeim transformer stations are cut, there is no longer help for the Bayernwerk coming from RVE and PEA.

If we cut Landshut transformer station, it is a second and double cut for Munchen-Regensburg Railroad Line.

The same for Rosenheim transformer station, as regards Munchen, Rosenheim, Worgl, Innsbruck railroad line, and also Rosenheim-Traunstein-Bergstengaden railroad line.

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The same for Gronhart transformer station as regards Munchen, Nurnberg Railroad Line.

The same for Augsburg transformer station as regards Munchen-Stuttgart Railroad Line.

The same for Passing transformer station as regards Munchen-Garmisth Innsbruck Line.

For Tyrol-Arlberg railroad system, all supplies from the north is cut by Walchensee.

Then destroying Spullersee, Achensee and Stubach power stations, all local supplies are destroyed.

A double cut is obtained by bombing Zirl transformer station as regards Innsbruck-Voralberg Railroad Line, and Hall transformer station as regards Innsbruck-Worgl-Rosenheim and Salsburg Railroad Lines.

For Brenner Line (Austrian side), it is sufficient to cut Matrei transformer station, no supplies from the Italian side, and from the other side because of Hall transformer station cutting.

For the Tauern Line, destroying the Wallnitzbach power station is not sufficient and we are obliged to destroy also the Schwazbad-St.-Veit transformer station. It has been said that for the Austrian railroads, there are two other secondary targets, Fuetz and Stubach power stations which complete the set of the five local power stations for all this area.

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Austria Austria

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25 February 1945

SUBJECT OF M. CHARRINGTON'S STUDIES OF ELECTRICAL PYLONS WITHIN MAAF RANGE

These reports are principally concerned with the selection of targets which serve certain railway systems of Austria and Bavaria and the Munich area. The purpose of these reports is with a view to the feasibility of denying the use of electrical traction to any of the rail lines in the aforementioned areas. This has been approached from the study of both the electrical generating stations and transformer stations, and the number of targets in any specific operation would usually vary according to the size of the particular rail network, the area in question and the desired result. Exceptions to this from the standpoint of area might be cities.

In Austria, particular attention has been devoted to the Arlberg line which runs laterally through Innsbruck.

It is held that, with the destruction of five generating plants and three transformer stations which service Austrian railways having been accomplished, all electric traction on the Arlberg line must cease. These targets are listed below.

Generating Stations	Transformer Stations
Spullersee	Zirl
Walchensee	Hall
Achensee	
Stubach	
Rueta	

With the additional destruction of the Matrei transformer unit, the Austrian Brenner would be without electrical power, as the Cardano power station on the Italian Brenner is south of Matrei.

In addition, the use of the Tauern line is reduced to steam by the knocking out of the Mallnitzbach power station and the Schwabad-St. Veit transformer station.

A second study purported to isolate the Bavarian power area contains two power stations and four transformer switching stations as targets. It might be noted that this particular project is broad in scope and would demand considerable effort.

Generating Stations	Transformer Stations
Walchensee	Aschaffenburg
Garbersdorf	Hamburg
	Landshut
	Rohrenbach

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To further reduce power sources within this sector the following targets have been recommended:

Generating Stations	Transformer Stations
Frombach	Marlsfeld
	Meitingen

An additional seven targets have been suggested in case it is found that the likelihood of success of the whole operation would be enhanced by their inclusion:

Generating Stations	Transformer Stations	Power and Transformer Stations
Ulm	Arlberg	Marbertingen
Munich (2)		
Achensee		
Schwandorf		
Gersthofen		

In conclusion, it is stated that photo reconnaissance would be needed on at least two more high tension lines to determine their status in possible connection with the above network.

Another report on Southern Bavaria contains five transformer stations and two power stations as targets while a report on the Bavarian system as a whole also lists five transformer stations and two power stations.

In this project, Ulm, Augsburg and Gersthofen are isolated and Munich deprived of 50% of its energy.

Transformer Stations	Power Stations
Niederstetzingen	Walchensee
Hohenseck	Trumbeck
Marlsfeld	
Meitingen	

The last report covered deals with the Munich and gives two power stations and two transformer stations as targets with the possible inclusion of a fifth target.

Power Stations	Transformer Stations
Finsing	Marlsfeld
Schambing	Passing
Isartalstrasse	

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CONCLUSIONS

There have doubtless been some additions, modifications and other changes brought about in the German electrical grid system in the past few years. These were made with the purpose of strengthening the network as a whole, and also in an attempt to preclude the possibility of any serious failure in either generation or transformation of electric energy in an area as a result of damage to an individual installation in that or an adjacent area. The latter attempt has been largely accomplished through an efficient interconnecting of transmission units.

Reliable sources state that about 65% of the electricity produced in the Reich is utilized by industry and less than 10% consumed by the railroads. However, in the mountainous regions of Lower Bavaria and of Austria the railways use up substantially more than 10% of the output of electricity produced in that portion of the Reich. This is due, in the main, to two factors. First, deposits of coal in the Ruhr and certain sections of northern Germany provide a suitable source of power for traction in these areas at relatively flat terrain, and second, the steep gradients on many rail lines in the south make the use of electricity much more desirable in this more mountainous country.

It is assumed that all the sources of electric energy including thermal and hydroelectric plants are being used to about capacity, and that any sustained reduction in output will be followed by a nearly commensurate loss in the capacity of an electric rail line dependent upon the particular plant which has had its output reduced. Should an instance of reduction occur in a plant's output, steps might be taken to permit any rail lines affected to work from another plant, providing the necessity of keeping the rail lines in a maximum or near maximum capacity status was great, and also that the second plant was not thereby forced to disrupt an already established program of power distribution.

The large hydroelectric plants in Austria and Lower Bavaria are sturdily constructed units and probably would require more than one direct hit in order to be effectively damaged or destroyed. Were one of these important plants rendered wholly inoperative by bombing it is very doubtful if it could be replaced at this stage of the war. The loss would be bound to disturb the normal production, transmission and consumption process in the sector involved, and it is reasonable to conclude that there would be a consequent lessening, however small, in the capacity and the use of the electric lines in that zone.

If successful, a program of bombing entailing the destruction of two or more large generating plants, not too far apart, would certainly force a definite reduction in the use of the electric rail lines in the area.

The importance of transformer stations in the electrical network is, of course, very great. For without their use there can be no utilization of the current generated. It is known that the enemy possesses a fairly elaborate and well coordinated set of these units in the more important industrial and communication areas. The need for a definite program, undertaken as a commitment, and embracing several key transformer stations is apparent, if any

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appreciable benefit is to accrue from the bombing of these facilities. They are considerably more vulnerable to bomb damage than are power stations.

The various proposals reviewed are but a sample of what might be achieved by the destruction of certain targets, but it is strongly suggested that a more detailed study be carried out on the subject of the electric grid network of Lower Bavaria and the correlative position of the electric railways therein, before any of these proposals is laid on.

It can readily be seen from a study of a map showing electrical facilities that a number of projects can be offered while the selection of one or more for an actual operation would await the decision regarding the particular area it was desired to isolate or cripple.

In general, it is to be remembered that completely denying electric power to a specific area for any sizable length of time is a big task requiring a large effort to be expended in a minimum of time. A successful campaign against key transformer stations would be just as effective in denying electric traction to railroads and would necessitate less individual effort, although the effort allotted would have to be sustained longer due to the more numerous means of substitution of transformer units.

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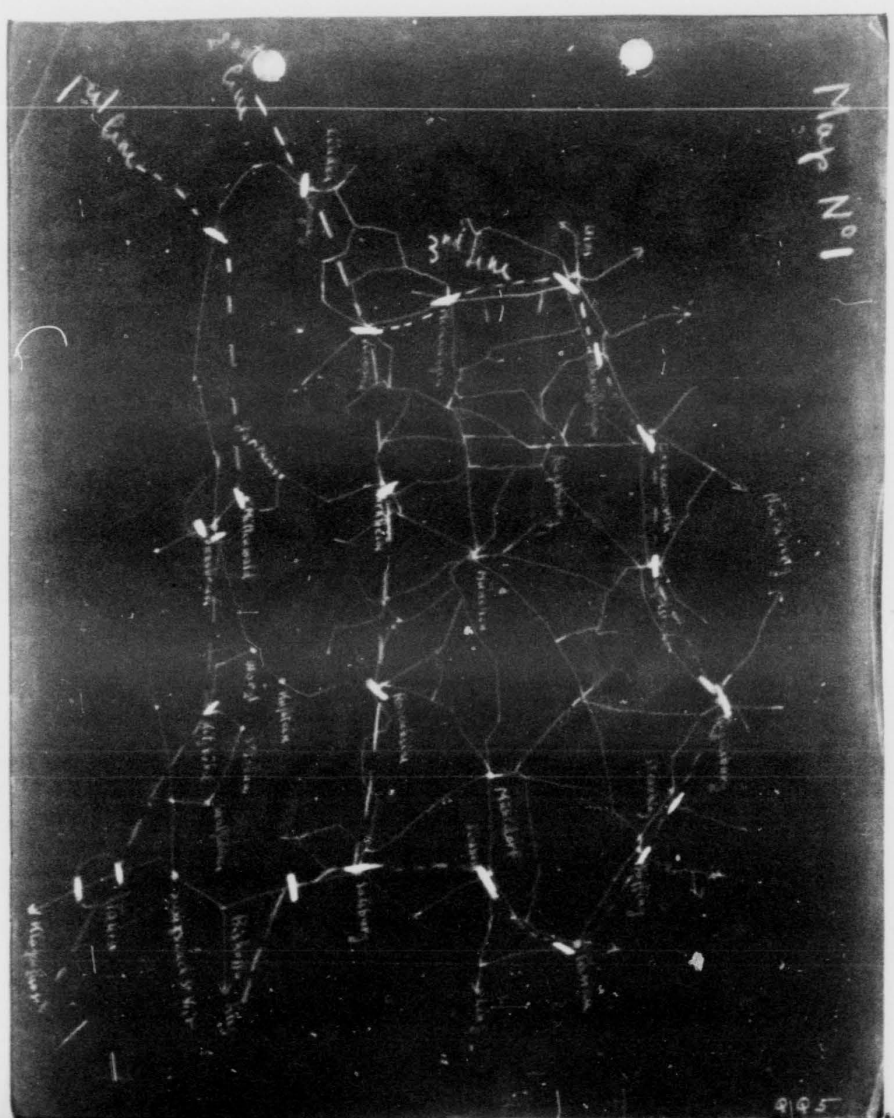

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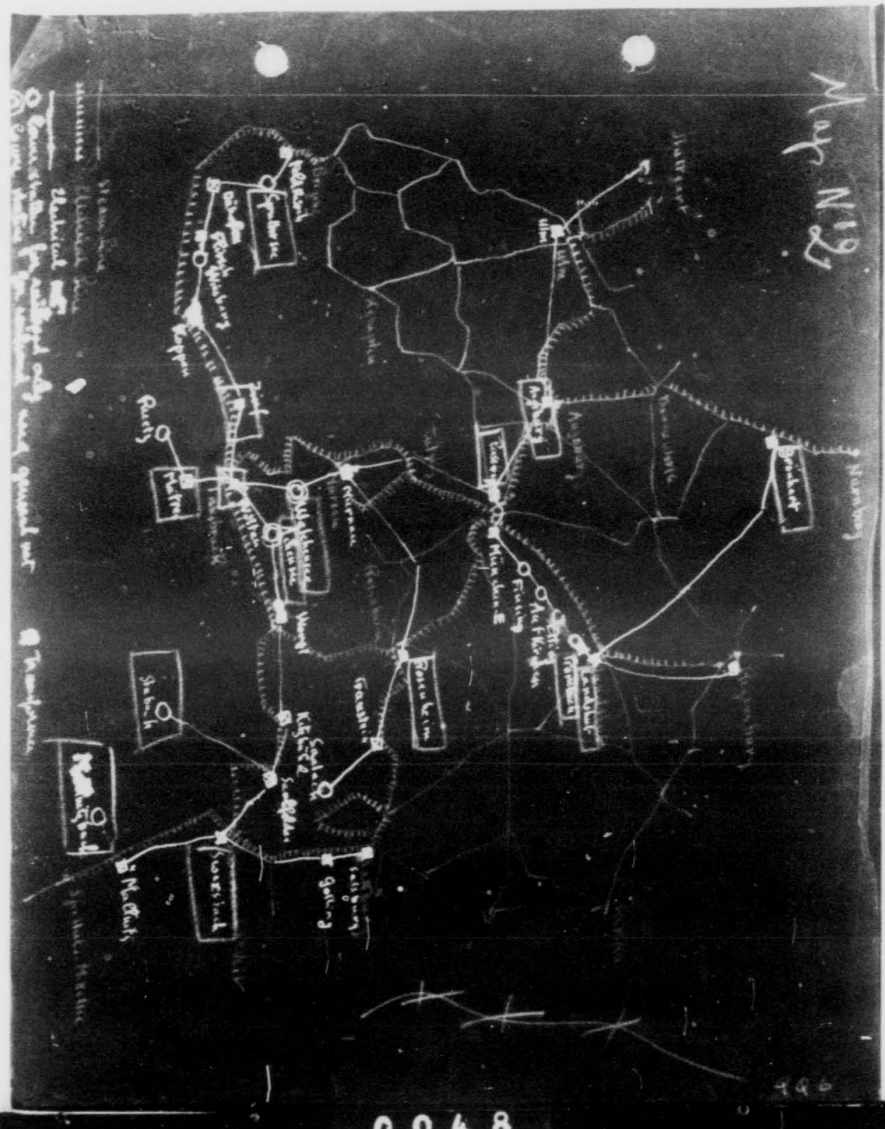

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CEWA 8 12 Austria Electric 5-7

POWER STATIONS [illegible] OPERATING ON ELECTRIFIED SECTIONS OF THE AUSTRIAN RAILWAYS.

The current-system used by Austrian railways is single phase, alternating current at 15,000 volts, 16⅔ cycles. This is standard with German and Swiss railways.

The following table shows the principal powerstations supplying current to Federal and local railways:-

Stations.	Plant Capacity for Traction (HP).
I. Supplying the Federal Railways:	
Mallnitz I	15.0
Mallnitz III (estimated)	7.5
Tuetz	7.5
Spullersee	13.2
Stubach I	12.0
Stubach II	20.0
Total	75.2
2. Achensee	16.0
Gosau V (Steeg)	2.4
Total	18.4
3. Supplying local railways:	
Tarnbach	not known
Deutsch-Matrei (estimated)	not known
Erlaufboden	1.2 ■
Mitt bei Schruns	not known
Stillupbach	not known
Wienerbruck	not known

■ 3-phase, 25 cycle supply.

Details:

Mallnitz I.

Location: on the R. Mallnitzbach, a tributary of the R.Moll, below the old Mallnitz station II.

Description: The level of the river Mallnitzbach is raised 12 feet by a first weir near Lassach, and water diverted through a sand-trap with four chambers into the head race. This can carry a water flow of 175 cusecs and consists of 110 yards of covered canal and 2,700 yards of tunnel leading at a gradient of 0.09% to a covered forebay 230 ft. long and 33 ft. wide, near the Spullersch railway station. There are [illegible] pressure pipes 3,000 ft. long, diameter decreasing from [illegible] ft. at the top to [illegible] ft. at the power house.

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Wallitz III:

It is probable that a dam has been constructed across the river Seebach, a tributary of the Wallmitzbach, utilizing the outflow from the Stappitzer lake and the reservoir for seasonal storage, thus creating a capacity of 6 million tons.

Reutzwerk:

Location: On the river Reutzbach, a tributary of the Sill, near Telfes.

Description: This station utilizes a water head of 600 feet.

The river Reutzbach is dammed at 2,900 ft. altitude by a weir near Pulpes. On the left bank of a small pond created by the weir is the intake structure which leads into the headrace. It passes in aqueducts first across a side valley and then across the Reutz valley itself. It then enters the mountain on the right side of the valley and passes through a tunnel to the old forbay above Schoenberg. This forbay of 2,770 tons capacity is connected by a tunnel 240 yards long to the surge chamber of the Sill power station for mutual exchange of water. Two pipelines lead from the forbays to the powerhouse, situated at 2,400 ft. altitude.

Spullerseewerk:

Location: About 12 K. of Bludenz near the Danoefen railway station.

Description: This station utilizes a water head of 2,700 ft. between the Spullersee and the river Alfenz. The water level of the Spullersee has been raised 102 ft. (6,100 ft. altitude) by two concrete dams, one at the W. end 79 ft. high and 615 ft. long and one at the outflow of the river Spreubach at the E. end 111 ft. high and 930 ft. long. The lake now serves as a storage reservoir and has a useful capacity of 13 million tons.

Two steel pipelines, 4,650 ft. long, descend in six sections of between 30° and 45° gradient to the machine house where they are each connected to two turbines.

The total energy available from this station during a normal working year is 25,360,000 kWh.

Stubach I.

Location: About 60 miles E. of Innsbruck at the confluence of the Weisenbach and the Tauernmoosbach one mile S. of Tauernmoos lake.

Description: Water supply [illegible] Tauernmoos lake. The water level of this lake has been raised 30 feet by the construction of a concrete dam 79 ft. high and 295 ft. long across its outflow. The lake now has a storage capacity of 21.1 million tons. The natural capacity and [illegible] increased by the construction [illegible]

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[illegible]sensee with the Tauermoosbach above Tauermoos lake. It is believed that the annual output of Stulach I. and Stulach II. (36 and 70 million kWh respectively) has been increased 10% by this measure.

The intake, about 60 ft. [illegible] highest water level of Tauermoos lake leads to a concrete pipe 7½ ft. inner diameter which after a short distance divides into two branches of 3.3/4 ft. diameter. After passing through an underground valve chamber the branches unite again in a steel pipe. This pipe is laid in a tunnel which descends first at a gradient varying between 15 and 40% and then runs horizontally for 525 ft., emerging from the mountain tunnel 130 ft. from the machine house at the Enzinger-boden. The water head of this stage is 1,760 ft.

One of the auxiliary sets in this machine house receives water through a separate pipe line from the [illegible]mensee 300 ft. above the station.

The tail water of the Stulach I. station is collected in an equalizing reservoir of 0.2 million tons capacity. From there a tunnel 8½ ft. in diameter and 2,000 ft. long leads at a slight gradient to the surge chamber of the Stulach II. stage, from which a pressure pipe, 4,120 ft. long, tapering in diameter from 5 to 4 ft. descends to the machine house near Schneidersw. The water of this stage is 1,400 ft.

Stulach II.

Location: At the confluence of the Stulach and the Grünbach, 1/4 mile S. of Schneidersw.

Description: See above.

Achensee:

Location: On S. side of the road 1/4 mile [illegible] of Jenbach.

Description: This station operates from water supplied from the Achensee located at 2,1000 ft. altitude to the north of the river Inn. The intake at the Southern end of the lake consists of a [illegible] reinforced concrete pipe 7½ ft. in diameter which traverses 140 ft. [illegible] the lake [illegible] surrounded by iron caissons 15 ft. [illegible] below the water level. This intake pipe connects to the headrace of the station consisting of a concrete lined tunnel 2.3/4 miles long and 8½ ft. inner diameter and with a 0.9% gradient. The end of this tunnel is formed by a water chamber consisting of 2 shafts of 100 ft. total length cut into the rock about 100 ft. below the surface. The [illegible] connecting to this chamber is a vertical shaft, 130 ft. high, 11 ft. in diameter and ending [illegible] at its upper end.

The penstock is 1,700 ft. long [illegible] into the generating station at a gradient of 40%. It consists of an iron lined [illegible] tunnel

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tunnel cut into the rock, at places 200 ft. below the surface. Near the machine house the pipe line branches into 2 lines leading to the turbines.

Rosen K. (Steep):

Location: At the Northern pedis of the Falkenstein-see.

Description: Small section supplying current for the Steinach-Arthern electrified line and possibly for the Salzburg Arthern section.

Imbruch:

Location: Voitsberg.

Imbruch-Retzdi:

Location: South of Retzdi on the road leading from Imbruch to Krumer.

Pyhrnbrücke:

Location: 4 miles N.E. of Krumpell.

Mth. of Schrems:

Location: At Schrems.

Stillupbach:

Location: In the narrow mountain valley of the Stillupbach.

Innerbruck:

Location: About 3 miles N. of the Silbertalsee station.

Transmission:

The power stations are connected by transmission lines arranged for 55 kV, the transmission system being so built out that parallel working of all stations as well as a division into individual groups is possible.

In the substations 55 kV current is stepped down to 15 kV. The 4 older substations, Zell, Meyern, Mürzsteg, and Tanzion on the Arlberg line, are connected as built-in installations, and consist of transformers with artificial cooling equipment, cells, others, Selling, Schruns, St. Veit, Wandelden, Mittelhäl, Brück, Hall, Matrei, and Feldkirch, are constructed as semi outdoor stations, and are distinguished by the fact that while the 15 kV equipment is erected in the open, the 5 kV installations, as also the control room, are situated in the built-in portion. There are [illegible] others installed in the substations of 1000, 2100, or 2400 kW continuous output respectively.

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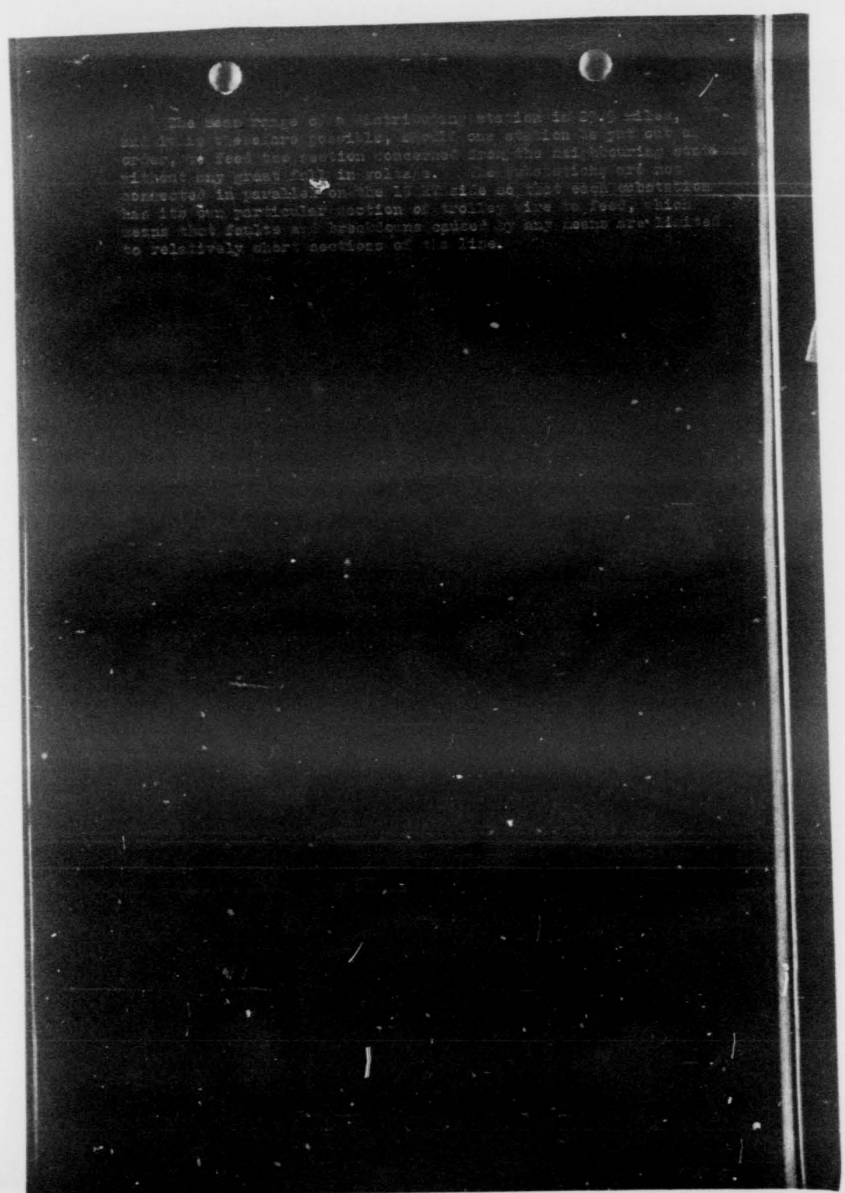

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L'usine de [redacted] constitue une puissante installation au Sud-Ouest de [redacted], elle utilise la chute de 300 m. existant entre le Walchensee et le Kochelsee. Le Walchensee reçoit les eaux de l'Isar supérieur par un canal de 8 km. débit 80 m3 seconde.

L'usine est alimentée par six conduites forcées alimentant, d'une part à raison d'un groupe par conduite quatre machines Francis double de 24.000 chevaux chacune entraînant des alternateurs triphasé 50 périodes, d'autre part à raison de deux groupes par conduite, quatre turbines Pelton double de 12.000 chevaux chacune entraînant des alternateurs monophasés 16 périodes. Le premier groupe à 50 périodes est relié au réseau des Bayernwerk.

Le groupe à 16 périodes [illegible] fait partie du réseau des Reichsbahn.

Installée sur le lac [redacted] dont le déversoir naturel est la vallée de l'Isar, [illegible] est réalisée par un barrage au Nord supprimant précisément le déversoir et prévue pour un exhaussement du niveau [illegible] possibilité d'une chute de 400 m. sur la vallée de l'Isar.

L'usine comprend deux parties:

- 5 groupes turboalternateurs de [illegible] KW. à 50 périodes produisant pour le réseau général de distribution,

- et 4 groupes de 8.000 KW. [illegible] périodes 2/3 pour le réseau 16.000 KW. monophasé de traction en liaison avec les usines spécialisées de Spullersee, [illegible], Ballnitz et Zubach.

L'usine thermique actuelle résulte de l'adjonction en 1940 d'une [illegible] fonctionnant avec de la vapeur à 17 kg/c², d'une usine nouvelle fonctionnant à 100 kg/c².

La nouvelle installation comporte deux chaudières (Lamong et Humboldt [illegible]) de 935 m2 de surface de chauffe, plus 400 à 700 pour le surchauffeur, donnant ensemble 90 T. de vapeur à l'heure à 400°.

Turbines Brown Boveri et Cie - 50.000 KW - 6.000 V.
Puissance totale installée de l'usine: 60.000 KW.

Dans la forêt noire [illegible], le cassis naturel [illegible] barrage de Wehlachsee sert à la fourniture des points d'énergie et par barrage à l'accumulation de l'énergie. Chaque année des [illegible] de l'Isar en Août.

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chute totale est de 320 m., le volume d'eau accumulé de 108 millions de m3.

Deux usines sont accouplées sur ce réservoir Hadsarm alimenté par deux conduites et comportant deux groupes complexes, turbines alternateur fonctionnant également en moteur pompe, avec accouplement hydromécanique fonctionnant en service d'une puissance de 38.000 Kv A chacun.

Eichholz du même type, 2 conduites pour des groupes de 17.500 Kva.

Production annuelle : 73 millions de Kwh, plus 80 millions de Kwh par pompage.

5° - USINE HYDRO-ELECTRIQUE DE KIRCHE - SCHWEIZERART -

Un barrage à vannes mobiles situé à 30 Km en amont de [illegible], surélevant le plan d'eau en eaux moyennes de 1000 m3/sec; d'une puissance variant de 30.000 à 140.000 Cv. L'usine est installée en prolongement du barrage coté allemand, comporte 3 turbines KAPLAN à aubes mobiles de 38.000 chevaux (fabrication suisse) entraînant des alternateurs de [illegible] Kva à 10.500 V.

Transformateurs type extérieur [illegible]/110.000/150.000 Kva.

6° - USINE HYDRO-ELECTRIQUE DE [illegible] - AUTRICHE -

A l'aval du confluent de l'Inn, un barrage à vannes mobiles, 5 portées de 25 m. créant une chute de 10 à 11 m. avec canal de dérivation de 5 Km.5 sur la rive droite alimentant l'usine.

Celle-ci équipée de 3 groupes KAPLAN à aubes mobiles de 37.500 Cv. pour 350 m3/Sec. entraînant des alternateurs triphasés de 32.500 KV/10.500 Cv. 50 périodes. Transformateur extérieur 10.5/10.4 Kv.

7° - USINE HYDRO-ELECTRIQUE D'AUGST - WYHLEN -

Usine double, AUGST sur la rive suisse, WYHLEN sur la rive allemande.

Barrage à vannes mobiles créant une chute de 6 m.70, dix ouvertures pour 210 m. de long. Chaque usine reçoit 500 m3/Sec. et comporte 20 groupes KAPLAN de 3.500 Cv. avec alternateur de 2.300 Kva. 7.000 V.

8° - USINE HYDRO-ELECTRIQUE DE [illegible] -

La première de la chaîne de 6 usines. Installée sur le canal de 111 Km entre [illegible] et [illegible] réalisant une puissance installée totale de 700.000 Cv. Détruite le 17 Juin 19[illegible].

9° - USINE HYDRO-ELECTRIQUE DE [illegible] -

Fonctionnant en parallèle avec l'usine thermique de [illegible] dont elle améliore l'exploitation, elle est installée sur l'Ilzer au voisinage de [illegible]. Le réservoir d'accumulation supérieur a été récemment très agrandi, 700.000 m3. Puissance installée 115.000 Cv en quatre groupes turbines Francis [illegible] Cv, sous 245 m. à 500 t/min, machine synchrone 38.500 KV 11.000 V, 50 périodes, pompe, accouplement hydromécanique. Transformateur 10,5 Kv/110.000 Kv.

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10° - Usine [illegible] -

la plus puissante d'Europe. Le bassin inférieur est réalisé par un barrage sur le Rhin à l'aval de Rheinau, le bassin supérieur, entièrement en béton, a une capacité de 1,5 millions de mcb.

4 groupes turbines Francis de 48.000 CV..

Alternateur synchrone de 40.000 Kw. Pompe de 33.000 Ch au débit de 15 m3/sec. sur 183 m. de hauteur moyenne. Accouplement Voigt-Pottinger hydrodynamique fonctionnant en service (mise en route générale, passage de turbine à pompe 150 Sec, passage de pompe à turbine 90 sec.).

11° - [illegible] -

Sur le Verruntal. Barrage prévu de 82 m. Capacité du réservoir 25 10⁶ m3. Chute 270 m. 2 conduites forcées pour 4 groupes. Turbines Pelton 33.000 CV. Alternateur 24.000 kva 10 Kv, Puissance totale 130.000 Kva. Ligne partant de 10 kv, au poste de Hôru, transformateur 10 Kv/220/Kv.

12 - 13° - Le matériel des postes de la ligne à [illegible] Kv. Quatorze transformateurs 220 Kv/110 Kv d'une puissance chacun de 30.000 kva à 50 périodes. On peut également avoir les tensions 45 Kv, 55 Kv et 32 Kv et enfin 10 kv pour les services auxiliaires.

Le poids de ces engins atteint 150 tonnes par unités indivisées.

Les transformateurs sont pourvus d'un 10 kv de transformateurs de réglage et de bobines d'inductance. Enfin, les disjoncteurs à [illegible] sous 900 A.. On sait à la fois la complicité et la puissance de ces installations. Groupement comporte trois jeux de [illegible] A [illegible] volts et deux jeux à 110.000 volts.

14° - On rappelle l'essentiel de l'électrification des chemins de fer autour de Stuttgart.

L'installation est unifiée, [illegible] à 50 périodes 3/..

Les lignes électrifiées sont les suivantes:

Partant des noeuds de Stuttgart et Nürnberg, on trouve respectivement pour les liaisons avec l'Autriche:

Stuttgart - Ulm (électrifié) Munich (électrifié)
et de Ulm
Ulm-Friedrichshafen par Biberach
Ulm-Lenpton (Lindau par la vallée de l'Iller)
Ulm-Augsburg-Munich (électrifié)
de Nürnberg
Nürnberg Treuchtlingen (Augsburg ; électrifié)
Nürnberg Treuchtlingen Ingolstadt Munich
Nürnberg Regensburg
Regensburg Landshut Munich (électrifié)
Regensburg Passau Linz (multiple

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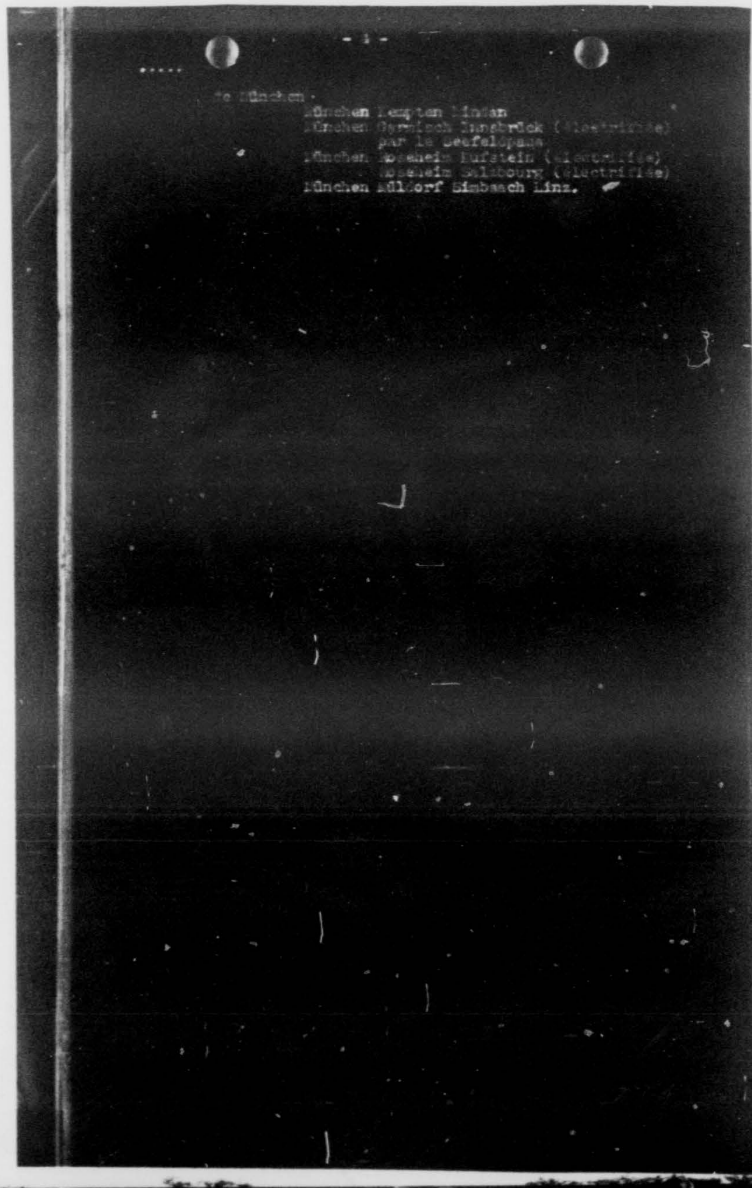

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de München.

München Lenggen Lindau
München Garmisch Innsbruck (électrifiée)
par le Seefeldpass
München Rosenheim Kufstein (électrifiée)
Rosenheim Salzbourg (électrifiée)
München Adlkofen Simbach Linz.

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(14) Ameron Electric 59

BLOCKADING THE ARLBERG-TYROL-BAVARIAN RAILROAD SYSTEM

The area studied is limited north by the Danube Valley from Ulm to Passau, south by the Alp (Italian boundaries), west by the Switzerland boundaries, then Lindau, Kempten and the Iller Valley, east including the Tauern line, then Salzburg and the Inn Valley.

Blockading the whole railroad system of this area has been studied on two successive operations.

In the first one we cut into pieces the whole system by bridge destructions, isolating the Arlberg Tyrol from Bavaria and Bavaria from the rest of Germany; then in the second part we stop almost all traffic inside of the isolated sections by destroying the electric power system. The second part is included in a general electric power war against Bavaria.

This study shall be continued by a similar work on the east, including Austria and the Semmering Line.

First Part

Destruction has been studied on three successive lines. (See the Map No. 1.)

First Line begins on the west side by cutting the Arlberg line between Arlberg Tunnel and the Rhine Valley, then isolating Innsbruck from Landeck (Arlberg Line), Matrei (Brenner Line), Worgl (Arlberg Line east side), Mittenwalk (Munchen Line), then cutting the Kufstein Pass Line, then once more the Arlberg line between Kitzbuhel and St. Johan, then the Tauern Line on both sides of the Tauern Tunnel.

Second Line begins on the west side by cutting the Arlberg Line near the Lake of Constance, then the Kempten important junction, then the Weilheim Junction on the Munchen Garmisch Innsbruck Line, then the Rosenheim most important junction, then the Salzburg Junction, and once more the Arlberg Line near Golling.

Third Line follows the Iller Valley from Kempten to Ulm, with a cut at Memmingen, then the Danube Valley (Ulm, Neuoffingern, Donauworth, Ingolstadt, Regensburg, Straubling, Pfoffing, Passau), then the Inn Valley down to Salzburg.

The First Line cuts all the railroad connections between Bavaria and Arlberg, Tyrol and Carinthie, and all traffic along the Arlberg-Tyrol line.

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The Second Line cuts once more the railroad connections between Bavaria and Arlberg-Tyrol and makes it impossible to repair the destructions on the First Line.

The Third Line isolates all the Bavarian system from the rest of Germany. With such a complete set of destructions, all the railroad system is put into pieces unable to help each other.

Description of Targets

This study is pursued without any photography cover. Locations will be given by geographical coordinates, and references are taken from the 1/500 000 Europe Air Map of the War Office.

First Part - First Line

(a) Arlberg Line West Side. Klosterle Bridge (or Waldlitobel Bridge) 2 Km 5 West of the West Entrance of the Arlberg Tunnel (47° 8' N, 10° 8' E on Bolzano folio of the Map). Such stone bridge 40m long; 45m above the ground.

(b) Innsbruck

(1) Brenner Line. Bridge on the Sill River at the south entrance of a little tunnel, 2 Km south of the E.sr Westbahnhof, 1 Km N.E. of Mutters (Bolzano 47° 14' N, 11° 24' E).

(2) Munchen Line. Bridge on the Inn River, just west of the town and very near the Westbahnhof (Bolzano 47° 15' N, 11° 24' E).

Another bridge on the Brenn Tal on the N.E. entrance of a tunnel 2 Km long, 12 Km W. of Innsbruck (Bolzano 47° 17' N, 11° 15' E).

(3) Arlberg Line-West Side.

(4) Arlberg Line-East Side. Bridge on the Inn River, N.E. of the town, 2 Km from Hauptbahnhof close to Rauchmuhle (Bolzano 47° 16.5' N, 11° 25' E).

(c) Innsbruck-Garmisch-Munchen Line. Railroad Bridge on the Isar River 1 Km south of Mittenwald Bahnhof (Bolzano 47° 26' N, 11° 16' E).

(d) Innsbruck-Salzburg Line (Arlberg Line). Railroad Bridge 1 Km south of Kitzbuhel Station (Bolzano 47° 26' N, 12° 16' E).

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(e) Tauern Line

(1) Angertal Railroad Bridge from Viaduct, central arch 70m long, 65m above the valley, 2 Km north of the Tauern Tunnel, between Badgastein Railroad Station and Boenstein Railroad Station. (Bolzano 47o 6' N, 13o 7' E).

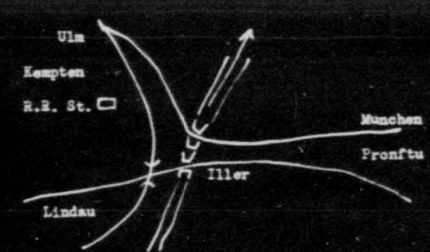
(2) Stenberg-Pfaffensberg Railroad Bridge. 3 iron viaducts each 50m long.

These two railroad bridges are the most important of a complete set of 24 viaducts all along the 81 Km between Schwazach St. Veit and Spittal-Millsbaitersu.

First Part - Second Line

(a) Arlberg Line. Railroad bridge on the Bregenzer Ach 4 Km S.W. of Bregenz Railroad Station. (This railroad bridge is used both by the Arlberg Line and by line coming from Switzerland.) (Berne 47o 29' N - 9o 43' E).

(b) Kempten Junction (Lindau-Ulm-Lindau Augburg and Munchen) Three railroad bridges on the Iller Valley, east of Kempten Railroad Station. The two North Bridges close together, each double tracks, [redacted] arch bridges 63m.90 long, south bridge, double tracks, stone arch 64m long. (Bolzano 47o 33' N, 10o 19' E). I have also photographs of these bridges.



(c) Weilheim Junction (Innsbruck-Munchen Line). Railroad bridge on Waidsbach, just south of Weilheim railroad station. (Bolzano 47o 50' N, 11o 8' E).

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(d) Rosenheim Junction (Munchen-Kufstein Pass Line--Munchen Salzburg Line, Rosenheim-Muhldorf Line).

(1) Two railroad bridges on Mangfull River east of Rosenheim railroad station. These bridges connect the two lines coming from Kufstein and Salzburg with the three lines coming two from Munchen, the third from Muhldorf. (Bolzano 47o 51' N, 12° 8' E)

(2) Railroad bridge on Isar River 2 Km east of Rosenheim railroad station, on Rosenheim Salzburg Line. (Bolzano 47° 51' N, 12° 8.5' E)

(e) Salzburg Junction (Munchen-Salzburg Line, Muhldorf-Salzburg Arlberg Line) Railroad and Road Bridge on Salzach River in the town 2 Km N.E. of the Kapuzinerberg, between Ludwigs Victor Road Bridge and Franz Kail Road Bridge, 2 Km S.W. of Railroad Station.

(Out of the seven Bridges in Salzburg, two are for railroad, five for road only).

(Bolzano 47° 48' N, 13° 3' E)

(f) Innsbruck (Tamern)--Salzburg Line. Two railroad bridges on Salzach River just south and north of Golling Tunnel, two Km south of Golling railroad station. (Bolzano 47o 35' N, 13o 11' E)

First Part - Third Line

(A) Iller Valley.

(a) Kempten Junction (see above Second Line).

(b) Lindau Memmingen Line. Railroad bridge on the Iller Valley 5 Km west of Memmingen railroad station (Berne 48° N, 10o 8' E).

(B) Donau Valley.

(a) Ulm Junction (Kempten-Ulm Line)
(Augburg-Ulm Line) Railroad bridge on the Donau. S.W. in the town. (Munchen 48° 14' N, 10° E).

(b) Neuoffingen Bridge (Ulm-Nurnberg Line). Railroad bridge on the Donau between Neuoffingen and Gundelfingen. (1 Km N of Neuoffingen railroad station). (Munchen 48° 29' N, 10° 22' E).

(c) Donauworth Bridge (Ulm-Ingolstadt Line--Augsburg-Nurnberg Line). Railroad bridge on the Donau. 2 Km east of Donauworth railroad station. (Munchen 48° 43' N, 10° 47' E).

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(d) Ingolstadt Bridge (Munchen-Nurnberg Line). Railroad bridge on the Donau between Ingolstadt-Nord and Ingolstadt Hauptbahnhof (Main Railroad Station). (Munchen 48° 47' N, 11° 26' E).

(e) Regensburg (Ingolstadt-Regensburg Line - Munchen-Nurnberg Line) - Munchen-Dresde Line).

(1) Poikam Bridge. Railroad bridge on the Donau between Abbach Railroad Station and Poikam. 15 Km S.W. of Regensburg. (Munchen 48° 56' N, 12° E).

(2) Riegling Bridge. Railroad bridge on the Donau. 5 Km W. of Regensburg. (Munchen 49° N' 12° 2 E).

(3) Pinferung Bridge. Railroad bridge on the Donau. 5 Km W. of Regensburg (1 Km North of Riegling Bridge). Munchen 49° N', 12° 2 E).

(4) Regensburg Bridge. Railroad bridge on the Donau. 2 Km E of Regensburg. (Munchen 49° 3' N, 12° 8'E).

(f) Straubling Bridge. Railroad bridge on the Donau between Straubling railroad station and Bogen railroad station (1 Km S. of Bogen). (Munchen 48° 55' N, 12° 41' E).

(g) Plattling Bridge (Munchen-Prague Line). Railroad bridge on the Donau between Plattling and Degendorf. (Munchen 48° 50' N, 12° 56' E).

(C) Inn Valley.

Passau Bridge

(a) (Passau-Simbding Linz Line). Railroad bridge on the Inn River. South of the town, above two road bridges on the same river. (Munchen 48° 34' N, 13° 28' E).

(b) Simbach Bridge. Railroad bridge on the Inn River between Simbach and Braunau. (Munchen 48° 16' N, 13° 2' E).

NOTE: Similar destruction lines may be studied further south of the Donau, all along the Lech, the Isar and Amper, and the Inn Rivers.

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Second Part

In some notes we have studied the complete electric net in Germany, and in Bavaria; in other notes we described the special electric

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system for Bavarian railways, Arlberg Tyrol Railroad and Tauern Line. We also proposed the principles of electric war against Germany and especially against Bavaria.

Referring to Map No. 2, which shows the special electric system for the Bavarian-Arlberg-Tauern Railroad system, we have only to repeat the complete set of special targets whose destruction shall stop completely all electric railroad traffic in the whole area.

Tauern Line - Power station of Mallnitzbach transformer station of Schwarzbad St. Veit.

Arlberg Line - Power station of Spullersee.
Power station of Stubach
Power station of Achensee
Transformer station of Zirl
Transformer station of Hall

Brenner Line (Austrian side) - Transformer station of Matrei

Bavarian System - Power and transformer station of Pfrombach
Transformer Station of Landshut
Power station of Walchensee

In a further study we shall explain the reasons of such a choice, and the whole incidence of such destructions

Transformer station of Rosenheim
Transformer station of Gronhart
Transformer station of Augsburg
Transformer station of Passing

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Czecho-Slovakia Gen
Appx 60

October 9, 1944

MEMORANDUM TO: Intelligence Section
Hq, MAAF, APO 650

Referring to conversation with Lt. Col. Ballard and F/Lt. Clough on Saturday, October 7, 1944, this memorandum will serve to give a summary of our conversations.

Railroad Communications in Slovakia

The most important lines of the Slovakian railroad net are the lines from Kossice to Zilina and from there into Moravia and Upper Silesia, the old main line (double-track) from Vienna to Bratislava - Novy Zamky - Budapest (on the left side of the Danube), both running generally in an West-East direction, and finally the line (double-track) linking up these two main lines from Bratislava into the valley of the river Vah (Vag) running North and Northeast to Zilina.

Assuming that the railroad bridges over the Danube at Szob - Budapest (North and South) and below Budapest are put out of commission, these lines immediately assume the utmost importance. The Vienna - Bratislava - Novy Zamky - Budapest line can be reached by a secondary line which runs from Novy Zamky to Komarom crossing the railroad bridge at Komarom and there joining the Vienna Hegyeshalom - Gyor - Komarom - Budapest line. This secondary line is single track but could be used to relieve the heavy traffic on the Budapest - Gyor - Vienna line.

The Slovakian lines themselves are vulnerable in several points. The main double track Bratislava - Novy Zamky - Budapest line is particularly vulnerable at one point, namely the railroad bridge across the river Vah (Vag) west of the railroad junction of Galanta and near the small town of Vagsellye (Shaly). The river Vag is here fairly wide and is a swift flowing river. The bridge consists of several spans of unknown length.

After crossing the river Vag and reaching Galanta one double track line turns north following the valley of the Vag and on the right bank of the river. At the city of Trencin the

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line crosses over a railroad bridge of some length to the left bank of the river. The town of Trencin can easily be spotted from an old castle ruin towering right above the city and from two further ruins on the crest of some hills on the opposite (right) bank of the river.

The next vulnerable point is further northeast in the Vag valley at the town of Zilina where the lines from Bratislava and from Kosice meet. There is again a railroad bridge crossing the river Vag and which is of the utmost importance.

At or near Zilina there are actually two railroad bridges: one slightly to the south which is the more important bridge since it crosses the river after the junction of the two main lines; the other bridge is slightly to the east of Zilina, and carries the line from Kosice.

There is for further consideration one more railroad bridge serving a secondary, single track line branching off west north of Trencanska Teplice (about 12 miles north of the city of Trencin) and leading into Moravia. This line is, however, not of primary importance, because it has no great capacity but may become more important, because it is one of only four lines crossing from Slowakia into Moravia.

Summary: In case of a general German retreat on the left bank of the river Danube there are the following points in the railroad communication system which are of great importance:

1. Railroad bridge across the Danube at Komarom.
2. Railroad bridge across the Vag west of Galanta (near Vagsellye).
3. The railroad bridge across the Vag at Trencin.
4. The railroad bridge across the Vag north of Zilina.
5. The railroad bridge across the Vag at Trencanske Teplice.

As a complement to these possible targets a number of cities have marshalling yards, which may profitably be bombed. The most important ones are at Novy Zamky, which also on the main Bratislava Budapest line and where there are also repair shops. This is an extremely important railroad junction. From here a line branches off to Komarom in the south - and several lines (to Nitra, Vlate Moravce and Leve) serving the regions north and northeast. The line to Nitra rejoins the Bratislava - Zilina line north of Galanta - but could not be used for heavy traffic.

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Secondly the marshalling yards at Trnava (Nagy Szombat) as well as the important repair shops, some of the biggest in Slovakia, are of importance for southwestern Slovakia. Trnava is on the Bratislava - Nowy Zamky - Budapest line, and from here the main line to Zilina branches off. There is also a secondary single track line into Moravia via Jablonica and ultimately joining the Bratislava - Brno - Praha main line. It goes without saying that the large marshalling yards and repair shops at Bratislava are of great importance. Furthermore there are large marshalling yards and repair facilities at Zilina.

ADVANTAGE: As a corollary to the bombing and destruction across the rivers Danube and Vah it may be extremely useful to bomb the marshalling yards at:

1. Zilina
2. Trnava
3. Nowy Zamky
4. Bratislava

Note: It should be borne in mind that unless the Germans have taken over completely all responsibility for repair work, any result work undertaken by the Slovak government would take considerable time since - the writer is sure - that government would not be inspired to act with speed or efficiency and railroad traffic would probably be in a state of utter confusion for some time.

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ECONOMIC TRAFFIC IN THE RAILWAY MARSHALLING YARDS OF AUSTRIA AND SOUTHERN GERMANY

The following notes attempt to assess the economic importance of the various marshalling yards in Austria and Southern Germany. It is emphasised that this paper is a draft only and subject to revision in the event of further information becoming available in this theatre.

It is extremely difficult to make any definite analysis of the type of traffic to be found in any one yard at any particular time as requirements and priorities are continually changing and when allied bombing causes traffic obstructions in any one area, the types of goods usually dealt with by the yards affected are transferred to other stations. In addition, military traffic priorities change from day to day, so that no firm statement can be made as to the percentage of military traffic to be found in any one yard. This can only be given when ground reports of wagon counts are forthcoming, and these reports, which cover German railways, do not appear to be available in this theatre. In general, however, the main military routes are well known, and as restrictions on ordinary commercial traffic in different areas of Germany are announced from time to time, it is to be presumed that most of the traffic found in marshalling yards in the areas affected by these restrictions will be military. Apart from specialized traffic which is peculiar to the economic structure of the area which it serves (e.g. aircraft components in the Stuttgart and Augsburg areas, salt in the Salzburg area, etc.), it is to be realized that coal, grain, and other such bulk commodities take up an appreciable proportion of the contents of many marshalling centres, merely because of their bulk. Naturally, with regard to foodstuffs, the more populated the area a particular marshalling yard serves, in general the larger will be the proportion of foodstuffs to be dealt with. Very approximately, on the present German scale of rations, a town with a population of 100,000 inhabitants would need about 3,300 metric tons of essential foodstuffs per month, of which perhaps some 50% might arrive by rail.

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A. BAVARIA AND WURTTEMBERG

(4) Munich area (Population 825,000)

Munich is the political and commercial captial of Bavaria and the 4th largest city in Germany.

There has been a marked industrial development in the Munich area in recent years, particularly in engineering and in production of chemicals and rubber tires.

40% of its population depends on industry and 27% depends on trade and transport. The main industrial districts are around the central marshalling yards.

Munich is a focal point in the German railway system. The terminal railway station is situated on the western side of the city center. Direct track lines radiate to the north and northwest Germany via Nurnberg; to Vienna via Braunau and via Salzburg; to the south via Rosenheim and also via Mittenwald to Innsbruck and the Brenner Pass; South westwards to Lindau, Friedrichshafen and Switzerland; and to the west via Augsburg to the Upper Rhine valley and Strassburg. Several minor branch lines lead southward from Munich and serve the Upper Bavarian highlands. The main station is fully electrified, as are all but one of the main lines that radiate from Munich. Electric power for the railway system in the Munich area comes through the transformer stations of Passing and Munich-East.

MUNICH WEST (Or Laim) Marshalling Yard)

This is the chief marshalling yard in the Munich area. It deals with traffic particularly to and from Regensburg and the Danube, Ingolstadt, Augsburg, Innsbruck and the Brenner route, Lake Constance, Nurnburg, Salzstein and Stuttgart.

Probable Contents:

xx Transit military traffic

x Aircraft components and aero-engines

Oil

Coal and coke

Timber and firewood

Food

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Metals and ores

Armaments

Machinery

Chemicals

Iron and steel products

Consumer goods

MUNICH EAST MARSHALLING YARD

This marshalling yard probably serves to some extent the following important factories: Bayerische Leichtmetallwerk, Friedrich Deckel Precision Tool Works, B.M.W. (both works), Dornier Works, Maffei Locomotive Works.

It deals with traffic in particular from Vienna, Salzburg, Linz, Innsbruck and the Brenner (via Mörgl), Passau and Eastern Bavaria, Italy (via Rosenheim) and some Danube transit traffic.

Probable Contents

xx Transit military traffic

xx Aero-engines & aircraft components

x Coal and coke

Timber and firewood

Paper and cellulose

Machinery and electrical equipment

Machine Tools

Metals and ores

Armaments

Chemicals

Oil

Foodstuffs

Consumer Goods

MUNICH SOUTH MARSHALLING YARD

This is the other yard dealing with foodstuffs and supplies for the Munich area. In close proximity to the M/Y are the slaughter houses and cattle market, Zentral Hall (for foods), and the food storage and refrigerator depot.

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Probable Contents

x Foodstuffs
Cattle
Firewood
x Grain and flour
Coal
Consumer Goods

AUGSBURG -. (Population 186,000)

On main E - W railway line Wien - Munchen - Rhine Valley and joined by main Berlin-Munchen line, Augsburg is one of the most important junctions in S. Germany. It is likely to become a bottleneck if heavy military traffic is using these routes.

Apart from a few factories individually of considerable importance as producers of primary products for the armed forces, there is no general industry of high priority in this area. Most of the large textile mills have closed down.

AUGSBURG - MUNICH MARSHALLING YARD

Serves: Berlin line
Regensburg and Danube traffic
Friedrichshafen routes
Wien line
Rhine Valley

Probable contents:

x Military traffic
x Machinery
x Textile materials
Foodstuffs
Cattle
Metals and ores
Coal and coke
Paper and cellulose
Timber and firewood
Leather
Chemicals
Consumer goods

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KEMPTEN (28,000)

Principally a market town and a centre for the important Allgau dairy industry.

KEMPTEN MARSHALLING YARD

Probable Contents

Transit military traffic

x Chemicals

x Aircraft components & fuselages (sent to Regensburg or Augsburg)

Metals and ores

Coal

Foodstuffs

LANDSHUT (32,000)

Landshut is situated both on the main line from Munich to Czech. frontier and on the cross country line from Regensburg to Salzburg and Upper Austria. It is a market town with several small industries, none of which is individually of importance.

Probable Contents

Transit military traffic

Grain and flour

Sugar beet and sugar

Other foodstuffs

Agricultural implements

Coal

Firewood

ROSENHEIM (20,500)

Rosenheim is situated on the main Munche-Innsbruck - Brenner route and on the alternate Munchen - Linz - Wien line and is a railway junction of great importance. Its marshalling yard is a useful standby should the Munchen yards be put out of action.

The industries of Rosenheim are normally on a small scale, but the rubber boat and clothing factory of Klepper G.m.b.H. has assumed a new importance since the war. The Rosenheim area is an important source of the German salt supply.

/Probable contents

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Probable Contents

Military Traffic

Coal

x Brenner Traffic

Timber

Grain and flour

Other foodstuffs

x Salt

Machinery

Chemicals

x Rubber goods

Cellulose and paper

INGOLSTADT (Population 32,000)

Is a small traffic centre on the main line from Nurnburg to Munchen. Single track routes radiate to Regensburg, Augsburg and Donauwerth. Apart from the important railway workshops there are few industries of note.

M/T Probable Contents

Transit military traffic

Foodstuffs

Aircraft components

Coal

Machinery

Metals

LINDAU (15,000)

Terminus for the main line from Munchen and Augsburg to Lake Constance and the main port for ferry services across the lake to Switzerland. Lindau has no industry of importance apart from the Dornier aircraft works.

M/T

x Aircraft components (from Dornier Works)

Foodstuffs

Coal

Military traffic

/PASSAU

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PASSAU (26,000)

A trunk railway connection through Nurnberg and Regensburg to Vienna passes through Passau, which is on the frontier of Austria.

There are a number of granite quarries for road metals and railway ballast, but there are few other industries.

PASSAU MARSHALLING YARD

Probable Contents

Transit military traffic
Coal
Oil
Grain
Salt
Minerals
Chemicals
Agricultural Products
Other Foodstuffs
Stone & building materials.

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(b) NUREMBERG AREA

NUREMBERG (Population 450,000)

Nuremberg is the largest industrial town in Northern Bavaria. It lies at the intersection of two main railway routes of major importance to the German war effort:

(a) from Ruhr and Frankfurt to Regensburg, Passau, Linz, Wien and S.E. Europe.

(b) from Berlin, Leipzig and Central Germany to Augsburg, Munchen, Switzerland and Italy.

Train sorting done chiefly in the large new yard to the south of the town.

Nuremberg is an important centre of the electrical and armaments industries, and also includes metal working, footwear and glove factories.

NUREMBERG MARSHALLING YARD

Probable Contents

x Military traffic
Coal and Coke
Oil
x Iron and steel products
x Metals and ores (incl. lead ore for Ruhr)
x Machinery and machine tools
Armaments
x M.T. and A.F.V. components
Pig iron
x Electric motors and accessories
Chemicals
Grain and flour
Timber and firewood
Leather goods
Foodstuffs
Consumer goods

[illegible] (Population 107,000)

[illegible]burg is an important railway centre and lies on main through route from Ruhr to Munich; it might easily become a bottleneck if used

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for heavy and continuous traffic. The town also lies on one of main north-South routes in Germany, that from Hamburg via Hannover and Hebra to Munich.

Wurzburg is in the midst of a large agricultural district, and is an important flour milling centre. The other industries are varied and include engineering, textiles, varnish and dye manufacture and furniture making.

WURZBURG-ZELL MARSHALLING YARD

	Probable Contents
x	Military traffic
	Timber
	Metals and ores
	Oil, (there are oil storage tanks, chiefly grouped to the east of the main station).
	Machinery
	Coal
	Armaments
	Textile materials
	Cereals and flour
	Chemicals
	Foodstuffs

ASCHAFFENBURG (Population 43,000)

Aschaffenburg is located at the point of connection of railway lines joining the Ruhr and industrial Rhineland with the Italian and Roumanian fronts.

It is an important transhipment point for the waterborne traffic between NW and Southern Germany.

It is chiefly important commercially as the limit of navigation for large vessels up to the Main.

There are a number of industries of various kinds, of which the most important are precision tools, and paper and cellulose.

ASCHAFFENBURG MARSHALLING YARD

	Probable Contents
x	Military Traffic
	Textile materials
x	Machinery and machine tools
	Cellulose
x	Paper
	Foodstuffs
	Coal

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REGENSBURG (Population 87,000)

Regensburg is an important railway junction and Danube transhipment port - the latter has the largest turnover of foreign trade on the Danube. It is the terminus for entire Danube shipping for barges up to 1,000 tons. The port, however loses its importance when the river is frozen which is usually (but not always) during part of December and January.

Regensburg is located on the main Berlin-Leipzig-Munchen railway line, (which connects with the Brenner Pass) and on the Frankfurt a M - Wien line also.

It is thus a controlling point for traffic moving from N. Germany to Italian front and from W. Germany to E. and SE Europe.

Estimated transhipment figures for Regensburg port in 1944 are as follows:-

Loaded -	300,000 t.p.a. for downstream, of which:-		
	Iron and Steel prods.	60,000	t.p.a.
	Fertilizers	16,000	"
	Salt	21,000	"
	Paper & Gellulose	16,000	"
Unloaded -	1,048,000 t.p.a. of which:-		
	Minerals	450,000	"
x	Petroleum	270,000	"
	Agricultural Produce	176,000	"

(N.B. Since the loss of Roumania, oil traffic has dropped off considerably.)

The Messerschmitt concern have an important aircraft complex at Regensburg and other industries include shipbuilding, ceramics manufacture, timber, and general engineering. The Vmwag have a large alumina works at Schwandorf, 15 miles to the North. There are large scale oil storage facilities in the port area of Regensburg.

/Regensburg Marshalling Yard

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HELMSBURG MARSHALLING YARD

Probable Contents

x Military Traffic

Cellulose (for local factory)

Timber

Coal and coke

x Aircraft and a/c components

xx Oil

Machinery

x Agricultural Products

Chemicals

Salt

Paper

Textile materials

Iron and Steel Products

x Metals and Minerals

Foodstuffs

Sugar beet and sugar

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(c) STUTTGART AREA

STUTTGART (Population 600,000)

Stuttgart, the capital of Wurttemburg, is the most important industrial town in Southern Germany.

The town's engineering and armaments industry consists principally of aero-engine (incl. the main plant of the Daimler Berg company) machinery, machine tools, ball bearing works, and electrical engineering concerns, and other leather, clothing and paper manufacture.

The normal activities of Stuttgart are peculiarly vulnerable to disruption owing to the concentration of its communications in a bottleneck.

Almost all railway traffic to and from Stuttgart is concentrated in its N.E. valley exit. The railway through Canstatt and up the Neckar Valley is a main truck route. A considerable proportion of the factory workers in this area live at some distance from their work, and travel in daily. The Bosch electrical engineering establishments in Stuttgart and Feurbach draw employees from all the surrounding towns and villages in a 15 mile radius.

The main railway line from Munchen to Mannheim and Karlrube passes throughn Stuttgart, from whence there are also direct lines to Zurich and Nurnburg.

UNTERTURKHEIM MARSHALLING YARD

This adjoins the D.B. works (Parent plant of the Daimler Berg Complex).

Probable Contents

x Military traffic

xx Aero engines and aircraft components

x A.F.V. gear boxes and other parts

x Aluminium and other metals

Ores

xx Machinery and machine tools

Iron and steel goods

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Probable Contents (Cont'D)

Oil
x Coal and coke
Consumer goods
Firewood
Sugar beet and sugar
Foodstuffs
Textile materials
Chemicals
Iron and steel goods } Partly from Rhine harbors
Cellulose

MORMENSTHEIM MARSHALLING YARD

Probable Contents

xx Electrical accessorites
xx Aero Engine Parts
x Machinery & machine tools
xx Leather - (One of the largest German boot and shoe factories (adjoins the marshalling yard)
Textile materials
Foodstuffs
Firewood
Metals & ores
x Ball Bearings
Coal (incl. in transit for Italy)
x M/T components
Iron & steel goods
x Oil } Partly from Rhine harbors
Chemicals

HEILBRONN (Population 73,000)

Heilbronn is the center of a salt-mining area, is a railway junction of some importance, and of some significance in the internal distribution of goods for Wurttemburg of which it is the third largest city.
It is a transhipment port from the R. Neckar and large quantities of hardware and finished products are recieved here for the Stuttgart area, as well as scrap for shipment in the other direction. The port also handles coal and grain.

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[redacted] MARSHALLING YARD

Probable Contents

Military traffic

Iron and steel goods

Salt

Wood

Metals and ores

Coal and coke

Chemicals (perhaps 25 - 30 Wagons per day)

Grain and flour

Hardware

Machinery

Scrap

Foodstuffs

ULM (Population 68,000)

Ulm is the second largest town in Wurttemberg. It is situated on the main rail route - Rhine to Hungary and Italy, and also on the main line Stuttgart - Munchen.

Also to Friedrichshafen Innsbruck via Kempten.

The goods facilities are used to capacity to cope with the industrial activity of town. The loading facilities are particularly important since the town contains several large works producing war material.

M/T	Probable Contents
x	Military traffic
xx	A.F.Vs, M/T and M/T parts
x	Tires
	Ores and metals (incl. copper and brass)
x	Machinery (from Friedrichshafen)
	Coal (incl. in transit for Italy)
	Textiles and leather goods
	Foodstuffs
	Oil
	Consumer goods

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d) KARLSRUHE AREA

KARLSRUHE (190,000)

Industrially, Karlsruhe is by no means as important as Mannheim. But it is one of the main railway centres in the Upper Rhine district, and it is on this route that the bulk of coal supplies from the Ruhr to Italy is transported. At Karlsruhe the E/W flow of traffic from France to Munich and SE Europe, crosses the N/S flow from the Ruhr to Switzerland and Italy.

Karlsruhe is more important as a railway centre than as a port, as the largest class of Rhine barges do not sail up beyond Mannheim.

In October 1944, the Karlsruhe - Pforzheim - Stuttgart line was of exceptional importance for the movement of troops and supplies to the Rhine valley and Alsace and for military and economic evacuation movements from France into Reich.

KARLSRUHE VBF, MARSHALLING YARD

Probable Contents

xx Transit military traffic

xx Coal (transhipped from Rhine for Italy and also for the Karlsruhe Power Station, Gas works, and individual factories).

Clothing and textile raw materials

x Machinery and machine tools

x Metals and ores

Consumer goods

M/T and Munitions (incl. S.A.A.)

Grain

Foodstuffs

Oil

x Iron and steel goods

Wood

Chemicals and fertilizers

Cellulose

} Partly from the Rhine harbors destined for Wurttemburg

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OFFENBURG (20,000)

Offenburg is mainly a market town for the surrounding agricultural and wine-growing district, but has a number of textile and specialist industries. It is on the main railway line which follows the course of the Rhine to Basle.

OFFENBURG MARSHALLING YARD

This yard is the sorting point for S. bound traffic to Basle and Konstanz.

Probable Contents

x Coal in transit from the Ruhr for Italy
Transit military traffic
Iron and steel products
Chemicals
Foodstuffs
Agricultural produce
Textiles
Timber and firewood

MANNHEIM (Population 280,000)

Together with Ludwigshafen, forms the most considerable traffic and trade center in the middle and upper Rhine areas. It is second only in importance to Duisberg and all the Rhine harbors.

Mannheim is the main Rhine transhipment point for Ruhr coal for Italy. (Heavy damage inflicted on tptn. targets at Mannheim in December 1940, caused an interruption in this traffic which was felt for at least 3 months.) It is the chief transhipment point for grain and oil also.

MANNHEIM MARSHALLING YARD

Probable Contents

xx Coal (in transit for Italy and for local industry)
x Transit military traffic
xx Oil
x Chemicals
x Machinery and machine tools
Metals and ores (incl. Bauxite)
Electrical equipment
x Timber
xx Grain and flour
Cement
x Iron and steel products.

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Probable Contents (cont'd)

Paper
Armaments
Foodstuffs
Coke
Jute
x Cellulose (biggest plant in Germany)
A.F.V's and tank components
Leather
Rubber
Consumer goods

LUDWIGSHAFEN (Population 150,000)

Ludwigshafen is Germany's principal chemical manufacturing centre and includes the huge chemical works of I.G. Farben industrie.

Together with Mannheim it forms most considerable centre of traffic and trade activity in middle and upper Rhine areas. One of the largest flour mills in Germany is located at Ludwigshafen.

LUDWIGSHAFEN MARSHALLING YARD

Probable Contents

x Military traffic
x Alumina (perhaps 25 wagons per day)
Other metals
xx Chemicals (perhaps 150 wagons per day)
x Coal (perhaps 100 wagons per day)
Coke
xx Oil
Ores (incl. bauxite)
x Grain (perhaps 50 - 75 wagons per day)
Iron and steel products
Pyrites
Sugar beet (one of largest refineries in Germany)
Machinery and machine tools
Armaments
Consumer goods
Foodstuffs

/KAISERSLAUTERN

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KAISERLAUTERN (Population 70,000)

A minor manufacturing town. Includes several engineering works, foundries and textile factories.

KAISERLAUTERN MARSHALLING YARD

Deals with traffic from Saar to Ruhr, Mannheim, etc. and is probably chiefly important at present time for troop movements towards Metz.

Probable Contents

xx Military Traffic
Coal and coke
Iron and steel products
Timber
Chemicals
Machinery
Textile materials
Foodstuffs

HEIDELBERG (85,000)

The town is of little industrial importance.

It lies on the main Frankfurt - Stuttgart - Munchen route.

HEIDELBERG MARSHALLING YARD

Probable Contents

Coal
Firewood
Armaments
Foodstuffs
Cement
Chemicals
Transit military traffic

FREIBURG (119,000)

On the main Karlsruhe - Basle railway line, and junction for two important branch lines leading west across the Rhine into France and East through the Black Forest to Donauschingen and Bavaria.

FREIBURG MARSHALLING YARD

Probable Contents

x Timber
Agricultural products
Precision Instruments

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Probable Contents (Cont'd)

Consumer Goods

Foodstuffs

Coal

Textile Materials

Military Traffic

FRANKENTHAL

A largely industrial town 5 miles NW of Ludwigshafen, on the main railway line halfway between Ludwigshafen and Worms. Connected to the Rhine by a canal.

M/T

Transit Military Traffic

Machinery

General engineering products

x Sugar beet and sugar (from Suddeutsche Zucker A.G. annual output 160,000 tons)

Foodstuffs

Coal

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3. AUSTRIA

Economically the most important region of Austria is the Vienna region, consisting of the town of Vienna itself with its twenty two districts; a region of the more outlying districts XXIII - XIV, the area around the town of Wiener Neustadt, and the oil producing area of Zistersdorf.

There are two more areas of secondary importance:

a) The area in and around the triangle of Linz, Wels and Steyr in Upper Austria and adjoining the extensive brown coal deposits to the west of Wels;

b) the area around Leoben and Graz in Styria, with their nearby ore deposits of the Erzberg and a number of hard-coal mines.

For the rest, industries can be found dispersed throughout Austria but nowhere else is there any concentration of first economic importance.

Agriculturally, the provinces of Upper and Lower Austria and parts of Styria are important as grain producing areas (but unable to cover the needs of Austria as a whole.) There is also a considerable production of sugar beets, supplying the Austrian factories, and, finally, over the whole of Austria there is cattle raising and an important dairy industry, which even showed some surplus before the Anschluss.

The Austrian timber industry is of some importance and timber constituted, before the Anschluss, the biggest single export item.

1. VIENNA AREA

The districts of Vienna in order of their importance are:-

a) XXI FLORIDSDORF

In which are located a number of important industries, including the

Shell Oil Refinery

Austro-Fiat Automobile Works

Hofherr Schrantz Engineering Works

Siemens and Helcke

Tatra Automobile Works

Lokomotiven Fabrik

Mautner Markhof Alcohol Factory

A Wood Gas Generator Works

As well as the City Gas Works and the A.E.G. Chemical Factory

/Railways

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Railways: Two important railway lines go through Floridsdorf. The N.W. Bahn using the more Northern railroad bridge and the North Bahn using the bridge farther South. Both lines connect Vienna with Czechoslovakia and Germany (N.W. Bahn: Vienna - Prague - Dresden - Berlin; N. Bahn: Vienna - Lundenburg - Prerov - Silesia and Poland.) The M/Y along the N. Bahn in Floridsdorf is of considerable importance.

Probable Goods Handled in these yards

x	Military traffic
xx	Coal (destined for Floridsdorf and/or in transit)
x	Oil
x	Machinery
x	Heavy armaments
x	Lorries, A.F.Vs, automobiles
	Iron and Steel
	Non-ferrous metals
x	Chemicals
	Glass and Ceramics
	Fertilizers
	Electrical Apparatus
x	Grain and/or flour
	Other foodstuffs
	Textiles

b) SIMMERING

The most important industries are:-

The City Gas Works,

The City Electricity (Thermal) Station

Masolimen and Waggonbau A.G. (Manufacturing tank cars etc. & diesel engines)

Saurer Werke (Armaments)

Railway repair shops

and Schicht A.G. soap works.

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Railways:

An interconnecting line, linking the Nord Bahn with the Ost and Sudbahn runs through the District and through the Marshalling Yards of Simmering. This M/Y is of great importance.

Probable Goods handled in these yards

x Military traffic
xx Coal
x Oil (from the Zistersdorf fields)
x Iron and steel products
Heavy machinery
x Diesel Engines
Tar products
x Automobiles and lorries
Guns, tanks
Armaments
Metals and ores
Alcohol
Textiles
Plastics
xx Cattle (for the nearby stockyards, city slaughter houses)
Foodstuffs

c) GROSS ENZERSDORF

The most important industries include:
The oil refinery at Lobau,
The Oil Refinery at Kagran
The A.E.G. Union Electrical machinery factory
The United Leather Works, and the
Wagner Biro Engineering Works

d) FAVORITEN (Including the immediate area around the Ost - and Suedbahnhof.)

The most important industries include:
The Locomotive Repair shops (Suedbahn).
The Arsenal
Pelten Guillomene, and
Anker Brot. There are also a large number of small factories.

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Railways:

There are important railroad stations in this area with goods sheds M/Ys, repair facilities for locomotives and wagons, and connections with all other Vienna railroad stations: The Sudbahnhof and the Ostbahnhof. The Sudbahnhof is the terminal for the important line via the Semmering to Graz and Trieste; or via Klagenfurt (Villach) into Italy; or to Zagreb and Yugoslavia. The Ostbahn connects Vienna with Hungary (Budapest) on the right bank of the Danube and also through the district of Simmering using the Southernmost of the Danube bridges with Slovakia (Bratislava) and Moravia (Brno).

The Matzleinsdorf M/Y is probably the most extensive and the most important in Vienna. It is part of the Sudbahn and is used chiefly for sorting, so that it may be said that any kind of goods may be found moving through this yard and it would be almost impossible to determine the type of goods most likely to be found there. It is to be expected, however, that the type of freight moving in greatest bulk such as coal and foodstuffs can be expected in the greatest quantity.

Probable goods handled in the M/Yards of the Ostbahn:

XX	Military Traffic
xx	Grain and/or flour
	Other foodstuffs
x	Cattle
	Petroleum products
x	Coal
x	Iron and steel products
x	Armaments
	Electro steel tools.
x	Bricks and other building materials
	Machinery
x	Radio, and radio accessories
	Glass
	Chemicals
	Textiles
	Consumer goods

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Probable goods handled in the M/Yards of the Sudbahn

x Military traffic

x Coal

x Timber

Paper

Iron and steel products

Wire, wire rope

Electro steel tools

Metals and ores

Bricks

Machinery

Radio and radio accessories

Glass

Chemicals

Textiles

Consumer goods

Foodstuffs

e) II. LEOPOLDSTADT

The important industries and installations include:

The City Electricity (Thermal) Station,

The Siemens Schuckert Works

Warehouses of the City Tramways

The Nord Bahnhof and large coal bunkers and M/Y

The Nord West Bahnhof and M/Y

NOTE: The Nord West Bahnhof, which was formerly also used for passenger traffic is now used exclusively as a goods station. The two M/Yards may be taken together. They serve not only the II district (Leopoldstadt) but also the adjoining XX district (Brigittenau)

Probable goods handled by the M/Yards of the Nordbahn and Nord-westbahn

x Military supplies

xx Coal

x Lumber

x Electrical machines, submarine parts

Metal goods

Ores

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Probable goods handles (Cont'd)

Electrical supplies

Chemicals

Textiles

Building materials

Radio tubes and other radio equipment

Telephone and signal apparatus

Machinery

Consumer goods

x Potatoes (from Germany

Other foodstuffs

These are the most important industrial concentrations in the city of Vienna itself. There are, however, two more important railroad stations with their M/yards which must also be mentioned.

i) The Westbahnhof in the XV district, with its M/Y. It is the terminus for the lines from Vienna to St. Polten - Linz - Bassau into Germany; Vienna - Salzburg - Munchen; and Vienna - Schwarzach St. Veit - Innsbruck - Switzerland.

Probable Goods handled at the M/Y

x Military supplies

x Timber

Paper

Steel, aluminium and raw materials for the metal working industries,

x Telephone and signal apparatus

Glass

Electrical apparatus

Radio tubes and other radio equipment

Ammunition

Machinery

Metal ware

ii) The Franzjosefsbahnhof in the IX district (Alsergrund) and the M/Y in the XIX district (Dobling.) The Franz Josefsbahn connects Vienna the Prague via Gmuend, Budjevice and Pilsen and ultimately connects with Dresden and Germany.

/Probable goods handled at the M/Y

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Probable goods handled at the M/Y

x Military supplies

x Timber

Lorries and M/T parts

Machinery

Bulbs, radio tubes

Aircraft engines (from works at Mussdorf)

Of the more outlying districts the following summary of industries will show their respective importance:

f. XXIII. Schwechat (served by the Ostbahn)

Schwechat brewery

Hammer bakery

Aga works (nitrogen, oxygen)

Nova oil refinery

Glass works (at Mossbrun)

Ziag Brick works

g. XXVI. Klosterneuburg

Shell Oil Refinery

h. The District XXV may be considered in conjunction with the Wiener Neustadt region. This whole area contains the aircraft components and assembly plants. It is estimated that in the Vienna area a total of 25 plants are working on aircraft components and assembly. This district is served by the Sudbahn.

1) Vienna Atzgersdorf

a) Wiener-Neustadter Fligzeugwerke

b) Graf and Stift (Lorries)

2) Wiener Neudorf

a) Flugzeugwerke Ostmark (largest plant for Daimler-Benz engines)

3) Bad Voslau

Airfield and Assembly plant

4) Enzesfeld

Enzesfeld Explosives factory

5) Bluman

Powder plant

6) Himpassing

Semperit rubber plant.

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7) Solenau

Bohler works (engineering)

8) Berndorf

Berndorfer Metall goods plant, Krupp

9) Hirtenberg

Small caliber ammunition and fuses

10) Wiener Neustadt

a) Wiener Neustadter Flugzeugwerke

b) Flugmotorenwerke Ostmark

c) Wiener Neustadt-Wollersdorf, airfield, air stores park and equipment depot

d) Steyr Dainler Puch Werke (aero-engines)

e) Henschel and Sohn

Railways

The Marshalling Yards and goods stations (on the Vienna-Semmering line - Sudbahn)

Probable goods handled by these yards

X Military supplies

xx Aircraft component parts

x Steel, iron, aluminium, etc.

Lorries

x Ammunition

Rubber goods

Machinery

Metal goods

x Timber

Foodstuffs

E. St. Polten about 35 miles W. of Vienna on the Vienna-Linz line.

1) J.M. Voith (engineering works)

2) Railway shops: also chemicals, textiles and buildings industries.

3) Aircraft components factory at Obergrafendorf, (near St. Polten)

4) Aircraft components factory at Ravenstein (near St. Polten)

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2. LINZ-[illegible]S-STEYR AREA

This area is within easy reach of the extensive brown coal deposits of Upper Austria and it may be considered second in importance after the Vienna area.

a) Important industries in Linz include:

The Herman Goering works, aircraft components and assembly plants, chemical and fertilizer factories and the Klimax shipouilding yard. There is also a power station (180,000 kw. joined to the high tension grid system and capable of supplying H. Goering Works and surrounding industries), an inland port and harobr, railway workshops and marshalling yards.

The marshalling yards are intended mainly for distribution of goods wagons in Upper Austria. Important goods they probably handle are as follows:

x Military supplies
x Coal
x Iron ore
Iron and steel products
x Oil
Aircraft components
Timber and firewoods
x Chemicals
Foodstuffs

(N.B. The Hermann Goering works at Linz receive high grade ore from the Erzberg - probably via the Leoben-Hieflan - Linz single track rail line - and low grade ore from Franconia and coking coal from Silesia).

b) Industries in Steyr include the:

Steyr Daimler Puch works and a new aero-engine plant.

c) Industries in Wells include the

Flugzeug Metallwerke (Aircraft repair factory).

The Wells marshalling yard is one of the most important in Austria. It is on the Vienna-Linz-Passau and/or Salzburg, and/or Innsbruck line, and these lines converge on Wells from the N. and W. The M/Y has been greatly enlarged since the Aunschluss and is now supposed to be one of the largest in Germany. Any raw materials or manufactures entering or leaving the Vienna,

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Linz and Graz regions on the way to or from Southern or Central and Northern Germany is likely to pass through these yards.

3. GRAZ - LEOBEN AREA

This area lies in the neighborhood of the rich iron and coal deposits of the Erzberg in Styria.

a) Industries in Graz include the

Grazer Waggon und Maschinenfabrik (Engineering, goods wagons, passenger coaches; sections for wooden barracks; now part of H. Goering combine) and several paper factories.

Graz is situated on main line from Vienna to Trieste or Zagreb.

Probable goods handled in the four marshalling yards

x Military supplies
x Timber
Paper
Metals and ores
Machinery
Aircraft components
x Coal
Foodstuffs

b) At Graz - Puntigan is located the large Steyr-Daimler-Puch works, producing aircraft components, tanks and motor cycles.

c) At Graz - Neudorf the Flugmotorenwerke Ostmark or Steyr Daimler-Puch Works, probably produces and assembles aero engines, and motors for military motor cycles and trucks.

d) At Kapfenberg near Leoben a.d. Mur, the Gebrueder Boehler & Co. steel works produce heavy tanks, anti-tank guns, M.G. barrels, armor plate, etc.

e) At Krottendorf (Near Kapfenberg) Gebrueder Boehler & Co. have another plant producing A.F.Vs and tanks.

f) At Loeben there are a number of small industries and the Alpine Montan Gesellschaft Werk, largest producres of steel ingots, rolled steel, gun barrels in pre-war Austria.

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4. INNSBRUCK AND SALZBURG

a) INNSBRUCK

Innsbruck is the key point for all rail traffic from Germany to Italy via Brenner.

INNSBRUCK MARSHALLING YARD

Traffic in this yard now consists mainly of military goods and stores in transit for the Brenner route, and day to day wagon counts are available from current intelligence. At the same time, quantities of aircraft components, consumer goods, foodstuffs and firewood are also marshalled at Innsbruck.

b) SALZBURG

SALZBURG MARSHALLING YARD

Is the assembling point for traffic from S. Germany to Italy and SE Europe via the short line through the Tauern tunnel. It carries, among other traffic the bulk of the production of lead mined in Karinthia (and occupied Yugoslawia) and bauxite from Yugoslavia (such as is still being produced) to the industrial centers of SW Germany. Agricultural products of Yugoslavia and Italy pass by this route to S. Germany.

Other Probable Contents

x Military traffic

x Salt

Foodstuffs

Firewood

Coal

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20 April 1945

MEMORANDUM

TO : Director of Operations and Intelligence

SUBJECT : Communication Targets in Triangle, Prague-Linz-Regensburg

1. Signal ref. AC W.A. 67725, 19 April 1945 from USSTAF to AAF stresses importance of attack on communication targets within Prague-Linz-Regensburg triangle, as outlined in signal A-266.

2. These targets are- (numbers as in A-266)

B. Rail Centers

4.A. Linz M/Y
B. Linz south railway station
C. Linz goods depot and loco sheds

5. Knollet power station dam on Rhine-Danube canal.
6. Regensburg M/Y and main station.

C. Danube Bridges

1. Linz rail bridge over river Traunel.
2. Linz eastern rail bridge over river Danube.
4. Passau rail bridge over river Inn.
6. Regensburg rail bridge on main line to Hof.
7. Regensburg rail bridge on main line to Nurnberg.

3. Destruction of these targets would interdict north-south rail traffic along the line of the Danube between the big rail centers of Linz and Regensburg and would disrupt marshalling facilities in these two centers.

4. Destruction of the Knollet dam at Passau would stop barge traffic between Passau and Regensburg along the Danube-[illegible], a distance of about 100 miles.
In addition floods would be caused in the Danube valley, possibly as far as Linz (see A.A. No. 6(b) 198).

5. The general effect of this plan would be to interdict rail traffic carrying enemy troops and supplies from Berlin-Leipzig-Dresden area, attempting to pass through Czechoslovakia into southern Bavaria and the Salzburg area.

6. Most recent recce of the Brenner route shows that on 18 April the line was open from Trento to Matrei, a few miles south of Innsbruck.
The northeastern frontier routes are at present well cut, but the enemy appears to be making a strong repair effort in this area.

6. It appears that at present time the upper Brenner could profitable absorb a considerable bombing effort.

TARGET ANALYSIS SECTION

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STUDY ON THE WATERWAY MAIN-DONAU

II. Preliminary.

Before the war connections between Main and Donau were still almost very bad.

The Main River is navigable up to Wursburg; the Donau up to Regensburg; the old Ludwitz Pegnitz Canal using first the Altmuhl River (Donau Basin), then the Pegnitz River (Main Basin) connecting Regensburg and Bamberg; the river Main between Bamberg and Wursburg was not a waterway.

Just before the war the Germans projected two large new canals, a new way between Nuremberg and Regensburg, and a junction canal between Bamberg and Wursburg. The first one was begun just before the war, going south from Nuremberg; it follows the Pegnitz River, crossed the pass between Pegnitz Valley and Altmuhl Valley between Roth and Greding, then was to go directly to the Donau.

The way to disturb by bombing a waterway looks distinct if it is an ordinary river or a canal. For a river the only way is to destroy locks, but still the river may be used on high water. It is easier to stop completely transport on a canal because we can stop the water supply. There are two points where such a thing can be made, at the end, the lower point where the canal joins by means of locks the main river, and secondly and chiefly at the upper point where the canal is fed ordinarily by a little dam.

Speaking of the Main Donau waterway, and of the old Pegnitz-Ludwig Canal, the best points are as follows:

A low point is the south junction with the Donau, exactly at Kelsheim (48° 55'-10°55' München) (see the little map); the main locks are just west of the little town.

Ludwigs Canal - - - - Locks - - - - Altmuhl

Lock Kelsheim

Donau →

The upper point of the Ludwigs Canal is 5 Km south of Neumarkt (49° 16'-11°28' München). We have never seen this point.

Another point of blockading the Donau waterway is at Kachlet; it is studied in a special note as it interests both waterways, railways and electric power stations.

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III. Study on Kachlet Target.

The well-known Kachlet hydroelectric power station may be chosen for a target for three reasons:

(1) It is a powerful hydroelectric station and transformer station.
(2) As a point of the Main Donau waterway.
(3) As a railway crossing of the Donau.

(1) As a power station it supplies chiefly the Bayernwerk by long distance 110 Kv line to Buremberg by Regensburg. Its actual capacity is 70 MW and annual output 275 million Kwh. It is junctioned with the Raima and Partenstein hydroelectric power stations, so the transformer house works both with Austria and Bavaria.

(2) In order to have head of water a large low dam with six iron gates was constructed and two locks were adjoined. The blockading of the locks will stop the navigation along the Donau, except between April and September, when the high water allows the emergency possibility of crossing by the gates of the dam once open.

(3) East of the station is a railroad iron bridge. This bridge has been previously selected in the study, Blockading the Arlberg-Tyrol Bavarian railroad system - First Part, third line - (c) Isar Valley, Passau Bridge.

The best point to destroy is the area including the two locks, the switch house and the transformer station, and southeast of the railway bridge.

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The Practicability of using the "Movement of Oil Products" as the guiding factor in planning an attack on enemy rail communications.

1. The Problem: The enemy rail system within range of MAAF is so large that our available bombing effort can only have an appreciable effect, if it is concentrated upon some part of the whole system.

This concentration may be achieved by limiting the attack:-

(a) Geographically
(b) To one of the vital functional parts of the transport system, for example its rolling stock, marshalling capacity or locomotives and their facilities.
(c) To those sections of the system and those facilities handling some vital enemy requirement such as oil and its products., or to a combination of (a) with (b) or (c).

In so far as the enemy is unable to move his vital supplies in safety to the required destinations on his transport system, so the system loses its value to the enemy.

Of the enemy's vital requirements, oil products and gasoline in particular are those in shortest supply.

The object of this study is to discuss the practicability of using the factor of oil transportation as the guiding factor in planning an attack on rail transportation in general, thus assisting the number 1 priority attack on oil while at the same time causing general disorganization of the enemy's rail transport system.

2. General Considerations:a)With the available effort it will probably be necessary at the same time to limit the system geographically to the rail communications supplying the Italian and southeastern battle fronts.

This discussion will therefore be chiefly concerned with oil transportation targets in Austria, Yugoslavia and Southern Bavaria and possibly part of Czechoslovakia.

(b) Oil and gasoline is normally carried on the railway in tank wagons. These can be recognized on clear photographs but of course it cannot be said whether they are full or empty.
The position is further complicated by the reported German camouflaging of tankers to imitate box cars.
In some cases transportation is effected by pumping the oil along pipe lines or carrying it in barges along waterways.
Its final distribution is by road transport.

(c) Oil has normally to be transported between:-

1. Oil field and refinery.
2. Refinery or synthetic oil plant and bulk storage depot.
3. Storage depot to consumer.

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3. In the area under consideration, oil fields are located:-

a. In Hungary, west of Lake Balaton.
b. In Austria, northeast of Vienna.

4. Refineries are located in the immediate vicinity of Vienna, which handles part of the Austrian and Hungarian crude production.

It is thought that any crude surplus is transported to the North German refineries by rail and waterway, or to the northern Czechoslovakian refineries by rail or by pipe line via Roudnice storage depot.

5. The chief bulk storage depots are located at:

a. Lobau in Vienna
b. Roudnice in Czechoslovakia
c. Freiham)
d. Weissenborn)
e. Neuberg) Bavaria
f. Geislingen)
g. Regensburg)

It is thought however, that the present shortage, especially of gasoline, necessitates the transportation of finished products directly from the production centers to the consuming point (battle area or airdromes) without passing through the bulk storage depots.

If this is the case one would not expect to find much rail activity in connection with these depots. Regensburg and Roudnice are shown by photo recce to contain large numbers of tank wagons in their sidings or marshalling yards. However they are special cases, as the former is a Danube oil trans-shipment point, while the latter is at the head of the important pipe line from Vienna as well as being an Elbe trans-shipment center.

6. The off-loading of gasoline or oil behind the battle area can be carried out at any siding. Light, mobile, portable pumps transfer the petroleum from the tankers into barrels, which are then taken away by M/T.

In present circumstances the turn round is likely to be quick and it is unlikely that any large collections of full tank cars will be allowed to gather at such points.

7. The nearest synthetic plants to our area are at Brux, Blechhammer, Odertal and Oswiecim in Czechoslovakia and Silesia.
Some gasoline may be transported by rail or pipe line to our area from these sources.

8. only of recent months have the photo interpretation units been consistently reporting the number of tank cars seen in marshalling yards photographed. Owing to the intervention of much unfavorable weather during this period, existing records of tank car concentrations in M/Ys are limited and scrappy.
However, an analysis of 5th P.G. second phase reports from early November 1944 to 12 January 1945 gives the following results.

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Only 40 marshalling yards of those photographed in Germany, Austria, Yugoslavia and Czechoslovakia were reported to contain tank wagons.

In only 5 of these were more than 100 tankers seen at any one time. These were:-

Regensburg
Roudnice
Florisdorf
Wels
Korrwestheim

The first three are connected with other oil installations and the last two are probably near storage depots. Twelve yards were seen to contain between 50 and 100 tankers at one time. Fifteen were seen to contain 20 to 50." Eight were seen to contain 10 or less.

9. Admittedly these records were scrappy, and were not selected as being on probable oil transport routes. However, they seem to indicate that large collections of tank wagons are only likely to be found in M/Ys adjacent to oil installations and that very limited numbers will normally be allowed to accumulate in other yards en route between installations.

10. In the case of marshalling yards near oil installations, if weather allowed the area to be reached, the installation would probably be attacked as being more important than the collection of tank wagons. If weather was bad, neither targets would be attacked.

11. These considerations lead to the following questions:

a. Would the bombing of marshalling yards containing 20-100 tank wagons be an economical contribution to the oil program?

b. Are there likely to be a sufficient number of such yards on otherwise important lines to justify their use as the selective factor in planning an attack on enemy communications behind the battle areas.

c. Does the evidence so far obtained justify the carrying out of the necessarily heavy routine photo recce program to prove or disprove the case?

d. Would it be easy for the enemy to defeat the plan by routing his oil traffic over alternative lines?

e. Can any other factor be found, which if consistently attacked, would cause more dislocation to rail transport in general, including oil transport, than would the attack on the oil factor itself?

H.P. CLOUGH
Flight Lieutenant
Communications

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AUSTRIA AND YUGOSLAVIA

	Number of recces reporting oil tankers	Largest number of tankers seen on one day
Floridsdorf	1	240
Stockerau	1	80
Wiener Neustadt	1	10
Neunkirchen (SW of Wiener Neustadt)	1	40
Gloggnitz (SW of Neunkirchen)	1	2
Linz }	2	50
Linz }	47	175
Wels }	1	35
Wels }	1	20
Dasselbrun (SW of Wels)	1	60
Klagenfurt }	1	45
Klagenfurt }	2	20
Deutsch Wagram	1	50
Graz	3	
Celje	1	50
Zagreb }	1	54
Zagreb }	1	30
St. Polten	1	25
Ljubljana	1	
Worgl		
Arnoldstein (SW of Villach)		

GERMANY

Passau }	5	37
Passau }	7	448
Regensburg }		
Regensburg }	1	15
Regensburg }	2	45
Regensburg	1	39
Straubing (SW of Regensburg, on Danube)	1	89
Stuttgart }	1	
Stuttgart }		97
Gauting (W. of Starnberg)	1	
Neuberg }		65
Neuberg }	2	22
Neuberg }		8
Brux }	1	50
Brux }	1	20
Brux }	1	10
Dresden }	1	60
Dresden }	1	100
Aulendorf (SSW of Ulm)	1	
Rosenheim		
Gorlitz		
Munich		
Munich		
Kormoosthein		

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AUSTRIA AND YUGOSLAVIA

	Number of recces reporting oil tankars	Largest number of tankars seen on one day
Floridsdorf	1	240
Stockerau	1	80
Wiener Neustadt	1	10
Neunkirchen (SW of Wiener Neustadt)	1	40
Gloggnitz (SW of Neunkirchen)	1	2
Linz))	2	50
Linz)		
Wels))	4	175
Wels)		
Desselbrun (SW of Wels)	1	35
Klagenfurt))	1	20
Klagenfurt)		
Deutsch Wagram	1	60
Graz	2	45
Celje	1	20
Zagreb))	3	50
Zagreb)		
St. Polten	1	50
Ljubljana	1	54
Worgl	1	30
Arnoldstein (SW of Villach)	1	25

GERMANY

Passau))	5	37
Passau)		
Regensburg))	7	448
Regensburg)		
Regensburg))		
Regensburg)		
Straubing (SW of Regensburg, on Danube)	1	15
Stuttgart))	2	45
Stuttgart)		
Gauting (N. of Starnberg)	1	39
Neuberg)	1	89
Neuberg))		
Neuberg)		
Brux)	1	97
Brux)		
Brux)	2	65
Dresden))		22
Dresden)	1	8
Aulendorf (SSW of Ulm)	1	50
Rosenheim	1	20
Gorlitz	1	10
Munich	1	60
Munich	1	100
Kornwestheim		

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	Number of recces reporting oil tankars	Largest number of tankars seen on one day
Landshut (NW of Munich	1	18
Plattling (NW of Landshut)	2	30
Vilshofen (SE of Plattling)	1	16
Altenburg (S. of Leipzig)	1	25
CZECHOSLOVAKIA		
Prague	1	10
Roudnice (Storage depot and pipe terminus on Roudnice Elbe near Burx and N. of Prague)	1	336
Roudnice	1	15
Olomouc	1	30
Znaim		

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German Town Targets 65

1 October 1943 Amended 26 Oct 1944

Memorandum:- Interdiction of Brenner Line by Attacks on Substations in Austria.

Annex No. 2

GENERAL ASPECTS

1. In a memorandum dated 21 October 1943, Entitled "Electric Sub-Stations as Railroad Targets on Italian Brenner Line", it was concluded that complete interdiction of the Brenner Line by attacks on sub-stations on the Italian side of the pass could not be accomplished. A study of the possibilities of such an attack on the Austrian side of the Brenner was indicated in that report. Results of this study are incorporated in the following.

2. The Austrian section of the Brenner line runs from Innsbruck to Brennero, a distance of about 22 miles. This stretch of line, as is the case with all German and Swiss lines, is driven by 15000 volt, single phase, 16 2/3 cycle electric power. This power is distributed from the generating stations over 55,000 volt transmission lines and stepped down to the proper voltage at sub-stations located at moderate intervals along the railroad right-of-way.

3. These sub-stations resemble those on the Italian side in general construction; that is to say, they consist of a moderately small, two story brick or stone building plus the intricate and vulnerable external equipment. These Austrian sub-stations, however, handle a different type of current from those in Italy, and no interchange with the Italian system is possible. Also,

4. The Austrian sub-stations have the same span of effectiveness as those on the Italian side. Namely, if only one sub-station is destroyed, the railway could continue operation on a somewhat reduced scale by resorting to emergency switching arrangements. Failure of two adjoining sub-stations would result in stoppage of traffic - provided the maximum range of adjoining sub-stations is not less than the normal distance (its about 10 miles). The most optimistic figure for repair of a sub-station is given as three months.

5. Steam operation over the steeper sections of this line, from Matrei to Brennero, would be difficult. There are, however, no repair or maintenance facilities for steam locomotives in this section of Austria.

6. There are two possible expedients which might be used in case of electric failure on this section of line. One is use of the Shay-type steam locomotive with vertical pistons; this locomotive can pull a tonnage (incl. wt. of rolling stock) roughly equal to twice its weight over a ten percent grade. The other expedient is use of a compounding system whereby the generating electric locomotive furnishes a very considerable amount of electric power, which can be transformed into the electric system pulling the line. Both of these are American developments and it is unlikely that the Axis is in a position to apply them on the Brenner. However, it might be well to check these points with suitable parties available. [It is reported that no Shay Type locomotives exist in Axis Europe]

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7. Proceeding northward from the frontier on the Austrian side, the first sub-station is encountered at Imst (47°-17'-30"N, 10°-44'-E), about 20 miles from Innsbruck. The Imst sub-station is the only one between the frontier and Innsbruck (a total distance of about 21 miles). The sub-station is an L-shaped four story building, containing the external installations within the "L". It adjoins the RR station of the south side of the tracks, and a few feet north of where the RR crosses the main Brenner Highway.

8. The next sub-station north is beyond Innsbruck at Hall (47°-17'-N, 11° 30'-E), about 16 miles from Imst and 5 miles from Innsbruck (east of). The sub-station at Hall is similar to that at Imst, It lies on the southwest fringe of the little town, close to the Inn River, and 1600' due west of the only bridge in the neighborhood (a minor road bridge). It is on the south side of the RR tracks, immediately adjoining the RR station. Transmission lines leading in from NE and W. RR. Furnish an additional land mark.

9. Since the Imst sub-station is the last sub-station on the line, switching arrangements (in event of destruction) could be made from one side only. Therefore it is possible, but by no means certain, that destruction of Imst alone would be adequately sufficient to stop service. If this is not the case, it would be necessary, not only to destroy the next sub-station, at Hall, but certain emergency arrangements situated at Innsbruck (about 11 miles N of Imst and 5 miles west of Hall) as well. Details are as follows.

10. At the Innsbruck - Hilton Switching, transformer and control center, [illegible] emergency arrangements for converting the 3-phase, 50 cycle, AC industrial and domestic current into RR current. This station on which the entire district depends for domestic current is located about 3000 feet SE of the Hilton (West) RR Station and about 1000 feet West of Hilton Church and Minister. It is a [illegible] building with complex external installations on its south side. Both building and installations are larger than in the case of the RR sub-stations, and they of course do not lie close to the RR right-of-way. Coordinates are 47°15'N, 11°23'E.

11. Possibly superfluous, but certainly insuring a complete wiping out of all power sources in this vicinity, is a fourth target. This is the [illegible] Power Station generating RR current and lying east of the rail line about 5 miles south of Innsbruck. This is a power station of the older type, hence [illegible]. The tall building housing the [illegible] looks very much like a Italian hotel, with numerous, high-pointed gables. It is situated in a side valley (at appx. 47°12'N, 11°23'E) to west of, and parallel to, the main valley through which runs the Brenner line. Nearest station on the line is Patsch, which lies due west. It is important not to confuse the Innsbruck Power Station with one a mile or two NE in the main valley and on the opposite side of the river from the railroad.

[illegible] Innsbruck [illegible] Station would [illegible]

12. Up-to-date photo cover is being ordered on all four of these targets, all of which lie within an area having a maximum diameter of less than 10 miles.

[Appendix note]

13: If there are mobile sub stations of the Austrian Brenner RR sub stations would ~~be~~ reduce but not totally deny the power supply]

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HEADQUARTERS
MEDITERRANEAN ALLIED AIR FORCES
APO 650

15 March 1945

STUDY OF ELECTRIC RAILWAY POWER TARGETS IN SE BAVARIA AND AUSTRIA

1. Introduction: Intelligence from many sources indicates that the enemy is now suffering from an overall hard coal shortage as a result of the loss of the Silesian coal fields to the Russians and the bombardment of the Ruhr rail communications.

The Ruhr is now the only really large producing center of hard coal left to the enemy, and under present conditions the transportation of this commodity from the Ruhr to southeastern Germany, Austria and Italy must constitute a major problem.

Steam locomotives require hard coal for efficient working. No doubt brown coal can be used to some extent, but efficienty will be lost and maintenance work on the locos will increase as a result.

It is evident that in areas which are distant from the coal mines, electric traction is likely to become of ever growing importance to the enemy.

The main rail lines leading from southeastern Germany to the Italian and southeastern battle fronts are designed for electric traction.

If the electric power can be denied to those lines it appears that the enemy may find the greatest difficulty in meeting the coal requirement to work them by steam. In the event of the allies overrunning the Ruhr coal mines then the loss of his electric rail power might well prove disastrous to his lines of communications with the Italian and southeastern battle fronts.

The following study reviews the possibilities of denying electric power to the electrified railways, connecting Munich with Italy on the one hand and Vienna on the other.

2. In Germany and Austria, the electric grid supplying railway current is quite distinct from the grid supplying general industrial and domestic power. The general power network utilizes 3 phase 50 cycle a.c. while the railway current is single phase 16 2/3 cycle a.c. The single phase 16 2/3 cycle railway current is generated as such by seperate generators.

This study is concerned with the possible denial of the single phase current to the electric railways in Southern Bavaria and Austria.

It is quite possible to convert the 50 cycle general current to the 16 2/3 cycle railway current by the use of special apparatus, but in the area under consideration data at hand relates to only one such installation. In the existing system, such frequency changers would be uneconomical, but it is possible that

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some may have been installed as a precautionary measure, in anticipation of an attack upon the railway current generating stations.

3. An electric power network consists essentially of three parts:

a. Generating stations
b. Transformer stations
c. Transmission lines

Power can be denied to the consumer, in this case the electric locomotive, by the destruction of any one of these parts, or specific lines may be isolated by the destruction of a combination of selected generating and/or transformer stations.

4. In the mountainous area under consideration, practically the whole of the railway current is produced by hydro-electric generating stations, as opposed to thermal stations. In a thermal station, steam is employed to drive the turbines and a boiler house is an integral part of all such installations. In the case of a hydro-electric station, a reservoir providing a head of water and the penstocks replace the boiler house and steam lines. The penstocks are the large bore water pipes leading the water under pressure from the reservoir to the water turbines.

5. The main targets in the railway power network would be (a) the generating stations and (b) the transformer stations. Lengths of transmission lines can be easily destroyed but are replaceable in a few hours.

6. Vulnerability of targets

a. Hydro-electric generating stations: (i) Most serious damage would be effected by destruction of the turbines and generators. If these were destroyed replacement would probably require six months to a year. However, the machine house of a power station which contains these mechanisms offers a relatively small target and direct hits would be necessary to destroy the heavy machinery.

(ii) The penstocks if destroyed would probably require a number of weeks for repair. At the same time serious additional damage and flooding of the power house might occur, due to the great volume of water released from the broken penstocks.

The target area offered by the penstocks varies at different stations with the height of the water head and could be comparable in size to a long rail bridge or at the other extreme to a short canal bridge. The penstocks are usually unprotected and would probably be very vulnerable to attack by frag bombs.

(iii) The target area of transformer and switch gear attached to a generating station would be roughly equivalent to that of the power house. Transformers if destroyed would require an estimated 1 to 3 weeks for repair, if replacements were available. If the switch gear alone was destroyed emergency arrangements would probably be completed in a few days.

The transformers would in many cases be very vulnerable as they are usually found in the open air and would probably be destroyed by frag bombs or cannon fire.

(iv) Most of the hydro-electric stations in the area under consideration are situated in a very mountainous area and usually at the foot of a very steep

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mountain slope which would mask the target on one side. The vital sections offer a relatively small target area and they would probably be difficult targets for high altitude bombing.

b. Transformer sub-stations: In Germany and Austria the electric railway high voltage transmission current is transformed down to a working voltage of 15,000 volts at transformer stations spaced along the railways at intervals of about 40 miles. These sub-stations offer a very small target area but the transformers, which are set up in the open air would be vulnerable to attack by frag bombs or cannon fire. If replacement transformers are available, repairs could be completed in a few days to a week. If spare transformers are not available and had to be manufactured, repairs would take a matter of months.

As an emergency measure mobile transformers, if available, could be brought into use and a reduced service re-installed within a few hours of the transformer reaching the required point.

It is practically certain that some mobile transformers would be available to the enemy but how many is not known.

7. General Target Programs to be considered

a. Generating Stations: There are six stations in Southern Bavaria and eight stations in Austria generating railway current. These are listed below:

Southern Bavaria	Austria
Walchensee	Mallnitz I
Aufkirchen	Mallnitz III
Riting	Ruetz
Pfronbach	Spullersee
Saalach	Stubach I
Gartenau	Stubach II
	Achensee
	Gosau-V (Steeg)

These stations appear to be so interconnected that it would probably be necessary to destroy 10 or 12 of them in order to be certain of cutting off all direct rail current from any single section of the electric rail network. Even then, if frequency changers have been installed at unknown locations, current could be provided from the general power grid.

Destruction of 6 or 8 of the main generating stations would certainly severely restrict the working of the electric railways, but it is very difficult to estimate exactly how many would have to be destroyed to prevent the use of electric traction for moving a limited amount of essential traffic.

If all the main railway generating stations were knocked out and no frequency changers were available, the prohibition of rail current would be of great duration, but the number, size and location of the targets, in addition to the unknown factors, make the success of a program based on generating stations highly problematical.

b. Transformer Stations: To be certain of making a break in electric traction on any of the electrified rail lines in Germany and Austria, three

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consecutive transformer stations must be knocked out at the same time along the line. These transformer stations are placed at intervals of about 40 miles.

They offer a very small target area, probably not exceeding 15-20 yards square, except in the case of Passing, to the west of Munich, which is a larger and more complex installation.

However, they would be vulnerable to attack by frag bombs or cannon fire, as well as H.E., as the transformers are installed in the open air. By knocking out 7 of these stations, through electric rail traction between Munich and the Italian and southeastern battle fronts could be prohibited.

Continuous photo recce would have to be employed to keep a check on repairs and to locate mobile transformers if utilized, and repeat attacks would probably have to be made.

As stated above, if new transformers are easily available a sub-station could probably be repaired within a week, but it is felt that the enemy would be hard put to it to find more than one replacement at short notice for each of the six substations.

C. Specific Attack Projects

In each of the following projects it will be noted that the objective is the same, namely, to deny the use of electric traction to as large a section of the given rail line as is effective under the limits of relatively small target systems.

(a) In the Munich area, the transformer station at Passing is of such importance that its inclusion as a target is essential. It supplies both of the electric lines running south from Munich, i.e., to Salzburg and to Innsbruck, in addition to serving other areas to the north. (One authority suggests that there is a second transformer station at München Ost marshalling yard. Should this be true, München Ost must figure as an additional target in any program which includes Passing.) Along the more easterly of the two above named lines, successive transformer stations exist at Rosenheim and Traunstein on the main line to Salzburg. In all, three units are considered, as it is generally conceded that three consecutive transformer stations must be knocked out before it is practically certain that there will be a break in the flow of current. With the destruction of the three mentioned, Passing, Rosenheim and Traunstein, it can be concluded that a large part of the Munich-Salzburg line will be without electric current and a substantial reduction will ensue in the capacity of the Munich-Rosenheim-Innsbruck route.

(b) A second plan is designed to cut out electric current on the Munich-Rosenheim-Wörgl line and to definitely reduce the capacity of the Munich-Salzburg line. The targets embrace the Passing, Rosenheim and Wörgl transformer stations. It is seen that there are two targets which are mutual to each of these two plans.

(c) A third scheme entails the incapacitating of three stations again; Passing, Murnau, which is on the Munich-Garmisch-Innsbruck route and Hall and/or Zirl, which are just east and west of Innsbruck respectively. The purpose of this plan is to deny through electric current to the Munich-Innsbruck line via Garmisch.

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In each of the preceding cases, three successive stations have been selected so as to assure the effectiveness of the break. The targets in each system are adjacent to those of another system and readily blend into a composite plan which includes all of the six named transformer units. The effect of their combined destruction would be to deny any electrical link between Munich and Innsbruck on either of the two main lines, to create a large break in the Munich-Salzburg main line and to create a somewhat smaller break in the Innsbruck-St. Veit line.

(d) With regard to the Austrian Brenner, the effect of the combined plan would not be sufficient to curtail electric traction appreciably and it would be necessary to destroy the Zirl station, west of Innsbruck, the Matrei station located on the Brenner and the Wilten station at Innsbruck. The last named is important because of its reported facility of frequency changing by which method commercial current can be converted to railway use and the possibility of it having a direct 15,000 volt connection with the trolley line.

Thus, there are nine targets in all. It must be particularly emphasized that because of the capacity of mobile sub-stations to act in an emergency and bridge any gap in the electric flow between fixed transformer stations, any target system which is laid on has to be regarded as a definite commitment, if the objective is to be permanent denial of power, as each mobile station would have to be first sought out and then destroyed once it had been introduced at some point near the break. The use and existence of it on the line could be determined by the observation of the type of traction employed after the break had been initiated.

It is not fully known to what extent the enemy would be capable of supplying these mobile units should he need several at one time within the area bounded by Innsbruck, Munich and Traunstein.

9. Conclusions: It must be pointed out that no complete and authentic description of the German and Austrian rail current transmission system is available at present. The data given above has been collected from a number of different sources and much of it requires confirmation by photo reconnaissance.

However, from the available evidence it appears that more predictable and quicker results may be obtained by an attack on transformer stations than by attacking generator stations.

On the other hand, a program based upon transformer stations, would probably be a continuing commitment owing to the possibility of speedy replacement of damaged transformers.

Effective attacks upon a sufficient number of rail current generating stations would have a much more permanent effect. However, owing to the small size of the targets and their awkward locations in mountainous country it could not be expected that these installations could be made inoperable with the first attack. Finally, if frequency changers have been installed, our required result would not be achieved. A consideration for high authority is the great length of time it would take our occupying forces to restore electric traction, should the generating stations be destroyed.

Intelligence at hand is not sufficient to establish the precise effect on the rail network of the destruction of specific generating stations, or of their vulnerability to attack.

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However, it is believed that attacks on transformer stations complimentary to attacks on transportation targets would achieve an additional measure of overall dislocation to an already heavily strained transportation system.

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German Power

HEADQUARTERS
MEDITERRANEAN ALLIED AIR FORCES
APO 650

D-HPG-iw

67

2 May 1945

STUDY OF ELECTRIC RAILWAY POWER TARGETS
IN S.E. BAVARIA AND AUSTRIA (Addendum)

CONCLUSIONS DRAWN FROM REPORT NO. HI.301(S) BY 336 PRW

1. The conclusions arrived at in the report on the above subject of 15 March 1945 remain substantially the same in the light of the P.R. Report No. HI.301(S). However, one or two corrections are necessary.

a. There appears to be no substation at Wörgl. Instead, the section of line in this area is served by the transformer station at Kirchbichl, which is slightly North of Wörgl, in the direction of Kufstein. In the report, therefore, "Kirchbichl" should be substituted for "Wörgl". This does not affect any of the other considerations.

b. The transformer station at Zirl, West of Innsbruck, appears to have no direct connection with the Mittenwald-Innsbruck line. (This is now only of academic interest as our ground forces are already in control of this line.)

2. The following stretches of electrified lines appear to be served by the substations given below:

a. Rosenheim to Attnang-Puchheim

(i) Rosenheim (destroyed)

(ii) Traunstein (possibly damaged)

(iii) Steindorf

(iv) Basic data states that there is a substation at Attnang-Puchheim but none can be seen on photos of the area.

b. Rosenheim to Innsbruck

(i) Rosenheim (destroyed)

(ii) Kirchbichl

(iii) Hall

(iv) Possibly Wilten at Innsbruck

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c. Wörgl to Salzburg via Schwarzach St. Veit

(i) Kirchbichl

(ii) Kitzbuhel

(iii) Saalfelden

(iv) Schwarzach St. Veit

(v) Golling

3. The situation still remains that the destruction of any three consecutive substations along a line will create an electrical break on that line. If our ground forces are able to keep up their present speed of advance, it will probably be to our ultimate advantage to keep the remaining substations intact. Should enemy resistance stiffen and should they show themselves capable of making a stand in the central redoubt area, denial of the electric current to the railways by the destruction of the appropriate substations should receive further consideration.

TARGET ANALYSIS SECTION

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Annex No. 5

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LOUSE

TO : Director of Operations and Intelligence.

FROM : Target Analysis, Communications.

RAIL TARGETS BETWEEN MUNICH & INNSBRUCK

1. It is suggested that the following four rail bridges in the INN Valley would provide suitable targets for Strategic Air Force. Destruction of these bridges would interdict through traffic between MUNICH and INNSBRUCK leaving the BRENNER pass route intact.

a. [illegible] INN/MATTENBERG bridge, which the main line from INNSBRUCK to MUNICH crosses the INN at 47° 30' N/ 11° 35' E, near MATTENBERG. (See Min. Civilian Chart, Number MOC 14-44).

b. Main bridge over river INN on north west outskirts of INNSBRUCK where the main line to MUNICH crosses the river. (See Target Chart 14-41-MA)

c. Bridge over the river INN at E. 1880 near KIRCHBICHL, north of [illegible].

d. Rail bridge over river INN on western outskirts of INNSBRUCK, where the line from MUNICH through [illegible] crosses the INN. (See Target Chart 14-47-MA).

2. Targets (b), (c), and (d) lie on the main MUNICH-[illegible]-INNSBRUCK line, which carries the bulk of the traffic from Germany destined for the BRENNER via INNSBRUCK.

(a) is a masonry bridge 450 m. long and should be given priority over (b) and (c), as it lies south of Innsbruck, thereby providing a more difficult bypass-replacement problem. [illegible] at this point stops all traffic from the southern direction to INNSBRUCK as well as from MUNICH.

(b) should be given second priority, as it puts the MUNICH line [illegible] of action.

(c) [illegible] priority as it lies [illegible] would be of smaller problem to overcome.

(d) [illegible] of the secondary line from MUNICH through KUFSTEIN [illegible] would be only in conjunction with the main line.

3. The only other route from MUNICH to INNSBRUCK is via STEIN-[illegible] line, which also runs through KUFSTEIN but this line is inferior [illegible] in winter on account of snow. Route recommended [illegible] this line is [illegible].

[illegible]
Target Analyst
Communications Section

[illegible]

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Hungary Basic

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11 Oct. 1944

Copy to: Intelligence Section, H.Q., M.A.A.F., A.P.O. 650.

Subject: Electric Power Supply for the Budapest-Vienna Railway.

1. With reference to possibility of stopping traffic on the main BUDAPEST-VIENNA railway by the destruction of electric power facilities for that route, we attach for your information a number of intelligence reports of varying reliability, which you may possibly not have received and which serve to give some picture of the electric power supply situation in the Budapest area.

Electric Power Supply

2. A summary of the evidence available brings out the following points:

a) Quite apart from any Allied air attacks, there has been a shortage of electric current in Budapest for some time, in February it was even announced that if economies were not carried out willingly the current would be cut off.

b) A comparison of the output of electricity in the city during 1943, with the approximate installed capacity of the plants, also suggests there is little or no idle capacity to spare for an emergency, in spite of occasional reports that Kelenfold is largely, or in part, a stand-by for Csepel.

c) The stations at Csepel and Kelenfold are not only the largest in Hungary but represent between them about 90% of total capacity in the Budapest area. It is highly doubtful (in view of the believed full utilisation of capacity) whether either of them could assume the necessary extra load in the event of the other failing. Should both stations be put out of action, it is believed that it would be patently impossible to obtain the required power from any other source. The Veszprem, Gyor and Komarom power systems are connected with Budapest but the generating stations in these areas are of too small capacity to be of any importance in taking over extra loads, and indeed they are thought to be almost fully employed in providing current for local needs. (According to London, the Austrian network is definitely not able to provide power for the Hungarian system.)

/Therefore

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Therefore, were both the DAMIDA and KELENFOLD power stations rendered inactive, the main rail line BUDAPEST - KISTERDALOM would be deprived of electric power.

Alternative Means of Operating the Railway

3. The BUDAPEST - KISTERDALOM electrified line would function under steam only if:

a) sufficient steam locomotives were available,

b) station facilities for cooling and watering still existed.

However, the loss of electric power would incapacitate the whole system of points and signals on this route, as they are believed to be electrically operated throughout. (They are definitely so worked in the KOMAROM area.)

A limited steam train service could conceivably be run (granted conditions under (a) and (b) above) on the Elementary Block System, using only flags and boards as signals, and hand-controlled points, provided telephone or telegraph communications were still functioning. Failing that, trains might perhaps be run on a time-interval basis. In the opinion of a transportation expert, mechanical or electrical points and signals increase the capacity of a line but are not essential for working a limited number of trains.

However, with the degree of disorganisation and confusion already caused to the Hungarian railways system by bomb damage and other military action, the quick institution of such an emergency system outlined above would be a considerable undertaking, and it is considered very doubtful whether it could be carried out at all unless under complete German control with personnel provided entirely by German railway operating companies.

Effect on Traffic

4. In this case, the German reaction in the event of a destruction of the electric power supply for this line, would probably be the inauguration of an extremely limited steam operated service for essential military trains, plus the transfer of the balance of priority military traffic to the line via BRATISLAVA and GALANTA. However, the movement of first priority economic traffic to Germany, i.e. crude oil and bauxite, which are now almost the only commercial commodities allowed to move on the Hungarian export rail routes, would be seriously diminished.

J.R. WRAIGHT.

Major. R.H.A.

(C.F.)

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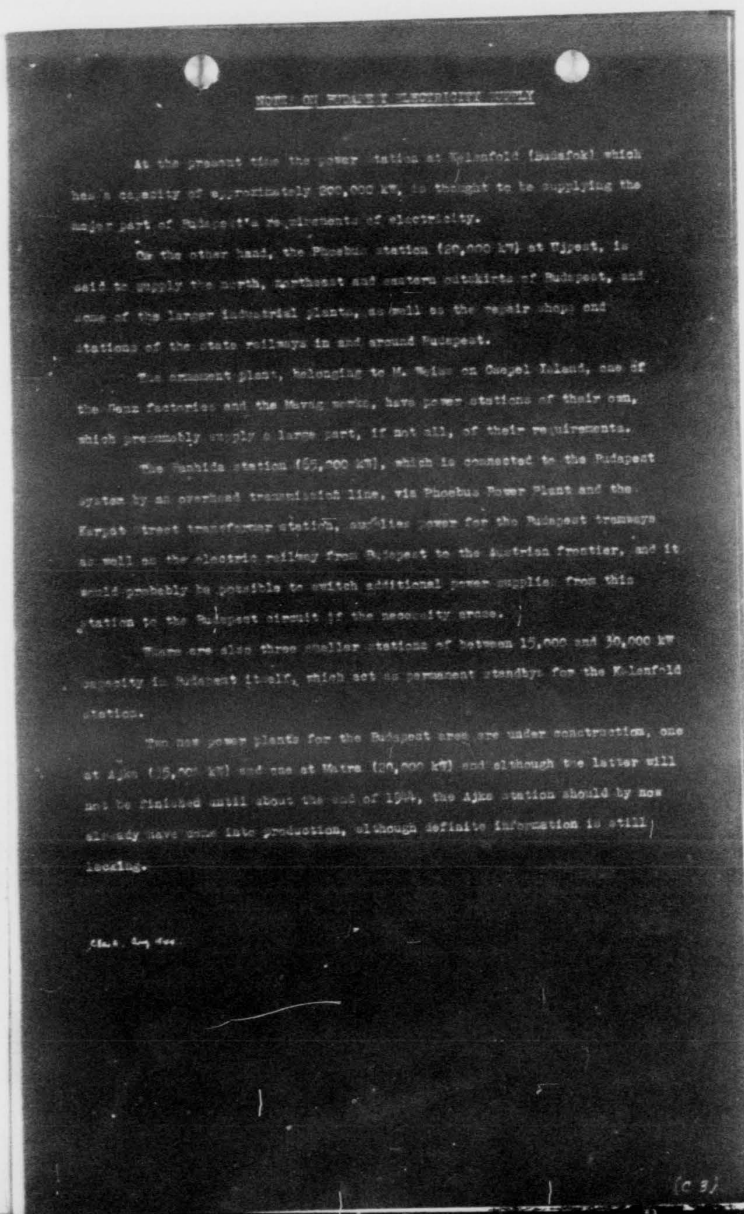

[illegible] OF HUNGARIAN ELECTRICITY SUPPLY

At the present time the power station at Kelenfold (Budafok) which has a capacity of approximately 200,000 kW, is thought to be supplying the major part of Budapest's requirements of electricity.

On the other hand, the Phoebus station (60,000 kW) at Fijpest, is said to supply the north, northeast and eastern suburbs of Budapest, and some of the larger industrial plants, as well as the repair shops and stations of the state railways in and around Budapest.

The armament plant, belonging to M. Weiss on Csepel Island, one of the Ganz factories and the Mavag works, have power stations of their own, which presumably supply a large part, if not all, of their requirements.

The Ujpalota station (50,000 kW), which is connected to the Budapest system by an overhead transmission line, via Phoebus Power Plant and the Konyat street transformer station, supplies power for the Budapest tramways as well as the electric railway from Budapest to the Austrian frontier, and it would probably be possible to switch additional power supplies from this station to the Budapest circuit if the necessity arose.

There are also three smaller stations of between 15,000 and 30,000 kW capacity in Budapest itself, which act as permanent standby for the Kelenfold station.

Two new power plants for the Budapest area are under construction, one at Ajka (15,000 kW) and one at Matra (50,000 kW) and although the latter will not be finished until about the end of 1944, the Ajka station should by now already have come into production, although definite information is still lacking.

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29th November, 1943.

Information dated : 15.11.43.

ISTANBUL.

HUNGARY

WAR PRODUCTION :- Banhida Central Station.

The so-called "Talbot" electric power station at BANHIDA began to operate late in June, 1930. The station lies at a distance of about 5.5 km., from the Hungarian Coal Mining Co's TATABANYA mine. The coal transport to the station is by overhead cable traction from the mine right into the boiler house. The same cableway serves for the removal of ash and slag to a sand pit about 3 km., from the Central Station. The cooling water is pumped in from BANHIDA LAKE, on the bank of which the station is situated.

The station is equipped with three turbo-generator sets of 21,000 KW each, and thus has a continuous power output of about 28,150 HP when only one set is operating at any one time. The boiler house contains eight boilers of 989 m2 or 10,645 ft. of heating surface each, using a pressure of 28.5 kg/cm 2 or 405 psi. The 50 cycles three-phase voltage is stepped up to 110,000 V by four transformers handing 22,500 KVA each continuously. The current is distributed by a long-wave transmission line of altogether 160 km length.

The bulk of the total energy output is taken up by the city of BUDAPEST (about 130 million KWhrs/year), and used by the Municipal Tramway Company and the City Central Station. About 48-million KWhrs/year are taken up by the Hungarian State Railways to supply current for the electric line BUDAPEST-HEGYESHALOM (German-Frontier). About 6-million KWhrs per annum are used to supply the Northern half of Transdanubia (Counties of GYOR and SOPRON.)

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Cont.

Report on the Bauhide Electric Power Plant.

Source: A. Komal, former candidate for officer in the Hungarian Army; left Hungary in 1940 after serving for the previous year as guard at a Hungarian concentration camp for Polish refugees during which he claims to have assisted numerous Poles in escaping; now serving with the Polish Army awaiting assignment in Italy; appears to be sincere and reasonably intelligent; information believed to be given in good faith and probably accurate as far as it goes.

Background: The Bauhide Electric Power Plant was begun around 1930 as a favorite project of a member of the then Hungarian cabinet. Purpose was to utilize local deposits of fuel to obviate the need for transporting coal for electric power production for the Budapest area. (The dictionary translation of the Hungarian word for the fuel employed is "slate", though the material may be a kind of a peat. It is unlikely that the fuel used is peat because it is mined in country hilly enough to justify a funicular railway, and the area was formed in the Oligocene period. This suggests that the Hungarian word "slate" stands for a carboniferous shale which might be either oil-bearing shale or lignite.)* A scandal developed involving allegations of graft and the cabinet fell partly over the alleged irregularities in connection with the Bauhide development, but it was later completed and is said to have proved very efficient and so economical that it is now the source of electric power for the surrounding area. The former Kelenfold power plant, located in a suburb in southwest Budapest over the southern railway bridge is said to have been inoperative since 1940 but kept in good repair as an emergency plant. Source believed it likely that emergency reserves of coal would be kept for the Kelenfold station, but that the industrial expansion in the area has created power requirements well in excess of the capacity of the old plant and that transport of sufficient coal to operate it would create serious difficulties.

Location: Bauhida is a small village situated _____ kilometers west of Budapest (map reference 47°36' N: 18°23' E.) The power plant is located on the left of the railway from Budapest to Vienna and can be seen from the train window. It is a large building under one roof and is built of red brick. A funicular railway leads from the plant to the mining area which is shifted from time to time; in 1940 the "slate" was being brought from a point about three kilometers from the plant. Principal land-mark in the area is the Turul monument situated on top of a hill on the other side of the railway line about one-half to one kilometer north of the plant. Monument is a huge carved eagle with a wingspread of about thirty feet and is easily identified from a distance.

Area served: Source was positive that the Bauhide plant in 1940 was serving the entire area from Vasc to Budapest, including Szekesfervar and the electrified Budapest-Vienna railway.

* O.W.W., Cairo, Comment. March 3th, 1944. (T.W.W.)

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HUNGARIAN TRANSMISSION SYSTEM.

Hungary does not possess a systematic grid system although a number of lines now in existence may eventually serve as the backbone of such an interconnecting system. The main difficulties are the still existing diversity of energy characteristics (type of energy and not standardized cycles), the limited carrying capacity, and the wide variety of voltage of the transmission lines.

The most important line at present is the 160 kilometer 110 kilovolt double transmission line from Hegyeshalom, near the Austrian border, to Budapest, connecting the large power plant at Bunhida (based on lignite and owned by the State, with a capacity of 63,000 kilowatts) with the power plants in Budapest through the Karpat Street Transformer Station. Also connected to this line is the power station of the city of Gyor, with a capacity of about 8,000 kilowatts. This plant was reported recently increased to 30,000 kilowatts. This line connects about 50 percent of the capacity installed in public plants serving the most important industrial centers of the country. The Budapest power plants, however, although physically interconnected, do not work entirely parallel because part of their energy is generated at non-standardized frequency. The electrified railroad line from Budapest to Hegyeshalom, 190 kilometers, near the Austrian border, is fed from this transmission line. This line is operated with 50 cycle alternating current at 15 kilovolts on the trolley from the industrial network using a special system worked out in Hungary. This system, unique of its kind, made it possible to electrify this line at a much lower cost than would have been feasible with any of the systems generally used. Evidence is not entirely conclusive whether the plant at Tatabanya is also connected to this line. A considerable area south of Gyor is served from this transmission line over a 20 kilovolt network.

The Karpat Street Transformer Station is located on Karpat Street in Sector V. It receives energy from the Kelenfold Power Station and from the Bunhida Power Station of the Magyar Dunantuli Villamossagi R.T. 30 miles west of Budapest. The energy received from Kelenfold is distributed for street lighting and domestic use, as well as to various industries, while the energy received from Bunhida is supplied to the Budapest electric street railways.

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The transformer can also supply the Rumble energy to the various transformers of the municipal electric units if Plainfield should be out of commission. The station has two transformers with a capacity of 12,000 kilovolt amperes each.

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OSS. [redacted]

19th August 1944.

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SUBJECT

ECONOMIC

HUNGARIAN POWER STATIONS

1. Das wichtigste aller ungarischen Industrieprobleme ist das des elektrischen Stromes. Nachdem Ungarn, im Gegensatz zu Oesterreich oder grossen Teilen Deutschlands, keine Wasserkräfte Bedeutung hat, konnte es in den letzten Jahren nicht mehr Schritt halten können. Das zeigt sich in den letzten 3 Monaten wo, nach der Gleichschaltung der ungarischen Industrie, trotz der Sommermonate, Restriktionen in nicht ernstzunehmenden Kriegsindustrien (Textil, Leder, etc.) vorgenommen werden.

2. Die wichtigen Landszentralen, die praktisch die gesamte notwendige Stromenge liefern, sind die folgenden:-

3. BANHIDA. Diese Zentrale dient in erster Linie der Stromversorgung ungarischer Staatsbahn, besonders der Hauptlinie BUDAPEST-WIEN, wo derzeit sehr wesentliche Transporte abgewickelt werden. Es sind ungefähr 30-30 elektrische Lokomotiven in Betrieb, deren Leistung um etwa 40% höher ist als die der Dampf-Lokomotiven. Eine Zerstörung von BANHIDA würde die Ausschaltung der elektrischen Lokomotiven bedeuten, was sehr beträchtliche Transportschwierigkeiten mit sich bringen würde. BANHIDA erzeugt etwa 50.000 Kw. Die genauen Pläne sind bei den Metropoliten Vickers in London vorhanden, die an der Konstruktion mitgearbeitet haben.

4. [redacted]. Diese Zentrale ist etwas grösser als BANHIDA, mit ca 140.000 Kw. Erzeugung. [redacted] dient in allgemeinem dem Privatverbrauch. Die genaue Lage ist auf jedem Plan der Hauptstadt zu finden.

5. CSEPEL. Erzeugung ca 70.000 Kw. Dient den ganzen Industrieanlagen auf CSEPEL.

6. TATA-BELSOLLA. Erzeugung ca 30 - 40.000 Kw. Dient der Kohlenförderung, Aluminiumherstellung, Ölraffinerie, Karbid- und Ferrosiliciumfabrik.

7. DOROG. Erzeugung ca 15-20.000 Kw.; für Kohlenförderung, chemische Anlagen, auch für die bedeutenden Werke von ALMASFUZITO.

8. OSD (20-30.000 Kw.) und DIOSGYÖR (15-20.000 Kw.) liegen nicht weit voneinander. OSD versorgt praktisch die gesamte Stahlerzeugung, während DIOSGYÖR für die dortige Kanonenfabrik usw. bestimmt ist und besonders für die Kohlengruben

9. AJKA. Eine neue Zentrale mit ca 30-40.000 Kw. Erzeugung (kürzlich von Schuhler, Schweiz, erbaut.) Versorgt Aluminiumfabrik, Kohlenbergwerke, Kryptonlampe, usw.

10. PEC-VASPALOTA. Ist wesentlich. Versorgt Nitrogen, Hydrogen und Anlagen für synthetisches Benzin und sonstige Chemie-produkte.

11. KOMLO. Erzeugung 15-20.000 Kw. Nicht weit von DOMBOVAR. Dient zwar keinem direkten Industriezwecken, kann aber immerals Reserve eingeschaltet werden.

12. NAGYBANYA. Sehr wichtig für die dortige Blei-und Kupfererzeugung und eine Anzahl von Chemischen Fabriken.

13. MATRAVIDEKI Zentrale bei GYÖNGYÖS, derzeit im Bau, dürfte im Oktober 1944 fertig sein.

14. Damit ist die Aufzählung der wichtigsten Zentralen beendet. Man kann nicht genugend betonen, dass die Schlüsselposition der ganzen ungarischen Kriegsindustrie sind, und dass im Falle einer Zerstörung alles stehen bleibt.

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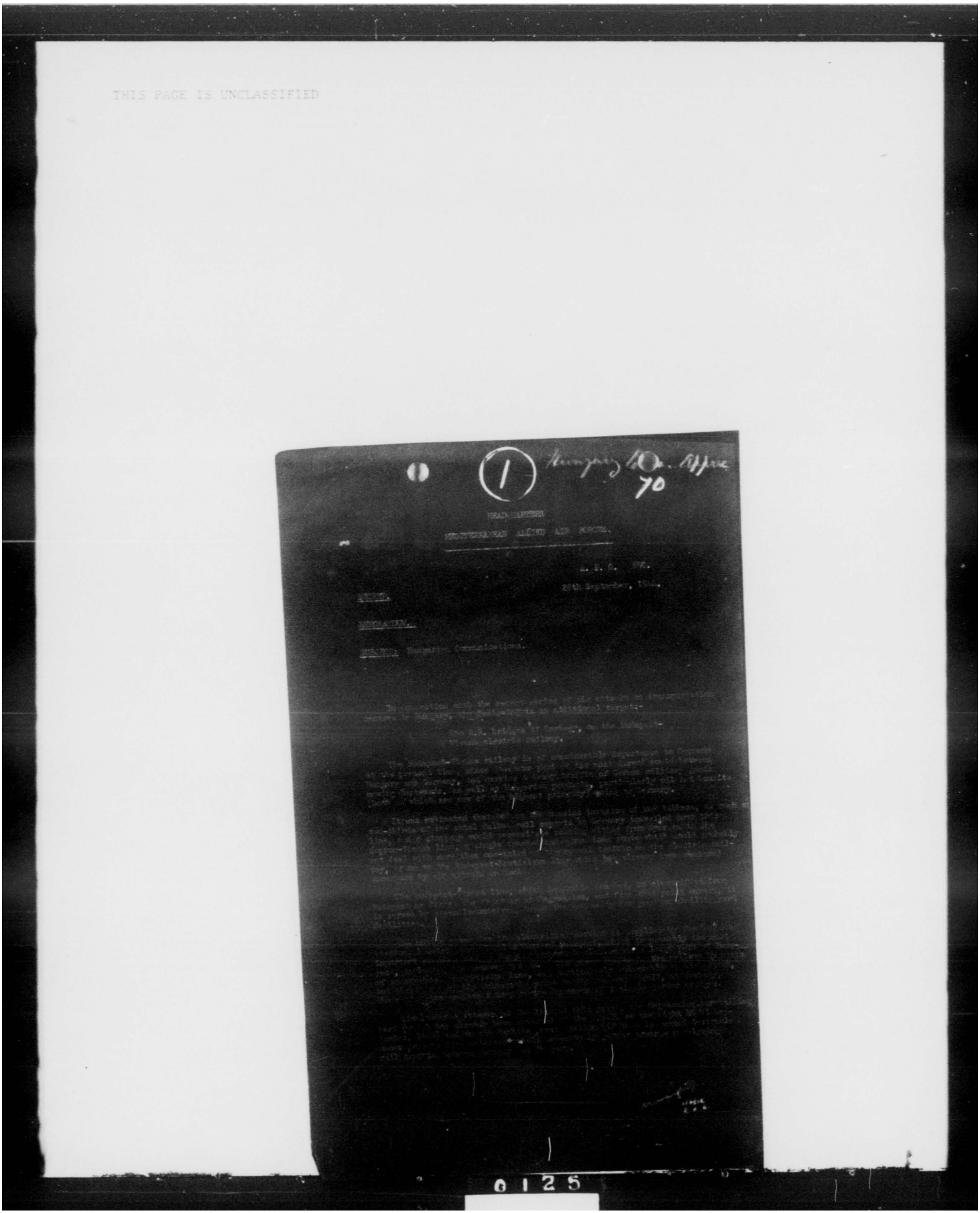

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Result of Interview 25 September 1944 71

1. General Situation: At the present moment the ground situation is fairly static, with the Russians concentrating for the next drive.

The Germans do not intend to do more than fight a withdrawing action until they reach the line of the Danube, which they will probably defend.

Consequently they are only transhipping such supplies eastward from Budapest as they require for their immediate needs. They are apparently moving surplus supply depots from the east to the west of the Danube.

2. Rail Communications: (a) At the present moment the main lines from Budapest to the Austrian border are seriously disorganised, as a result of our air-attacks during the last two weeks.

However, by utilising secondary routes where necessary, the rail system is still fully capable of handling present military supply requirements.

(b) Most of the German military supply trains pass through KELENFÖLD station and junction, which lies in the westerly outskirts of Budapest on the main line to VIENNA. It was suggested that KELENFÖLD station should be bombed.

Much military transport also passes through SZOB. This has already been attacked and is largely out of commission, though through lines are serviceable.

(c) The MARGIT north and south railway bridges over the Danube are both unserviceable and it was thought that it would require five or six weeks to repair either of them. As a result, military traffic is having to use CSEPEL Bridge across the Danube, some distance to the south of BUDAPEST. This bridge should be attacked.

SZOLNOK and SZEGED railway bridges over the TISZA river are unserviceable.

(d) As far as was known, bridge repairs in Hungary were being carried out by Hungarian engineers and labour. It was not thought that the German Todt organisation was employed on this work.

(e) There is a general shortage of locomotives, rolling stock and railway personnel in Hungary, but apparently there is sufficient for immediate military requirements.

(f) The following places were said to be unloading points for military supplies destined for the front. (These points are marked with red ring on the accompanying map.)

[redacted]

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(g) Nearly all German military supply trains are made up before arriving in Hungary. Very little marshalling of German supply trains takes place in Hungarian yards.

3. Road Transport: There is a great lack of motor transport owing to severe shortage of tires and petrol.

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10 October 1944

HUNGARIAN RAIL COMMUNICATION TARGETS

The Hungarian rail targets listed below are those which have been attacked by the 15th Air Force since the last week in August, resulting in a cut or blockage of the through lines as confirmed by photo reconnaissance.

Owing to unfavorable weather, photo recce over Hungary has been severely restricted. Where possible, however, in the case of bridges, the duration of the cut and the present status are given.

In the case of marshalling yards, it may be assumed that at least one through line will have been rendered within one to three days of the attack.

Most of the yards attacked were well loaded and as a result considerable quantities of rolling stock were destroyed. Had the weather been less unfavorable to operations during the past few weeks, there can be no doubt that many more rail cuts would have been created.

The targets are referred to on the accompanying map by the numbers in the first column.

Although the Hungarian rail system between Budapest and the Roumanian border has been severely restricted by our air attacks, no complete line of interdiction has so far been achieved, and it is probable that the enemy has been able to maintain his supply by rail of essential military requirements to the front.

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	Name		Duration of Interruption	Date of Last Attack	Present Status
1	CYCR	W/T		20/9/44	
1 A	[illegible]	*		7/10/44	
1 B	[illegible]	*		7/10/44	
2	[illegible]	*		20/9/44	
3	[illegible]	*		20/9/44	
4	[illegible]	*		21/9/44	
5	[illegible]	*		5/9/44	
6	[illegible]	*	1 to 3 days	19/9/44	Through lines serviceable.
7	[illegible]	*		19/9/44	
8	[illegible]	*		19/9/44	
9	[illegible]	*		5/9/44	
10	[illegible]	*		19/9/44	
10 A	[illegible]	*		17/9/44	
10 B	[illegible]	*		17/9/44	
11	[illegible]	Bridge	A few days	20/9/44	Serviceable.
12	[illegible]	*	21 days	20/9/44	Remains unserviceable.
13	[illegible]	*	7 to 14 days	20/9/44	Serviceable.
14	[illegible]	*	40 days plus	5/9/44	Remains unserviceable.
15	[illegible]	*	14 days	21/9/44	Serviceable.
16	[illegible]	*	19 days plus	21/9/44	Remains unserviceable.
17	[illegible]	*	40 days plus	9/9/44	Remains unserviceable.
18	[illegible]	*	12 days plus		Unserviceable.
19	[illegible]	*	21 days plus	21/9/44	Probably unserviceable.
20	[illegible]	*	21 days plus	8/9/44	No recent cover.
	[illegible]	*	2 or 3 days	8/9/44	No recent cover.

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HEADQUARTERS
MEDITERRANEAN ALLIED AIR FORCES
APO 650

MAAF/A.650/Tgt. 13 October 1944

SUBJECT: Recommended Communications Targets in Southeastern Europe.

TO : Commanding General, Mediterranean Allied Strategic Air Force

1. Attached hereto is an appreciation prepared, in consultation with this Headquarters, by Combined Services Enemy Supply Committee, (CSESC), with respect to recommended communications targets in Southeastern Europe.

2. This paper has been reviewed by this Headquarters and reflects our attitude in the matter. It is passed to you with the thought that it will be of assistance in target selection when such targets are attacked under existing or forthcoming directives.

By command of the Air Commander-in-Chief:

C. P. CABELL
Brig. Gen., U.S.A.,
Director of Operations
and Intelligence.

Encl:-
Recommended Communications Targets
in Southeastern Europe.

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COMBINED CHIEFS OF STAFF SUPPLY COMMITTEE
ALLIED FORCE HEADQUARTERS
APO 512

10 October 1944

Recommended Communications Targets in Southeastern EUROPE

1. Salient points emerging from a study of rail communications in HUNGARY and eastern AUSTRIA are:

a. On the one hand a fairly extensive network exists, although consisting mainly of single track lines.

b. On the other hand through communication from west to east is restricted by the River DANUBE over which are comparatively few bridges, some of which have already been successfully attacked by Allied air forces.

c. BUDAPEST is a railway centre of exceptional importance, and two railway bridges cross the DANUBE within the area of the city.

d. West of a line VIENNA - RACKEVE the railway system becomes considerably less extensive, being restricted by the more mountainous nature of the terrain.

2. In YUGOSLAVIA air attacks and Partisan activities have brought the communication system to a state little short of chaotic, but in the North certain important river crossings remain unbounced enabling through connections with HUNGARY and AUSTRIA to be made.

3. Recommendations.

a. As a forward line of interdiction, railway installations and bridges at [illegible] and all bridges over the DANUBE southwards from [illegible] continue to offer the best prospects, and it should be noted that although several of these bridges have been attacked, one of the [illegible] bridges is still passable for single line traffic, and the bridge west of BOLY is so far undamaged.

b. The DANUBE bridges at [illegible] and [illegible] are important targets as their destruction would deny intercommunication between the two very important railway lines between VIENNA and BUDAPEST.

c. As a strategical line of interdiction, to cause the maximum dislocation to through traffic between Greater GERMANY and southeastern EUROPE, attacks on railway bridges, viaducts and other rail installations on the following sections of line are suggested:

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[redacted] - [redacted].
[redacted] - [redacted].
[redacted] - [redacted].
[redacted] - [redacted].
[redacted] - [redacted].
[redacted] - [redacted] together with attacks on rail installations at [redacted] itself, as it is an important rail centre.
[redacted] - [redacted].
[redacted] - [redacted], including the [redacted] bridge at [redacted].

4. The bridges over the River [redacted] at the following points are also recommended:-

[redacted], [redacted], and that on the line between [redacted] and [redacted].

5. As the most important remaining communications between [redacted] and [redacted], the bridge over the [redacted] at [redacted], and the one over the [redacted] at [redacted] are recommended as most important targets.

6. The above recommendations are shown in red on the attached map, Appendix 'A', which also shows in blue the more important traffic cuts which have already been achieved.

Distribution	Copy No.
Supreme Allied Commander	1
Commander in Chief, Med.	2
C/Air Staff, A.A.F.	3
Chief of Staff, U.S.A.	4

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15 February 1945

MEMORANDUM

TO : Chief Intelligence Officer, Hqs. MAAF

SUBJECT : Concentration of German Armor in Northwestern Hungary

1. Recent photo reconnaissance of marshalling yards and sidings in the area east and southeast of Vienna has shown increased activity and an unusual number of loaded and unloaded flat cars in most of the rail centers covered, in the general area Vienna - Galanta - Gyor - Wiener Neustadt.

2. Flat cars are normally used for transporting motor transport (M/T) and armored fighting vehicles (AFV).

3. Both M/T, tanks and heavy guns have been identified at many of the points covered, either loaded on the flats or seen in the station yards or on the roads near the rail sidings in question.

4. This picture of large numbers of loaded and unloaded flats and AFVs in many closely related rail centers indicates a heavy concentration of armored units in this area.

Such a concentration might be for the purpose of entrainment and withdrawal from the area or it might represent the arrival and detrainment of reinforcements.

At Galanta, however, on 14 Feb. a train of 30 flats loaded with heavy AFVs and guns was seen to be headed east towards the battle front, while a train of 46 unloaded flats and 8 wagons was at the same time seen to be moving west. In this case reinforcement is indicated rather than withdrawal.

5. Details of flats, M/T and AFVs as shown by photo reconnaissance since 9 Feb. in the area described above, are given below:

Gyor - 9/2/45 - Main Yard: 10 AFVs, 16 M/T on flats.
13/2/45 - Heavy load. At least 1 string of 12 flats loaded with AFVs.
14/2/45 - 24 flats loaded with M/T and AFVs and 30 empty flats. 33 hospital train coaches.

Gyor Sabad 14/2/45 - Station: Military train including 8 loaded flats and 10 tanks on flats. Train length of 28 mixed stock with many personnel along side. Many M/T including AFVs seen in the town.

Papa 13/2/45 - 165 wagons. Many unloaded flats.

Wiener Neustadt 12/2/45 Active including 95 unloaded flats.
Sopron 12/2/45 40% loading, probably 106 loaded flats.
Szombathely 12/2/45 60% loading, active, 95 loaded flats.

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North of Danube

Bratislava - 14/2/45 Danube Yard: 850 wagons including 95 unloaded flats.
14/2/45 Primary 34: 160 wagons, 20 unloaded flats.
14/2/45 Town sidings H: 300 wagons including 20 unloaded flats.

Trenkujvar - 14/2/45 350 active wagons including many flats. 5 flak coaches, M/T and 4 heavy AFVs in station yard, 3 heavy AFVs on flats in siding. Train including flats carrying at least 5 AFVs in yard.

Galanta - 14/2/45 130 wagons including 60 unloaded flats. 1 stationary train of 30 flats loaded with heavy AFVs and guns headed east. 1 military train of 46 unloaded flats and 8 covered wagons.

TARGET ANALYSIS SECTION
Communications

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HEADQUARTERS
NORTHWEST AFRICAN AIR FORCES
Office of A. C. of S., A-2
APO 650

D-AFHB-tfa

Italy Basic 75

16 November 1943

SUBJECT: Targets for attack by B-25 G's in Coastal Area Marseilles - Civitavecchia.

TO : Assistant Chief of Staff, A-2,
Northwest African Coastal Air Force, APO 512.

1. Communications targets which appear to be susceptible to this type of attack include the following: railway sub-stations, transformer and switching stations, locomotives (particularly the triphase electric type), sections of railway right-of-way, marshalling yards (particularly the rolling stock and the electric switching control towers). Targets of opportunity would embrace chiefly trains in motion, M/T convoys, and coastwise shipping.

2. In the category of industry and military stores only a few installations are susceptible to this type of attack, such as oil storage and ammunition dumps.

3. While the area arbitrarily selected is that from Toulon to Rome to a depth of 50 miles from the coast, the topographic features of this zone (principally the Apennines and Maritime Alps) further restrict operations. Thus the area considered embraces principally the coastal strip including the coastal railroads and highways, the Arno valley inland to (but not including) Florence, and the coastal plain Piombino - Grosseto - Talamone.

4. Electric sub-stations are known to be located at the following points; Pisa (43° 43' N, 10° 24' E), Torre del Lago (43° 49' 30" N, 10° 18' E), Arenza (near Apuania) (44° 03' N, [illegible], 10° 03' 30" E), Spezia Migliarina (44° 07' N, 9° 49' E), Levanto (44° 10' N, 9° 37' 30" E), Rapallo (44° 21' N, 9° 13' E), Genoa - Sampierdarena (44° 25' N, 8° 53' E), Varazze, 44° 21' N, 8° 35' E, Savona (44° 18' N, 8° 18' E), Varigotti (44° 10' N, 8° 23' E), Albenga (44° 03' N, 8° 13' 30" E), Diano Marina (43° 55' N, 8° 05' E), Taggia (43° 50' N, 7° 51' E), Ventimiglia 43° 48' N, 7° 36' 30" E.

These sub-stations are located close to the railway station and the right-of-way. In many cases there will be unprotected external installations, which are the vulnerable points. In other cases, these same installations will be enclosed in blast walls or inside the sub-station buildings. The vulnerability in the latter cases will have to be determined by trial. Three consecutive sub-stations must be knocked out in order to stop traffic completely. It is believed that mobile standby units exist.

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5. Transformer and Switching Stations are located at the following points: Ventimiglia (TC 4-103-HA), Cairo Montenotte (TC 4-114-HA), Mortgallo (5 miles N. of Genoa), Chiavari - Lavagna (exact location not known; app. 44° 18' N, 9° 20' E), Pisa (TC 3-444-HA; transformer station not annotated). Others of less importance are to be found at Civitavecchia (TC-3-1114-HA), Massa/Carrara (TC 4-112-HA), Pistoia (TC 3-49-HA), and Prato (TC 4-133-HA).

6. Sections of railway track may be attacked. Enough damage to cause a spreading of the rails will wreck trains causing damage much more difficult to repair than are bomb craters in a similar position. Both for this type of work and for strafing the flat level stretches the following stretches of railroad appear most suitable. Pietrasanta - Via Reggio. Via Reggio - Pisa. Pisa - Pontedera. S. Rossore - Empoli. Lucca - Porcari. Pistoia - Sesto Fiorentino. Pisa - Leghorn. Pisa - Colle Salvetti. Cecina - San Vicenzo. Cecina - Follonica. Montepescali - Rispescia [redacted]. Talamone - Orbetelle Sta. Capalbio (42° 38' N, 11° 08'E). Talamone - Orbetelle Sta. Capalbio (42° 24' N, 11° 22' E) - Montalto di Castro. Tarquinia - 5 miles south. In general, the principal highways parallel the railways in the same areas mentioned above. In addition, there is the Autostrada (super highway) between Florence and Pisa, with straight, open stretches from Lucca to Altopascio, Altopascio to Montecatini; Pistoia to Florence.

Note: Detailed study has not been made of these stretches to determine location of electric highlines, hightrees, radio towers, or similar obstructions. Continuous photo mosaics are being prepared by the MAPRW.

7. Principal Railroad Yards are located at Cannes, Nice, Ventimiglia, Savona, Genoa (5), Lucca, Pisa (2) Viareggio, Pistoia, Prato, Leghorn (2), Grosseto, and Civitavecchia (2). Locomotives on the line between Ventimiglia and Viareggio are worthy of special attention, since they are of a special type (AC - 3 phase) and unlike those operating on the majority of the Italian electric lines. Control towers in electrically operated yards, if successfully attacked, will "freeze" the yard. On steam operated lines turntables are of particular importance especially when associated with a large round-house. These are most likely to be found on the French side of the Riviera Route and at Pisa and Lucca. Any destruction of rolling stock in such a way as to tie up trackage or start fires in M/T's is effective.

8. Oil storage units of large or considerable size are to be found at Savona, Vado Ligure, Genoa, La Spezia, and Leghorn. All of these are indicated on the appropriate target charts.

9. The situation relative to ammunition dumps is a fluid one, and current information should be watched.

10. As other targets or features develop, information will be forwarded.

GEORGE C. MC DONALD
Colonel, USA Air Forces
Assistant Chief of Staff, A-2

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HEADQUARTERS
MEDITERRANEAN THEATER OF OPERATIONS
APO 512

76

MAAF/3.4459/Int.

28 October 1944

MEMORANDUM FOR: Director of Operations and Intelligence

SUBJECT: Review of Proposals to Interrupt Brenner Route Traffic

1. It is generally recognized that interruption of Brenner traffic by means of heavy aircraft operating against bridges and similar targets in Italy has not been a complete success. This has been due, not so much to the failure to destroy the target, but (a) to the limited number of suitable targets on the Italian Brenner, and (b) to the strenuous and successful repair efforts of the enemy.

2. Accordingly, it seems obvious that a broader scope of targets, both areally and as to category, must be sought before operations against the Brenner can reduce its capacity below the critical point. The following do not constitute recommendations but, rather, a review and evaluation of the various proposals which have come forward over a period of more than a year.

3. Of these, the following proposals seem worthy of consideration:

a. Destruction of electric substations on the Italian Brenner.

b. Destruction of electric substations on the Austrian Brenner.

c. Denial of electric power to the Austrian Brenner by means of attacks on power sources.

d. Denial of electric power to electric railways of all Austrian Tyrol by means of attacks on power sources.

e. Washing out of substantial sections of the Italian Brenner by attacks on dams and railways.

f. Interdiction of traffic by attacks on larger bridge targets between Innsbruck and Munich (i.e. north of the Brenner proper).

4. Destruction of Electric Substations on the Italian Brenner and on the Austrian Brenner. These projects received serious study in the fall of 1943, and the results are summarized in Annexes 1 and 2. The principal objection to these projects is the enemy's capability of using mobile substations to replace the fixed substations which might be destroyed. Successful destruction of the fixed substations would certainly seriously reduce the

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capacity of the line, even if mobile substations were substituted. The Austrian Brenner is recommended above the Italian Brenner because (a) fewer targets are involved, and (b) substitution of steam traction would be more difficult (especially in winter) owing to the steeper gradient on the Austrian side. Electric railway substations are not considered to be heavy bomber targets; they have been attacked by fighter bombers in the Italian Peninsula.

5. Denial of Electric Power to the Austrian Brenner by Means of Attacks on Power Sources. A maximum of four targets would have to be successfully attacked to destroy or cut off the sources of power supplying the Austrian section of the Brenner. These are the Ruetz Power Plant, the Silian Transformation Station at Innsbruck (photo, Annex No. 2), the railway substation at Mirl (photo, Annex No. 3), and the Achensee Power Plant at Jenbach (photo, Annex No. 4). The selection of these targets is made as a result of the study of several intelligence reports on this subject by power experts. Only one of these includes the Mirl substation, which apparently is put forward for the purpose of interdicting flow of power from the west. It is possible that this target may be omitted. The remaining three targets are considered suitable for heavy or medium bomber attack. In general, the most vulnerable points in connection with a power plant are considered to be the outdoor transformer units (both fragile and inflammable) and the conduits from the reservoir to the power plant. Further details on the subject of vulnerability are incorporated in a forthcoming report on Axis Electric Power Targets. Naturally, each target must be studied individually if operations are contemplated.

6. Denial of Power to All Railways of Austrian Tyrol by Attacks on Power Sources. This proposal would affect not only the Austrian Brenner and its Northward extension toward Munich, but also its Tyrolean by-passes via Garmisch-Partenkirchen and via the Walbern, as well as the important Tauern Route from Salzburg to Villach. It would also yield extra dividends in the destruction of a major portion of the general power used by the municipalities and industries of Tyrol. It is almost certain that the railways other than the Brenner could not be worked by steam in the winter season and it is highly possible that even the Austrian Brenner might prove completely unworkable. Certainly its capacity would be seriously reduced at the same time that all its by-passes would be unapproachable. According to electrical authorities, only the power plants at Stallerzaun, Achensee (Jenbach) (photo, Annex No. 4), Melnitz, Mutbach, and Ruetz would need to be successfully attacked to accomplish this. These are all possible heavy or medium bomber targets, the vulnerability of each of which must be evaluated on its individual merits.

7. Isolation of Substantial Portions of the Italian Brenner by Attacks on Dams and Railways. Among targets of this type, the dam near Tarsens (photo, Annex No. 5) has received the most serious attention. This project was submitted a year ago, to Duff, Chief-of-Mission of the French General Staff ("Intelligence"), to [illegible], and to the Ministry, who in turn submitted it to several specialists in other [illegible]. All were agreed as to the high probability of the dam's destruction enabling cut a considerable section of the

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Brenner line, including bridges. At that time, however, the Department of Scientific and Industrial Research, in the United Kingdom, considered that the probability of destroying the dam by purely aerial bombing was unlikely. Their report is appended as Annex No. 3. In view of the possibility that certain developments might have changed the prospects within the past twelve months, the proposal is resubmitted at this time.

8. Several days ago (29 October), the dam at Rio di Pusteria ("Verna Dam"), 7 miles east of Tortezza Dam, was attacked by heavy aircraft. This dam is smaller in size to that at Tortezza and, like it, feeds the Bressanone Underground Power Plant. Unlike the Tortezza, however, which is an arc dam, the "Verna" Dam is a gravity dam and far less vulnerable. A further important consideration in connection with Tortezza is the fact that the by-pass rail line via Fortezza crosses the gorge of the Isarco a short distance below the dam and thus well within the spillway area of the dam target.

9. A second possibility, from the standpoint of washing-out a section of the Italian Brenner, exists at Cardano (photo, Annex No. 4). Study of this target suggests that destruction of the conduits leading from the reservoir to the Cardano Power House might cause a sudden flood which would wash out the rail line in the vicinity as well as knock out the turbines within the power house, a very important source of both general and railway electric current.

10. Interdiction by attacks on Isarco Railway Viaducts between Innsbruck and Munich. This proposal was submitted to the Director of Operations and Intelligence on 30 October, 1944, and a copy is appended as Annex No. 5, merely for the purpose of completing the record.

GILBERT D. HARDY
Captain, A.C.,
Communications Analysis Section.

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ALLIED FORCE HEADQUARTERS
Office of Assistant Chief of Staff, G-2

Italy Rail 77

7th September 1943

Interview with General di RAIMONDO
Director of Italian Military Transportation
On September 21st, 1943

1. General di RAIMONDO had been intimately connected with Italian railways in their relation to military movements. He had himself been responsible for improving the system by building of loop lines at important bottlenecks.

He gave the following information:

2. General Position.

The air bombardment of Italian rail communications had been most successful and had seriously delayed rail traffic. From the beginning of January to the 8 September, some 30,000 trucks and 500 locomotives had been destroyed. During one raid alone on BOLOGNA 800 trucks were destroyed in the marshalling yards causing considerable delay.

Before the Armistice there were no German troops operating the railways but there were a few pioneers used for repair work.

The bridge which was destroyed near BOLZANO was repaired within 40 hours.

The Italians lent to the Germans some 150 locomotives to replace those lost through air attacks on Germany. These the Germans refused to return on being requested but, just prior to the Armistice, 40 French locomotives arrived.

3. Bombing Targets.

a. Southern Area.

To cut the lines SOUTH from the NAPLES area, the most important targets to bomb are:

NAPLES
CASERTA
BENEVENTO
FOGGIA

Successful bombing of these four points prevents all railway movement SOUTH of NAPLES. FOGGIA and causes considerable disruption. VILLA LITTORNO is also important.

So long as FOGGIA is in German hands, it is of particular importance. There is a loop line at FOGGIA which by-passes traffic going through the main station. To stop completely the traffic it is necessary to bomb the three junctions.

b. Central Area.

In order to prevent traffic moving SOUTH from the ROME area, the most important targets to bomb are:

CIVITA VECCHIA
ORTE, which is very important
PESCARA
SULMONA

Comment: Presumably TERNI would serve the same purpose as SULMONA.

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4. Rail Communications.

Prior to the Armistice, actual daily train movements were as follows. Numbers represent movements in each direction.

via BOLZANO	40 trains per day
via BORMIO	2 trains per day
via VENTIMIGLIA	4 trains per day
via TRIESTE	4-10 trains per day
via LJUBLJANA	7-8 trains per day

Supply trains normally carried about 600 tons of material.

Normal traffic on some of the lines is as under:

via MILAN	30 trains per day
via BOLZANO	40 trains per day
via LJUBLJANA	40 trains per day

Routes to SOUTH:

ITALY via EAST	28 trains per day
ITALY via WEST	40 trains per day

For the A.C. of S., G-2:

E. J. FOORD,
Lt. Col., G.S.,
G-2 Section, GS

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Hq. Peninsular Base Air Depot
A.P.O. 78

Air Commodore,
D.A.D. of S.A-I.

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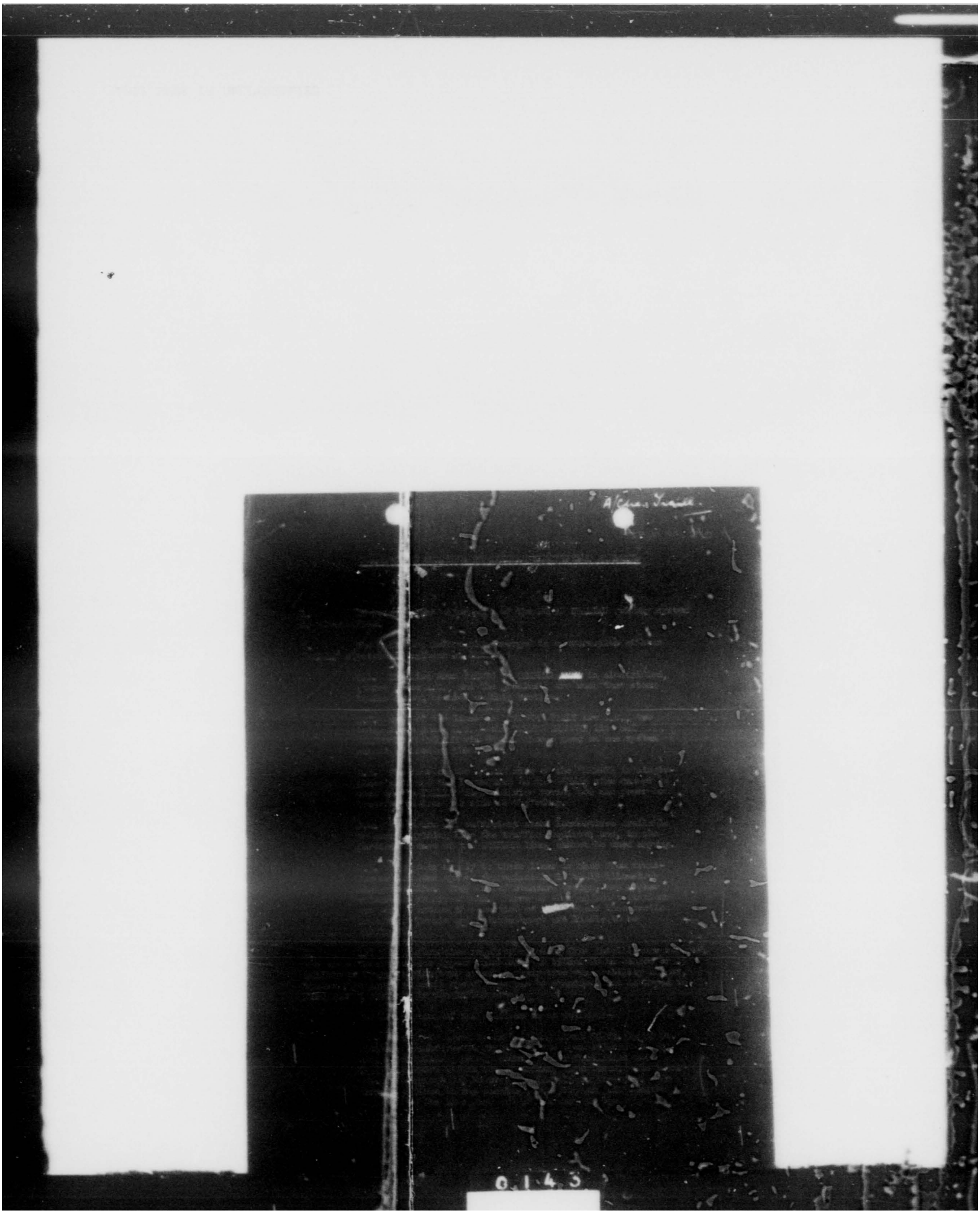

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PRINCIPAL INDUSTRIAL TARGETS
IN AAIS EUROPE, MIDDLE
STUDY

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PRINCIPAL INDUSTRIAL TARGETS IN AXIS EUROPE

* Indicates plant has been damaged.

** Indicates plant is no longer in operation.

4340-1961

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I - AIRCRAFT PRODUCTION

Single-Engine Fighters

● A. Assembly

No:	Name:	Location:
1.*	Focke-Wulf	Bremen
2.	Fieseler	Kassel
3.	AGO	Aschersleben
4.	Erla	Leipzig
5.	Arado	Warnemunde
6.	Messerschmitt	Regensburg
7.	Wiener Neustadter	Wiener Neustadt.
8.	Manfried Weiss	Budapest
9.		Prague

◉ B. Engine Production

No:	Name:	Location:
1.	Henschel	Kassel
2.	Niedersächsische	Brunswick
3.	Dainler-Benz	Stuttgart
4.	Klockner	Hamburg
5.	B. M. W.	Eisenach
6.	B. M. W.	Allach
7.*	B. M. W.	Munich
8.	B. M. W.	Zuhlsdorf
9.	Daimler-Benz	Genshagen
10.	Daimler-Benz	Berlin
11.	Junkers	Vienna
12.		Prague

○ C. Airframe

No:	Name:	Location:
1.	Focke-Wulf	Bremen
2.	Focke-Wulf	Bremen
3.	Fieseler	Kassel
4.	Erla	Leipzig
5.	Arado	Anklam
6.	Manfried Weiss	Budapest

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I - AIRCRAFT PRODUCTION (Cont'd)

Twin-Engine Fighters

A. Assembly

No:	Name:	Location:
1.	M.I.A.G.	Brunswick
2.	Junkers	Bernburg
3.	Messerschmitt	Augsburg

B. Components:

No:	Name:	Location:
1.	M.I.A.G.	Brunswick
2.	Junkers	Aschersleben
3.	Junkers	Halberstadt
4.	Junkers	Leopoldshall

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II - BALL BEARING PRODUCTION

No:	Name:	Location:
1.	S. K. F.	Paris
2.	S. K. F.	Paris
3.*	V. K. F.	Stuttgart
4.	S. R. O.	Annecy
5.	V. K. F. # 1	Schweinfurt
6.	V. K. F. # 2	Schweinfurt
7.	Fischer A.G.	Schweinfurt
8.	V. K. F.	Erkner
9.	S.A. Officine-Perosa	Perosa
10.	S.A. Officine-Perosa	Turin

III - CHEMICAL PRODUCTION

No:	Name:	Location:
1.	Leuna—I.G. Farben	Merseburg
2.	Badische Anilin— I.G. Farben	Ludwigshafen
3.	I.G. Farben	Piesteritz
4.	Bayer—I.G. Farben	Leverkusen
5.	I.G. Farben	Bitterfeld
6.	Aussiger Verein	Aussig
7.	I.G. Farben	Rüchst
8.	Nobel	Troisdorf
9.	A.G. für Stickstoff-düngor	Knapsack
10.	I.G. Farben	Wolfen

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IV - PETROLEUM PRODUCTION

	No:	Name:	Location:
△	Synthetic		
	1.	Cie. Bethune	Bethune
	2.	Gelsenberg A.G.	Gelsenkirchen
	3.	Union R.B.K.	Wesseling
	4.	Ruhroel, A.G.	Bottrop
	5.	Hydrierwerke, A.G.	Scholven
	6.	Krupp	Wanne Eickel
	7.	Brabag	Magdeburg
	8.	Leunawerke	Leuna
	9.	Brabag	Boehlen
	10.	Brabag	Zeitz
	11.	Goeringwerke	Brux
	12.	Poelitz	Poelitz
	13.	I.G.F.	Blechhammer
	14.		VIENNA
△	Natural		
	15. - 26.		Ploesti area
	27. - 38.		Stand-by refineries alternate to Ploesti
	37.*	Leghorn	

V - RUBBER PRODUCTION

	No:	Name:	Location:
		Synthetic Rubber Production and Rubber Tires	
	1.*	Hüls	Hüls
	2.	Schkopau	Schkopau
		Rubber Tire Plants	
■	1.	Englebert	Aachen
	2.*	Vorwerk & Sohn	Wuppertal
	3.	Dunlop A.G.	Montlucon
	4.	Dunlop A.G.	Hanau
	5.	Continental A.G.	Hanover
	6.	Continental A.G.	Hanover
	7.*	Phoenix A.G.	Hamburg
	8.	Michelin	Clermont-Ferrand
	9.	Metzler	Munich
	10.	Pirelli	Milan

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VI - SUBMARINE FACILITIES

No:	Name:	Location:
1.	Nordsee	Emden
2.	Deschimag	Bremerhaven
3.	Deschimag	Bremen
4.*	Vulcan	Bremen
5.*	Marinewerft	Wilhelmshaven
6.*	Blohm & Voss	Hamburg
7.	Deutsche Werft	Hamburg
8.	Howaldt	Hamburg
9.	Stülcken	Hamburg
10.*	Flensburger	Flensburg
~~11.~~	~~Tosi~~	~~Taranto (It.)~~
11 12.*	Deutsche Werke	Kiel
12 13.*	Kriegsmarinewerft	Kiel
13 14.*	Germania Werft	Kiel
14 15.	Flenderwerfe	Lübeck
15 16.*	Adero	Spezia (It.)
16 17.*	Neptun	Rostock
17 18.*	Oderwerke	Stettin
18 19.	Vulcan	Stettin
19 20.	Cantiere Reunite	Monafalcone (It.)
20 21.	Schichau	Danzig
21 22.	Danziger	Danzig
22 23.		Leros
1. - 5.*	French Submarine Refitting Depots	

VII - MISCELLANEOUS

No:	Name:	Location:
1.	Giurgiu Oil Loading Facilities	Giurgiu
2.	Iron Gates Barge Canal & Facilities	
3.	Bor Copper Mine	Bor
4.	Trepca Lead & Zinc Mine	Trepca

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WESTERN EUROPE

INDUSTRIAL TARGETS - AXIS EUROPE

I AIRCRAFT:
- Single Engine Fighters: ● Assembly; ○ Engine Production ◎ Airframe
- Twin Engine Fighters: ○ Assembly; ● Components

II BALL BEARING PRODUCTION

III CHEMICAL PRODUCTION

IV PETROLEUM PRODUCTION ▲ Synthetic △ Natural

V RUBBER PRODUCTION ▨ Synthetic Rubber ▩ Rubber Tire

VI SUBMARINE FACILITIES ♦ Facilities ◇ French Bases

VII MISCELLANEOUS

400 300 200 100 0 100 200 400

Statute Miles

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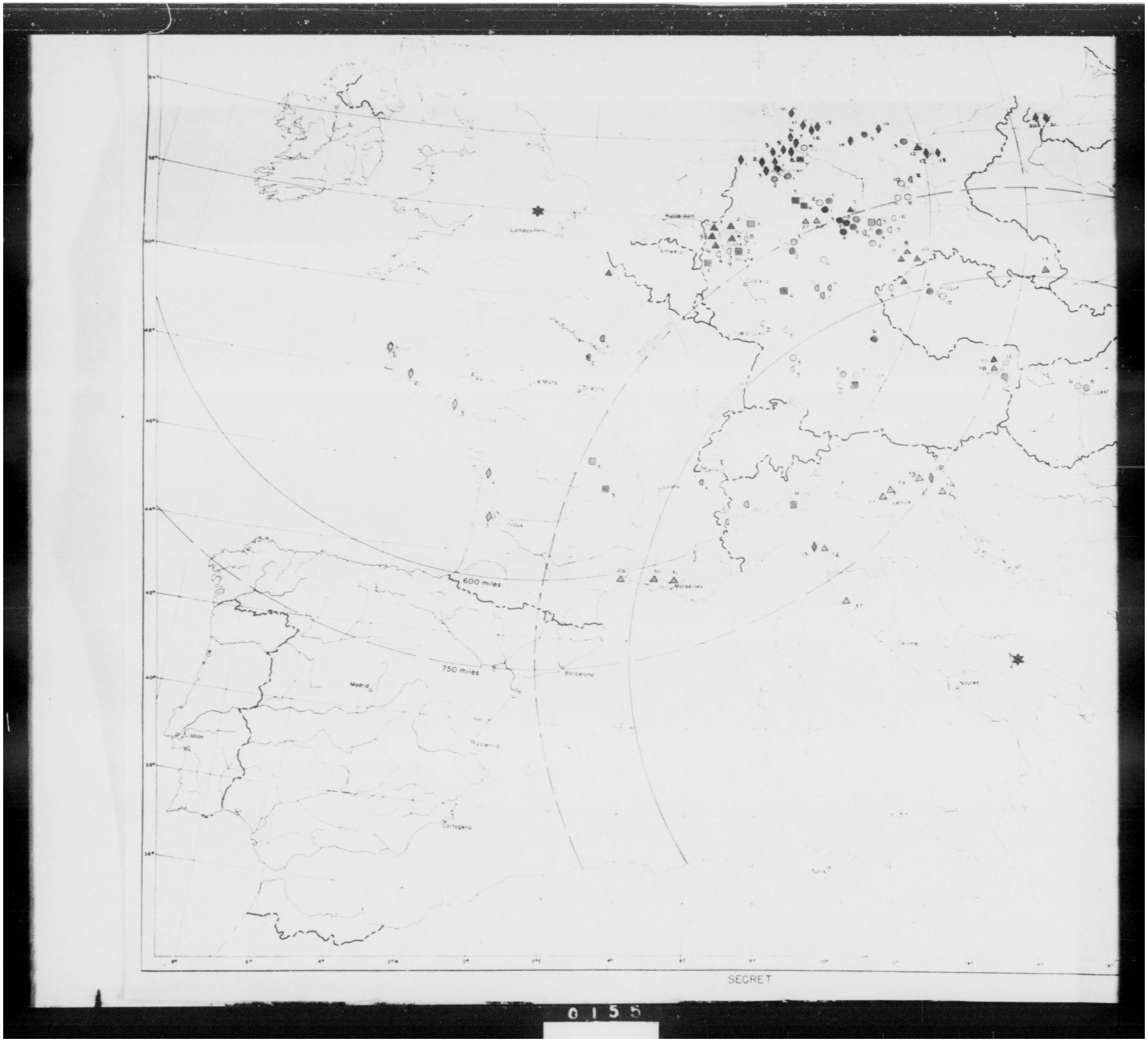

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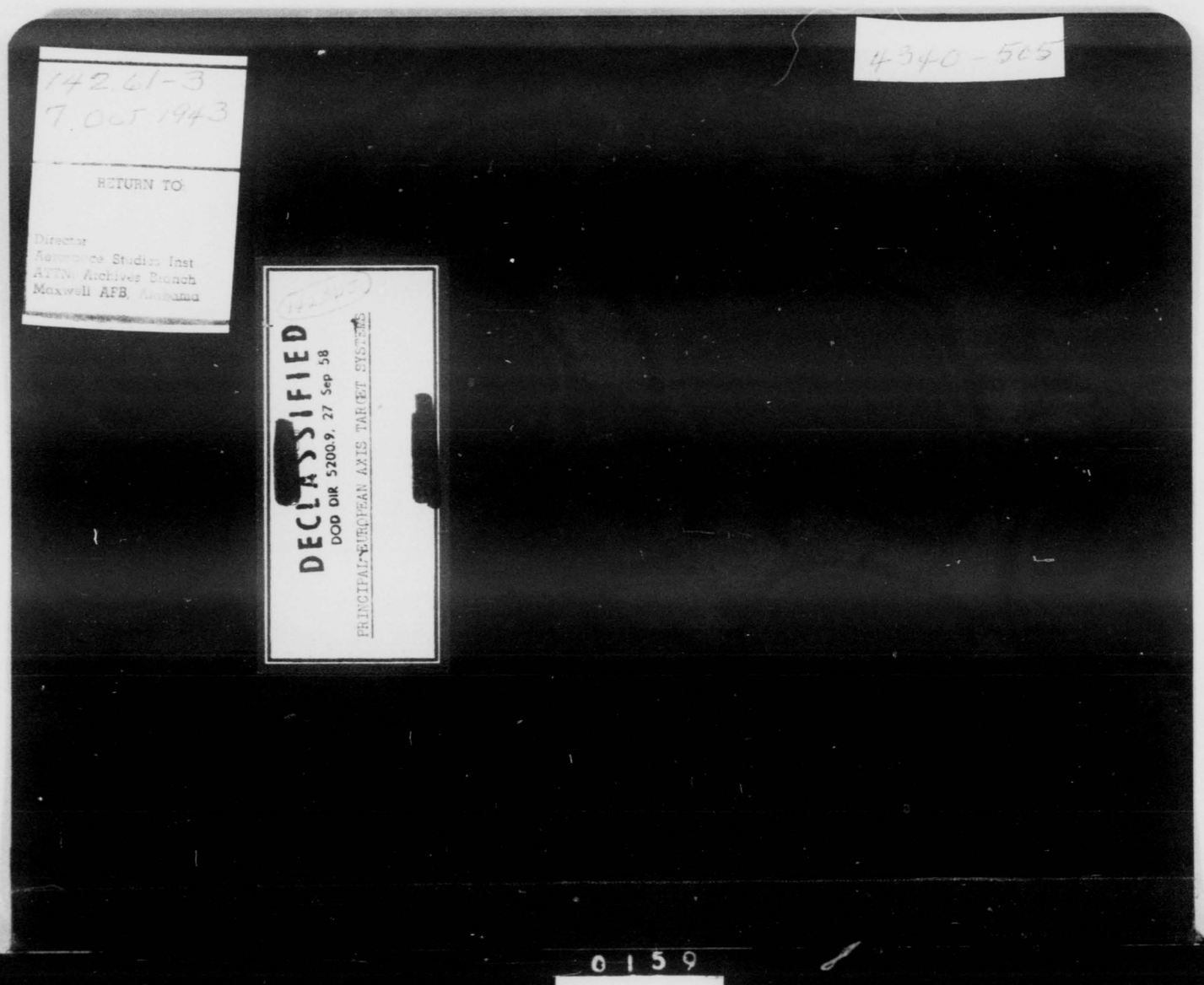

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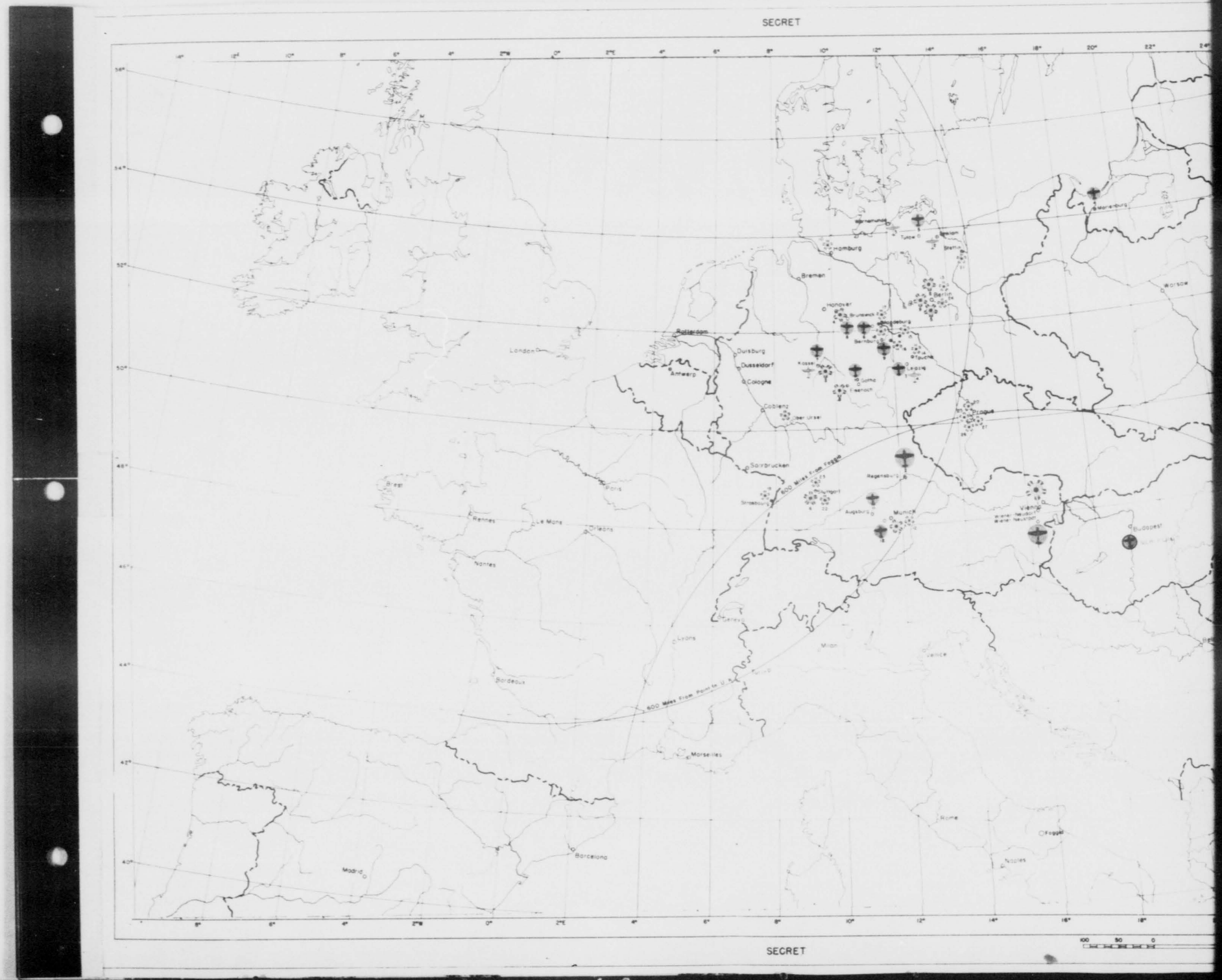

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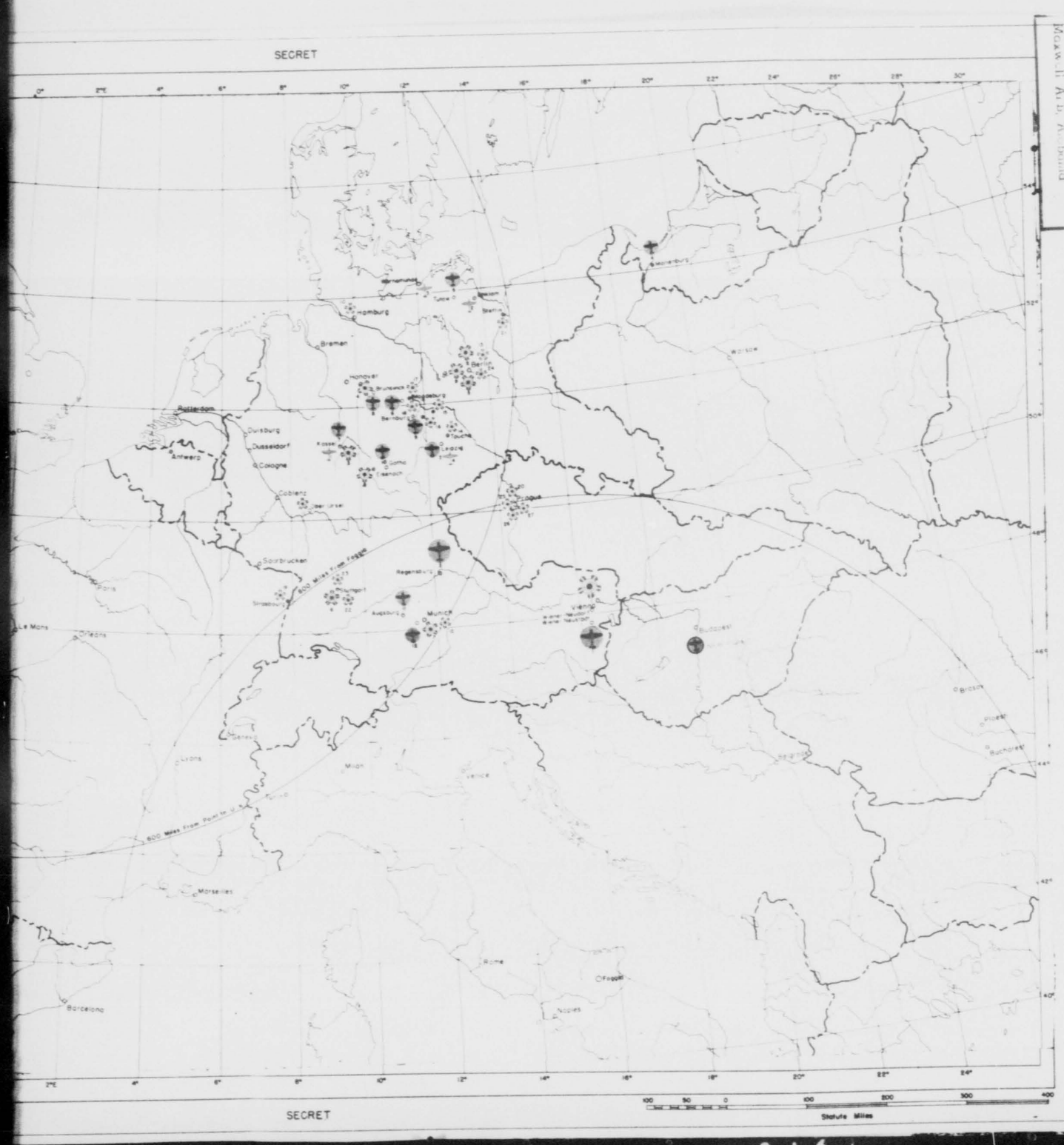
Fighter Aircraft & A/C Engines



FIGHTER AIRCRAFT FINAL ASSEMBLY

Plant	Type	Estimated Monthly Production July, 1943
1. Wiener Neustadter Wiener Neustadt	ME109.SEF	220
2. Messerschmitt, Regensburg	ME109.SEF	200
3. Erla, Leipzig Mockau	ME109.SEF	120
4. Focke-Wulf, former Bremen production probably moved to Marienburg	FW190.SEF	80
5. Arado, Tutow	FW190.SEF	60
6. Ago, Oschersleben	FW190.SEF	55
7. Fieseler, Kassel-Waldau	FW190.SEF	35
8. WNAC, Brunswick-Waggum	ME110.TEF	55
9. Junkers, Bernburg	JU88.TEF	50
10. Gothaer, Gotha	ME110.TEF	45
11. Messerschmitt, Augsburg	ME410.TEF	40
12. Dornier, Oberpfaffenhofen	DO217.TEF	20

FIGHTER AIRFRAME COMPONENT ERECTION

Plant	Type
1. Fieseler, Kassel-Bettenhausen	FW 190
2. Arado, Anklam	FW 190
3. Arado, Warnemunde	FW 190
4. Erla, Leipzig-Heiterblick	ME 109

COMBAT AIRCRAFT ENGINE ASSEMBLY

Plant	Type	Estimated Monthly Production August, 1942
1. Flugmotorenwerke Ostmark, Wiener Neudorf	DB	800
2. D.B. Berlin-Genshagen	DB	350
3. Henschel, Kassel-Allmbauste	DB	300
4. Rotzing NAL, Brunswick-Querum	DB	215
5. D.B. Berlin-Marienfelde	DB	95
6. D.B. Stuttgart-Untertürkheim	DB	Note (1)
7. B.M.W. Munich-Allach	BMW	250
8. B.M.W. Eisenach-Stockhausen	BMW	125
9. B.M.W. Berlin-Basdorf	BMW	100
10. Klockner, Hamburg-Moorfleth	BMW	75
11. Klockner, Oberursel	BMW	Note (1)
12. B.M.W. Munich-Oberwiesenfeld	BMW	Note (1)
13. B.M.W. Berlin-Spandau	BMW	Note (1)
14. Mitteldeutsche, Taucha	Jumo	Note (1)
15. Junkers, Dessau	Jumo	Note (1)
16. Junkers, Kothen	Jumo	Note (1)
17. Junkers, Magdeburg	Jumo	Note (1)
18. Junkers, Schoenebeck	Jumo	Note (1)
19. Motford-Junkers, Strassburg	Jumo	Note (1)
20. Junkers, Prague-Karbe, (Czech)	Jumo	Note (1)
21. Pommersche, Stettin-Altdamm	Jumo	Note (1)
22. Eberspacher, Esslingen	Jumo	Note (1)
23. Kirth, Stuttgart-Zuffenhausen	Hirth	Note (1)
24. Argus, Berlin-Reinickendorf	Argus	Note (1)
25. Walter, Prague-Jonice		Note (1)
26. Argus, Prague-Kbnice		Note (1)
27. Unknown, Prague-Caleonice		Note (1)

Note (1)
No Recent Estimate of Output

THIS PRESENTATION IS BASED ON CURRENTLY AVAILABLE INTELLIGENCE, AND IS SUBJECT TO REVISION

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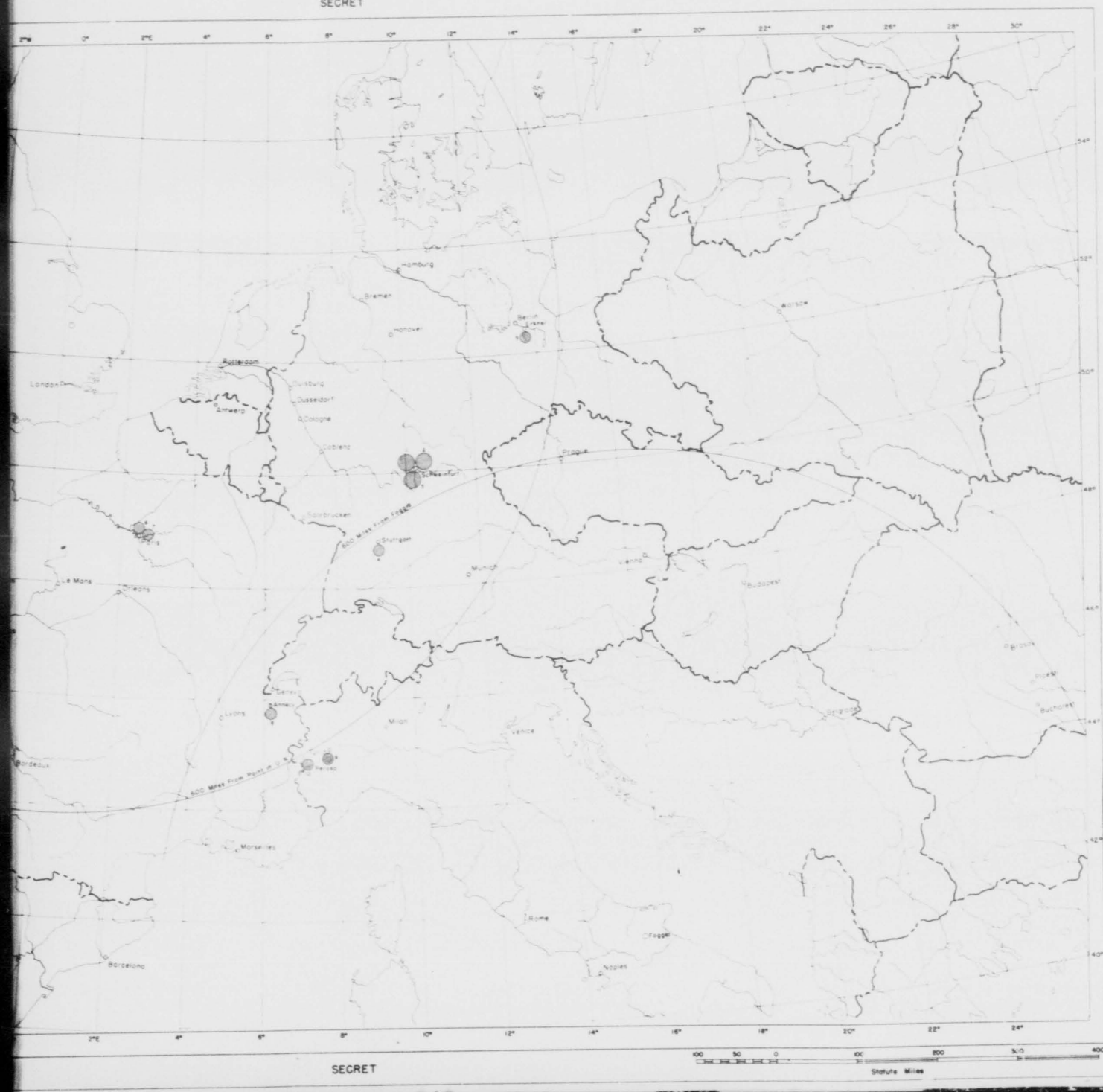

ANTI-FRICTION BEARING PRODUCTION

Plant	Reported % of European Axis Capacity
1. Fischer Schweinfurt	18.5
2. VKF Schweinfurt 1	22.2
3. VKF Schweinfurt 2	
4. VKF Stuttgart	7.4
5. VKF Erkner	7.4
6. SKF Paris (Colombes	5.0
7. SKF Paris (Issy	5.0
8. SKF Annecy	5.0
9. SKF Turin	14.9
10. SKF Pinerolo	
(2)	85.4

(2) Balance of output in 12 or more plants

Anti-friction Bearings

NOTES:

THIS PRESENTATION IS BASED ON CURRENTLY AVAILABLE INTELLIGENCE AND IS SUBJECT TO REVISION.

PERCENTAGES AND PRODUCTION RATES ARE APPROXIMATE AND HAVE NOT BEEN MODIFIED BY CONSIDERATION OF BOMB DAMAGE EFFECTS.

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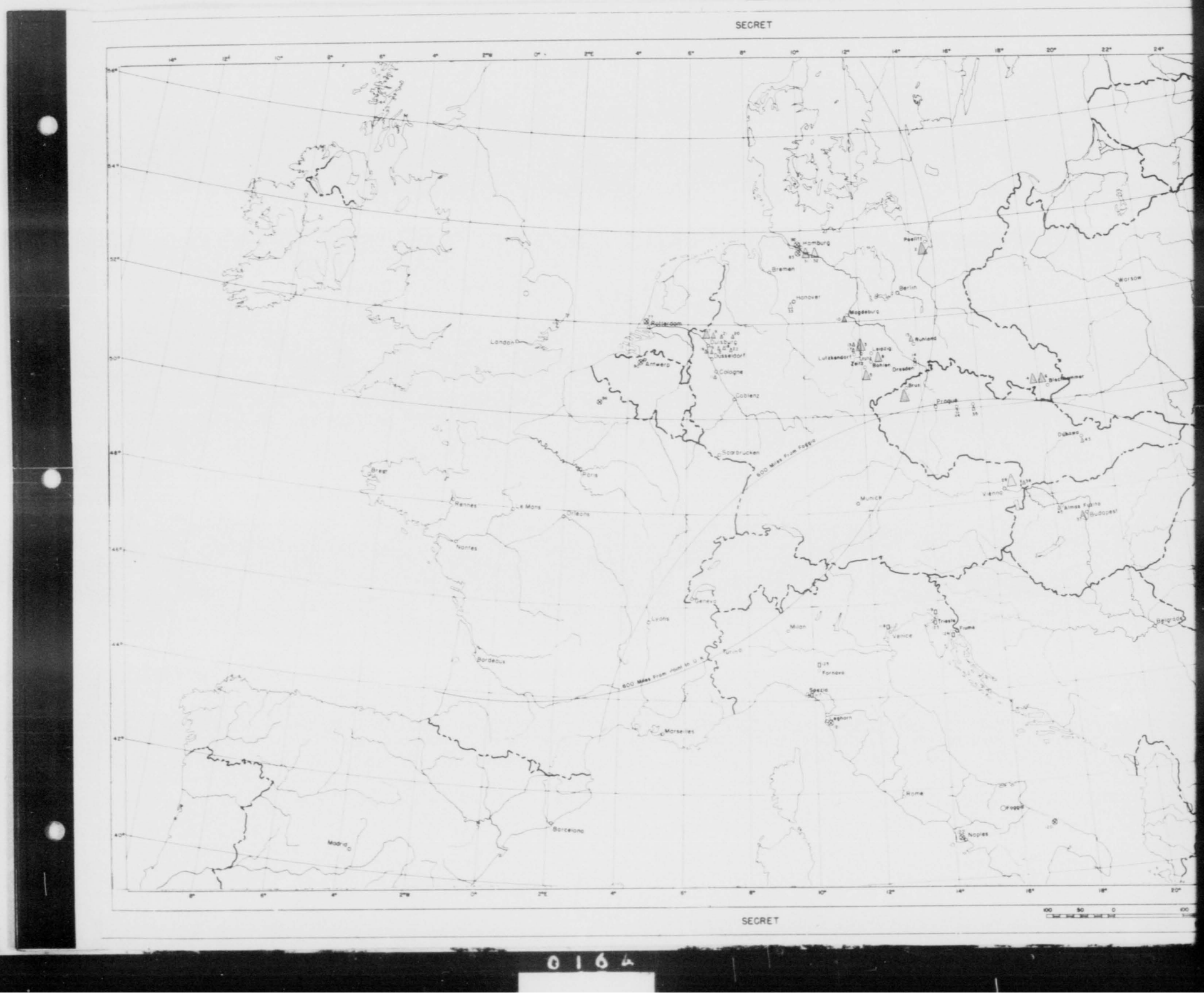

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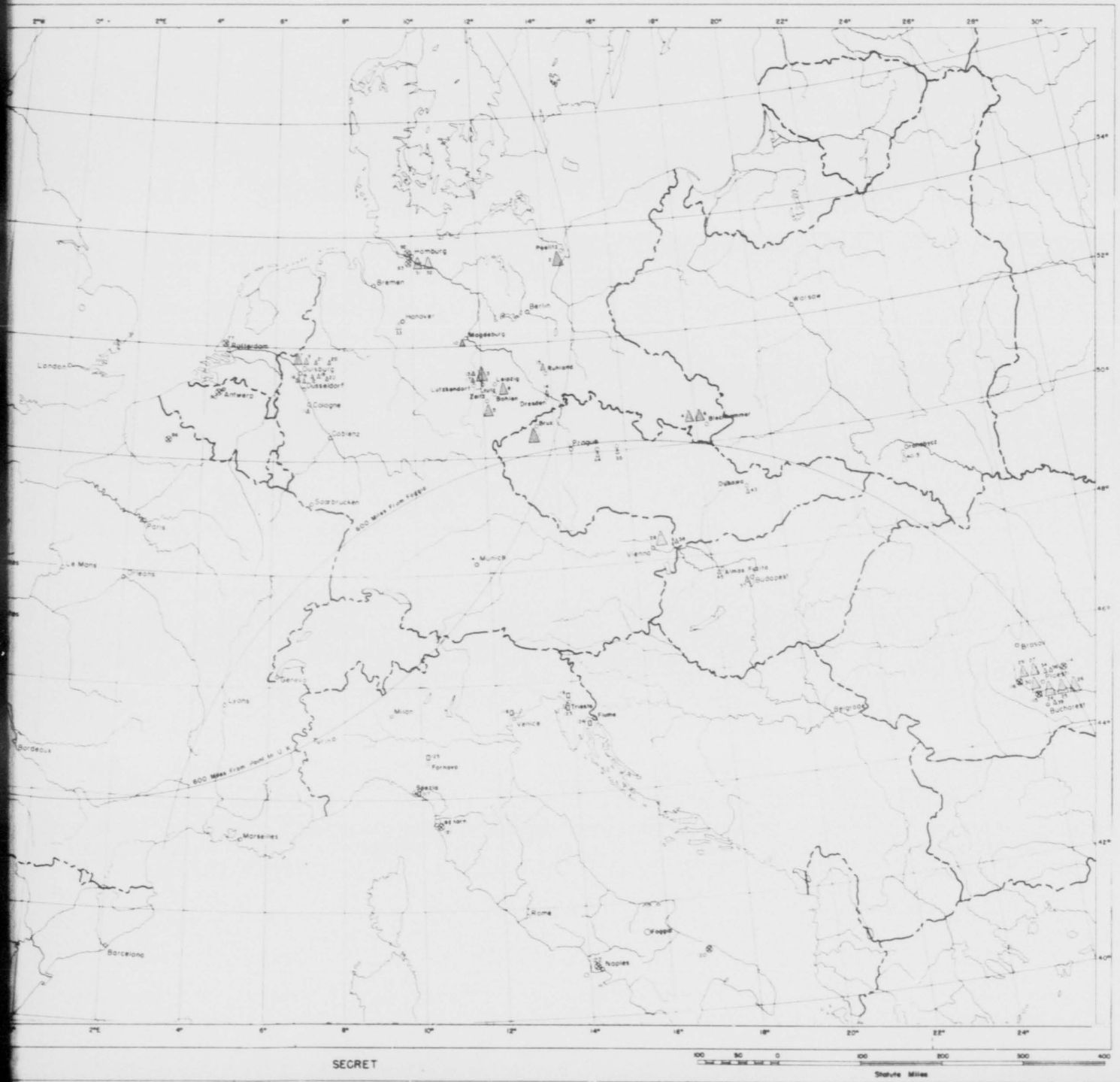

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SYNTHETIC OIL PLANTS

Plant	Location	Estimated % of European Axis Natural & Synthetic Petroleum Output
(Bergius)		
1. Brabag V	Brux	4.1
2. Hydrierwerke	Pölitz	3.8
3. Ammoniak W. M.	Merseburg-Leuna	3.3
4. Oberschlesische	Blechhammer N	2.7
5. Brabag IV	Troglitz (Anh)	2.7
6.	Blechhammer S	2.7
7. Gelsenberg Benzin	Gelsenkirchen	2.2
8. Brabag I	Bohlen-Rotha	2.2
9. Hydrierwerke Scholven	Gelsenkirchen Buer	1.9
10. Braunkohlen Benzin	Magdeburg	1.6
11. Ueber Rheinische	Wesseling (Köln)	1.1
12. Ruhrol	Wanheim Bottrop	0.8
13. Wintershall	Lützkendorf	0.7
14. Kraftstoffanlagen	Dresden	0.5
		30.1
Fischer Tropsch		
15. Brabag III	Ruhland Schwarzheide	1.6
16. Kraftstoffwerke	Homberg	1.1
17. Wintershall	Lützkendorf	0.8
18. Gewerkschaft V	Castrop-Rauxel	0.8
19. Ruhrbenzin	Holten Sterkrade	0.7
20. Chemische W. Essenw	Kamen	0.6
21. Kraftst. Treibstoffwerke	Wanne Eickel	0.5
22. Hoesch Benzin	Dortmund	0.5
		6.6

NATURAL PETROLEUM REFINERIES REPORTED OPERATING

Plant	Location	Estimated % of European Axis Natural & Synthetic Petroleum Output
24. Concordia Vega	Ploesti	6.4 (1)
25. Romana Americana	Ploesti	6.1
26. Astra Romana	Ploesti	4.5 (1)
27. Phoenix Orion	Ploesti	2.7 (1)
28. Wintershall	Vienna-Lobau	
Shell	Vienna Floridsdorf	
Vacuum	Vienna Kagran	
Cred. Miner	Vienna Korneuburg	5.3
N. O. & Brem	Vienna Schwechat	
Otc. Fantu	Vienna Kraindorf	
29. Petrol Block	Ploesti	2.5
30. Phoenix Unirea	Ploesti	2.4
31. Lump. Tanklager	Hamburg	2.2
32. Rhenania Ossag (large plant)	Hamburg	2.1
33. Durag Nerag	Hannover	1.6
34. Ismai	Ploesti	1.1
35. Fabr. Werke	Floridsdorf (Q.)	1.1
36. Dacia Romana	Ploesti	0.8
37. Shell Kuciuc		
Magyar Petrol	Budapest	1.3
Bud. Alovarsolaj		
38. Apollo (-)	Bratislava (Q.)	0.8
39. Prahova	Bucharest	0.6
40. Vismut		
Galicia	Drohobycz (Pol.)	1.3
Rafin Nawapotoku		
41. Govt. Refinery	Dobowa (Q.)	0.5
44. Vacuum	Kolin (Q.)	0.5
45. Vacuum	Adrian Fulto (Hung.)	0.5

ITALIAN REFINERIES OPERATING STATUS DOUBTFUL

Plant	Location
117. Raffa Shell	Spezia
118. Agip	Ancona
119. Aquila	Trieste
123. Siac SOCONI	Trieste
124. Agip Romsa	Fiume
125. Petrolifera	Fornovo Taro

NATURAL PETROLEUM REFINERIES REPORTED DESTROYED BY BOMBING

Plant	Location
77. Batavische Shell	Rotterdam
83. Ebano Asphaltwerke	Harburg
86. S. G. H. P.	Courcheletes
90. Redrewerke	Antwerp
92. Rhenania Ossag (Shell Cert)	Hamburg
114. Colombia Aquila	Ploesti
115. Unirea Mineral	Brazi
116. Steaua Romana	Campina
120. Anc	Bari
121. Anc	Leghorn
122. R. Di Napoli	Naples

NOTES

(1) CAPACITY REDUCED BY AAF BOMBING

(2) OTHER REFINERIES REPORTED NOT OPERATING ARE NOT INDICATED ON THIS MAP. THEY ARE PRINCIPALLY TIDEWATER PLANTS DEPENDENT UPON IMPORTS AND ACCESSIBLE TO BOMBING

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Petroleum and Synthetic Oil

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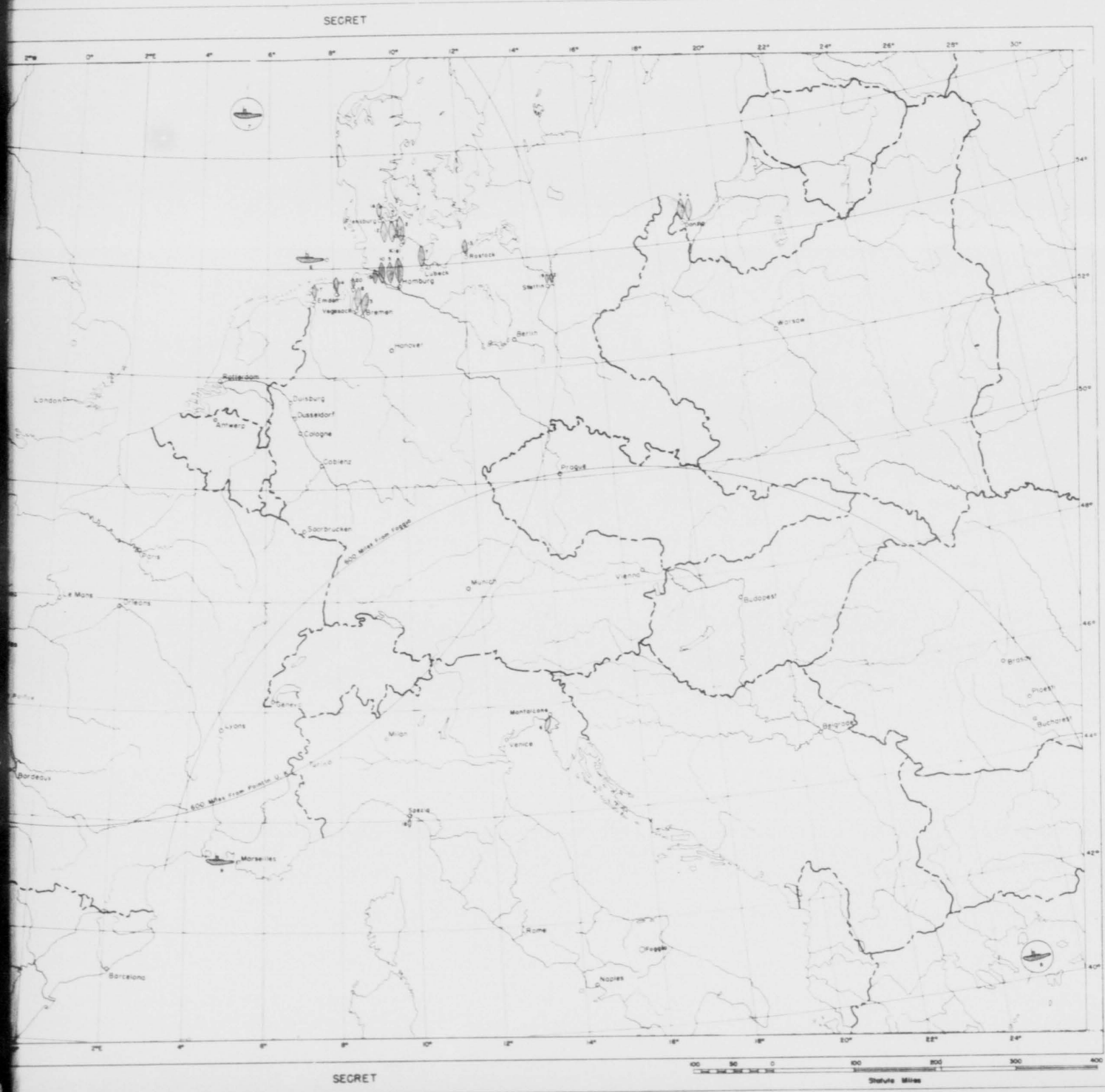

SUBMARINE BUILDING YARDS

Plant	Estimated % of European Axis Production
1. Blohm & Voss, Hamburg	16.2
2. Germania, Kiel	9.4
3. Deschimag, Bremen	7.7
4. Schichau, Danzig	6.8
5. Deutsche Werft, Hamburg	6.4
6. A.G.V.D.A., Montecone	3.7
7. Flenderwerke, Lübeck	6.0
8. Bremer Vulcan, Vegesack	5.5
9. Danziger Werft, Danzig	5.1
10. Howaldt Werke, Hamburg	5.1
11. Deutsche Werke, Kiel	4.7
12. Kriegsmarine Werft, Kiel	4.7
13. Neptun Werft, Rostock	3.8
14. Marine Werft, Wilhelmshaven	3.4
15. Stülken Sohn, Hamburg	3.0
16. Schiffsbau, Flensburg	3.0
17. Nordsee Werke, Emden	2.1
18. Naval Dockyard, Genoa	2.6
19. Oderwerke, Stettin	1.3
20. Deschimag, Bremerhaven	0.8
21. S. Sollow Vulkan, Stettin	0.8

SUBMARINE REPAIR FACILITIES
(Bases With Pens)

1. Lorient
2. Brest
3. St. Nazaire
4. Bordeaux
5. La Pallice
6. Helgoland
7. Trondheim
8. Skaramanga near Salamis (Base reported under construction)
9. Marseilles (Base reported under construction)

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PERCENTAGES AND PRODUCTION RATES ARE APPROXIMATE AND HAVE NOT BEEN MODIFIED BY CONSIDERATION OF BOMB DAMAGE EFFECTS.

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Submarine Yards & Repair Facilities

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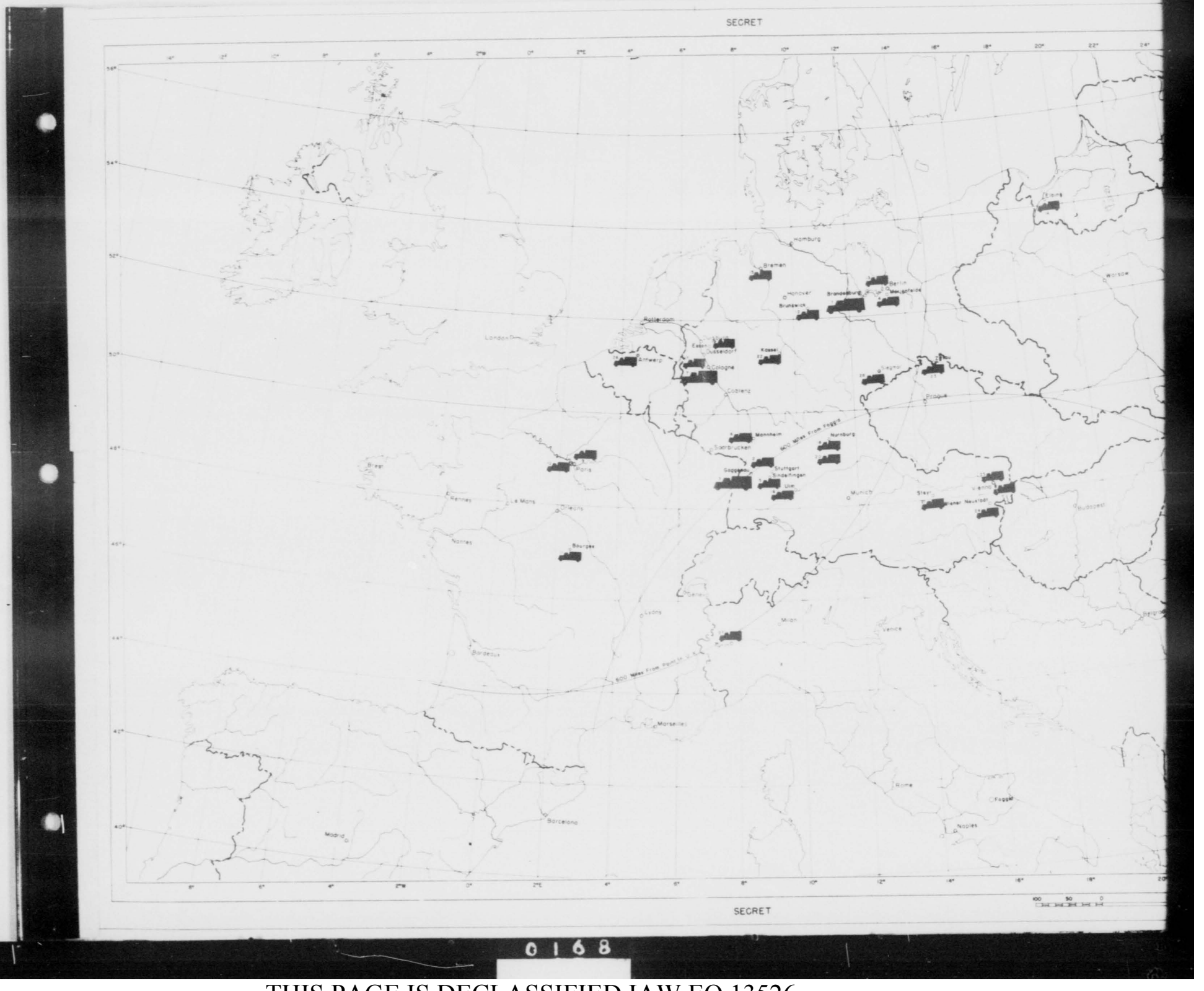

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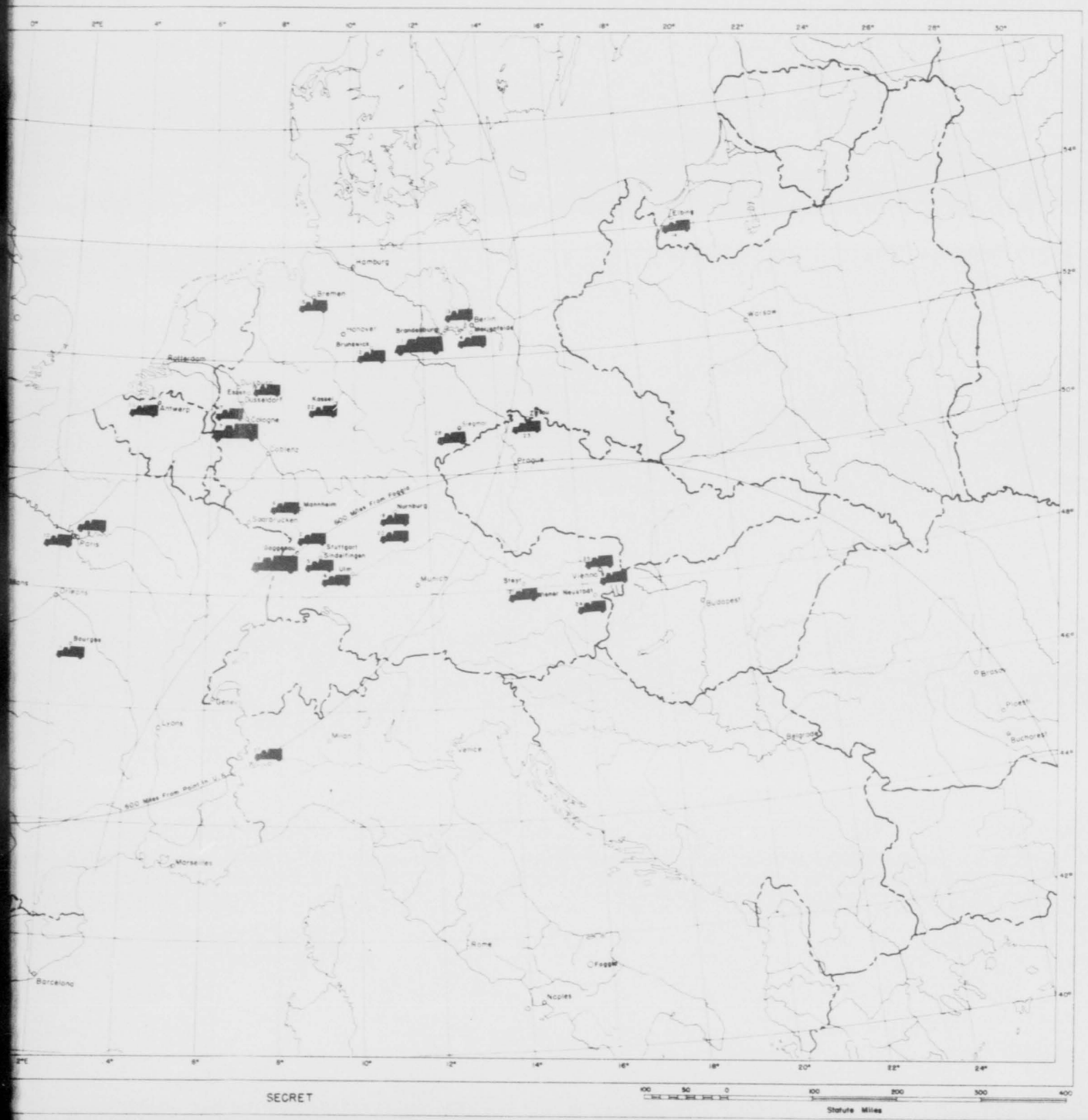

MILITARY TRANSPORT VEHICLES

Major Plants reported as producers of trucks of 3½ tons capacity or larger

Plant	Location	Last confirmed Year of Manufacture
1. Adam Opel	Brandenburg	1943
2. Daimler Benz	Stuttgart	
3. Daimler Benz	Gaggenau	
4. Daimler Benz	Marienfelde	1942
5. Daimler Benz	Sindelfingen	
6. Daimler Benz	Mannheim	
7. Ford	Koln-Niehl	1942
8. Frido Büssing	Hanna	1942
9. Renault	Paris-Billancourt	1943
10. Citroen	Paris	1942
11. Matford	Bourges	
12. Büssing NAG	Brunswick	
13. Büssing NAG	Berlin-Oberschöneweide	1942
14. Büssing NAG	Elbing	
15. Borgward	Bremen	1942
16. Humboldt Deutz	Ulm	
17. Humboldt Deutz	Koln	1942
18. M A N.	Nurnberg	
19. Krupp	Essen	1942
20. Faun Werke	Nurnberg	1940
21. Steyr	Steyr	
22. Henschel	Kassel	1941
23. Phanomen Werke	Zittau	1942
24. Austro Fiat	Wiener Neustadt	
25. Saurer Werke	Vienna	1942
26. Ford	Antwerp	1943
27. Fiat Lingotto	Turin	
28. Auto Union	Siegmar Chemnitz	

NOTE:

THE ABOVE LIST IS SELECTIVE IN THAT IT INCLUDES ONLY THE LARGEST PLANTS PREVIOUSLY SELECTED AS TARGETS AND THOSE PLANTS WHICH HAVE BEEN TENTATIVELY IDENTIFIED AS MANUFACTURERS DURING RECENT YEARS OF 3½ TON TRUCKS OR LARGER. THE PLANTS LISTED ABOVE ARE SHOWN ON THIS MAP. MANY OTHER PLANTS IN THE FORMER AUTOMOTIVE INDUSTRY ARE NOT SHOWN ON THIS MAP FOR REASONS ENUMERATED BELOW

(1) IDENTIFIED AS MAKING OTHER ITEMS SUCH AS PASSENGER CARS, AFV OR TANKS OR BELIEVED TO BE ENGAGED IN SUCH WORK
(2) PRODUCTS DURING RECENT YEARS NOT IDENTIFIED. SOME OF THE PROMINENT INSTALLATIONS OMITTED FOR SUCH REASONS ARE LISTED BELOW

Plant	Location
Adler Werke	Frankfurt
Auto Union	Chemnitz
Auto Union	Zwickau
Adam Opel	Russelsheim
Demag	Duisburg
NAMO	Breslau
Ford	Berlin-Johannisthal
Hanomag	Hannover-Linden
MIAG	Brunswick
M A N.	Gottbus
VOMAG	Plauen
Peugeot	Montbeliard Sochaux
Volkswagen	Fallersleben
Austro-Daimler	Wiener Neustadt

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Military Transport Vehicles

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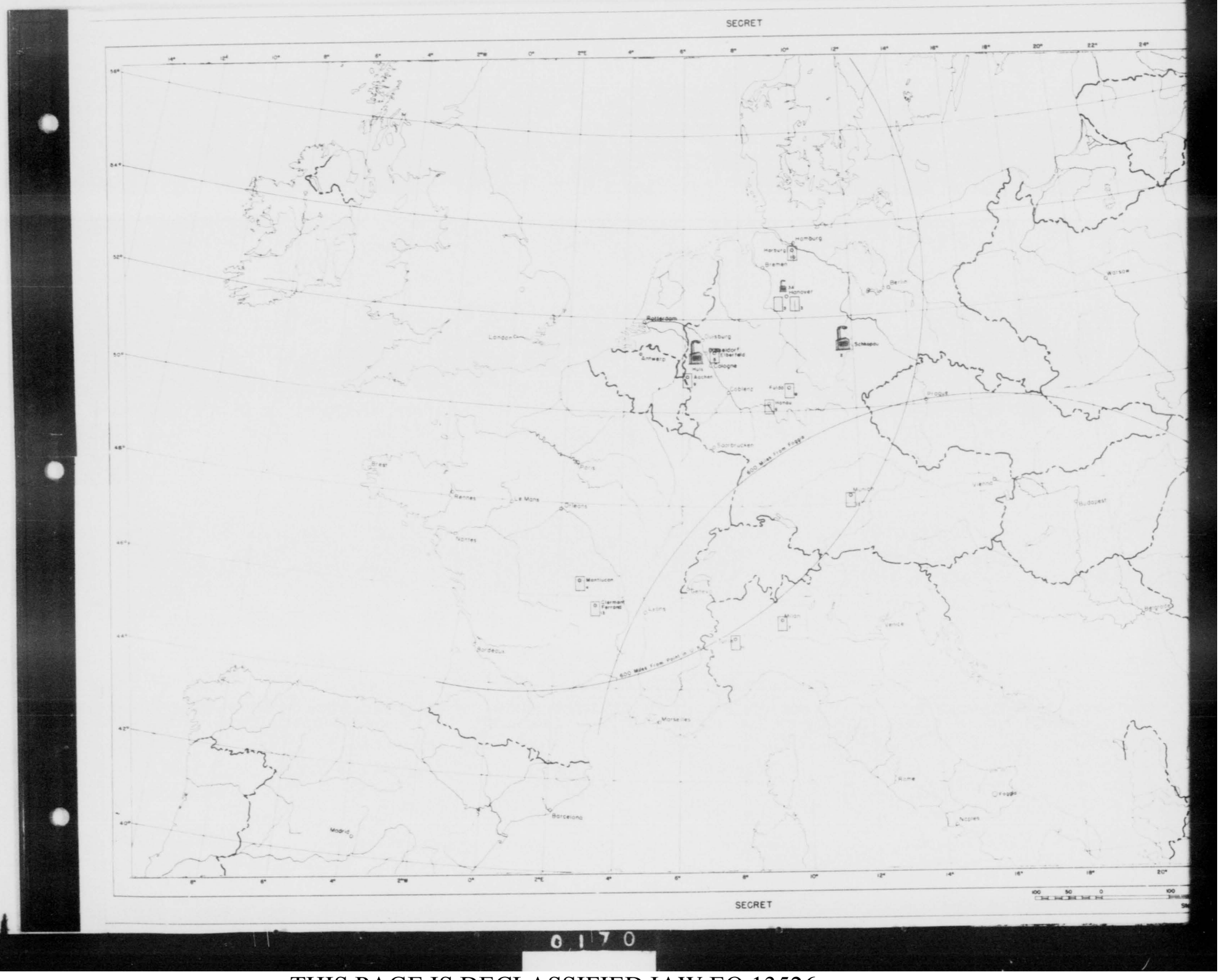

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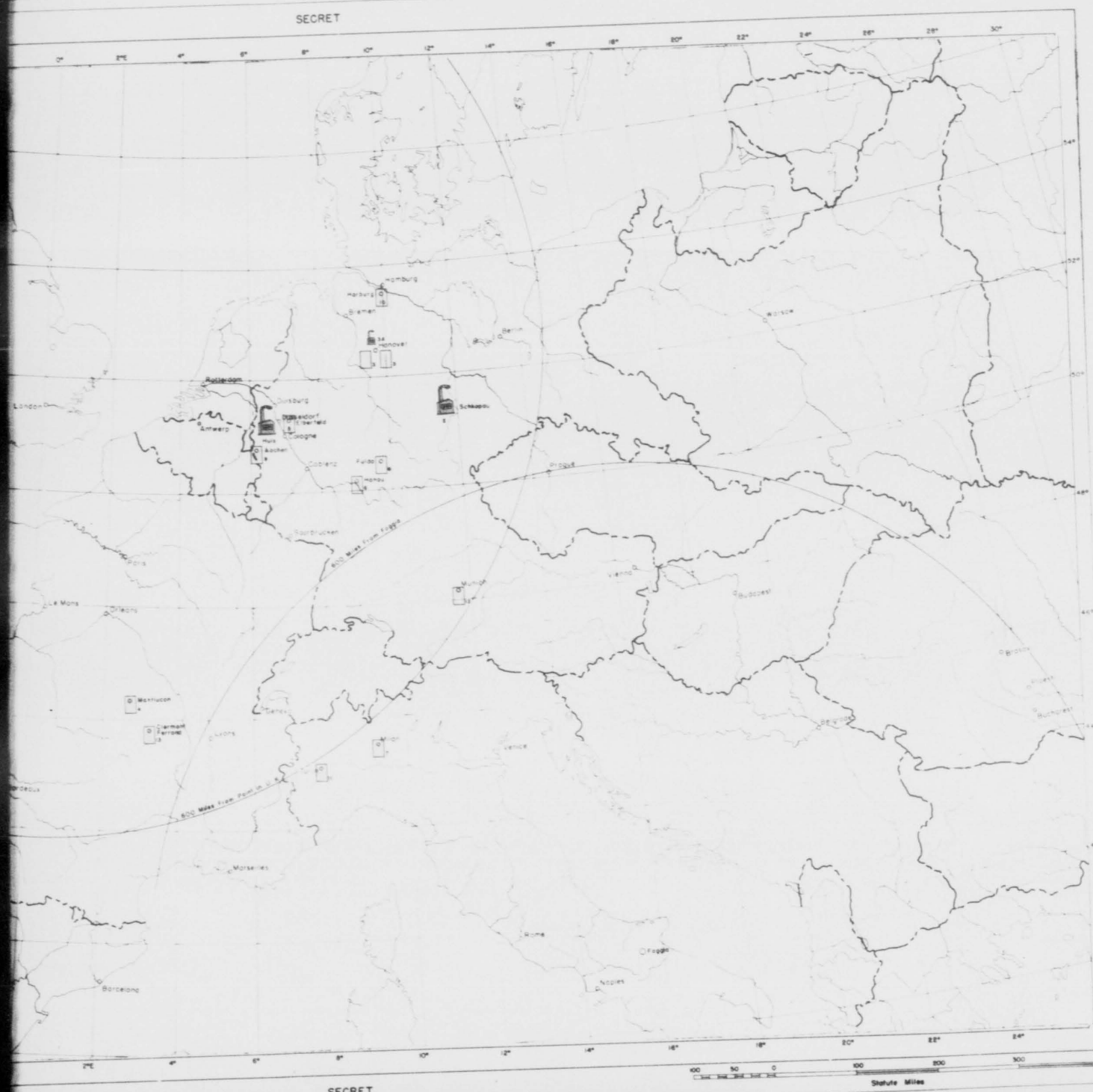

SYNTHETIC RUBBER PRODUCTION

Plant	Estimated % of European Axis Output
1. Huls	24 - 30
2. Schkopau	24 - 30
3A. Hanover, Limmer	8 - 10
(2)	56 - 70

(2) Balance of output believed in (3) or more plants.

TIRE MANUFACTURING

Plant	Estimated % of European Axis Production
3. Continental, Hannover (1) (2 main plants)	24.7
4. Dunlop, Montluçon (2)	12.9
5. Vorwerk, Eberfeld	12.3
6. Dunlop, Hanau	9.3
7. Fredk. Maier (1)	6.2
8. Fulda, Fulda	6.2
9. Engelbert, Aachen	4.6
10. Phoenix, Harburg (1)	4.6
11. Michelin, Turin	3.1
12. Metzeler, Munich	3.3
13. Michelin, Clermont Ferrand (1)	Small 87.2

(1) Believed making Aero Tires.
(2) Balance of output in approximately 11 plants.

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Synthetic Rubber & Tire Mfg.

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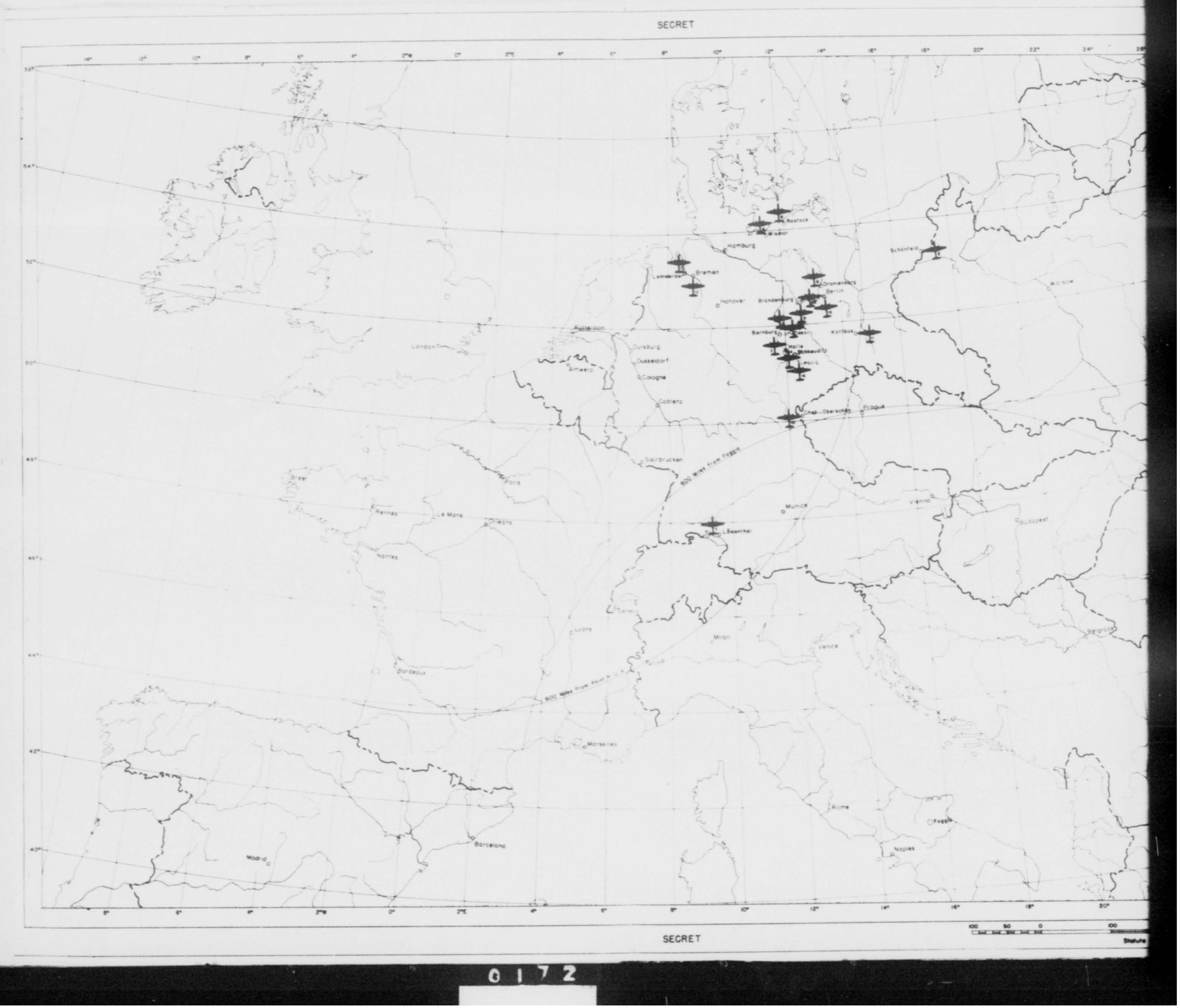

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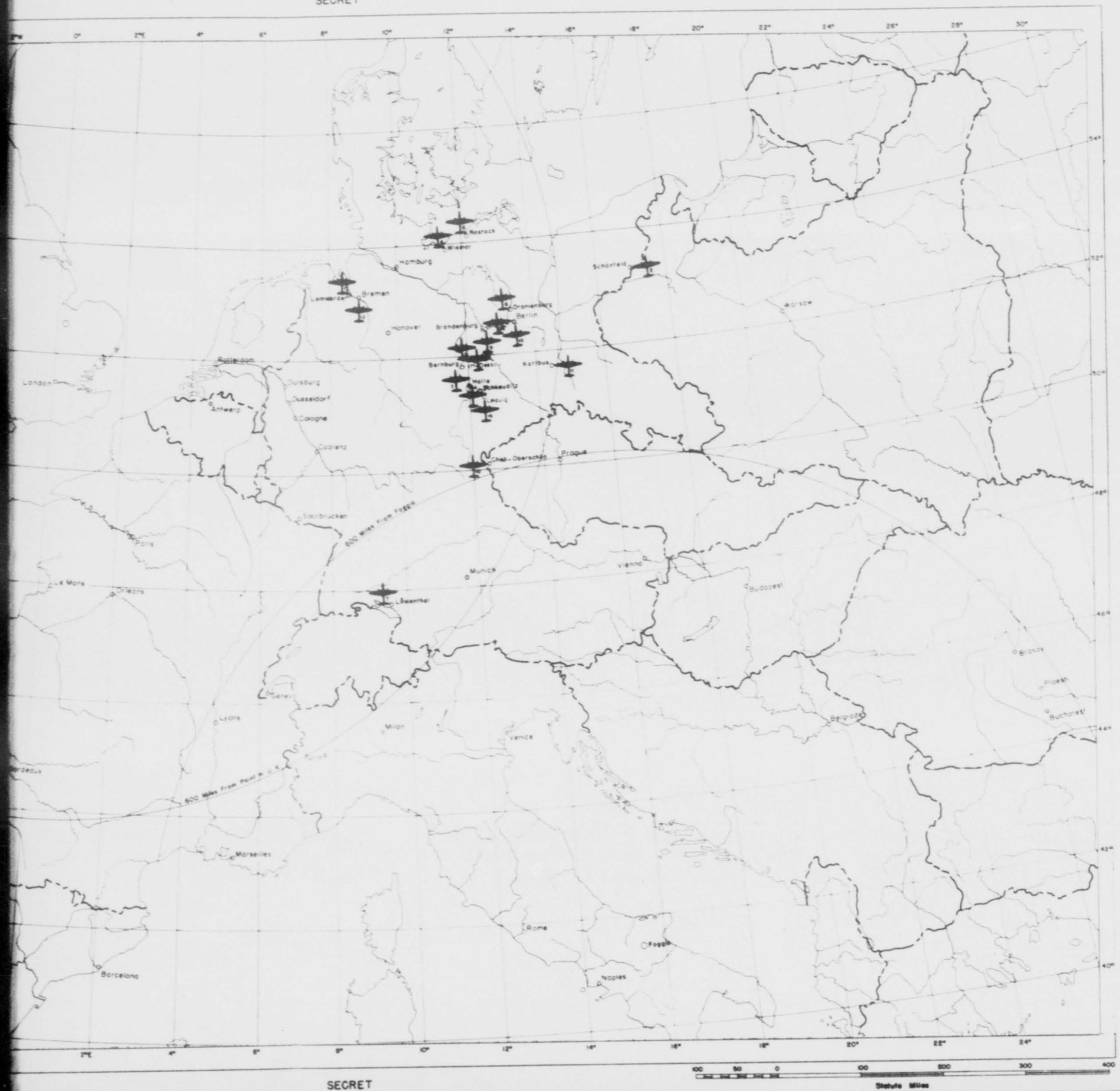

BOMBER ASSEMBLY

Plant	Type	Estimated Monthly Production July, 1943
1. Junkers, Bernburg	JU 88	120
2. Henschel, Schonfeld	JU 88	70
3. Siebel, Halle	JU 88	40 (2)
4. Siebel, Schkeuditz	JU 88	
16. A.T.G. Leipzig	JU 88	35
5. Heinkel, Rostock	HE 111	100
6. Heinkel, Oranienburg	HE 111 HE 177 (1)	
7. Dornier, Lowenthal	DO 217	10
8. Dornier, Wismar	DO 217	30
9. Arado, Brandenburg	HE 177	20
10. Ago, Oschersleben	HE 177	
11. Focke-Wulf, Kothen	FW 200	5
12. Weser, Bremen	JU 87	75
13. Weser, Lemwerder	JU 87	
14. Weser, Berlin	JU 87	10 (2)
15. Henschel, Berlin Johannisthal	HS 129	15
17. Junkers, Dessau (See Note (1))		

(1) Included in production estimate for 9 & 10.
(2) Includes unidentified production.
(3) Factories producing bomber engines included in "Combat Aircraft Engines" on another map.
(4) Probably making new types now.

Bomber A/C Assembly

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SELECTED STRATEGIC OBJECTIVES IN AXIS EUROPE

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SELECTED AERIAL OBJECTIVES IN AXIS EUROPE

PART I - All Targets Listed by Cities:

Country	Page
Greater Germany	3
Belgium	20
Bulgaria	20
France	21
Greece	24
Holland	24
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Norway	26
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PART II - 'Key Targets' Listed by Industry:

Industry	Page
Fighter Aircraft Assembly	28
Fighter Airframe Components	28
Bomber Aircraft Assembly	28
Combat Aero-engine Assembly	29
Ball Bearings	29
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Rubber Tires	30
Synthetic Rubber	31
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EXPLANATORY NOTES

1. Listing of Targets

In Part I, targets are listed alphabetically by cities under the country in which they are located. 'Greater Germany' includes Austria, Czechoslovakia and Poland. In Part II, 'Key Targets' are listed by industrial groups.

2. Selection of Localities and Targets

This list includes only localities which contain 'Key Targets' or numerous industries important to the Axis war effort. The selection of 'Key Targets' is based primarily on the report of the Committee of Operations Analysts.

3. Evaluation of Targets

Targets in the more important industrial areas in Axis Europe are included in this list, and where plants are listed by name they represent important objectives in their industries. Some 'Key Targets' are not located in important industrial areas but the objectives themselves are parts of industries vital to the Axis war effort. There is placed after each 'Key Target' a figure in parentheses which is either the estimated percentage of total Axis production or the estimated monthly production as of July 1943 where the data is available for the plant.

4. Aircraft and Aero-engine Repair Plant Targets

The aircraft and aero-engine repair plants listed are tentative selections based upon relatively inadequate data. This industry is now under study and it is expected that a revised list will be prepared in the near future.

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PART I

GREATER GERMANY

Location*	Target	Product
AACHEN	Key Targets Englebert Rubber Tire Plant	Rubber tires (4.6%)
AHLEN	Key Targets Arado Fighter Component Plant	Components for FW 190
AUGSBURG	Key Targets Messerschmitt Fighter Assembly Plant	Me 410 (40/month)
	Other Targets Maschinenfabrik Augsburg-Nurnburg Engine Plant	Diesel engines submarine types

* Note: Names in parentheses following plant names indicate suburbs or sections of towns throughout the report. The following suburbs or small towns, which are frequently used as the location of key targets, are to be found in this listing under the major city noted:

Allach	MUNICH	Kamen	DORTMUND	Schoenebeck	MAGDEBURG
Altenbauna	KASSEL	Lemwerder	BREMEN	Schonefeld	BERLIN
Bettenhausen	KASSEL	Ludwigshafen	MANNHEIM	Siemenstadt	BERLIN
Bottrop-Welheim	ESSEN	Marienfelde	BERLIN	Spandau	BERLIN
Basdorf	BERLIN	Mockau	LEIPZIG	Taucha	LEIPZIG
Castrop-Rauxel	BOCHUM	Oberhausen	ESSEN	Unterturkheim	STUTTGART
Elberfeld	WUPPERTAL	Oberwissenfeld	MUNICH	Waldau	KASSEL
Gelsenkirchen	ESSEN	Oranienburg	BERLIN	Waggum	BRUNSWICK
Genshagen	BERLIN	Poelitz	STETTIN	Wanne-Eickel	BOCHUM
Heiterblich	LEIPZIG	Querum	BRUNSWICK	Zuhlsdorf (See Basdorf)	

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Location	Target	Product
BERLIN	Key Targets	
	Argus Motoren Aero-engine Plant (Reinickendorf)	AS 410 - trainer type
	Bayerische Motoren Werke Aero-engine Plant (Basdorf)	BMW 801 (100/month)
	Bayerische Motoren Werke Aero-engine Plant (Spandau)	BMW 801
	Bussing-Nag Truck Plant (Oberschoneweide)	Military Transport Vehicles
	Daimler-Benz A.G. Aero-engine Plant (Genshagen)	DB 605 (350/month)
	Daimler-Benz A.G. Aero-engine Plant (Marienfelde)	DB 605 (95/month) Also tractors, diesel engines
	Daimler-Benz Truck Plant (Marienfelde)	Military Transport Vehicles
	Ford Truck Plant (Johannisthal)	Military Transport Vehicles
	Heinkel Bomber Assembly Plant (Oranienburg)	He 177. He 111 (with Rostock-100/month)
	Henschel Bomber Assembly Plant (Johannisthal)	Hs 129 (15/month)
	Henschel Bomber Assembly Plant (Schonefeld)	Ju 88 (70/month)
	Weser Bomber Assembly Plant	Ju 87 (10/month)
	Other Targets	
	Allgemeine Elektrizitäts Gesellschaft Cable Works (Oberschöneweide)	Electrical Equipment
	Allgemeine Elektrizitäts Gesellschaft Maschinenfabrik (Wedding)	Electric Motors
	Ambi-Budd Presswerke (Johannisthal)	Pressings of all kinds for vehicles and tanks
	Borsig Lokomotive-Werke (Henningsdorf)	Main line locomotives
	Deutsche Industrie-Werke (Spandau)	Engineering and armaments
	Pallas Apparate (Wedding)	Carburettors for aero-engines
	Railway Repair Shops (Tempelhof)	-
	Rheinmetall-Borsig (Tegel)	Engineering and armaments
	Siemens and Halske (Siemenstadt)	Communications Equipment
	Siemens-Schuckert (Gartenfeld)	Cables and wires
	Numerous other engineering, armaments, electrical equipment and chemical plants	

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Location	Target	Product
BERNBURG	**Key Targets**	
	Junkers Assembly Plant	
	Fighters	Ju 88 B (50/month)
	Bombers	Ju 88 (120/month)
	Other Targets	
	Deutsche Solvay Werke A.G.	Chemicals
BITTERFELD	**Key Targets**	
	None	
	Other Targets	
	I.G. Farbenindustrie Plants	Magnesium (17% of German prod.), aluminum, war-gases, chlorine magnesium (30% of German prod.), sulphuric acid, rayon
BLECHHAMMER	**Key Targets**	
	Oberschlesischelt Oil Refinery (N)	Bergius Process (2.7%)
	Oil Refinery (S)	Bergius Process (2.7%)
BOCHUM	**Key Targets**	
	Klockner Wintershall Oil Refinery (Castrop-Rauxel)	Fischer-Tropsch Process (0.8%)
	Krupp Treibstoffwerke Oil Refinery (Wanne-Eickel)	Fischer-Tropsch Process (0.5%)
	Other Targets	
	Vereinigte Stahlwerke A.G.	Pig iron, high-grade steels, armaments
	Numerous gas and coke by-products plants, chemical, steel, and engineering plants	
BOEHLEN-ROTHA	**Key Targets**	
	Brabag Oil Refinery, I	Bergius Process (2.2%)
BRANDEN-BURG	**Key Targets**	
	Adam Opel Truck Plant	Military Transport Vehicles
	Arado Bomber Assembly Plant	He 177 (with Cheb-Oberschon 20/month)

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Location	Target	Product
BRATISLAVA (Czecho-slovakia)	Key Targets Apollo I.G. Oil Refinery	Refining of crude (0.8%)
BREMEN	Key Targets C.F.W. Borgward Truck Plant Deschimag Submarine Yard Weser Flugzeugbau Bomber Plants (Bremen and Lemwerder) Focke-Wulf Fighter Repair Plants (Bremen, Hastedt and Hemelingen)	Military Transport Vehicles Submarine manufacture (7.7%) Ju 87 (75/month) Repair mainly to FW 190
BREMER-HAVEN	Key Targets Deschimag Submarine Yard	Submarine manufacture (0.8%)
BRESLAU	Key Targets None Other Targets Famo Fahrzeugund Moteren Werke Junkers A.G. Linke-Hoffman Werke A.G. Rheinmetall-Borsig A.G. Various other metals, motor vehicles and armaments plants	 Submarine diesel engines, half-track vehicles Aircraft assembly Largest German RR car builder Light metal munitions components
BRUNSWICK	Key Targets Bussing-NAG Truck Plant Muhlenbau und Industrie A.G. Fighter Assembly Plant (Waggum) Niedersachsische Aero-engine Plant (Querum) Other Targets Hermann Goring Steel Plant (Hallendorf) MIAG Truck Plant	 Military Transport Vehicles Me 110 (55/month) DB 605 (215/month) Coke and steel Half-tracks

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Location	Target	Product
BRUX (Czechoslovakia)	Key Targets Brabag Oil Refinery, V	Bergius Process (4.1%)
CHEB-OBERSCHON (Czechoslovakia)	Key Targets Eger Bomber Assembly Plant	He 177 (20/month with Brandenburg)
CHEMNITZ	Key Targets None	
	Other Targets Schubert & Salzer A.G. Wanderer Werke	Small arms components Machine tools, motor cycles, bicycles, troop carriers
	Auto Union Truck Plant Numerous other machine tool and armament plants	Armored cars
DANZIG	Key Targets Danziger Werft Submarine Yard	Submarine manufacture (5.1%)
	Schichau Submarine Yard	Submarine manufacture (6.8%)
DESSAU	Key Targets Junkers Aero-engine and Aircraft Plant	Jumo 212 Ju 88
DORTMUND	Key Targets Chemische W. Essener Oil Refinery (Kamen)	Fischer-Tropsch Process (0.6%)
	Mousch Benzin Oil Refinery	Fischer-Tropsch Process (0.5%)
	Other Targets Vereinigte Stahlwerke A.G. (Horde)	Iron and steel, armaments
	Hoesch-Koeln-Neuessen A.G. Steel Plant	Steel and armaments

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Location	Target	Product
DRESDEN	Key Targets	
	Kraftstoffanlagen Oil Refinery	Bergius Process (0.5%)
	Other Targets	
	Numerous machine tool, armament and chemical plants	
DROHOBYCZ (Poland)	Key Targets	
	Galicja Oil Refinery Nafta-Galapolska Oil Refinery Polmin Oil Refinery	Refining of crude (1.3%)
DUISBURG	Key Targets	
	None	
	Other Targets	
	Demag	Steel products, half-track vehicles, machine parts, armaments
	Deutsche Solvay Col.	Alkalis (2nd largest works in Germany)
	Gelsenkirchener Bergwerks A.G.	Coke, benzol, tar, ammonia
	Ruhrchemie A.G.	Ammonia, nitric acid
	Ver. Stahlwerke A.G.	Steel, steel products, machine parts, armaments
	Various other steel, coke and chemical plants	
DUSSELDORF	Key Targets	
	None	
	Other Targets	
	Henkel and Company	Heavy chemicals, soap, war gases
	Mannesmann-Rohrenwerke A.G.	Steel products, munitions
	Rheinmetall-Borsig A.G.	Guns, shells, tanks, electric steel
	Various other steel, machine and chemical plants	
DUBOWA (Czecho-slovakia)	Key Targets	
	Government Oil Refinery	Refining of crude (0.5%)

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Location	Targets	Product
EISENACH	Key Targets Bayerische Motoren Werke Aero-engine Plant(Stockhausen)	BMW 801 (125/month)
ELBING	Key Targets Bussing-Nag Truck Plant	Military Transport Vehicles
EMDEN	Key Targets Nordsee Werke Submarine Yard	Submarine manufacture (2.1%)
ERDING	Key Targets Air Park	
ERKNER	Key Targets V.K.F. Ball Bearing Plant	Ball bearings (7.4%)
ESCHWEGE	Key Targets Air Park	
ESSEN	Key Targets Gelsenberg Benzin Oil Refinery (Gelsenkirchen)	Bergius Process (2.2%)
	Hydrierwerke Scholven Oil Refinery (Gelsenkirchen)	Bergius Process (1.9%)
	Ruhrol Oil Refinery (Bottrop-Welheim)	Bergius Process (0.8%)
	Krupp Truck Plant	Military Transport Vehicles
	Other Targets Gutehoffnungshütte Steel Plant (Oberhausen)	Iron and steel
	Pr. Krupp Steel Plant	Iron, steel, and armaments
	Numerous other steel and machine products plants	
ESSLINGEN	Key Targets Boerspacher Aero-engine Plant	Jumo 212

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Location	Target	Product
FLENSBURG	Key Targets	
	Schiffbau Submarine Yard	Submarine manufacture (3%)
FRANKFURT/ MAIN	Key Targets	
	None	
	Other Targets	
	Adler Werke	Armored fighting vehicles
	Alfred Teves	Aircraft components
	Farbwerke	Explosives, war gases, sulphuric acid
	Hartmann and Braun A.G.	Aircraft instruments, firing devices
	Naxos Union	Grinding wheels
	Vereinigte Deutsche Metallwerke	Light metal alloys, aircraft parts
	Numerous other instrument, abrasive, machine tool, and chemical plants	
FULDA	Key Targets	
	Fulda Rubber Tire Plant	Rubber Tires (6.2%)
GAEBLINGEN	Key Targets	
	Air Park	
	Other Targets	
	I.G. Farbenindustrie A.G.	Poison gas
GAGGENAU	Key Targets	
	Daimler-Benz Truck Plant	Military Transport Vehicles
GOTHA	Key Targets	
	Gothaer Fighter Assembly Plant	Me 110 (45/month)
HAGEN	Key Targets	
	None	
	Other Targets	
	Accumulatoren-Fabrik A.G.	Submarine batteries
	Klockner-Werke A.G.	Special steels
	Numerous other steel products, machine parts plants	

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Location	Target	Product
HALLE	Key Targets	
	Siebel Flugzeug Werke Bomber Assembly Plant	Ju 88 (40/month with Schkeuditz)
HAMBURG	Key Targets	
	Blohm & Voss Submarine Yard	Submarine manufacture (16.2%)
	Deutsche Werft Submarine Yard	Submarine manufacture (6.4%)
	Europ Tanklager Oil Refinery	Refining of crude (2.2%)
	Howaldt Werke Submarine Yard	Submarine manufacture (5.1%)
	Klockner Aero-engine Plant	BMW 801 (75/month)
	Rhenania-Ossag Oil Refinery	Refining of crude (2.1%)
	Stulcken Sohn Submarine Yard	Submarine manufacture (3%)
	Other Targets	
	Humboldt Deutz	Diesel engines
	Norddeutsche Affinerie	Copper, lead, sulphuric acid
	Vereinigte Deutschmetallwerke A.G. (Altona)	Airplane propellers
	Other chemical, oil, engineering plants	
HANAU	Key Targets	
	Dunlop Rubber Tire Plant	Rubber Tires (12.9%)
	Other Targets	
	Heraeus-Vacuum-Schmelze A.G.	Non-ferrous alloys
HANNOVER	Key Targets	
	Continental Gummiwerke (2 plants)	Rubber Tires (24.7%)
	Durag-Nerag Oil Refinery (Misburg)	Refining of crude (1.6%)
	Continental Gummiwerke (Limmer)	Synthetic Rubber (8-10%)
	Other Targets	
	Hanomag Engineering Plant	Tractors, half-tracks
	Hanomag Locomotive Plant	Locomotives
HARBURG	Key Targets	
	Phoenix Rubber Tire Plant	Rubber Tires (4.6%)
	Other Targets	
	Numerous chemical and oil plants	

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Location	Target	Product
HELIGOLAND	Key Targets Submarine Repair Base	
HOMBERG	Key Targets Kraftstoffwerke Oil Refinery	Fischer-Tropsch Process (1.1%)
HÜLS	Key Targets Chemische Werke Rubber Plant	Synthetic Rubber (24-30%)
JENA	Key Targets None	
	Other Targets Carl Zeiss Schott Genossen	Optical instruments Optical glass
KASSEL	Key Targets Fiuselor Fighter Assembly Plant (Waldau) Fiuselor Fighter Component Plant (Bettenhausen) Henschel Aero-engine Plant (Altenbauna) Henschel Truck Plant	FW 190 (35/month) Components for FW 190 DB 605 (300/month) Military transport vehicles
	Other Targets Henschel Locomotive Plant	Locomotives
KIEL	Key Targets Deutsche Werke Submarine Yard Germania Submarine Yard Kriegsmarine Werft Submarine Yard	Submarine manufacture (4.7%) Submarine manufacture (9.4%) Submarine manufacture (4.7%)
	Other Targets Submarine Component and Torpedo Plants	

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Location	Target	Product
KOLIN (Czecho-slovakia)	Key Targets Vacuum Oil Refinery	Refining of crude (0.5%)
KOLN	Key Targets Ford Truck Plant (Niehl) Humboldt Deutz Truck Plant (Kalk)	Military transport vehicles Military transport vehicles, internal combustion engines
	Other Targets Fleten & Guillaume Cable Plant Gottfried Haran A.G. (Kalk) Humboldt Deutz (Deutz)	Cables and wire Submarine batteries Diesel engines
KONIGSBERG	Key Targets None	
	Other Targets Schichau G.m.b.H. Various other machine and armaments plants	Submarine and auxiliary naval craft
KÖTHEN	Key Targets Junkers Aero-engine Plant	Jumo 212
KOTTBUS	Key Targets Focke-Wulf Bomber Assembly Plant	F. 200 (5/month)
	Other Targets M.G Truck Plant	Half-tracks
KREFELD	Key Targets None	
	Other Targets Deutsche Edelstahlwerke Various Machine and Chemical Plants	High-grade steel, armor plate

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Location	Target	Product
LEIPZIG	Key Targets	
	Allgemeine Transport Anlagen G.m.b.H. (Grosszschocher)	Aero-engines
	Junkers Bomber Assembly Plant	Ju 88 (35/month)
	Erla Fighter Assembly Plant (Mockau)	Me 109 (120/month)
	Erla Fighter Component Plant (Heiterblick)	Components for Me 109
	Mitteldeutsche Aero-engine Plant (Taucha)	Jumo 212
	Other Targets	
	Bussing Truck Plant (Wahren)	Armored Fighting Vehicles
	Numerous other aircraft and armament plants	
LIEGNITZ	Key Targets	
	Air Park	
LOWENTHAL	Key Targets	
	Dornier Bomber Assembly Plant	Do 217 (10/month)
LÜBECK	Key Targets	
	Flenderwerke Submarine Yard	Submarine manufacture (6%)
LÜTZKENDORF-MUCHLEN	Key Targets	
	Wintershall Oil Refinery	Bergius Process (0.7%)
	Wintershall Oil Refinery	Fischer-Tropsch Process (0.8)
MAGDEBURG	Key Targets	
	Braunkohlen Benzin Oil Refinery	Bergius Process (1.6%)
	Junkers Aero-engine Plant	Jumo 212
	Junkers Aero-engine Plant (Schoenebeck)	Jumo 212
	Other Targets	
	Junkers Aircraft Plant	Airframe Components for Bombers
	Krupp Grusonwerke Steel Plant	Engineering and Armaments
	Numerous other armament and chemical plants	

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Location	Target	Product
MANNHEIM	Key Targets	
	Daimler-Benz Truck Plant	Military Transport Vehicles
	Other Targets	
	I.G.Farben (Ludwigshafen)	Chemicals and Explosives
	I.G.Farben (Oppau)	Chemicals and Explosives
	Numerous other machine, armament, and chemical plants	
MARIENBURG	Key Targets	
	Focke-Wulf Fighter Assembly Plant (formerly in Bremen)	Fw 190 (80/month)
MERSEBERG-LEUNA	Key Targets	
	Ammoniak Oil Refinery	Bergius Process (3.3%)
	Other Targets	
	I.G.Farben Combine	Chemicals and Explosives
MUNICH	Key Targets	
	Bayerische Motoren Werke Aero-engine Plant (Allach)	BMW 801 (250/month)
	Bayerische Motoren Werke Aero-engine Plant (Oberwissenfeld)	BMW 801
	Metzeler Rubber Tire Plant	Rubber Tires (3.3%)
	Other Targets	
	Kraus-Maffei Locomotive Plant	Locomotives
	Numerous other engineering and aircraft plants	
NURNBERG	Key Targets	
	Faun-Werke Truck Plant	Military Transport Vehicles
	Maschinenfabrik Augsburg-Nürnberg Truck Plant	Military Transport Vehicles
	Other Targets	
	Numerous engineering and armament plants	
OBERPFAFFEN-HOFEN	Key Targets	
	Dornier Fighter Assembly Plant	Do 217 (20/month)

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Location	Target	Product
OBERURSEL	Key Targets Klockner Aero-Engine Plant	BMW 801
OSCHERSLEBEN	Key Targets Aero Fighter Assembly Plant	Fw 190 (55/month)
PARDUBICE (Czecho-slovakia)	Key Targets Panto Werke Oil Refinery	Refining of crude (1.1%)
PRAGUE (Czecho-slovakia)	Key Targets Argus Aero-engine Plant Junkers Aero-engine Plant Walter Aero-engine Plant --- Aero-engine Plant Other Targets Aero Vysocany Aircraft Assembly Plant	Aero-engines Jumo 212 Aero-engines Aero-engines Aircraft
REGENSBURG	Key Targets Messerschmitt Fighter Assembly Plant	Me 109 (200/month)
ROSTOCK	Key Targets Neptune Werft Submarine Yard Heinkel Bomber Assembly Plant	Submarine manufacture (3.3%) He 111 (100/month with Berlin-Oranienburg)
RUHLAND-SCHWARZ-HEIDE	Key Targets Brabag Oil Refinery III	Fischer-Tropsch Process (1.5%)
SCHKOPAU	Key Targets Buna Rubber Plant	Synthetic Rubber (24 - 30%)

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Location	Target	Product
SCHKEUDITZ	Key Targets	
	Siebel Flugzeugwerke Bomber Plant	Ju 88 (40/month with Halle)
SCHLEINFURT	Key Targets	
	Fischer Ball Bearing Plant	Ball bearings (18.5%)
	V.K.F. Ball Bearing Plant I)	
	V.K.F. Ball Bearing Plant II)	Ball bearings (22.2%)
SIEGMAR	Key Targets	
	Auto Union Truck Plant	Military transport vehicles
SINDEL-FINGEN	Key Targets	
	Daimler-Benz Truck Plant	Military transport vehicles
STEHKRADE-HOLTEN	Key Targets	
	Ruhrbenzin Oil Refinery	Fischer-Tropsch Process (0.7%)
STETTIN	Key Targets	
	Vulkan Submarine Yard	Submarine manufacture (0.8%)
	Hydrierwerke Oil Refinery (Poolitz)	Bergius Process (3.8%)
	Oderwerke Submarine Yard	Submarine manufacture (1.3%)
	Pommersche Aero-engine Plant	Ju 211 or 212
STEYR (Austria)	Key Targets	
	Steyr-Daimler-Puch Truck Plant	Military transport vehicles
STUTTGART	Key Targets	
	Daimler-Benz Aero-engine Plant (Unterturkheim)	DB 605
	Daimler-Benz Truck Plant	Military transport vehicles
	V.K.F. Ball Bearing Plant	Ball bearings (7.4%)
	Hirth Aero-engine Plant	Hirth engines
	Other Targets	
	Robert Bosch Engine Accessory Plant	Magnetos, fuel injection pumps, spark plugs, etc.

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Location	Target	Product
PUTOW	Key Targets	
	Arado Fighter Assembly Plant	FW 190 (60/month)
ULM	Key Targets	
	Humboldt-Deutz Truck Plant	Military transport vehicles
	Other Targets	
	Wieland Werke A.G.	Light alloy aircraft components
VEGESACK	Key Targets	
	Bremer Vulcan Submarine Yard	Submarine manufacture (5.5%)
VIENNA (Austria)	Key Targets	
	Creditul Minier Oil Refinery (Korneuburg)	Refining of crude (5.3%)
	M.O. and Brons Oil Refinery (Schwechat)	
	Ost. Fanto Oil Refinery (Vosendorf)	
	Shell Refinery (Floridsdorf)	
	Vacuum Refinery (Kagran)	
	Wintershall Oil Refinery (Lobau)	
	Fross-Bussing Truck Plant	Military transport vehicles
	Sauerwerke Truck Plant	Military transport vehicles
	Other Targets	
	Flugmotorenwerke Ostmark Aero-engine Plant	Aero-engines
	Locomotive Building Shops	Locomotives
	Osterreichische Aero-engine Plant	Aero-engines
WARNEMUNDE	Key Targets	
	Arado Fighter Component Plant	Components for FW 190
WESSELING	Key Targets	
	Union Rheinische Oil Refinery	Bergius Process (1.1%)

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Location	Target	Product
WIENER-NEUDORF (Austria)	Key Targets Flugmotorenwerke Ostmark Aero-engine Plant	DB 605 (800 - 1200/month)
WIENER-NEUSTADT (Austria)	Key Targets Austro-Fiat Truck Plant Wiener-Neustadter Fighter Assembly Plant	Military transport vehicles Me 109 (220/month)
	Other Targets Henschel Locomotive Plant Steyr-Daimler-Benz Fighter Component Plant Austro-Daimler Truck Plant	Locomotives Components for Me 109 Military transport vehicles
WILHELM-SHAVEN	Key Targets Marine Werft Submarine Yard	Submarine manufacture (3.4%)
WISMAR	Key Targets Dornier Bomber Assembly Plant	Do 217 - (30/month)
WUPPERTAL	Key Targets Vorwerk Rubber Tire Plant (Elberfeld)	Rubber tires (12.3%)
	Other Targets Jaeger Roller Bearing Plant	Ball and roller bearings
ZEITZ-TROEGLITZ	Key Targets Brabag Oil Refinery, IV	Bergius process - (2.7%)
ZITTAU	Key Targets Phaenomen Truck Plant	Military transport vehicles

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BELGIUM

Location	Target	Product
ANTWERP	Key Targets	
	Ford Truck Plant	Military transport vehicles
	Erla Aircraft Plant	Aircraft and aero-engine repair
BRUSSELS	Key Targets	
	Erla Aircraft Plant (Evere)	Aircraft repair
	Airfield with heavy repair facilities	
COURCELLES	Key Targets	
	Verreries de Courcelles	Aero-engine repair
	Aero-engine Plant	

BULGARIA

Location	Target	Product
SOFIA	Key Targets	
	Airfield with heavy repair facilities	

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FRANCE

Location	Target	Product
ALBERT	Key Targets Aircraft Repair Facilities (Meaulte)	
ANNECY	Key Targets Schmid-Roost Plant	Ball bearings (5%)
BORDEAUX	Key Targets Submarine Repair Base Soc. Nat. de Construction Aero-nautique de Sud-Ouest (Merignac)	Aircraft repair and assembly of FW 189
BOURGES	Key Targets Aircraft Repair Facilities Matford Truck Plant	Parts for military transport vehicles
BREST	Key Targets Submarine Repair Base	
CAEN	Key Targets Airfield with heavy repair facilities	
CLERMONT-FERRAND	Key Targets Aircraft Repair Facilities (Aulnat) Michelin Company	Rubber tires (small production)
LA PALLICE	Key Targets Submarine Repair Base	
LE BOURGET	Key Targets Airfield with heavy repair facilities	

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Location	Target	Product
LE MANS	Key Targets Gnome-Rhone Aero-engine Plant	Aero-engine repair
LIMOGES	Key Targets Gnome-Rhone Aero-engine Plant	Aero-engine repair
LORIENT	Key Targets Submarine Repair Base	
MARSEILLES	Key Targets Submarine Repair Base	
MEULAN-LES MUREAUX	Key Targets Airfield with heavy repair facilities	
MONTLUCON	Key Targets Dunlop Rubber Tire Plant	Rubber Tires (12.9%)
NANTES	Key Targets Soc. Nat. de Construction Aero-nautique de Sud-Ouest (Chateau Bougon)	Aircraft repair
PARIS	Key Targets Caudron-Renault Aircraft Plant (Quai de Javel)	Aircraft repair
	Citroen Truck Plant	Auto engines and truck assembly
	Farman Aircraft Plant	Aircraft repair
	Renault Armament Plant (Billancourt)	Motor vehicles and armaments
	Salmson Aircraft Plant	Aircraft repair
	S.K.F. Ball Bearing Plant (Bois Colombes)	Ball bearings - (5%)
	S.K.F. Ball Bearing Plant (Ivry)	Ball bearings - (5%)

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Location	Target	Product
PARIS (Cont'd.)	Other Targets	
	Avions Amiot Aircraft Assembly Plant (Colombes)	French types and Ju 52
	Gnome-Rhone Aero-engine Plant (Blvd. Kellerman)	Spare parts for BMW 801
	Goodrich Rubber Tire Plant (Gennevilliers)	Rubber tires
	Hispano-Suiza Aero-engine Plant (Bois Colombes)	Spare parts for DB 605
	Soc. d'Outillage Mecanique et d'Usinage d'Artillerie - Vehicle Plant (Clichy)	Armored fighting vehicles
	Soc. Nat. de Construction Aeronautique du Sud-Est-Aircraft Assembly Plant (Argenteuil)	French types
	Soc. Nat. de Construction de Moteurs - Aero-engine Plant (Argenteuil)	French types
REIMS	Key Targets	
	Junkers Aircraft Plant (Champagne)	Aircraft repair
ROMILLY	Key Targets	
	Airfield with heavy repair facilities	
ST. NAZAIRE	Key Targets	
	Submarine Repair Base	
	Other Targets	
	Soc. Nat. de Construction Aeronautique de l'Ouest Aircraft Assembly	French types
STRASBOURG	Key Targets	
	Matford-Junkers Aero-engine Plant	Jumo types
VILLACOUBLAY	Key Targets	
	Airfield with heavy repair facilities	

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GREECE

Location	Target	Product
ATHENS	Key Targets	
	Blackburn Aircraft Plant (Phaleron)	Aircraft repair
	Siebel Front Aircraft Plant (Tatoi)	Aircraft repair
SCARAMANGA	Key Targets	
	Submarine Repair Base	

HOLLAND

AMSTERDAM	Key Targets	
	Fokker Aircraft Plant	Aircraft repair
VALKENBURG	Key Targets	
	Airfield with heavy repair facilities	

HUNGARY

ALMAS-FUZITO	Key Targets	
	Vacuum Oil Refinery	Refining of crude (0.5%)
BUDAPEST	Key Targets	
	Aircraft Repair Facilities (11 mi SSE Budapest)	
	Budapest-Asvanolag Oil Refinery	(
	Magyar Petrol Oil Refinery	(Refining of crude.
	Shell Koolas Oil Refinery	((1.3%)
	Manfred Weiss Aircraft Plant (Csepel Is.)	Aircraft repair

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ITALY

Location	Target	Product
MILAN	Key Targets	
	Breda Aircraft Plant (Sesto San Giovanni)	Aircraft repair
	Pirelli Rubber Tire Plant	Rubber tires. (6.2%)
	Other Targets	
	Alfa Romeo Aero-engine Plant	DB types
	Ernesto Breda Steel Works	Engineering and armament
	Caproni Aircraft Assembly Plant	Italian types
	Isotta-Fraschini Aero-engine Plant	DB types
	Pirelli Rubber Storage House	
REGGIO EMILIA	Key Targets	
	S.A. Reggiane (Caproni) Aircraft Plant	Aircraft repair
SPEZIA	Key Targets	
	Adero-Terni-Orlando Submarine Yard	Submarine manufacture (2.6%)
	Other Targets	
	Naval Oil Storage Depot	
TRIESTE	Key Targets	
	Cantieri Riuniti dell'Adriatico Submarine Plant (Monfalcone)	Submarine manufacture (1.7%)
	Other Targets	
	Aquila Oil Refinery and Storage	Refining of crude
	Siap Soconj Oil Refinery	Refining of crude

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Location	Target	Product
TURIN	Fiat Truck & Aero-engine Plant (Lingotto)	Military transport vehicles and aero-engine repair
	Fiat Aero-engine Plant (Mirafiore)	Aero-engine repair
	S.A. Officine Ball Bearing Plant	Ball bearings (14.9% with Villar Perosa)
	Michelin Company	Rubber tires (3.1%)
	Other Targets	
	Fiat Aircraft Assembly Plant	Italian types
VILLAR PEROSA	Key Targets	
	S.A. Officine Ball Bearing Plant	Ball bearings (14.9% with Turin)
	NORWAY	
TRONDHEIM	Key Targets	
	Submarine Repair Base	
	RUMANIA	
BRASOV	Key Targets	
	Airfield with heavy repair facilities	
BRAZI	Key Targets	
	Creditul Minier Oil Refinery	Refining of crude Reported destroyed by bombing

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Location	Target	Product
BUCHAREST	Key Targets	
	Airfield with heavy repair facilities	
	Prahova Oil Refinery	Refining of crude (0.6%)
	Other Targets	
	Industria Nationala Aeronautica	Aircraft (?)
CAMPINA	Key Targets	
	Steaua Romana Oil Refinery	Refining of crude Reported destroyed by bombing
PLOESTI	Key Targets	
	Astra Romana Oil Refinery	Refining of crude (4.5%)
	Columbia Aquila Oil Refinery	Refining of crude Reported destroyed by bombing
	Concordia Vega Oil Refinery	Refining of crude (6.4%)
	Dacia Romana Oil Refinery	Refining of crude (0.8%)
	Petrol Block Oil Refinery	Refining of crude (2.5%)
	Phoenix Unirea Oil Refinery	Refining of crude (2.4%)
	Phoenix Orion Oil Refinery	Refining of crude (2.7%)
	Romana Americana Oil Refinery	Refining of crude (6.1%)
	Xenia Oil Refinery	Refining of crude (1.1%)
YUGOSLAVIA		
BELGRADE	Key Targets	
	Ikarus Aircraft Plant (Zemun)	Aircraft repair
	Rogozarski Aircraft Plant (Zemun)	Aircraft repair

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PART II

FIGHTER AIRCRAFT FINAL ASSEMBLY

Plant	Type	Estimated Monthly Production July, 1943
Wiener-Neustadter, Wiener Neustadt	ME109, SEF	220
Messerschmitt, Regensburg	ME109, SEF	200
Erla, Leipzig (Mockau)	ME109, SEF	120
Focke-Wulf, former Bremen production probably moved to Marienburg	FW190, SEF	80
Arado, Tutow	FW190, SEF	60
Ago, Oschersleben	FW190, SEF	55
Fiesler, Kassel (Waldau)	FW190, SEF	35
MIAG, Brunswick (Waggum)	ME110, TEF	55
Junkers, Bernburg	JU 88, TEF	50
Gothaer, Gotha	ME110, TEF	45
Messerschmitt, Augsburg	ME110, TEF	40
Dornier, Oberpfaffenhofen	DO217, TEF	20

FIGHTER AIRFRAME COMPONENT ERECTION

Plant	Type
Fieseler, Kassel (Bettenhausen)	FW 190
Arado, Anklam	FW 190
Arado, Warnemunde	FW 190
Erla, Leipzig (Heiterblick)	ME 109

BOMBER AIRCRAFT ASSEMBLY

Plant	Type	Estimated Monthly Production July, 1943	
Junkers, Bernburg	JU 88	120	
Henschel, Berlin (Schonefeld)	JU 88	70	
Siebel, Halle	JU 88)		
Siebel, Schkeuditz	JU 88)	40	(2)
V. T. G. Leipzig	JU 88	35	
Heinkel, Rostock	HE 111)		
Heinkel, Berlin (Oranienburg)	HE 111)	100	
	HE 177	(1)	
Dornier, Lowenthal	DO 217	10	
Dornier, Wismar	DO 217	30	
Arado, Brandenburg	HE 177)		
Eger, Chob-Oberschon	HE 177)	20	
Focke-Wulf, Cottbus	FW 200	5	
Weser, Bremen	JU 87)		
Weser, Bremen (Lemwerder)	JU 87)	75	
Weser, Berlin	JU 87	10	(2)
Henschel, Berlin (Johannisthal)	HS 129	15	
Junkers, Dessau	See Note (3)		

(1) Included in production estimate for Arado and Eger.
(2) Includes unidentified production.
(3) Probably making new types now.

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COMBAT AIRCRAFT ENGINE ASSEMBLY

Plant	Type	Estimated Monthly Production in August, 1943
Flugmotorenwerke Ostmark, Wiener-Neudorf	DB	800-1200
D. B., Berlin (Genshagen)	DB	350
Henschel, Kassel (Altenbauna)	DB	300
Bussing-NAG, Brunswick (Querum)	DB	215
D. B., Berlin (Marienfelde)	DB	95
D. B., Stuttgart (Unterturkheim)	DB	
B. M. W., Munich (Allach)	BMW	250
B. M. W., Eisenach-Stockhausen	BMW	125
B. M. W., Berlin (Basdorf)	BMW	100
Klockner, Hamburg-Moorfleth	BMW	75
Klockner, Oberursel	BMW	
B. M. W., Munich (Oberwissenfeld)	BMW	
B. M. W., Berlin (Spandau)	BMW	
Mittledeutsche, Leipzig (Taucha)	Jumo	
Junkers, Dessau	Jumo	
Junkers, Kothen	Jumo	
Junkers, Magdeburg	Jumo	
Junkers, Magdeburg (Schoeneback)	Jumo	
Matford-Junkers, Strassburg	Jumo	
Junkers, Prague (Karlin)	Jumo	
Pommersche, Stettin (Altdamm)	Jumo	
Eberspacher, Esslingen	Jumo	
Hirth, Stuttgart (Zuffenhausen)	Hirth	
Argus, Berlin (Reinickendorf)	Argus	
Walter, Prague (Jinonice)		
Argus, Prague (Jinonice)		
Unknown, Prague (Cakovice)		

BALL BEARINGS

Plant	Reported % of European Axis Capacity
Fischer, Schweinfurt	18.5
VKF, Schweinfurt 1.)	
VKF, Schweinfurt 2.)	22.2
VKF, Stuttgart	7.4
VKF, Erkner	7.4
SKF, Paris (Colombe)	5.0
SKF, Paris (Ivry)	5.0
SHO, Annecy	5.0
SAC, Turin)	
SAC, Perosa)	14.9
	85.4 *

* Balance of capacity in 12 or more plants.

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MILITARY TRANSPORT VEHICLES

Major Plants reported as producers of trucks of 1½ tons capacity or larger.

Plant	Location
Adam Opel	Brandenburg
Deimler-Benz	Stuttgart
Daimler-Benz	Gaggenau
Daimler-Benz	Berlin (Marienfelde)
Daimler-Benz	Sindelfingen
Daimler-Benz	Mannheim
Daimler-Benz	Koln-Miehl
Ford	Vienna
Fross-Bussing	Paris-Billancourt
Renault	Paris
Citroen	Bourges
Watford	Brunswick
Bussing-NAG	Berlin (Oberschoneweide)
Bussing-NAG	Elbing
Bussing-NAG	Bremen
Borgward	Ulm
Humboldt-Deutz	Koln
Humboldt-Deutz	Nurnberg
M. A. N.	Esser
Krupp	Nurnberg
Faun-Werke	Steyr
Steyr	Kassel
Henschel	Zittau
Phanomen Werke	Wiener-Neustadt
Austro-Fiat	Vienna
Saurer Werke	Antwerp
Ford	Turin
Fiat Lingotto	Siegmar-Chemnitz
Auto Union	

TIRE MANUFACTURING

Plant	Estimated % of European Axis Production
Continental, Hanover - 2 (main plants) (1)	21.7
Dunlop, Montlucon (1)	12.9
Vorwerk, Wuppertal (Elberfeld)	12.3
Dunlop, Hanau	9.3
Pirelli, Milan (1)	6.2
Fulda, Fulda	6.2
Engelbert, Aachen	4.6
Phoenix, Harburg (1)	4.6
Michelin, Turin	3.1
Metzeler, Munich	3.5
Michelin, Clermont Ferrand	Small
	85.5 (2)

(1) Believed making aero Tires.

(2) Balance of output in approximately 15 plants.

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SYNTHETIC RUBBER PRODUCTION

Plant	Estimated % of European Axis Production
Huls	24 - 30
Schkopau	24 - 30
Hanover, Linmer	8 - 10
	56 - 60 (1)

(1) Balance of output believed in 10 or more plants.

SUBMARINE BUILDING YARDS

Plant	Estimated % of European Axis Production
Blohm & Voss, Hamburg	14.2
Germania, Kiel	9.4
Deschimag, Bremen	7.7
Schichau, Danzig	6.8
Deutsche Werft, Hamburg	6.4
C. R. D. A., Monfalcone	1.7
Flenderwerke, Lubeck	6.0
Bremer Vulcan, Vegesack	5.5
Danziger Werft, Danzig	5.1
Howaldt Werke, Hamburg	5.1
Deutsche Werke, Kiel	4.7
Kriegsmarine Werft, Kiel	4.7
Neptun Werft, Rostock	3.8
Marine Werft, Wilhelmshafen	3.4
Stulken Sohn, Hamburg	3.0
Schiffabau, Flensburg	3.0
Nordsee Werke, Emden	2.1
Nova dockyard, Spezia	2.6
Oderwerke Stettin	1.3
Deschimag, Bremerhaven	0.8
S. Gollnow-Vulkan, Stettin	0.8

SUBMARINE REPAIR FACILITIES

Location
Lorient
Brest
St. Nazaire
Bordeaux
La Pallice
Heligoland
Trondheim
Scaramanga near Salamis (Base reported under construction)
Marseilles (Base reported under construction)

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SYNTHETIC OIL PLANTS

Plant	Location	Estimated % of European Axis Natural & Synthetic Petroleum Output
(Bergius)		
Brabag V	Brux	4.1
Hydrierwerke	Stettin (Poelitz)	3.8
Ammoniak W. W.	Merseburg-Leuna	3.3
Oberschlesischelt	Blechhammer I	2.7
Brabag IV	Zeitz-Troglitz	2.7
Unknown	Blechhammer S	2.7
Gelsenberg Benzin	Essen (Gelsenkirchen)	2.2
Brabag I	Zoelen-Gotha	2.2
Hydrierwerke Scholven	Essen (Gelsenkirchen Buer)	1.9
Braunkohlen Benzin	Magdeburg	1.6
Union Rheinische	Wesseling (Wolf)	1.1
Ruhrol	Essen (Welheim-Bottrop)	0.8
Wintershall	Lutzkendorf	0.7
Kraftstoffanlagen	Dresden	0.5
		30.3
(Fischer-Tropsch)		
Brabag III	Ruhland-Schwarzheide	1.6
Kraftstoffwerke	Homberg	1.1
Wintershall	Lutzkendorf	0.8
Gewerkschaft V	Bochum (Castrop-Rauxel)	0.8
Ruhrbenzin	Sterkrade-Holten	0.7
Chemische W. Essener	Dortmund (Hamen)	0.6
Krupp Treibstoffwerke	Bochum (Wanne Eickel)	0.5
Moesch Benzin	Dortmund	0.5
		6.6

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NATURAL PETROLEUM REFINERIES REPORTED OPERATING

Plant	Location	Estimated % of European Axis Natural & Synthetic Petroleum Output
Concordia Vega	Ploesti	6.1 (1)
Romana Americana	Ploesti	6.1
Astra Romana	Ploesti	4.7 (1)
Phoenix Orion	Ploesti	2.7 (1)
Winterhall	Vienna-Lobau	5.3
Shell	Vienna-Floridsdorf	
Vacuum	Vienna-Wagram	
Credl. Minier	Vienna-Fischamund	
N. C. Mers	Vienna-Schwechat	
Ost. Panto	Vienna-Rosendorf	
Petrol Block	Ploesti	2.5
Phoenix Unirea	Ploesti	2.4
Europ. Tanklager	Hamburg	2.2
Rhenania-Ossag (large plant)	Hamburg	2.1
Deutsch-Verag	Harburg	1.8
Xenia	Ploesti	1.1
Panto Werke	Pardubice (Cz.)	1.1
Dacia Romana	Ploesti	0.8
Shell Moolaz	Budapest	1.3
Magyar Petrol.		
Bud.-Asvanyolag		
Apollo -I. C.	Bratislava (Cz.)	0.8
Prahova	Bucharest	0.6
Polmin	Drohobycz (Pol.)	1.3
Galicja		
Nafta-Polapolska		
Govt.-Refinery	Lubowa (Cz.)	0.6
Vacuum	Kolin (Cz.)	0.5
Vacuum	Almas Fuzito (Hung.	0.5
Colombia Aquila	Ploesti (2)	
Creditul Minier	Brazi (2)	
Steaua Romana	Campina (2)	

Notes: (1) Capacity reduced by AAF bombing.

(2) Reported destroyed by bombing.

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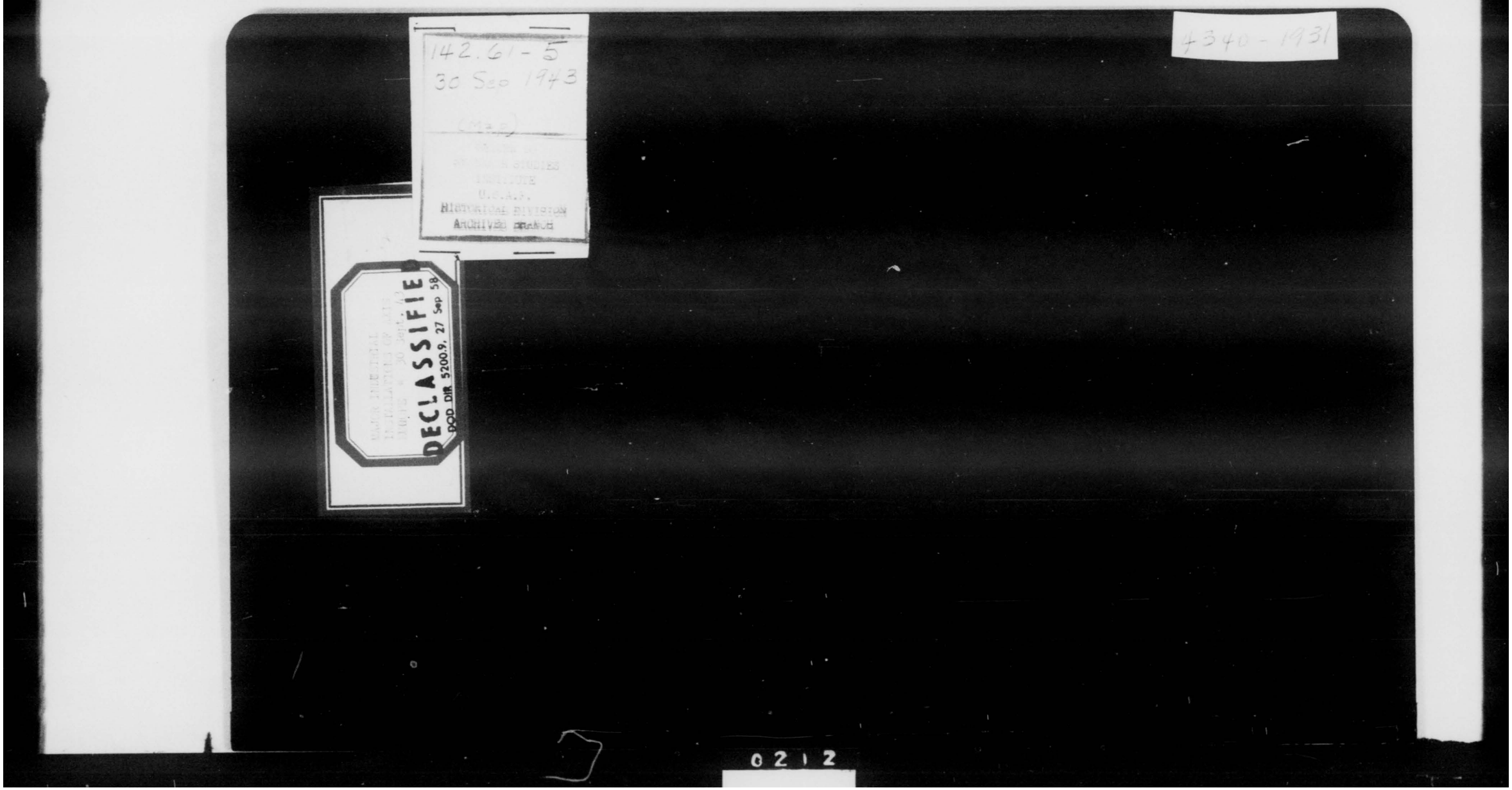

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FIGHTER AIRCRAFT PRODUCTION

No.	Name	Location	Estimated % of European Axis Fighter Aircraft Production
	Fighter Aircraft Final Assembly		
1 *	Wiener-Neustadter (ME 109)	Wiener-Neustadt	22
2 *	Messerschmitt (ME 109)	Regensburg	20
3	Erla (ME 109)	Leipzig-Mockau	12
4 *	Focke-Wulf (FW 190)	(Formerly Bremen, present location uncertain.)	8
5	Arado (FW 190)	Tutow	6
6 *	AGO (FW 190)	Oschersleben	5.6
7	MIAG (ME 110)	Brunswick-Waggum	5.6
8	Junkers (JU 88B)	Bernburg	5
9	Gothaer (ME 110)	Gotha	4.6
10	Messerschmitt (ME 410)	Augsburg	4
11 *	Fiesler (FW 190)	Kassel-Waldau	3.6
12	Dornier (DO 217)	Oberpfaffenhofen	2
	Fighter Aircraft Airframe Component Erection		
13 *	Fiesler (FW 190)	Kassel-Bettenhausen	
14	Arado (FW 190)	Anklam	
15 *	Arado (FW 190)	Warnemunde	
16	Erla (ME 109)	Leipzig-Heiterblich	
	Fighter Aircraft Engines		Estimated Units
17	Flugmotorenwerke Ostmark (DB 605)	Wiener-Neudorf	800-1200/mo.
18	DB (DB 605)	Berlin-Genshagen	350/mo.
19	Henschel (DB 605)	Kassel-Altenbauna	300/mo.
20	BMW (BMW 801)	▲ Munich-Allach	250/mo.
21	Niedersachsische (DB 605)	Brunswick-Querum	215/mo.
22	BMW (BMW 801)	Eisenach-Stockhausen	125/mo.
23	BMW (BMW 801)	Berlin-Basdorf	100/mo.
24	DB (DB 605)	Berlin-Marienfelde	95/mo.
25	Klockner (BMW 801)	Hamburg-Moorfleth	75/mo.
26	BMW (BMW 801)	Munich-Oberwissenfeld	
27	BMW (BMW 801)	Berlin-Spandau	
28	DB (DB 605)	Stuttgart-Unterturkheim	
29	Mitteldeutsche (JUMO 212)	Taucha)	
30	Junkers (JUMO 212)	Dessau)	
31	Junkers (JUMO 212)	Köthen)	200/mo. 1/
32	Junkers (JUMO 212)	Magdeburg)	
33	Junkers (JUMO 212)	Prague-Karlin)	
34	Junkers (JUMO 212)	Schoenebeck)	
35	Walter	Prague	
36	Argus	Prague	
37	Unknown	Prague	

1/ A/C engines of other types produced in these plants.

* GAF, WESTERN AIRCRAFT REPAIR & STORAGE FACILITIES

AIRCRAFT REPAIR FACILITIES

SUBMARINE BUILDING YARDS

No.	Name	Location	Estimated % of Confirmed European Axis Production
1 *	Blohm & Voss	▲ Hamburg	15.6
2 *	Germania	Kiel	9.0
3	Deschimag	Bremen	7.4
4	Schichau	Danzig	6.6
5	Deutsche Werft	▲ Hamburg	6.2
6	Monfalcone	Trieste	3.0 to 6.2
7	Flenderwerke	Lübeck	5.8
8 *	Bremer Vulcan	Vegesack	5.4
9	Danziger Werft	Danzig	4.9
10 *	Howaldt Werke	▲ Hamburg	4.9
11 *	Deutsche Werke	Kiel	4.5
12 *	Kriegsmarine Werft	Kiel	4.5
13	Neptun Werft	▲ Rostock	3.3
14 *	Marine Werft	Wilhelmshafen	3.3
15 *	Stulcken Sohn	Hamburg	2.9
16 *	Schiffabau	Flensburg	2.9
17 *	Nordsee Werke	Emden	2.1

NOTE:

This study is the result of an effort to obtain the best information available in the USA. Indicated production estimates are approximate.

Size of symbol indicates approximate importance of installations relative to other installations in the same category.

18° 16° 14° 12° 10° 8° 6° 4° 2°W 0° 2°E 4° 6° 8° 10°

62° 60° 58° 56° 54° 52°

600 MILES

Bremen

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EQUALS BRITISH MOST SECRET

effort to obtain
U.S.A.
pproximate.

ximate importance
stallations in the

MAP DIAGRAM

INDICATING PRINCIPAL CONFIRMED INSTALLATIONS IN SELECTED CATEGORIES OF EUROPEAN AXIS INDUSTRY, AND ITALIAN AIRFIELDS SUITABLE FOR MEDIUM AND HEAVY BOMBERS.

LEGEND

● Italian Airfields Reported Suitable for Heavy Bombers
◉ Italian Airfields Reported Suitable for Medium Bombers
Symbols for other Categories Indicated in Text on Left of Map

100 50 0 100 200 300 400
Statute Miles

600 MILES

Kiel
Hamburg
Bremen
Stettin
Danzig

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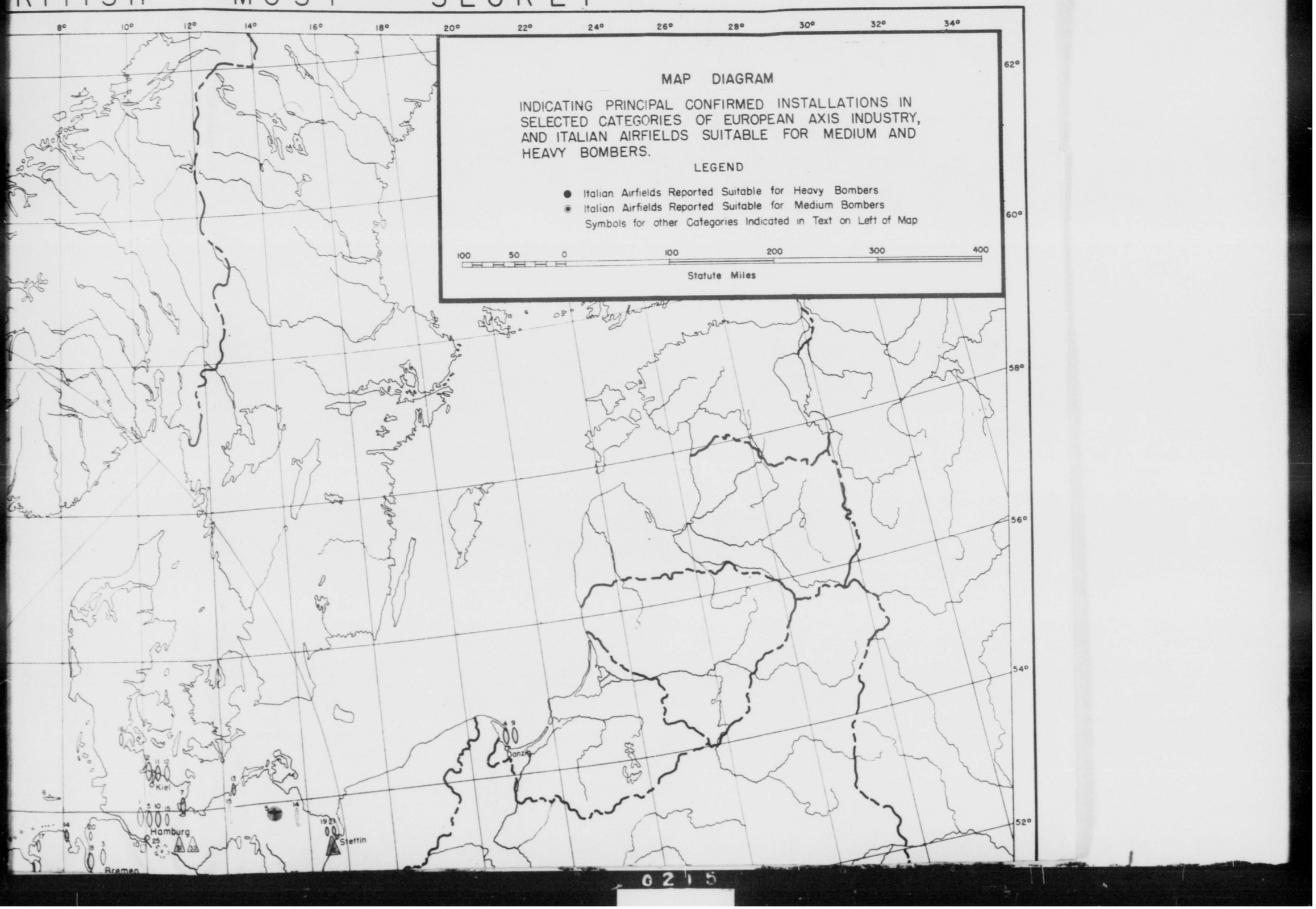

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37 Unknown

1/ A/C engines of other types produced in these plants.

* GAF, WESTERN AIRCRAFT REPAIR & STORAGE FACILITIES

AIRCRAFT REPAIR FACILITIES

SUBMARINE BUILDING YARDS

No.	Name	Location	Confirmed European Axis Production
1 *	Blohm & Voss	▲ Hamburg	15.6
2 *	Germania	Kiel	9.0
3	Deschimag	Bremen	7.4
4	Schichau	Danzig	6.6
5	Deutsche Werft	▲ Hamburg	6.2
6	Monfalcone	Trieste	3.0 to 6.2
7	Flenderwerke	Lübeck	5.8
8 *	Bremer Vulcan	Vegesack	5.4
9	Danziger Werft	Danzig	4.9
10 *	Howaldt Werke	▲ Hamburg	4.9
11 *	Deutsche Werke	Kiel	4.5
12 *	Kriegsmarine Werft	Kiel	4.5
13	Neptun Werft	▲ Rostock	3.3
14 *	Marine Werft	Wilhelmshafen	3.3
15 *	Stulcken Sohn	Hamburg	2.9
16 *	Schiffabau	Flensburg	2.9
17 *	Nordsee Werke	Emden	2.1
18		▲ Spezia	1.7
19	Oderwerke	▲ Stettin	1.2
20	Deschimag	Bremerhaven	0.8
21	S. Gollnow-Vulken	Stettin	0.8

SUBMARINE REPAIR FACILITIES

1 *	▲	Lorient
2 *	▲	Brest
3 *	▲	St. Nazaire
4 *	▲	Bordeaux
5 *		La Pallice
6		Heligoland
7 *		Trondheim
8		Scaramandra (Piraeus) (Concrete pens under const.)

OIL REFINERIES AND SYNTHETIC PLANTS REPORTED OPERATING

No.	Name	Location	Estimated % of European Axis Liquid Fuel Output
	Bergius		
1	Brabag V	Brüx	4.1
2	Hydrierwerke	▲ Poelitz	3.8
3	Ammoniak W.M.	Leuna	3.3
4	Oberschlesischelt	Blechhammer N.	2.7
5	Brabag IV	Trzebglitz-Zeitz	2.7
6		Blechhammer S	2.7
7 *	Gelsenberg Benzin	▲ Gelsenkirchen	2.2
8	Brabag I	Boehlen-Rotha	2.2
9	Hydrierwerke Scholven	Gelsenkirchen Buer	1.9
10	Braunkohlen Benzin	Magdeburg	1.6
11 *	Union Rheinische	Wesseling (Coln)	1.1
12	Ruhröl	Welheim-Bottrop	0.9
13	Wintershall	Leutzkendorf	0.7
14	Draftstoffanlagen	Dresden	0.5
			30.3
	Fischer-Tropsch		
15	Brabag III	Ruhland-Schwarzheide	1.6
16	Kraftstoffwerke	Homberg	1.1
17	Wintershall	Leutzkendorf	0.8
18	Gewerkschaft V.	Castrop-Rauxel	0.8
19	Ruhrbenzin	▲ Holten-Sterkrode	0.7
20	Chemische W. Essener	Kamen	0.6
21	Krupp Treibstoffwerke	Wanne Eickel	0.5
22	Hoesch Benzin	▲ Dortmund	0.5
			6.6
	Crude Oil Refineries		
24 *	Concordia Vega	Ploesti	6.4 2/
25	Romana Americana	Ploesti	6.1 2/
26 *	Astra Romana	Ploesti	4.5 2/
27 *	Phoenix Orion	Ploesti	2.7 2/
28	Wintershall	Vienna-Lobau	)
	Shell	Vienna-Floridsdorf	)
	Vacuum	Vienna-Kagran	)
	Cred. Minier	Vienna-Korneuburg	) 5.3
	N.O. & Brens	Vienna-Schwechat	)
	Ost. Fanto	Vienna-Vosendorf	)
29	Petrol Block	Ploesti	2.5
30	Phoenix Unirea	Ploesti	2.4
31	Europ. Tanklager	Hamburg	2.2
32	Rhenania-Ossag	Hamburg	2.1
33	Durag-Nerag	Hannover	1.6
34	Xenia	Ploesti	1.1
35	Fanto Werke	Pardubice (Cz.)	1.1
36	Dacia Romana	Ploesti	0.8
37	Shell Koolaz	Budapest	1.3
	Magyar Petrol.		
	Bud.-Asvanyolaj		

54° 52° 50° 48° 46° 44°

600 MILES

London Rotterdam Antwerp Duisburg Dusseldorf Cologne Coblenz Hanau Kassel Bremen Hanover Kiel Hamburg Sarrbrucken Stuttgart Strasbourg Paris Brest Rennes Le Mans Orleans Nantes Bordeaux Clermont-Ferrand Lyons Geneva Milan Turin Genoa Marseilles

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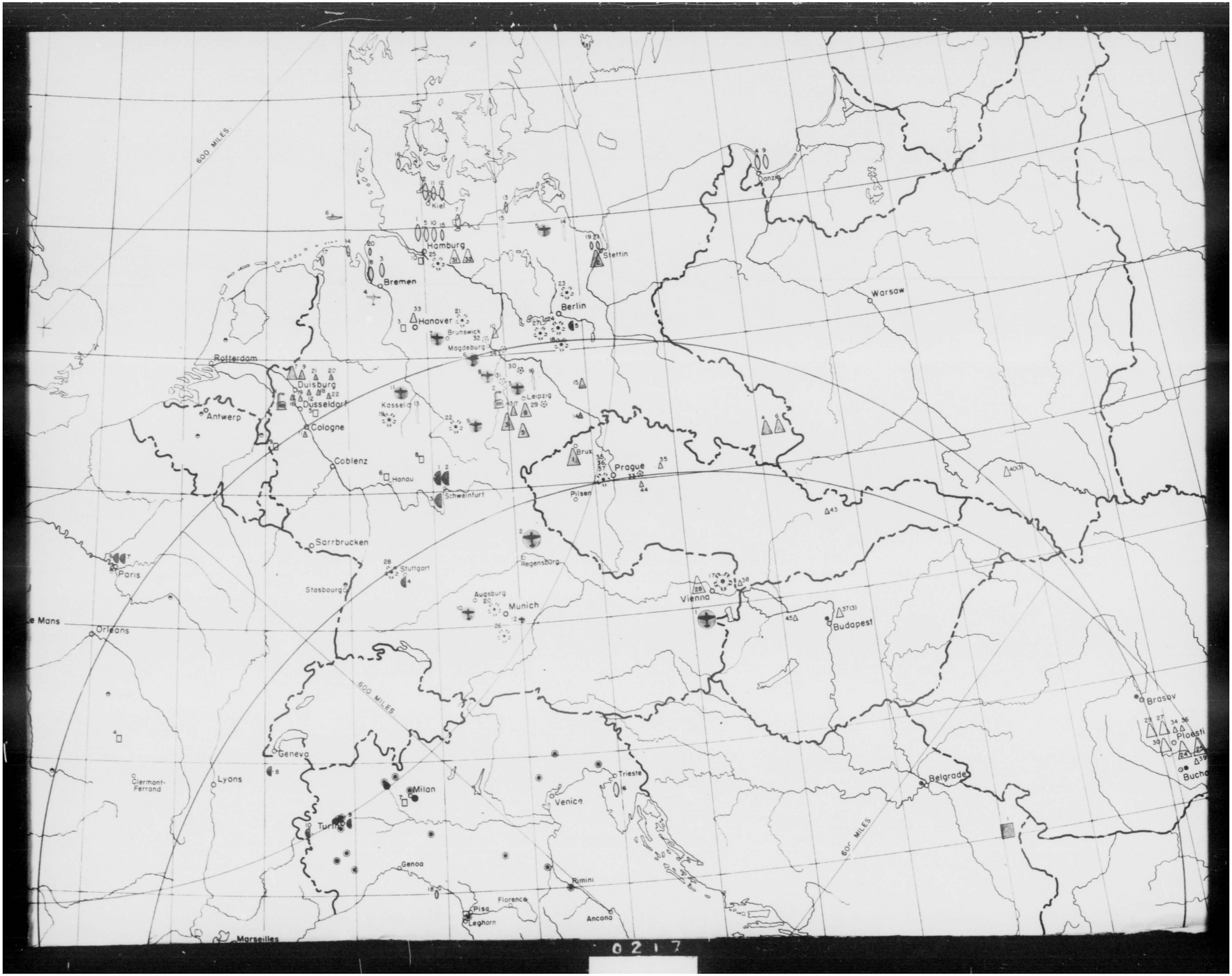

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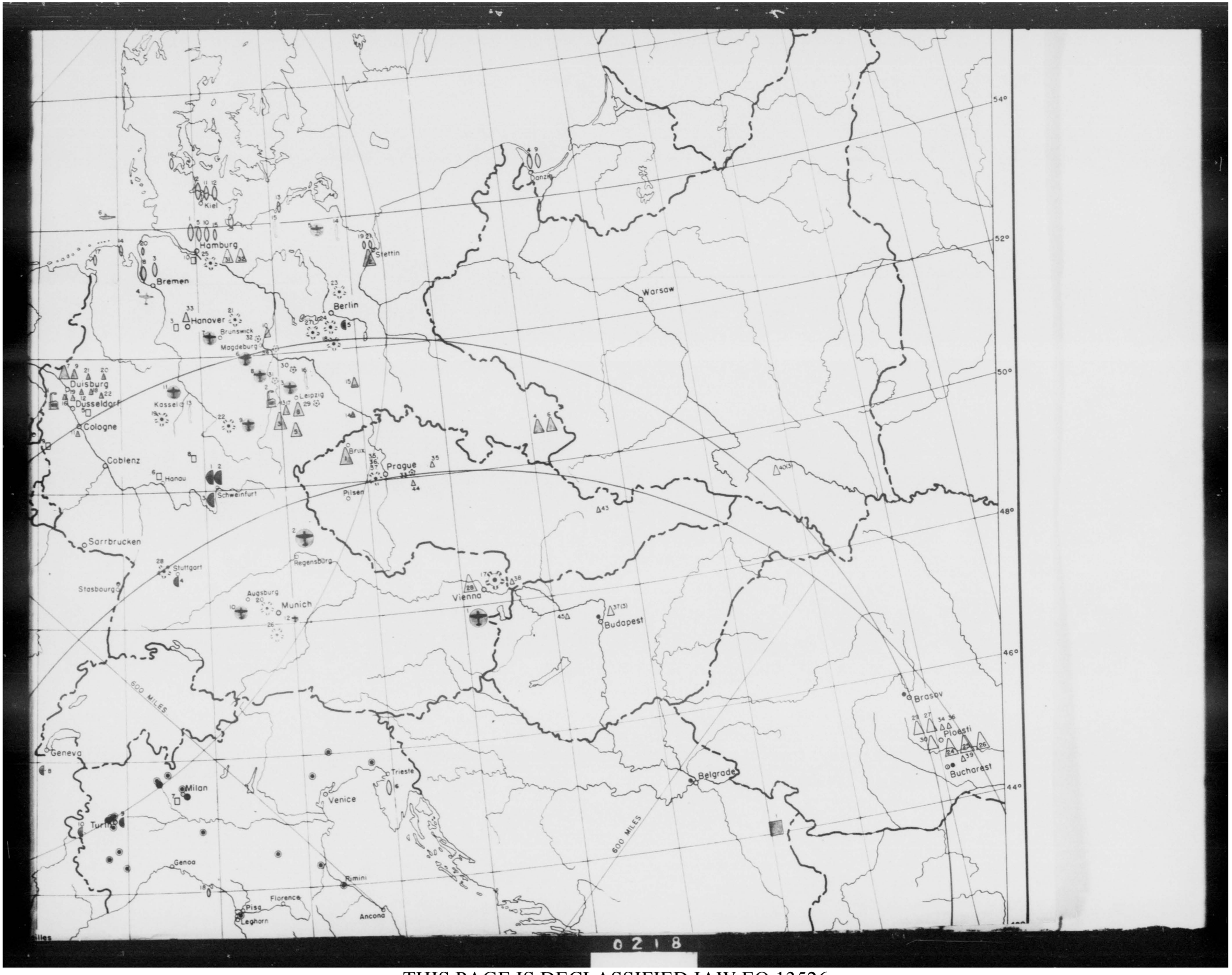

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15	Braag III	Ruhland-Schwarzheide		1.2
16	Kraftstoffwerke	Homberg		1.1
17	Wintershall	Leutzkendorf		0.8
18	Gewerkschaft V.	Castrop-Rauxel		0.8
19	Ruhrbenzin	▲ Holten-Sterkrode		0.7
20	Chemische W. Essener	Kamen		0.6
21	Krupp Treibstoffwerke	Wanne Eickel		0.5
22	Hoesch Benzin	▲ Dortmund		0.5
				6.6

△ Crude Oil Refineries

24	* Concordia Vega	Ploesti	6.4	2/
25	Romana Americana	Ploesti	6.1	
26	* Astra Romana	Ploesti	4.5	2/
27	* Phoenix Orion	Ploesti	2.7	2/
28	Wintershall	Vienna-Lobau		
	Shell	Vienna-Floridsdorf		
	Vacuum	Vienna-Kagran		
	Cred. Minier	Vienna-Korneuburg	5.3	
	N.O. & Brens	Vienna-Schwechat		
	Ost. Fanto	Vienna-Vosendorf		
29	Petrol Block	Ploesti	2.5	
30	Phoenix Unirea	Ploesti	2.4	
31	Europ. Tanklager	Hamburg	2.2	
32	Rhenania-Ossag	Hamburg	2.1	
33	Durag-Nerag	Hannover	1.6	
34	Xenia	Ploesti	1.1	
35	Fanto Werke	Pardubice (Cz.)	1.1	
36	Dacia Romana	Ploesti	0.3	
37	Shell Koolaz	Budapest	1.3	
	Magyar Petrol.			
	Bud.-Asvanyolag			
38	Apollo-I.G.	Bratislava (Cz.)	0.8	
39	Prahova	Bucharest	0.6	
40	Polmin	Drohobycz (Pol.)	1.3	
	Galicja			
	Nafta-Malapolska			
43	Govt. Refinery	Dubowa (Cz.)	0.5	
44	Vacuum	Kolin (Cz.)	0.5	
45	Vacuum	Almas-Fuzito (Hung.)	0.5	
114	* Columbia Acquila	Ploesti 3/	---	
115	* Creditul Minier	Brazi 3/	---	
116	* Steaua Romana	Campina 3/	---	

Notes:
2/ Capacity reduced by AAF bombing.
3/ Reported not operating due to AAF bombing.
4/ Other refineries reported not operating are not indicated on this map. They are principally tidewater plants dependent upon imports.

RUBBER PRODUCTION

No.	Name	Location	Estimated % of European Axis Total
	Synthetic Production		
1	*	Hüls	24 - 30
2		Schkopau	24 - 30

□ Tire Manufacturing

3	* Continental 5/	Hannover (3 plants)	
4	Dunlop	▲ Montlucon	
5	Vorwerk	▲ Elberfeld	
6	Dunlop 5/	Hanau	
7	Pirelli 5/	Milan	
8	Fulda	Fulda	
9	Englebert	Aachen	
10	Phoenix 5/	Harburg	

5/ Partially aero tire production.

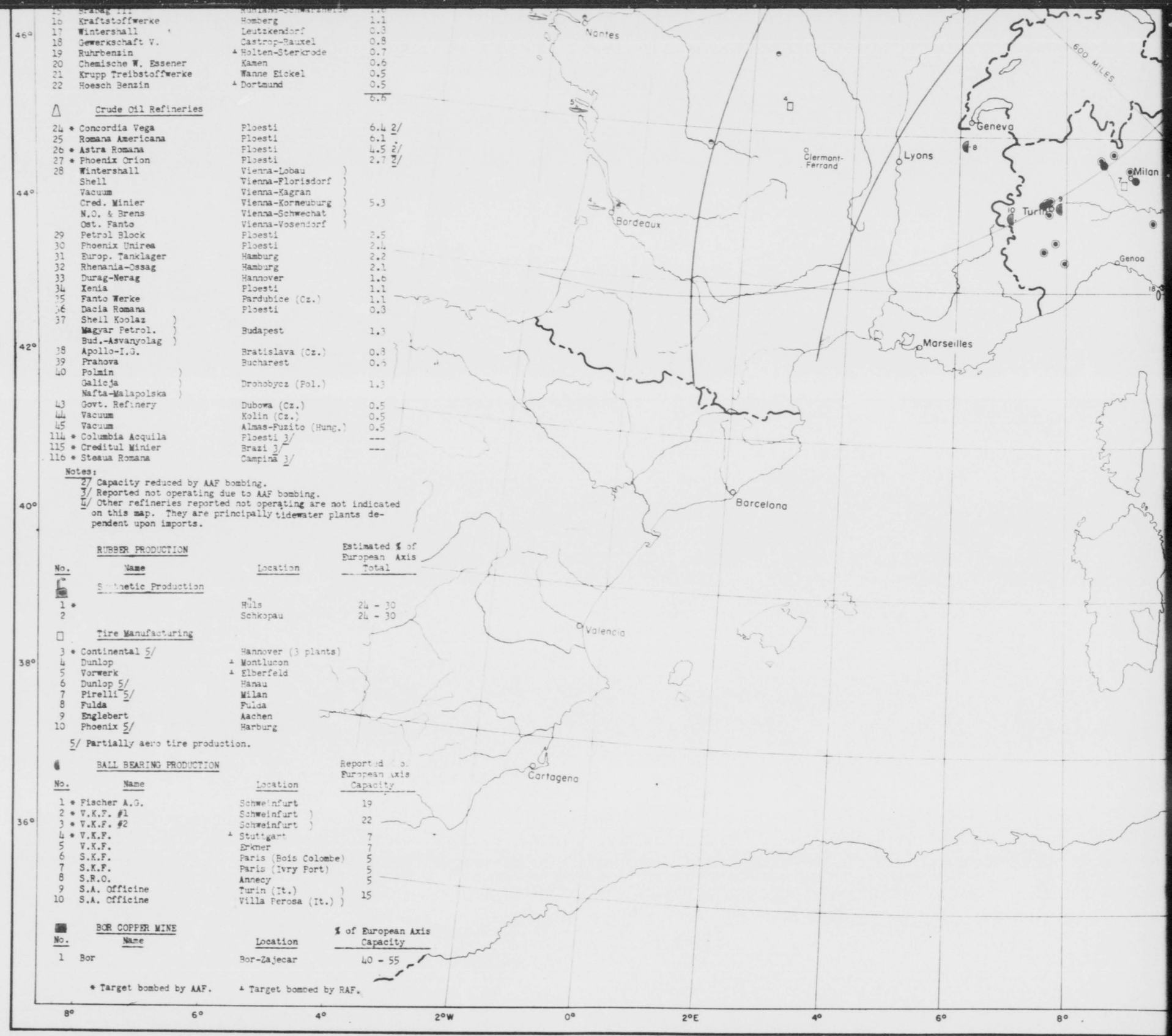
BALL BEARING PRODUCTION

No.	Name	Location	Reported % of European Axis Capacity
1	* Fischer A.G.	Schweinfurt	19
2	* V.K.F. #1	Schweinfurt	22
3	* V.K.F. #2	Schweinfurt	
4	* V.K.F.	▲ Stuttgart	7
5	V.K.F.	Erkner	7
6	S.K.F.	Paris (Bois Colombe)	5
7	S.K.F.	Paris (Ivry Fort)	5
8	S.R.O.	Annecy	5
9	S.A. Officine	Turin (It.)	15
10	S.A. Officine	Villa Perosa (It.)	

BOR COPPER MINE

No.	Name	Location	% of European Axis Capacity
1	Bor	Bor-Zajecar	40 - 55

* Target bombed by AAF. ▲ Target bombed by RAF.



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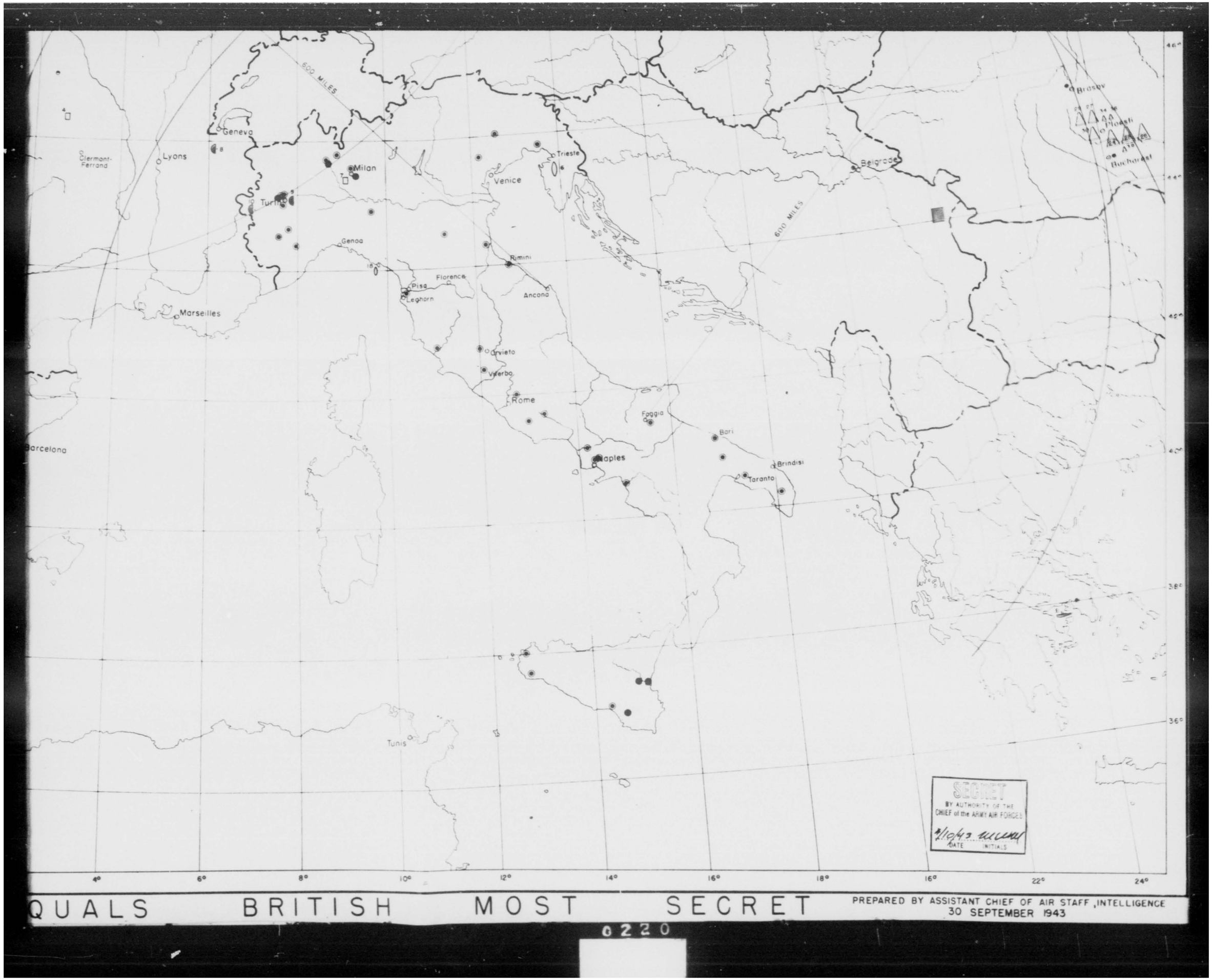

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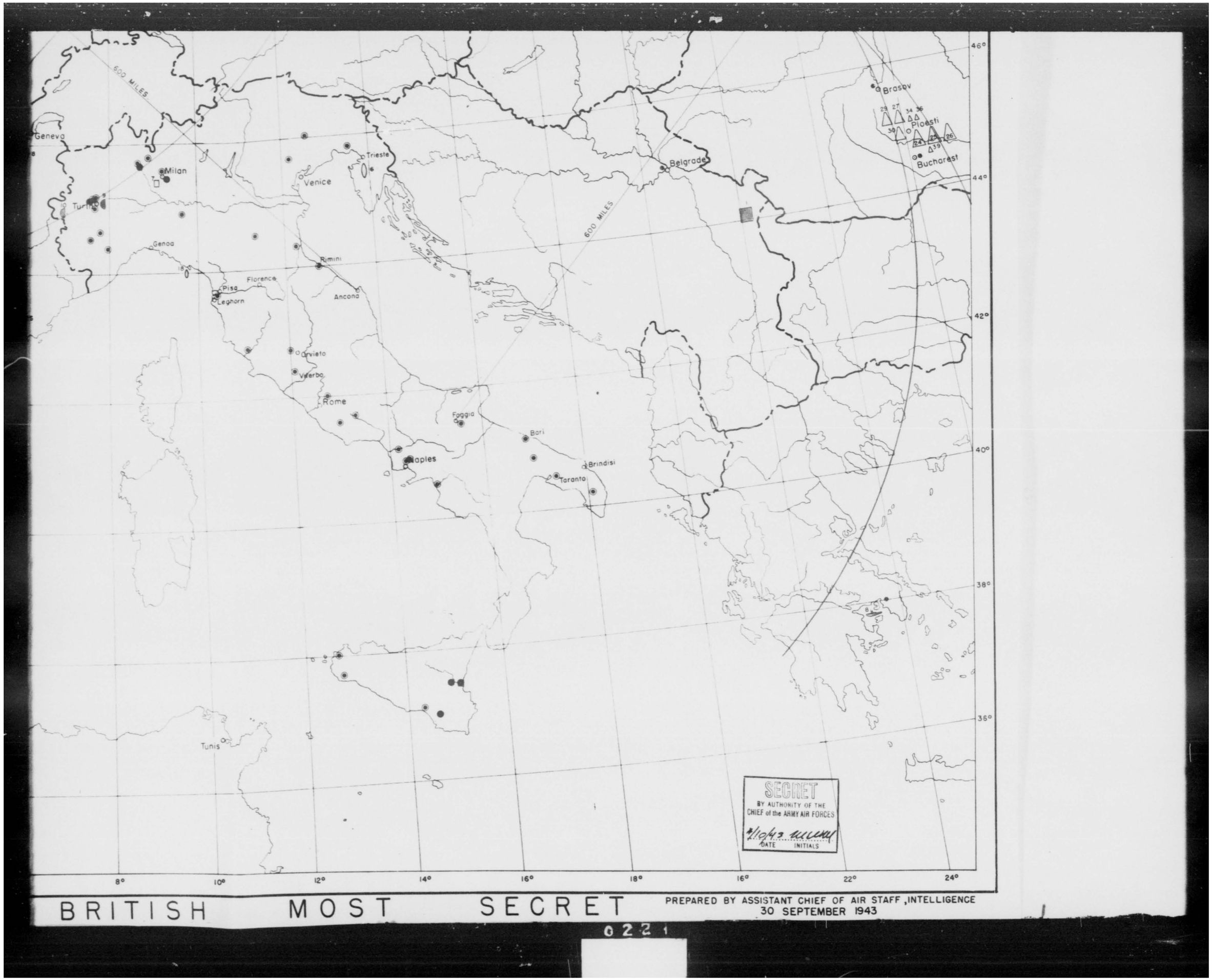

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HISTORICAL DIVISION
ARCHIVES BRANCH

DATA TO ACCOMPANY MAP SHOWING ALIPTIMAS
OF SOUTHERN GREECE
AND AXIS INDUSTRIAL TARGETS IN ROUMANIA
WITH R AND R OF AC/AS. PLANS
6 OCTOBER, 1943

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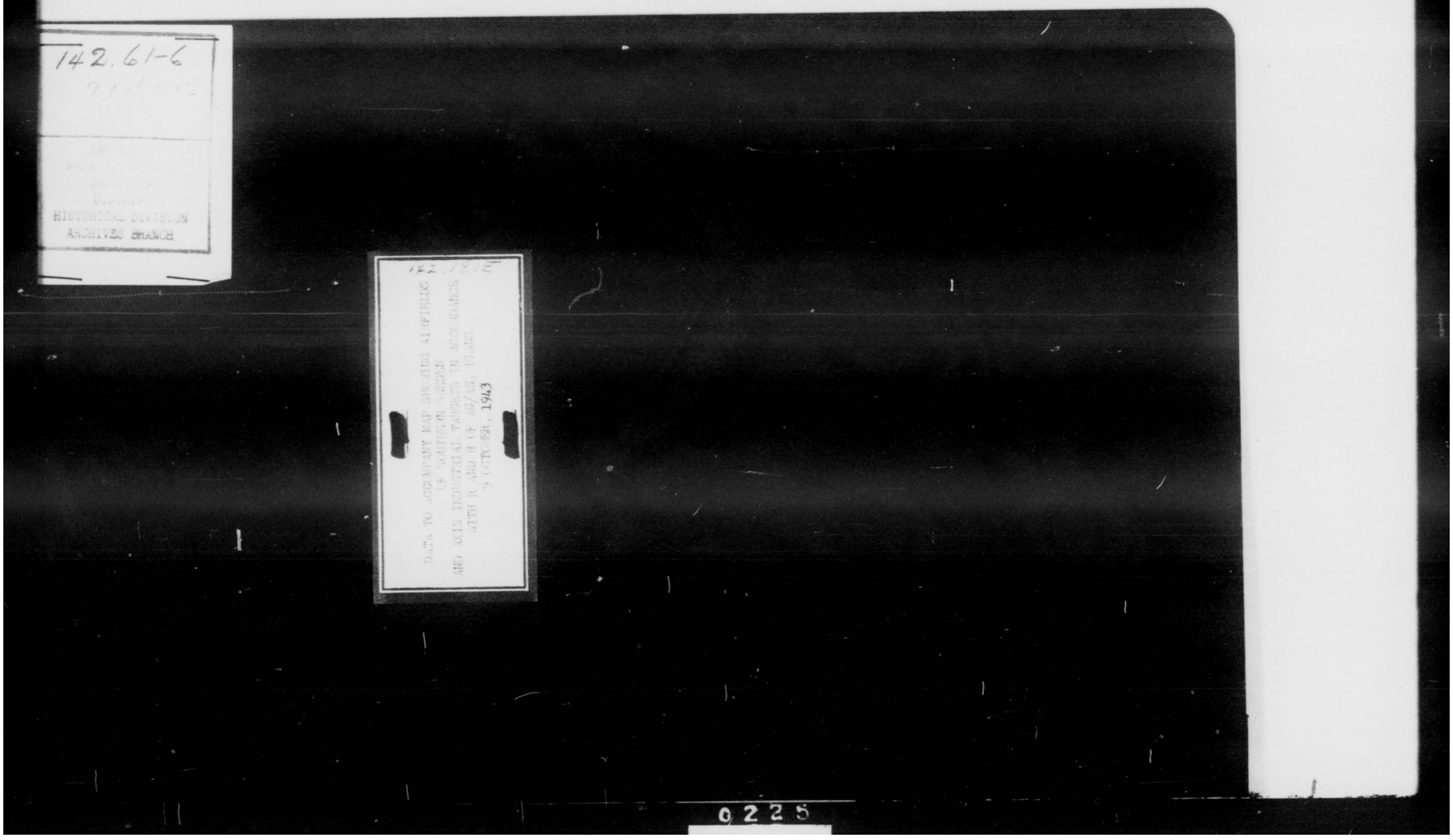

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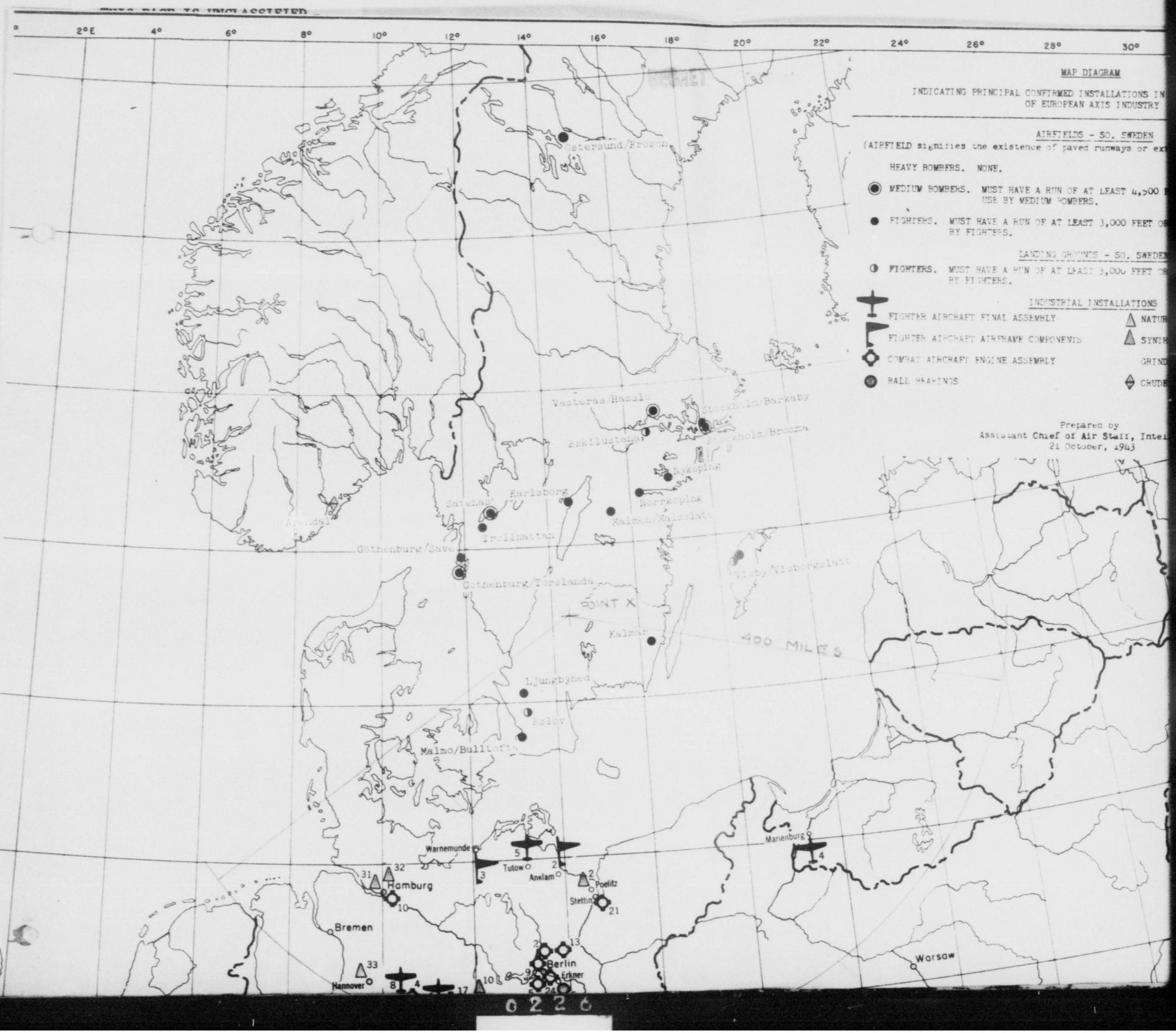

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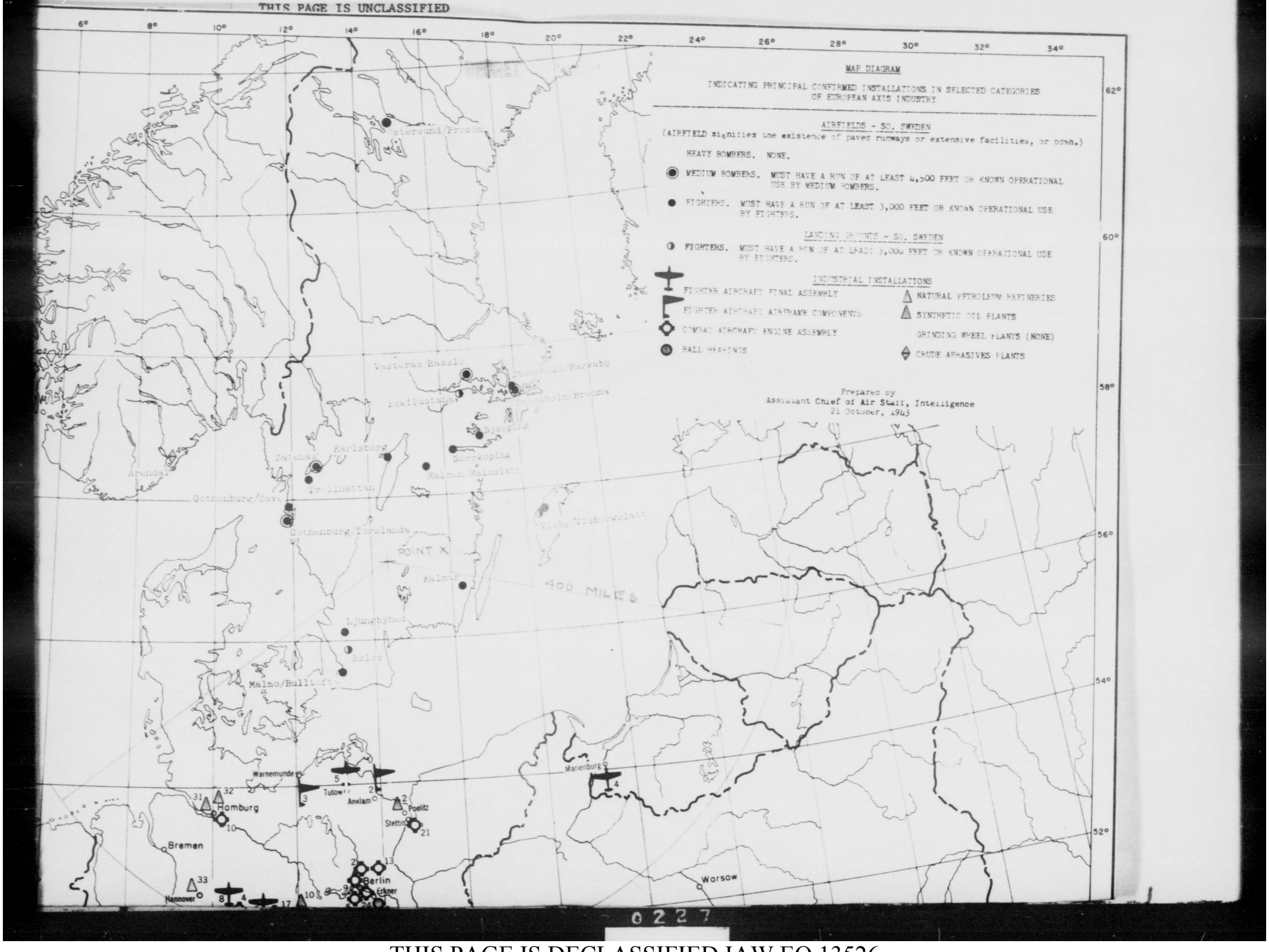

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MAP DIAGRAM

INDICATING PRINCIPAL CONFIRMED INSTALLATIONS IN
OF EUROPEAN AXIS INDUSTRY

AIRFIELDS - SO. SWEDEN

(AIRFIELD signifies the existence of paved runways or ext

HEAVY BOMBERS. NONE.

MEDIUM BOMBERS. MUST HAVE A RUN OF AT LEAST 4,500 F
USE BY MEDIUM BOMBERS.

FIGHTERS. MUST HAVE A RUN OF AT LEAST 3,000 FEET O
BY FIGHTERS.

LANDING GROUNDS - SO. SWEDE

FIGHTERS. MUST HAVE A RUN OF AT LEAST 3,000 FEET O
BY FIGHTERS.

INDUSTRIAL INSTALLATIONS

FIGHTER AIRCRAFT FINAL ASSEMBLY

FIGHTER AIRCRAFT AIRFRAME COMPONENTS

COMBAT AIRCRAFT ENGINE ASSEMBLY

BALL BEARINGS

NATU
SYNT
GRIN
CRUD

Prepared by
Assistant Chief of Air Staff, Inte
21 October, 1943

Östersund/Froson
Vasteras Hasslo
Stockholm/Barkaby
Stockholm/Bromma
Norrkoping
Karlsborg
Malmslatt
Trollhattan
Gothenburg/Save
Gothenburg/Torslanda
POINT X
400 MILES
Ljungbyhed
Malmo/Bulltofta
Warnemunde
Tutow
Anklam
Poelitz
Stettin
Hamburg
Bremen
Hannover
Brunswick
Ochersleben
Magdeburg
Bernburg
Berlin
Erkner
Rotterdam
Duisburg
Dusseldorf
Cologne
Antwerp
Coblenz
Prague
Warsaw
Marienburg

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MAP DIAGRAM

INDICATING PRINCIPAL CONFIRMED INSTALLATIONS IN SELECTED CATEGORIES OF EUROPEAN AXIS INDUSTRY

AIRFIELDS - SO. SWEDEN

(AIRFIELD signifies the existence of paved runways or extensive facilities, or both.)

HEAVY BOMBERS. NONE.

MEDIUM BOMBERS. MUST HAVE A RUN OF AT LEAST 4,500 FEET OR KNOWN OPERATIONAL USE BY MEDIUM BOMBERS.

FIGHTERS. MUST HAVE A RUN OF AT LEAST 3,000 FEET OR KNOWN OPERATIONAL USE BY FIGHTERS.

LANDING GROUNDS - SO. SWEDEN

FIGHTERS. MUST HAVE A RUN OF AT LEAST 3,000 FEET OR KNOWN OPERATIONAL USE BY FIGHTERS.

INDUSTRIAL INSTALLATIONS

FIGHTER AIRCRAFT FINAL ASSEMBLY

FIGHTER AIRCRAFT AIRFRAME COMPONENTS

COMBAT AIRCRAFT ENGINE ASSEMBLY

BALL BEARINGS

NATURAL PETROLEUM REFINERIES

SYNTHETIC OIL PLANTS

GRINDING WHEEL PLANTS (NONE)

CRUDE ABRASIVES PLANTS

Prepared by
Assistant Chief of Air Staff, Intelligence
21 October, 1943

400 MILES

62° 60° 58° 56° 54° 52° 50°

Ostersund/Froson
Vasteras Hasslo
Stockholm Barkaby
Nyköping
Norrkoping
Karlsborg
Malmo/Malmslatt
Arendal
Gothenburg/Save
Gothenburg/Torslanda
Visby/Visbyaadalen
POINT X
Halmstad
Ljungbyhed
Malmo/Bulltofta
Warnemunde
Tutow
Anklam
Poelitz
Stettin
Hamburg
Bremen
Hannover
Brunswick
Oschersleben
Magdeburg
Bernburg
Berlin
Erkner
Duisburg
Dusseldorf
Cologne
Coblenz
Prague
Marienburg
Warsaw

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TARGET INFORMATION BRANCH
OPERATIONAL DIVISION
AC/AS, INTELLIGENCE
23 OCTOBER 1943

MEMORANDUM

1. The Industrial categories on the attached map are those prescribed by AC/As, Plans.

2. The targets indicated on the map are the principal installations in the prescribed categories, according to currently available intelligence. Estimated production rates and percentages are indicated.

3. The origin of the 400 mile radius was placed at an approximately central point in the south Swedish peninsula and approximately 100 miles distant from Denmark. Had the origin been placed approximately half way between the existing medium bomber airfields the arc would have fallen north of Berlin and would have inclosed very few installations.

Attachments:

1. List of targets indicating production inside and outside 400 mile radius.
2. List of Swedish airfields.
3. Map showing targets and Swedish airfields.

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LIST OF INSTALLATIONS TO ACCOMPANY MAP DATED 21 OCTOBER, 1943

Fighter Aircraft Final Assembly

	Plant	Type	Estimated Monthly Production July, 1943
	Within 400 mile radius		
4.	Focke-Wulf, Marienburg	FW 190, SEF	80
5.	Arado, Tutow	FW 190, SEF	60
6.	Ago, Oschersleben	FW 190, SEF	55
8.	MIAG, Brunswick-Waggum	ME 110, TEF	55
9.	Junkers, Bernburg	JU 88, TEF	50
		Total	300
	Outside 400 mile radius		
1.	Wiener-Neustadter, Wiener Neustadt	ME 109, SEF	220
2.	Messerschmitt, Regensburg	ME 109, SEF	200
3.	Erla, Leipzig-Mockau	ME 109, SEF	120
7.	Fiesler, Kassel-Waldau	FW 190, SEF	35
10.	Gothaer, Gotha	ME 110, TEF	45
11.	Messerschmitt, Augsburg	ME 140, TEF	40
12.	Dornier, Oberpfaffenhafen	DO 217, TEF	20
13.	Unknown, Szentmiklos	ME 210	Unknown
		Total	680

Fighter Airframe Component Erection

	Plant	Type
	Within 400 mile radius	
2.	Arado, Anklam	FW 190
3.	Arado, Warnemunde	FW 190
	Outside 400 mile radius	
1.	Fiesler, Kassel-Bettenhausen	FW 190
4.	Erla, Leipzig-Heiterblich	ME 109

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Combat Aircraft Engine Assembly

	Plant	Type	Estimated Monthly Production August, 1943
	Within 400 mile radius		
2.	D.B., Berlin-Genshagen	DB	350
4.	Bussing-NAG, Brunswick-Querum	DB	215
5.	D.B., Berlin-Marienfelde	DB	95
9.	B.M.W., Berlin-Basdorf	BMW	100
10.	Klockner, Hamburg-Moorfleth	BMW	75
13.	B.M.W., Berlin-Spandau	BMW	Note (1)
15.	Junkers, Dessau	Jumo	Note (1)
16.	Junkers, Kothen	Jumo	Note (1)
17.	Junkers, Magdeburg	Jumo	Note (1)
18.	Junkers, Schoenebeck	Jumo	Note (1)
21.	Pommersche, Stettin-Altdamm	Jumo	Note (1)
24.	Argus, Berlin-Reinickendorf	Argus	Note (1)
	Outside 400 mile radius		
1.	Flugmotorenwerke Ostmark, Wiener-Neudorf	DB	800
3.	Henschel, Kassel-Altenbauna	DB	300
6.	D.B., Stuttgart-Unterturkheim	DB	Note (1)
7.	B.M.W., Munich-Allach	BMW	250
8.	B.M.W., Eisenach-Stockhausen	BMW	125
11.	Klockner, Oberursel	BMW	Note (1)
12.	B.M.W., Munich-Oberwissenfeld	BMW	Note (1)
14.	Mittledeutsche, Taucha	Jumo	Note (1)
19.	Matford-Junkers, Strassburg	Jumo	Note (1)
20.	Junkers, Prague-Karlin	Jumo	Note (1)
22.	Eberspacher, Esslingen	Jumo	Note (1)
23.	Hirth, Stuttgart-Zuffenhausen	Hirth	Note (1)
25.	Walter, Prague-Jinonice		Note (1)
26.	Argus, Prague-Jinonice		Note (1)
27.	Unknown, Prague-Cakovice		Note (1)

Note (1) No recent estimate of output.

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Synthetic Oil Plants

Plant	Location	Estimated % of European Axis Natural & Synthetic Petroleum Output
Within 400 mile radius		
(Bergius)		
2. Hydrierwerke	Poelitz	3.8
10. Braunkohlen Benzin	Magdeburg	1.6
	Total	5.4
Outside 400 mile radius		
(Bergius)		
1. Brabag V	Brux	4.1
3. Ammoniak W.M.	Merseberg-Leuna	3.3
4. Oberschlesischelt	Blechhammer N	2.7
5. Brabag IV	Troglitz-Zeitz	2.7
6.	Blechhammer S	2.7
7. Gelsenberg Benzin	Gelsenkirchen	2.2
8. Brabag I	Bohlen-Rotha	2.2
9. Hydrierwerke Scholven	Gelsenkirchen Buer	1.9
11. Union Rheinische	Wesseling (Koln)	1.1
12. Ruhrol	Welheim-Bottrop	0.8
13. Wintershall	Lutzkendorf	0.7
14. Kraftstoffanlagen	Dresden	0.5
(Fischer-Tropsch)		
15. Brabag III	Ruhland-Schwarzheide	1.6
16. Kraftstoffwerke	Homberg	1.1
17. Wintershall	Lutzkendorf	0.8
18. Gewerkschaft V	Castrop-Rauxel	0.8
19. Ruhrbenzin	Holten-Sterkrade	0.7
20. Chemische W. Essener	Kamen	0.6
21. Krupp Treibstoffwerke	Wanne Eickel	0.5
22. Hoesch Benzin	Dortmund	0.5
	Total	31.5

Natural Petroleum Refineries Reported Operating

Plant	Location	Estimated % of European Axis Natural & Synthetic Petroleum Output
Within 400 mile radius		
31. Europ. Tanklager	Hamburg	2.2
32. Rhenania-Ossag	Hamburg	2.1
33. Durag-Nerag	Hannover	1.6
	Total	5.9

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Natural Petroleum Refineries Reported Operating (Cont'd)

	Plant	Location	Estimated % of European Axis Natural & Synthetic Petroleum Output
		Outside 400 mile radius	
24.	Concordia Vega	Ploesti	6.4 (1)
25.	Romana Americana	Ploesti	6.1
26.	Astra Romana	Ploesti	4.5 (1)
27.	Phoenix Orion	Ploesti	2.7 (1)
28.	Wintershall	Vienna-Lobau	
	Shell	Vienna-Floridsdorf	
	Vacuum	Vienna-Kagran	
	Cred. Minier	Vienna-Korneuburg	5.3
	N.O. & Brens	Vienna-Schwechat	
	Ost. Fanto	Vienna-Vosendorf	
29.	Petrol Block	Ploesti	2.5
30.	Phoenix Unirea	Ploesti	2.4
34.	Xenia	Ploesti	1.1
35.	Fanto Werke	Pardubice (Cz.)	1.1
36.	Dacia Romana	Ploesti	0.8
37.	Shell Koolaa	Budapest	1.3
	Magyar Petrol.		
	Bud.-Asvanyölag		
38.	Apollo-I.G.	Bratislava (Cz.)	0.8
39.	Prahova	Bucharest	0.6
40.	Polmin	Drohobycz (Pol.)	1.3
	Galicja		
	Nafta-Malapolska		
43.	Govt. Refinery	Dubowa (Cz.)	0.5
44.	Vacuum	Kolin (Cz.)	0.5
45.	Vacuum	Almas Fuzito (Hung.)	0.5
		Total	32.0

Italian Refineries, Operating Status Doubtful

	Plant	Location
		Outside 400 mile radius
117.	Nafta Shell	Spezia
118.	Agip	Venice
119.	Aqila	Trieste
123.	Siap SOCONJ	Trieste
124.	Agip-Romsa	Fiume
125.	Petrolifera	Fornovo Taro

NOTES

(1) CAPACITY REDUCED BY AAF BOMBING.

(2) OTHER REFINERIES REPORTED NOT OPERATING ARE NOT INDICATED ON THIS MAP. THEY ARE PRINCIPALLY TIDEWATER PLANTS DEPENDENT UPON IMPORTS AND ACCESSIBLE TO BOMBING.

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Ball Bearings

	Plant	Location	Reported % of European Axis Capacity
		Within 400 mile radius	
5.	VKF	Erkner	7.4
		Outside 400 mile radius	
1.	Fischer	Schweinfurt	18.5
2.	VKF	Schweinfurt 1.)	22.2
3.	VKF	Schweinfurt 2.)	
4.	VKF	Stuttgart	7.4
6.	SKF	Paris (Colombe)	5.0
7.	SKF	Paris (Ivry)	5.0
8.	SRO	Annecy	5.0
9.	SAO	Turin	
10.	SAO	Perosa	11.9
		Total	78.0

Grinding Wheels

	Plant	Location	Estimated % of Axis Production 1942
		Within 400 mile radius	
	None		
		Outside 400 mile radius	
1.	Vereinigte Carborundum und Elektrik Werke	Dresden	13
2.	Naxos Union	Frankfurt A/Main	9
3.	Mayer and Schmidt	Offenbach A/Main	6
4.	Deutsche Norton Gesellschaft	Wesseling	5
5.	Deutsche Carborundum Werke	Reisholz (nr. Dusseldorf)	3
6.	Guilleaume Werke	Bonn	2.5
7.	Feldmuehle Werke	Wesseling	2.5
8.	Cie de Mueles Norton	Paris - Le Bourget	8
9.	Vereinigte Carborundum und Elektrik Werke	Benatek (nr. Prague)	11
10.	Est. Durrschmidt	Lyons	5
		Total	65

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Crude Abrasives

	Plant	Location		Estimated % of total Axis Production, 1942
		Within 400 mile radius		
4.	Arendal Schmelte Werke	Arendal, Norway		6
		Outside 400 mile radius		
1.	Electro-Schmeltze	Zschornowitz (nr. Bitterfelde)		34
2.	Electro-Schmeltze	Kempten, Bav.		7
3.	Mayer & Schmidt	Waldshut		6
5.	Galtarossa	Domo d'Ossola		5
6.	Aluminum du Sud Ouest	Sarrancolin		4
7.	Vereinigte Carborundum und Elektrik Werke	Dresden		3.5
			Total	59.5

NOTE: It should be noted that there are several installations only a few miles outside of 400 mile radius, which might come within an actual operating range. (See Map).

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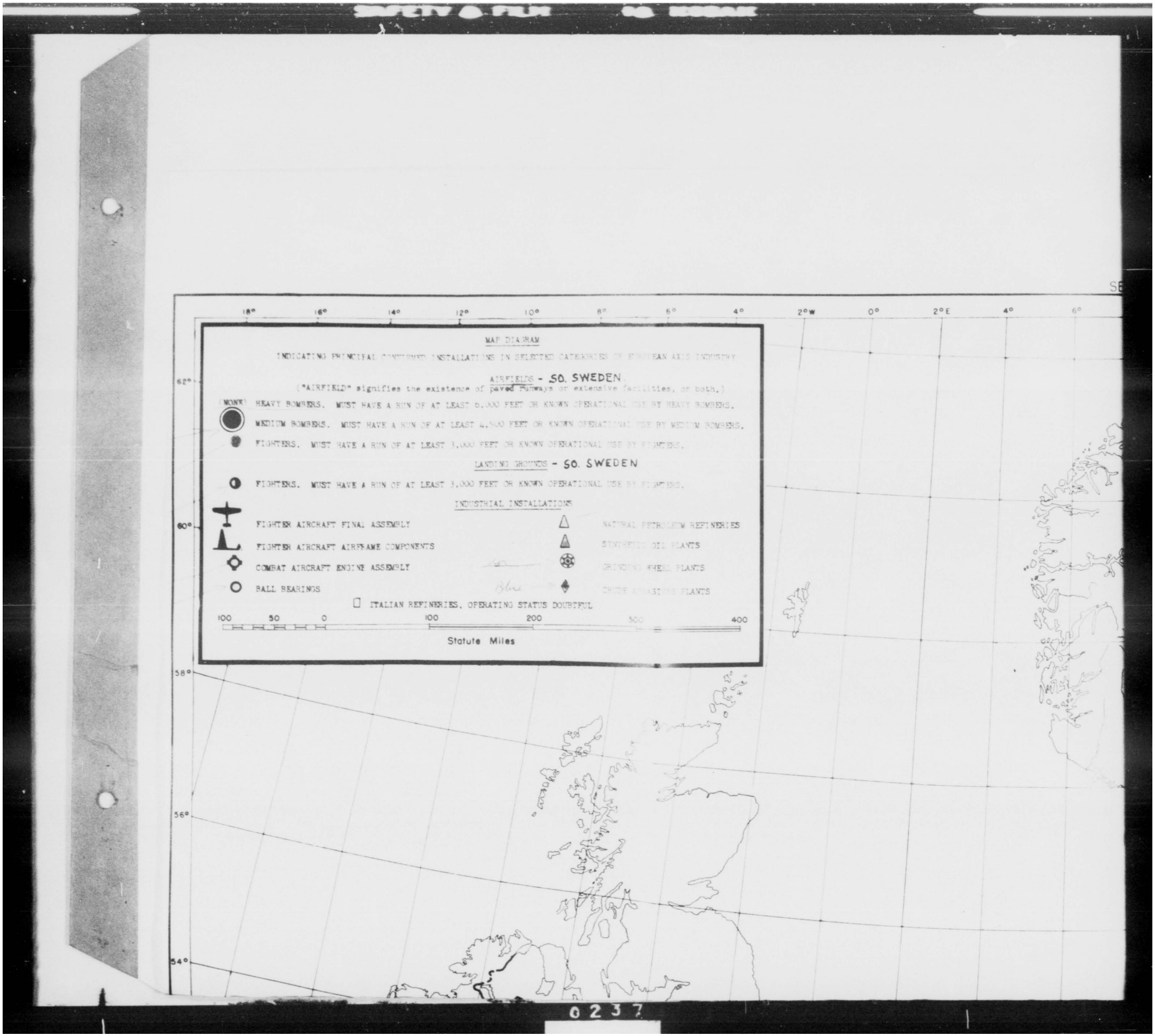

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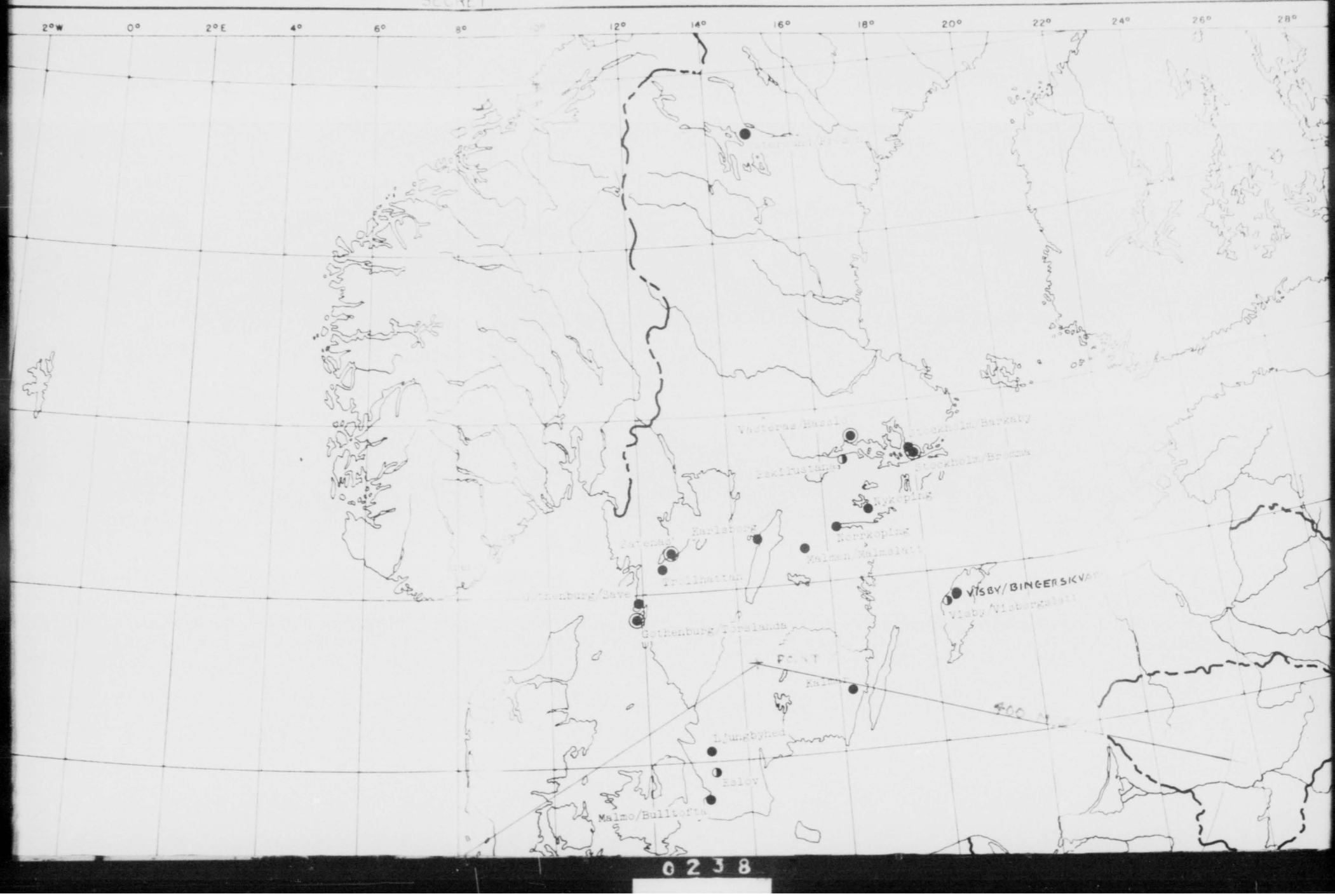

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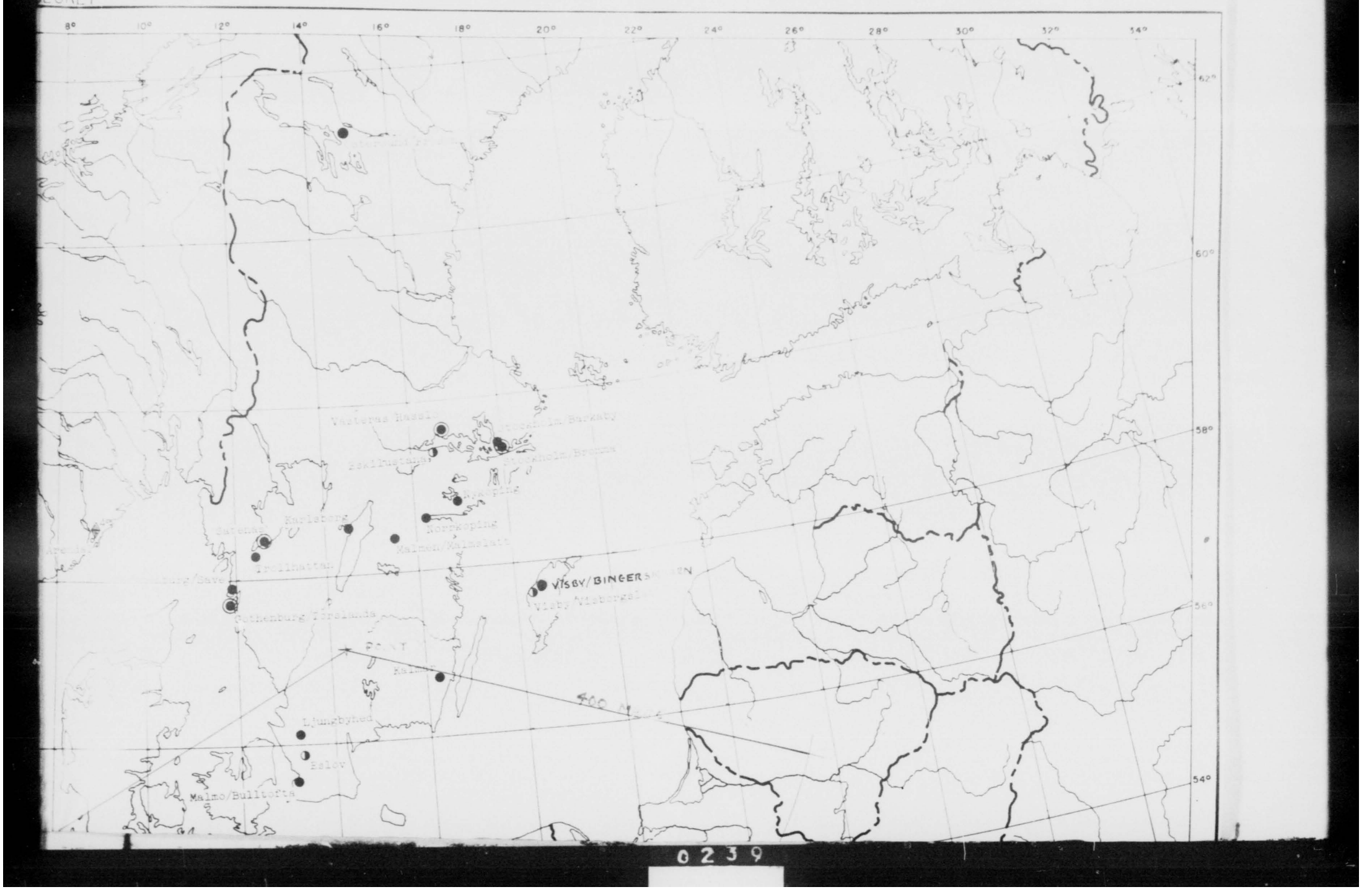

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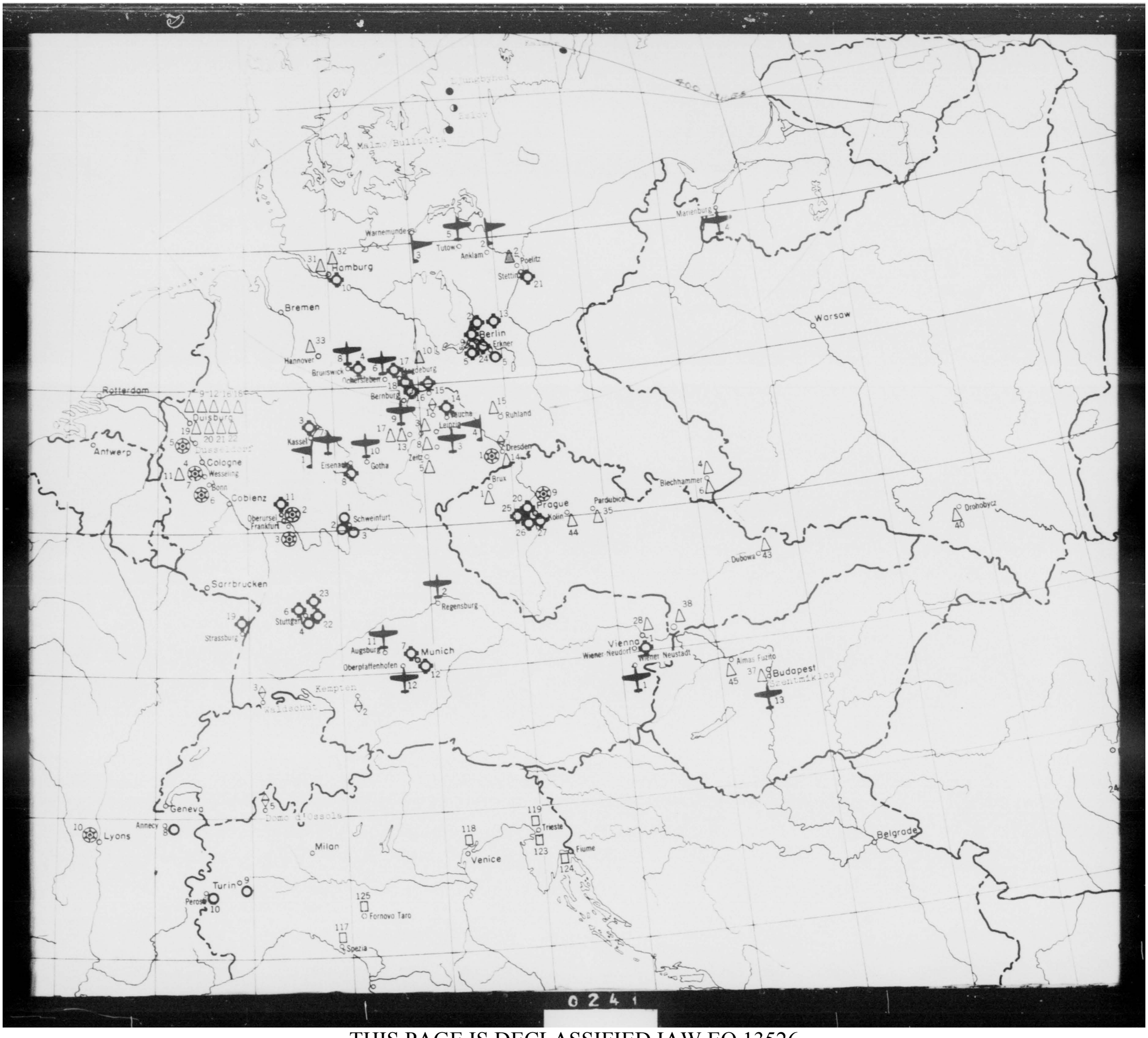

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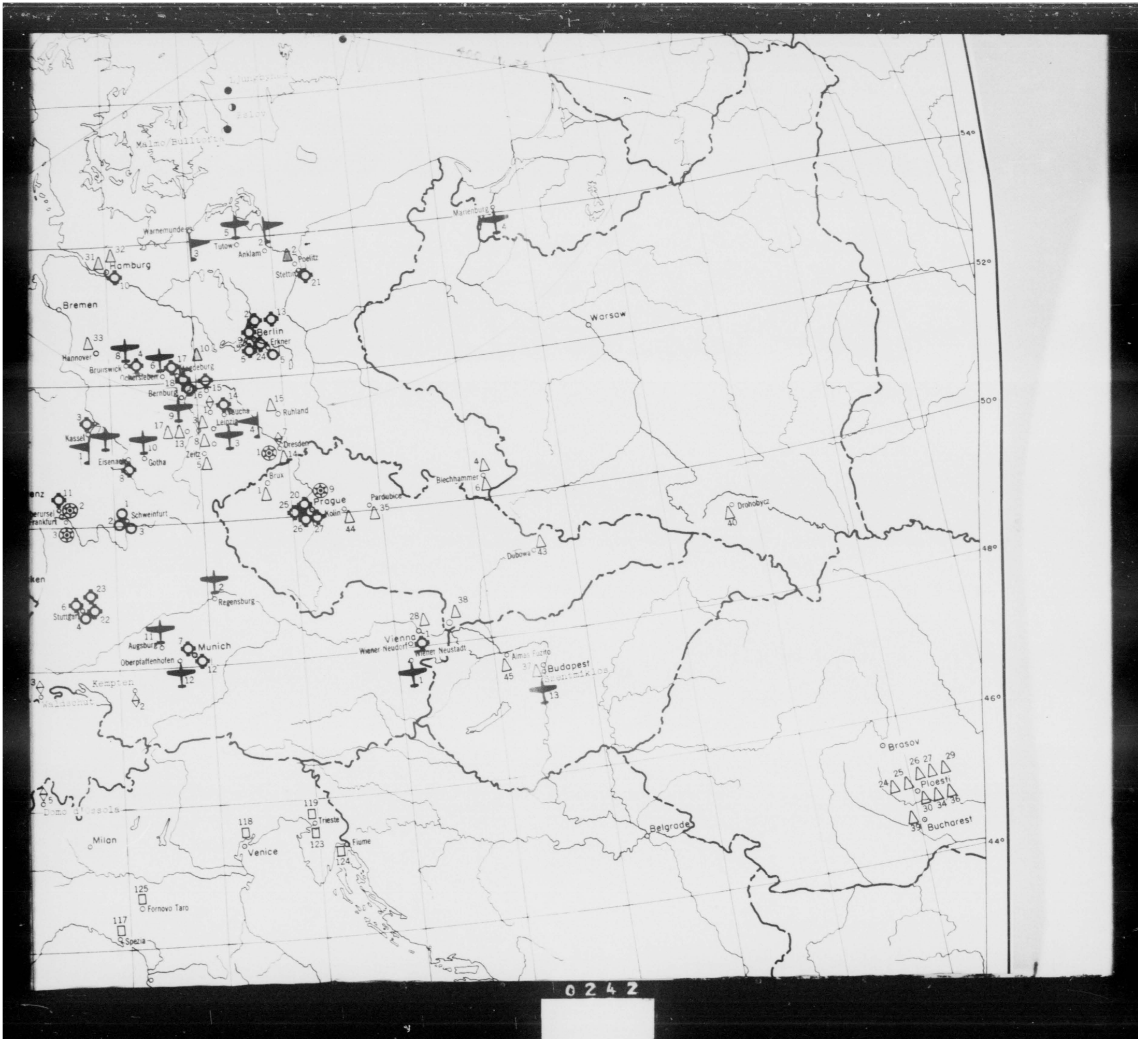

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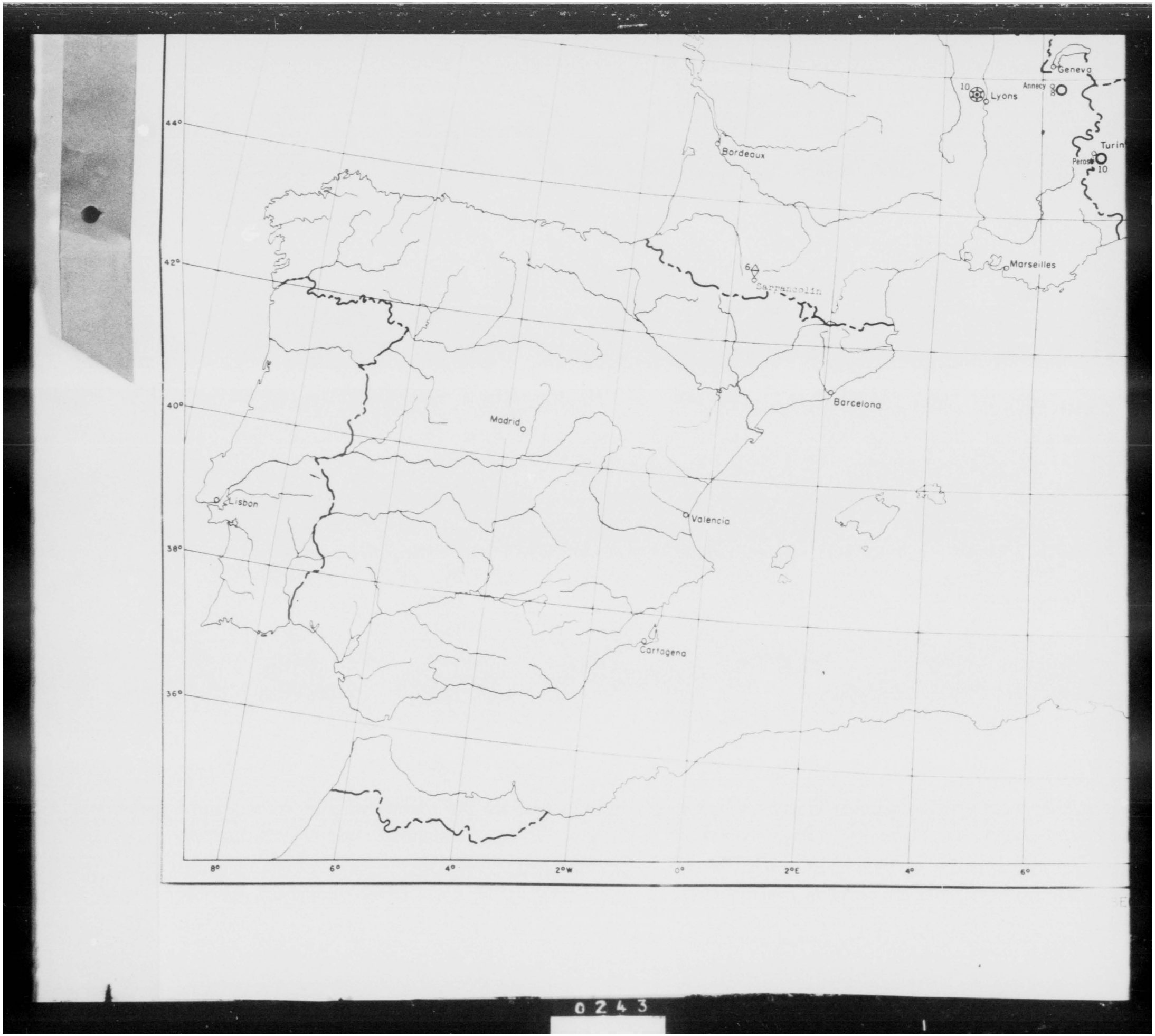

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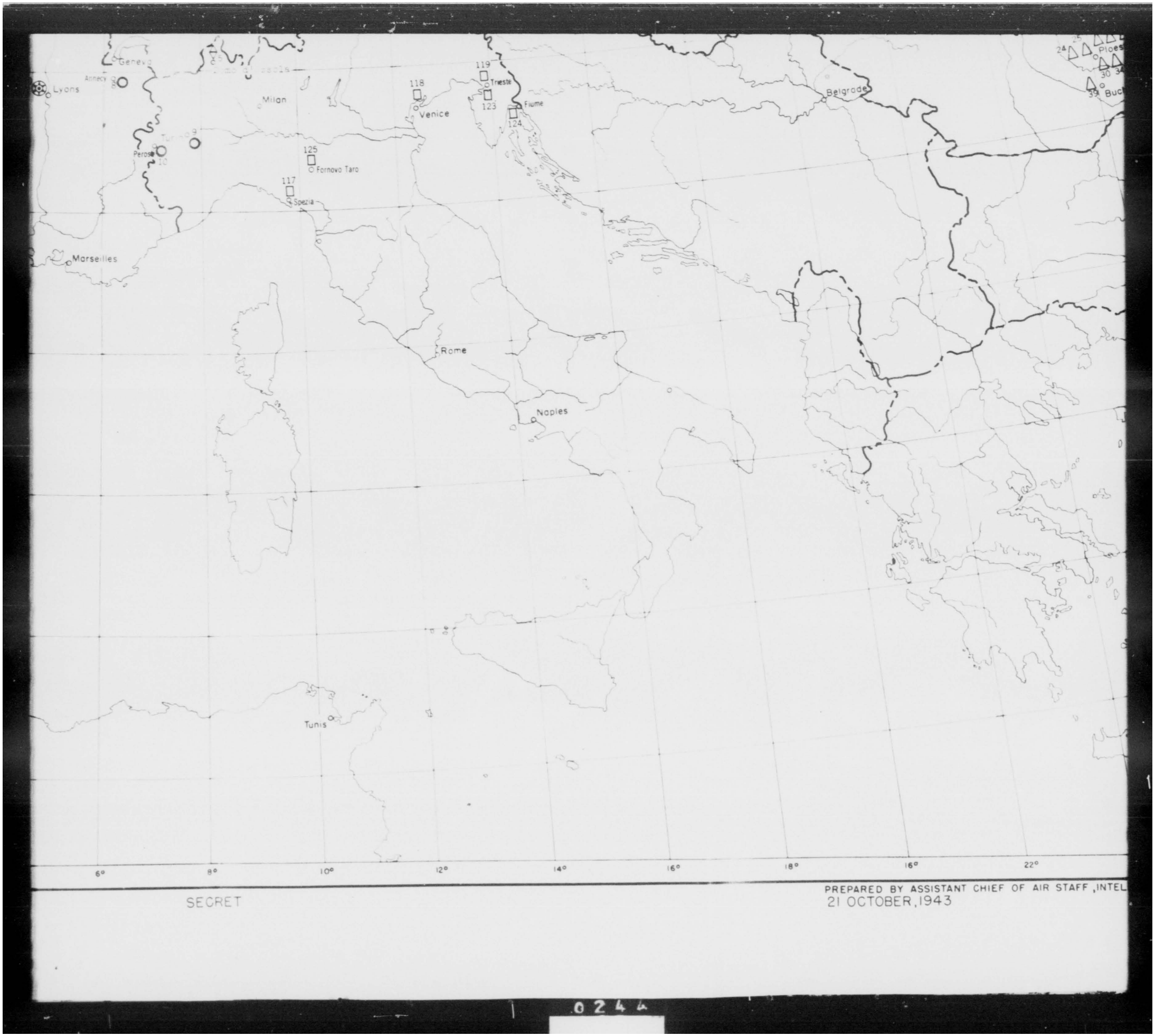

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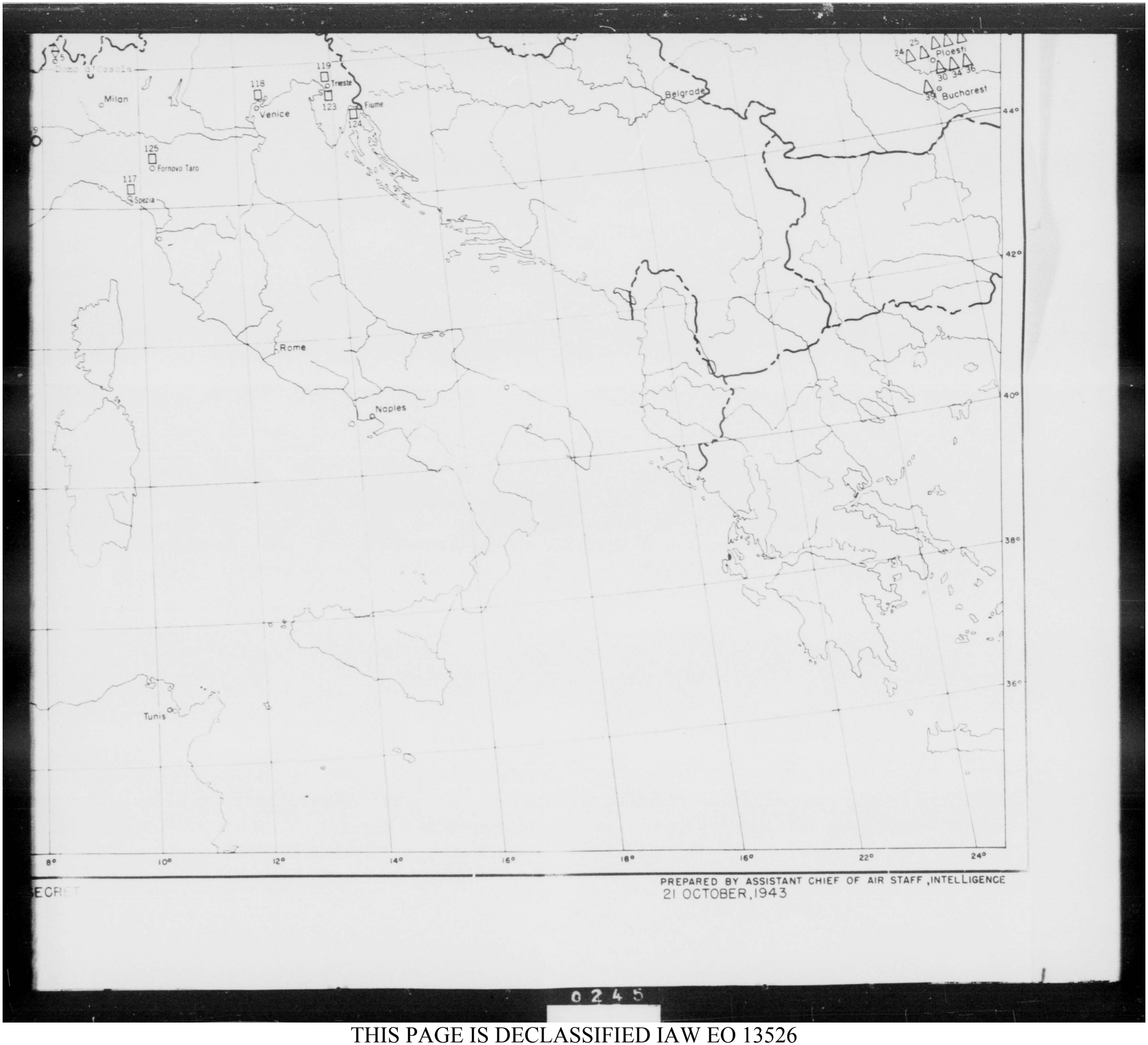

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PREPARED BY ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE
21 OCTOBER, 1943

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15 Jan 1949

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Retaliatory Bombardment, Jan. 15 1944

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142.611-1
15 Jan 1944

2-2343-41

Retaliatory bombardment, Jan. 15 1944

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This is an outline draft of the proposed report on Selected Aerial Objectives for Retaliatory Gas Attacks on Germany. It is proposed that thirty target areas (15 in this outline) will be selected for the final report and that descriptions and weather data will be prepared for all target areas (4 in this outline).

Before proceeding further, it is suggested that this draft be reviewed by the representatives of the Air Chemical Officer and the Chemical Warfare Service. Recommendations are requested on the form and content of the final report.

It is suggested that a meeting be held to discuss these recommendations on Wednesday, January 19, at 10:30 A.M. in Room C-730 at Gravelly Point.

January 15, 1944

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FOREWORD

This study is an analysis of the number and types of targets in Germany which might be attacked by the USAAF in retaliation for the use of gas by Germany. This retaliation program has important limitations on its scope:

(1) The program is to cover an intensive, punitive effort aimed at affecting the morale of the German people through the infliction of severe casualties in many parts of the country. Attack on the densely populated areas in larger German cities is indicated.

(2) Because of the essentially punitive nature of the program, this retaliatory program is aimed at cities within the boundaries of Germany before the annexation of Austria. No objectives are to be selected in satellite countries.

(3) The length of the retaliatory program period is estimated at fifteen days.

Within the framework of these limitations, both the air effort which the USAAF will be capable of making and the German cities which offer suitable targets have been studied. The conclusions which have been reached are subject to strong qualifications, but it is believed that they provide a basis for outlining a feasible retaliatory gas attack program.

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TABLE OF CONTENTS

Foreword

Summary and Conclusions

Target Selection Table

Weather Factor Summary Table

Target Areas

Map of Germany - locating all Targets

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SUMMARY AND CONCLUSIONS

1. **Assumptions**

   A. 75% of Heavy Bomber Strength in U. K. and Italy will be assigned to the Retaliatory Gas Attack Program.

   B. Heavy bombers will be used at 150% of average mission rate.

   C. The bomb load will be 75% gas and (25% HE ~~&~~ IB)

   D. The current sortie ratio will be maintained for these necessarily deep penetration missions because of the feasibility of gas attacks through cloud cover.

   E. The program will be scheduled for execution within a fifteen day period, ~~although operational conditions may extend this to a twenty-one day period~~.

   F. To attack a square mile target area requires sixty tons of gas bombs.

2. **Estimated Attack Feasible in**

	February 1944	June 1944
A. USAAF in United Kingdom		
Effective sorties which might be accomplished in 15 days	1329	1672
Total area (in square miles) which might be attacked	47	59
B. USAAF in Italy		
Effective sorties which might be accomplished in 15 days	686	814
Total area (in square miles) which might be attacked	24	29

3. **Feasible Target Program**

   A. Minimum and maximum target areas are determined by minimum and maximum feasible attack forces. These are estimated at 90 and 300 planes which would be most economically used against Target Areas of 2 and 7 square miles respectively.

   B. There are (approximately) thirty German cities with high density target areas at least 2 square miles in size and within 650 miles of present bases.

   C. Of these cities, only three are closer to the present USAAF bases in Italy than to bases in the United Kingdom. However, borderline cases might be assigned to the Italian based forces.

   D. Distribution of targets (15 only)

	No. of Targets	Area of Targets
Within 650 miles of United Kingdom bases	15	59
Within 650 miles of Italian bases	6	23.5
Total	15	59

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4. Selection of Targets

A. The key factors affecting target selection are population density, industrial importance, terrain and climate. All of these, except climate, can be evaluated quite precisely. Table 1 ranks the Target Areas in order of population density and gives their relative ratings on terrain, industrial importance and climate. In selecting targets, it is believed that weight should be given to the three ratings in the order given. This is recommended because the general factor on climate is subject to such extreme variations at the time of attack.

B. Table 2 evaluates the principal weather factors affecting gas attack: wind velocity, precipitation, cloudiness and humidity. These should be weighted according to the munition to be used. In each target tab, a detailed report on climate is given to which reference should also be made. (Sample only attached to this draft).

5. Conclusions

A. The forces now available could attack approximately 20 targets with a combined area of 70 square miles. By June 1944, the force will have so increased that an additional 18 square miles could be added to the target program.

B. The 30 recommended targets are well distributed over that part of Germany within range of present USAAF bases. The population of the target areas is between 135,000 and 630,000 persons while the density varies between 55,000 and 90,000 persons per square mile. The target areas vary between 5 and 7 square miles and total 120 square miles.

C. The feasible target program would affect between 4,500,000 and 6,000,000 persons in 20 to 25 of the largest German cities. In many target areas, important industrial plants, transportation facilities and public utility plants will also be affected.

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Table 1

TARGET SELECTION TABLE

Location	TARGET AREA in Sq. Mi.	RANK	POPULATION Ratings			RATING for Ter.	I. I.	Cli.
			P/t.a.	P/b.a.	Adj.A			
Berlin	7.5	1	1	1	1	4	3	1
Leipzig	7	2	1	1	2	4	2	
Frankfurt/Main	3	3	1	2	2	3	3	1
Dusseldorf	2	4	1	2	2	4	3	
Nuremburg	3	5	2	1	2	4	3	
Hanover	4	6	2	1	3	4	2	4
Cologne	4	7	2	2	2	4	4	
Munich	5	8	2	2	2	4	2	2
Stuttgart	3	9	2	3	3	2	3	
Stettin	3	10	3	1	3	3	2	
Magdeburg	3	11	3	2	2	4	1	
Wuppertal	6	12	4	3	3	1	2	
Bochum	2.5	13	3	4	2	3	2	
Augsburg	2.5	14	4	2	4	3	1	
Mannheim	3.5	15	4	3	3	4	3	

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EVALUATION OF RATINGS

P/t.a. is based on estimated population per total acre of the Target Area, including buildings, gardens, yards, streets and railways. The ratings are:

Class	Persons Per Acre
1	125 to 140
2	105 - 124
3	90 - 104
4	75 - 89

The range for the fifteen target areas is between 78 and 140.

P/b.a. is based on estimated population per built-up acre of the entire city, including buildings, gardens and yards only. The ratings are:

Class	Persons per Built-up Acre
1	84 to 97
2	72 83
3	60 71
4	48 59

The range for the fifteen target cities is between 48 and 97.

Adj. A. is based on the built-up character of the Area Adjacent to the Target Area, with allowance made for terrain and prevailing wind. The ratings are:

Class	% Adjacent Area Built-up
1	over 70%
2	40 - 70%
3	20 - 40%
4	0 - 20%

Terrain is based on the topographic conditions in and adjacent to the Target Area. The ratings are:

Class	Hills at least 100' high
1	Forming a bowl or valley.
2	On two adjacent sides.
3	On one side only.
4	None.

Ind. Imp. is based on the probable effect on important war industry of attack on the Target Area. The ratings are:

Class	Effect on Plants or Workers
1	Large proportion of workers and/or plants.
2	Many workers.
3	Small proportion of workers.
4	No effect on either.

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Climate is based on the position of each city in respect to the range of key weather factors (wind velocity, number of days of precipitation, cloudiness, humidity) affecting gas attacks. The ratings are:

Class	Average Range Position
1	Under 2
2	2 - 2½
3	3
4	3½ - 4

(See table 2 for further details).

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Table 2

WEATHER FACTOR SUMMARY TABLE

CITY	Average Range Position	WIND Mean	percentages Over 18	Under 8	RAIN days/ month	CLOUDINESS days clear	cloudy	HUMIDITY Mean Percent
Munich	(2)	14.5	(3) 51.5		14.5 (2)	3.5	(3) 13	54 (2)
Frankfurt/Main	(1)	7.5	(1) 64.5		13 (1)	5.5	(4) 11	52 (1)
Berlin	(1)	11	(2) 55		15 (2)	3	(1) 14	54.5 (2)
Hanover	(4)	11	(3) 47		15.5 (3)	5	(4) 11	62 (4)
Bremen	(4)	9	(4) 44		16 (4)	3	(2) 13	62.5 (4)

The range in the five readings is from 20% for humidity to 45% for wind.

Range Position is determined as: (1) in most favorable quarter of the range in readings, (2) in the quarter above the mean reading, (3) in the quarter below the mean reading, (4) in the least favorable quarter of the range in readings.

The Average Range Position is a rating obtained by averaging the four Range Positions as noted in the footnote to Table 1.

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1. BERLIN

(1) Population and Area

1,~~4~~30,000 345 square miles (of which 31.5% is built-up).

(2) Location

570 miles from London and ~~775~~ 790 miles from Foggia.
In North Central Germany at 52° 27' N and 13° 21' E.

(3) Strategic Importance

Berlin is important as the control center of the German government (despite removal of many administrative offices); as an industrial center, especially machinery and electrical equipment; and as a rail and highway center on routes leading to all parts of Europe.

Key plants are: the BMW, Daimler-Benz and Argus Aero-engine Plants; the Bussing-Nag, Ford and Daimler-Benz Truck plants; and the Heinkel, Henschel and Weser Bomber Assembly plants. Other important plants are: Siemens-Schukert, Siemens and Halske, and Allgemeine Elektrizitats Gesellschaft (electrical equipment); Ambi-Budd, Deutsche Industrie-Werke, Pallas Apparate, and Rheinmetall-Borsig (machinery and armaments); and the Borsig Lokomotive-Werke.

(4) Description ~~and Evaluation~~

a. Layout

Berlin is located in the middle of the north German plain, in a shallow depression through which runs the River Spree. The densely built-up part of Berlin is an area of about 35 square miles contained within the ring railway (Ringbahn). In the middle of this elliptical area is the commercial and government center comprising old and new structures. To the west of the city center is the large Tiergarten Park and to the southeast is Templehof Airdrome. Aside from these two large open areas, several smaller parks and small industrial areas, Inner Berlin is densely built-up with crowded apartments. Most of the important industrial plants are located in scattered suburban developments outside the Ringbahn.

b. Vulnerability

The congested multi-storied structures of Inner Berlin are served by narrow streets but many wide boulevards have been opened. The almost universal building material is brick.

Densities in Berlin are the highest in Germany. Densities in the tenement districts range from 150-300 persons per acre, with the average for all of Inner Berlin at 90 persons per acre. The central city has low night-time densities (10 to 80 persons per acre) but during the day is the most congested part of the city. Of the tenement areas, the most dense lie adjacent to and on the southeast and northeast of the central city.

c. Weather

Berlin is in the Berlin-Leipzig-Dresden Region but it is an exception to the region in having weather as favorable to gas attack as any city in Germany. Local conditions of significance are a high proportion of cloudy days per month and a low proportion of days with freezing temperatures in the winter.

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1. BERLIN (Cont'd.)

very rare. Precipitation occurs on nearly half the days in each month with highest frequency in early winter and lowest frequency in late spring. Weather conditions in Berlin are favorable for gas attack.

(5) Recommended Areas for Attack

Two areas are recommended for attack.

I. The central City

An attack during daytime (early morning to dusk) might be aimed at the City which is a very high density area during these hours. The 7½ square miles contain: about 600,000 persons which would be increased during the day; the principal government buildings and principal railroad stations; the business and commercial center; and many small industrial establishments.

II. Northeast Sector

This sector comprises the residential districts of Prenzlauerburg and Freidrichshain which lie north and east of the central City. The average density is 130 persons per acre over the total area of 7½ square miles. This target area contains 650,000 persons.

Of these two, the City is given first priority. It is centrally located so that whichever way the gas cloud drifts, many additional persons will be affected. Prevailing winds would presumably cause heaviest effect on the Northeast Sector even though the City only were attacked. The target areas might be combined to form a 15 square mile target if a very heavy blow were feasible.

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3. FRANKFURT

(1) Population and Area

590,000 76.5 square miles (of which 24% is built-up).

(2) Location

390 miles from London and 690 miles from Foggia.
In western Germany at 50° 08' N and 08° 40' E.

(3) Strategic Importance

Frankfurt is the commercial, industrial and transportation center of the upper Rhineland. At the center of important through rail lines and connected by canal to the Rhine, Frankfurt has developed important engineering, electrical apparatus, chemical, food and clothing industries. Among these industries are: the Adler Werke, (armored fighting vehicles); Farbwerke, (explosives and war gases); and Alfred Teves, Hartmann and Braun A. G. and Vereinigte Deutsche Metallwerke (aircraft parts and instruments).

(4) Description and Evaluation

a. Layout

Frankfurt is located on the Main River with most of the built-up area stretched along the north bank of the river. Two high density residential areas are located south of the river, the satellite towns of Sachsenhausen directly south of Frankfurt's center and Offenbach two miles east. Hills rise 100 to 300 feet immediately behind Frankfurt and its satellites forming a narrow valley only 2 miles wide but this valley widens to the east and west of Frankfurt's built-up districts. Most of the larger industrial plants lie spread out along the Main River for a distance of 3 to 5 miles east and west of Frankfurt, but important plants are located between Frankfurt and Offenbach and immediately west of the central area.

b. Vulnerability

Streets in the old city are narrow and many of the multi-storied buildings are half-timbered. In the built-up areas, brick four story tenements predominate.

The city center and fully built-up districts have an area of 800 acres in Frankfurt and Sachsenhausen with an average density of 100 to 200 persons per acre. Offenbach has a 400 acre built-up area of equal density. Adjacent to the fully built-up districts are partly built-up districts of wide streets and lower buildings totalling 1,500 acres in area and with average densities of 40 to 80 persons per acre.

c. Weather

Frankfurt is in a valley which channels winds into northeast and southwest directions. A high percentage of days are clear, but otherwise weather conditions are favorable to gas attack. Wind velocities in excess of 18 mph account for only 4 to 14% of the observations in any month. Precipitation occurs on from 11 to 15 days per month. Temperatures below freezing occur on from 9 to 19 days a month from November through March.

(5) Recommended Areas for Attack

The recommended area for attack is the two square mile densely built-up center comprising Frankfurt and Sachsenhausen. If operationally feasible, simultaneous attack on Offenbach's square mile built-up residential district is also recommended.

Within the two square mile area are: approximately 200,000 persons (with a considerable increase in daytime), and the business and administrative centers. Immediately to the west are the Adler Werke and Alfred Teves plants, an important classification yard and the main railway station. Immediately to the east is the port, a second marshalling yard and the gas works.

Within the target area of Offenbach are approximately 70,000 persons.

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~~12.~~ STUTTGART

(1) Population and Area

450,000 53 square miles (of which 30% is built-up).

(2) Location

460 ~~450~~ miles from London and 600 miles from Foggia.
In Southwest Germany at 48° 40' N and 09° 10' E.

(3) Strategic Importance

Stuttgart is important industrially, and as a transportation and administrative center. Among the key industries are: the Daimler-Benz Aero-engine plant and Truck plant, the V. K. F. Ball bearing plant, and the Hirth Aero-engine plant. Also of importance are the Robert Bosch Engine Accessory Plants.

As a transportation center, Stuttgart possesses important classification yards which handle traffic on the two through rail lines.

(4) Description and Evaluation

a. Laycut

Stuttgart lies in a saucer shaped depression which opens toward the N E into the broad valley of the Neckar River. Seven suburbs of Stuttgart are spaced out along the Neckar in a strip about ten miles long. Each of these suburban towns is composed of large industrial areas and related workers' housing, in contrast to Stuttgart proper which has small industrial areas but large areas given over to commercial and government purposes.

b. Vulnerability

The typical structures in Stuttgart are brick, multi-storied apartments within the central area, and brick two-storied houses on the hillside slopes to the north and south of the bottom of the depression.

The maximum density ~~of 200 persons~~ per acre occurs in the center of the valley and decreases rapidly as the hill slopes are reached. Density of the suburban towns is lower but Cannstatt has an area of 600 acres which is heavily built-up.

c. Weather

Stuttgart is enveloped in mists on four nights out of five. (Other data to be supplied later).

(5) Recommended Areas for Attack

c. Weather

Stuttgart is in the Upper Rhine Region where weather conditions are more favorable to either persistent or non-persistent gas attacks than any other part of Germany. Local conditions of significance are the unusually high number of days with fog (reported as more frequent in Stuttgart than any other German city) and the effect of the deep bowl in which Stuttgart lies which channels winds in north-west and southeast directions.

one-half of the total population or 225,000 persons. The areas within one-half mile on all sides are less densely built-up. The axis of the attack should be north-west and south-west with the central city in the center of attack. The hills will reduce wind effect and if air conditions encourage settling, the gas will be concentrated in the most dense areas. Principal drift will probably be toward the north-east which will carry the gas past marshalling yards and minor industrial areas to Canstatt.

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~~17.~~ 16. AUGSBURG

(1) Population and Area

~~186,000~~ 186,000 — 34 square miles (of which 16% is built-up).

(2) Location

~~550~~ 540 miles from London and 530 miles from Foggia.
Near Munich in Southwest Germany at 48° 23' N and 10° 53' E.

(3) Strategic Importance

~~Augsburg while not a large city has as its~~ chief industries machinery and armaments of war. The key industry is the Messerschmitt Fighter Assembly Plant. Also important is the M. A. N. Diesel Engine Plant.

~~Augsburg~~ It is a junction point on two main rail lines and has important classification yards.

(4) Description and Evaluation

a. Layout

Augsburg is located on relatively flat land at the junction of two small rivers. The densely built-up old city is the center around which industrial plants and heavily built-up residential areas are grouped in a ring. The major part of the city lies in the triangle formed by the two rivers but three heavily built up residential areas lie just across the rivers.

The Messerschmitt plant is two miles south of the city but the M. A. N. Diesel engine plant is located just north of the central city area.

b. Vulnerability

The typical structures are brick with a preponderance of multi-storied apartments. Streets are narrow, even in the newer parts of the city.

The city center of about 600 acres in area and the adjacent built-up Lechhausen and Oberhausen districts of 200 acres each are very dense. This city ranks in the first 12 in Germany in density.

c. Weather

Augsburg is located on the Bavarian Plateau just north of the Alps at an elevation of approximately 1700 feet. Temperatures below 32° F are to be expected on from 14 - 25 days per month from November through March. Wind velocities in excess of 18 mph are to be expected 20% of the time in February and April but only 10 - 13% of the time from May through September. Prevailing winds are from the western quadrant from March through November. Precipitation and cloudiness is fairly evenly distributed through the year, but the number of days with precipitation is slightly higher from November through March.

(5) Recommended Area for Attack

The recommended target area (2½ square miles) is the triangular part of the city comprising The Old City, Lechhausen and Oberhausen.

Within this area are; 140,000 persons (approximately 80% of the population). The M. A. N. Diesel engine plant, the gas works, the central railroad station and six large cotton textile plants.

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SELECTED AERIAL OBJECTIVES FOR RETALIATORY GAS ATTACK ON GERMANY

11 MARCH 1944

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PREPARED FOR THE
CHIEF OF THE CHEMICAL WARFARE SERVICE

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ON GERMANY

11 MARCH 1944

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Interviews; declassified
Approved for release by NARA on 12-17-2009

PREPARED FOR THE
CHIEF OF THE CHEMICAL WARFARE SERVICE
AND THE AIR CHEMICAL OFFICER
by the
OFFICE OF THE
ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE
WASHINGTON, D. C.

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Attention: AFDCH-4
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HEADQUARTERS, ARMY AIR FORCES
WASHINGTON

Army Air Forces
4/11/44 — EM
Date — Initials

11 Apr 44

SUBJECT: Report on "Selected Aerial Objectives for Retaliatory Gas Attack on Germany"

TO : Chemical Officer, U. S. Strategic Air Forces in Europe, AAF Station 586, APO 633, c/o PM, New York, New York.

1. There is forwarded herewith Copy No. 21 of a report entitled "Selected Aerial Objectives for Retaliatory Gas Attack on Germany". It is believed that the information included in this report will be of considerable value in preparing the necessary operational plans to be used in the event that retaliatory gas attack becomes necessary.

2. Any comments you may care to make will be appreciated.

/s/ E. Montgomery
/t/ E. MONTGOMERY
Brigadier General, U.S. Army
Air Chemical Officer

RETURN TO: AFB Publications Branch Maxwell Field, Alabama
142.611-1

1 Incl:
Cy No. 21 of subj rpt.

1st Ind.
HQ ASC - USSTAF, Office of the Chemical Officer, APO 633, c/o Postmaster, New York, New York. 24 April 1944.

TO: The Air Chemical Officer, HQ AAF, War Dept., Washington 25, D.C.

1. Receipt of the subject report is acknowledged. There is no doubt that it will be of considerable value to this office in preparing tactical recommendations for the Commanding General, and in fact if additional copies can be supplied we would like to present them to the Chiefs of Staff and Directors of Operations of this HQ and HQ 8th AF. It is assumed that it has already been sent direct to the 9th and 15th Air Forces and HQ AEAF.

2. Detailed comments on the report are as follows:

a. Objectives and Limitations of the Program.

The premises assumed are generally concurred in, except for the limitation to a 15-day operational period. It is extremely improbable, to say the least, that the period G to G + 15 will happen to coincide with a two-week interval of weather so uninterruptedly perfect as to permit of 150% of the average monthly mission rate. It is understood, however, that this factor has no bearing on the selection of optimum targets, which is the primary purpose of the report. Of course, alteration of the time factor correspondingly alters the size of the area which can be attacked within a given calendar period.

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b. Target Selection Considerations.
This office, after extensive study of the problem, has concluded that persistent gas is to be preferred for the daylight attack of cities, during both the initial and subsequent phases of gas warfare. This conclusion tends to lessen the importance attached to the climatic and terrain factors considered in the report, except for the limitation imposed by low temperatures in winter. The exclusion of terrain and climatic factors will alter slightly the order of rank given in Table 3. It is noted in passing that no explanation has been given for the ranking according to Wind, shown in Table 7.

c. Part I - The Feasible Air Attack.
Attention is drawn to the fact that 3.5 sorties per month per aircraft in the theater is an average value, and that the actual sorties vary seasonally with the weather. In winter it is not uncommon to achieve only 50% of the year-round monthly average mission rate.

The density of attack selected, 100 plane-loads per square mile, is well above British estimates and is in very close agreement with the views of this office. If any theoretical considerations or calculations were involved in the selection of this figure, we would very much like to examine them.

Incidentally, it may be remarked that if the operations projected in this report were to be carried out today, the conclusion of the 15-day attack period would find us with our supply of H bombs practically exhausted. The shipment of additional stocks of M47A2 H bombs has often been urged, and although it is understood that the present limit on our stocks has been imposed by War Department directive, it is still our opinion that the quantity in the theater should be increased by approximately 50%

d. Part II - Target Selection Considerations.
The assumption that high temperatures produce the most favorable time for H attack is not wholly concurred in. For the denial of occupancy over the greatest length of time, the greater persistency of H at lower temperatures might be an advantage.

In the 8th AF a combat group usually supplies only 20 of its total complement of 48 airplanes to any one mission. The force assigned to one square mile, 96 planes, would therefore correspond to approximately 5 actual groups.

/s/ Harold J. Baum
HAROLD J. BAUM
Colonel, CWS,
Chemical Officer.

Incl:
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No.	TO	FROM	DATE	SUBJECT
				Retaliatory Gas Attack.

Enter File Classification AG

1	Dir Ops Deputy Com Ops USSTAF	Cml O ASC-USSTAF	2/5/44	1. The publication "Selected Aerial Objectives for Retaliatory Gas Attack on Germany", Copy No. 19, is inclosed for your information and file. A copy of this publication originally came direct to this Sectia from the Air Chemical Officer and we thereupon requestw additional copies by cable. 2. Some of the basic material for this study was furnished by this Section a number of months ago. A copy of the comments of this Section on the finished publication is also included. HAROLD J. BAUM, Colonel, CWS, Chemical Officer.

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SELECTED AERIAL OBJECTIVES
FOR RETALIATORY GAS ATTACK ON GERMANY

CONTENTS

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II. Target Selection Considerations

III. Possible Target Programs

IV. Potential Results of Attack

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Table 1. Estimate of Number of Aircraft Required for Gas attack on a One Square Mile Target Area.

Table 2. Location, Population and Area of Target Cities

Table 3. Target Selection Table

Table 4. Effect on Civilian Population

Table 5. Effect on Axis War Effort

Table 6. Effect on Terrain on Vulnerability

Table 7. Effect of Climate on Vulnerability

APPENDIX A. Effect of Climate on Target Selection

Map II. Climate Regions

APPENDIX B. Description and Evaluation of Thirty Selected Target Cities

1. Berlin
2. Hamburg
3. Leipzig
4. Dusseldorf
5. Munich
6. Cologne
7. Frankfurt
8. Hannover
9. Magdeburg
10. Halle
11. Wuppertal
12. Nuremburg
13. Mannheim
14. Stettin
15. Bochum
16. Augsburg
17. Kiel
18. Aachen
19. Dortmund
20. Kassel
21. Stuttgart
22. Duisburg
23. Brunswick
24. Dessau
25. Essen
26. Dresden
27. Saarbrucken
28. Karlsruhe
29. Hagen
30. Lubeck

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THIS PAGE I:

FOREWORD

At the request of the Chief of the Chemical Warfare Service and the Air Chemical Officer, the Office of Assistant Chief of Air Staff, Intelligence has prepared the attached report on SELECTED AERIAL OBJECTIVES FOR RETALIATORY GAS ATTACK ON GERMANY.

This study is an analysis of the number and types of targets in Germany which might be attacked by the USAAF in retaliation for the use of gas by Germany. As noted in the text, this retaliation program has important limitations on its scope. Within the framework of these limitations, both the air effort which the USAAF will be capable of exerting and the German cities which offer suitable targets have been studied. The conclusions which have been reached are subject to modification in the light of further experience by both the USAAF and the Chemical Warfare Service, but it is believed that they provide a reasonable basis for outlining a retaliatory gas attack program.

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SUMMARY

A. Objectives and Limitations of the Program

1. The retaliatory gas attack program developed in this study is aimed primarily at inflicting widespread casualties and causing substantial damage to the Axis war effort. Attack on densely populated industrial cities is indicated.
2. No attacks are to be made on occupied or even satellite countries, because of the punitive nature of the program. Therefore, objectives selected in this study are located within the boundaries of Germany before the annexation of Austria.
3. The retaliatory gas attack program developed in this study is limited to the attack which could be accomplished in a fifteen day operational period starting as soon as possible after gas warfare breaks out.
4. In this study, selection of objectives is limited to those German cities which are not more than 650 straight-line miles from present USAAF bases in the United Kingdom and Italy.

B. The Feasible Scope of Attack

1. The air force required to attack a given target area with non-persistent gas is slightly greater than the force required to attack with persistent gas.
2. In March 1944, the USAAF based in the United Kingdom and Italy would be capable of attacking 53 square miles with either persistent or non-persistent gas within a fifteen day operational period. By June 1944, the USAAF operating against Germany will have increased by 20% to its planned maximum strength and would be capable of attacking a total of 64 square miles with gas. Of the total strength, approximately two-thirds would be based in the United Kingdom.
3. All of the thirty cities selected for analysis as important industrial and high density population centers are within 650 straight line miles of bases in the United Kingdom, but only five of these cities are within the same distance of bases in Italy. However, since the sum of the straight line distances from bases in Italy and the United Kingdom to each of twenty-five target cities is under 1300 miles, shuttle bombing would increase the scope of the USAAF based in Italy.

C. Target Selection Considerations

1. The factors determining the importance of the target are population density and war production significance. The factors determining the vulnerability of the target to gas attack are terrain and climate. All of these factors except climate can be evaluated quite precisely.
2. There is a high degree of correlation between the importance of the target cities as high density population areas and their importance as centers of Axis war production. Therefore, a program of attack can be prepared that will result in both severe civilian casualties and heavy damage to the Axis war effort.

D. Potential Results of Attack on Thirty Selected Target Cities

1. In the thirty cities selected for analysis in this report, the total target area of 84.5 square miles is estimated to contain 5,600,000 persons during the daylight periods most suited to USAAF gas attack. The total population of the thirty cities, which would be subjected to direct and indirect effects of the proposed attack, is 17,500,000 or more than half of the urban population and more than a quarter of the total population of Germany.
2. The thirty selected target cities contain over 60% of the industrial plants in Germany rated as 'Key Targets' by AC/AS Intelligence and rated by the Ministry of Economic Warfare as 'Major Plants of Major Importance' in the production of liquid fuels, aircraft, aircraft engines, rubber, chemicals, steel, non-ferrous metals, shipbuilding and armaments.

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PART I THE FEASIBLE AIR ATTACK

A. Assumptions

1. Use of gas by the United Nations will start on a date (G day) which will be determined after the first use of gas by the Axis, and from G to G-plus-15 an all-out retaliatory effort will be made.

2. 100% of the bomber strength in the United Kingdom and Mediterranean Theater will be assigned to the retaliatory gas attack program. At the present time, distances to targets are such that only heavy bombers can feasibly be used.

3. To obtain maximum striking power, aircraft will be used during the fifteen day period at 150% of the average monthly mission rate. 1/

4. The ratio (based on experience to date) of 3.5 sorties per month per heavy bomber in the theater will be maintained. Experience to date also shows that 70% of total sorties are effective. Effective as applied to sorties means that the aircraft reaches and attacks the selected target.

5. The weight of the bomb load carried during the retaliatory period is estimated to consist of 75% gas and 25% HE and/or IB.

6. To attack one square mile of target area will require: (1) for persistent (mustard) gases, the use of 100 planes carrying 4,000 one hundred pound bombs; (2) for non-persistent (phosgene) gases, the use of 100 planes carrying 600 one thousand pound bombs. (See Table 1).

B. Feasible Attack from Present Bases

Estimates of USAAF heavy bomber strength available in March and June, 1944 are used in this report. It is estimated that after June there will be no significant increases in heavy bomber strength based in the United Kingdom and in the Mediterranean, therefore, this figure represents the approximate maximum strength which will be available for the retaliatory gas attack program.

The estimate of effective sorties which might be accomplished in a fifteen day period is derived by applying 150% of the current ratio of effective sorties per heavy bomber to the estimated number of aircraft in the theatre.

1. From United Kingdom Bases	March 1944	June 1944
a. USAAF heavy bomber strength	2,404	3,045
b. Effective sorties which might be accomplished in 15 days at 150% of current ratio per heavy bomber	4,400	5,600
c. Total area (in square miles) which might be attacked with bomb load of 75% gas and 25% HE and/ or IB	33	42

1/ Note: Recent estimates of maximum sortie effort indicate that the theoretical maximum effort may be twice the ratio used in this study. Therefore the estimates of feasible attacks are probably conservative.

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B. Feasible Attack from Present Bases (cont'd.)

2. From Mediterranean Bases	March 1944	June 1944
a. Heavy bomber strength	1420	1586
b. Effective sorties which might be accomplished in 15 days at 150% of current ratio per heavy bomber	2600	2900
c. Total area (in square miles) which might be attacked with bomb load of 75% gas and 25% HE and/ or IB	20	22
3. Total area (in square miles) which might be attacked from USAAF bases in the Mediterranean and United Kingdon with a bomb load of 75% gas and 25% HE and/ or IB	53	64

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PART II TARGET SELECTION CONSIDERATIONS

A. Assumptions

1. For purposes of this study, no attacks should be made on occupied or even satellite countries because of the punitive nature of the retaliatory gas attack program. Therefore, only targets within the boundaries of Germany before the annexation of Austria are to be selected.

2. The retaliatory gas attack program is aimed primarily at: effecting widespread casualties, impeding transportation and public services, complicating and delaying the repair of HE bomb damage, and making targets highly vulnerable to IB attack.

3. Target selection should be concentrated on German cities which contain densely populated sections and are the locations of important war activities, so as to achieve the greatest possible effect.

4. The most suitable times for non-persistent gas attack are when conditions of inversion may be expected. The most suitable times for persistent gas attack are when temperatures are highest. Assuming gas attacks by the USAAF between 6 A.M. and 7 P.M., the most congested parts of German cities would be the central business and high density residential and industrial districts. Therefore, these districts would be the logical focal points in selecting the target area.

5. Controlling operational conditions in target selection are: (1) a maximum straight-line distance of 650 miles from London or Foggia, (2) a dispersed geographical distribution so as to permit varying patterns of attack and so that weather conditions over the several targets will be as varied as possible.

6. The minimum feasible USAAF heavy bomber force to be used in attacking targets in Germany is approximately two groups or 96 planes. This force could be most economically used against minimum targets of 1 square mile in area.

7. No allowance is to be made for damage from RAF area bombing since this factor in target selection may vary over a period of time according to (1) German efforts at repair and resettlement in cities with currently heavy bomb damage and (2) future direction of air attacks against cities currently undamaged. This factor can therefore be best determined just prior to G-day on the basis of the information then available in the field.

B. Importance of Potential Targets

Thirty German cities within 650 miles of present USAAF bases and with populations exceeding 100,000 have been analyzed as potential targets. These cities were selected because they include high-density population districts and/ or important war industries.

The significance of these thirty German cities may be judged by the fact that they include: (1) 19 of the 24 cities with populations exceeding 250,000, (2) 24 of the 28 German cities whose populations exceed 100,000 with 'Key Industrial Targets' as rated by AC/AS, Intelligence, and (3) 26 of the 40 German cities rated by the Ministry of Economic Warfare as 'economic targets of primary importance'.

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C. Distribution of Potential Targets

As shown on Map 1, these thirty target cities are well distributed throughout that part of Germany within 650 miles of present USAAF bases. It is important to note that while all the cities are within range of bases in the United Kingdom only five are within range of bases in Italy. Furthermore, of the five targets within range of both Italian and United Kingdom bases, only two are closer to the present Italian bases 1/.

Table 2, (See Tab) lists the target cities and shows the distances of each from London and Foggia. These may be summarized as follows:

1. Distance of Target Cities from	London (No. cities)	Foggia (No. cities)
Less than 350 straight-line miles	9	0
350 to 499 straight-line miles	11	0
500 to 650 straight-line miles	10	5

2. Combined Distance of Target Cities from London & Foggia	No. Cities
Less than 1100 straight-line miles	9
1100 to 1199 Straight-line miles	9
1200 to 1300 straight-line miles	7
Over 1300 straight-line miles	5

From this summary it can be concluded that although only five target cities are within 650 straight-line miles of Foggia, there are 25 target cities whose combined straight-line distance from London and Foggia is under 1300 miles. Thus the scope of operations of the USAAF based in Italy could be increased by using shuttle bombing.

D. The Four Target Selection Factors and their Relative Importance

The key factors affecting the selection of targets are: (1) the effect on population, (2) the effect on the Axis war effort, (3) the terrain or topographic conditions surrounding the target and (4) the climate. Factors 1 and 2 indicate which targets could be most profitably attacked while factors 3 and 4 indicate the relative vulnerability of the target cities to gas attack.

All these factors are reasonably stable. Terrain and topographic conditions surrounding the target will remain unchanged at all times. The factor estimating effect on the Axis war effort will remain substantially the same since the German tendency is to rebuild damaged industrial areas rather than move damaged plants elsewhere.

The factor estimating effect on population is not altogether reliable since permanent evacuation may have occured in parts of some cities, but the indications are that evacuation is neither permanent nor complete in most cases, particularly where industrial plants draw the population back to their residential areas. The factor for climate indicates the relative probability of weather conditions favoring gas attacks, but it is based upon climatic elements subject to considerable day-to-day variation. Furthermore, the number of days per month on which temperature readings are below 32° F is significant only for the months of October through April. (See Appendix A.).

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Table 3 is a summary table which is intended to be used as a guide in preparing a plan of attack. The target cities are ranked according to their combined ratings for potential effect on population and on the war effort. Ratings are also given for vulnerability of terrain and of climate to persistent and non-persistent gases. These ratings are derived from Tables 4, 5, 6, and 7, which explain the data used and the method of rating. It should be noted especially that all factors are rated by the quartile method, that is: a target city with a rating of: (1) is among the top seven or eight among the 30 cities, (2) is above the median, (3) is below the median, (4) is among the lowest 7 or 8 cities. This facilitates determining the standing of each target city in the Selection Table.

1/ Note: Assuming that bases become available at Pescara (which is on March 1, still in German hands) 100 miles northwest of Foggia, a total of 11 target cities would come in range of the USAAF in Italy. However, of these eleven targets, only two would be closer to Pescara than London.

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PART III — POSSIBLE TARGET PROGRAMS

A. Priority Ranking of Target Cities

Three possible rankings of the thirty selected target cities are outlined in Tables 3, 4 and 5 (See Tabs). Tables 4 and 5 give priority to the target cities in order of the potential effects on civilian population and the Axis war effort respectively. Table 3 ranks the targets according to their combined ratings for effect on the civilian population and the war effort. The following subsections summarize the results of basing target programs on each of the three procedures for assigning priorities.

A comparison of the potential results of attacks based on each of the three target city rankings shows that, with no significant loss of effectiveness against either civilian population or the Axis war effort, a combined program can be prepared that will: (a) inflict widespread casualties, and (b) cause substantial damage to the Axis war effort.

1. Targets Ranked by Potential Effect on the Civilian Population

Table 4 ranks the target cities in the order of greatest potential effect on the civilian population. As explained in the table, this ranking is based not only on the density of population within the target but also on the density and distribution of population in the area around the target where it is probable that important secondary effects would also be felt.

If the retaliatory gas attack program were to be based on the ranking established in Table 4, the relative population density of the targets in the high, middle and low thirds of the selected target cities would be as follows:

	Targets	Population per square mile of Target Area
(a)	1 to 10	99,000 persons
(b)	11 to 20	65,500 persons
(c)	21 to 30	46,300 persons

2. Targets ranked by Potential Effect on the Axis War Effort

Table 5 ranks the target cities in the order of potential effect on important war activities through casualties to workers or direct effects on transportation and plant facilities.

If the retaliatory gas attack program were to be based on the ranking established in Table 5, the relative industrial importance of the high, middle and low thirds of the selected target cities would be as follows:

	Targets	Industrial Rating per square mile of Target Area
(a)	1 to 10	35
(b)	11 to 20	36
(c)	21 to 30	15

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3. Targets ranked by Potential Effect on Population and Industry.

Table 3 ranks the target cities in order of combined effect on civilian population and important war activities.

If the retaliatory gas attack program were to be based on the ranking established in Table 3, the combined industrial importance and population density of the high, middle and low thirds of the selected target cities would be as follows:

Targets	Industrial Rating Per Square Mile of Target Area	Population Density
(a) 1 to 10	35	95,000
(b) 11 to 20	22	67,500
(c) 21 to 30	29	51,600

B. Possible Scope of Target Programs

The thirty selected target cities have a combined target area of 84.5 square miles. It is estimated that the USAAF could accomplish the following programs in the specified gas attack period:

	Percentage of Combined Target Area that could be attacked by USAAF in U.K.	USAAF in Italy	Total USAAF
1. March 1944	39%	24%	63%
2. June 1944	50%	26%	76%

It can be concluded that in March 1944 the combined USAAF heavy bomber forces operating against Europe could attack 63% of the target areas in the thirty selected cities. By June 1944, the USAAF forces will have reached their planned maximum strength and will be capable of attacking 76% of the area of targets in the thirty selected cities.

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POTENTIAL RESULTS OF ATTACK

PART IV

Since gas warfare on the scale outlined in the retaliatory gas attack program has never been tested, emphasis must be placed on the fact that the results of any target program can only be stated in terms of the potential effect. The following sections outline the potential effect on civilian population and the Axis war effort of attack on the thirty selected target cities.

A. Potential Results of Attack on Civilian Population

The air force available in March 1944 could attack all the thirty German cities selected for analysis. Their total population is in excess of 17,500,000 which represents over half of the urban population and more than a quarter of the total population of Germany. All of the population of these cities would be exposed to the effects of the attacks while nearly a third or 5,600,000 persons would be affected directly since they would be located within the target areas.

B. Potential Results of Attack on the Axis War Effort

Attack on the thirty selected target cities would affect the Axis war effort through: (a) inflicting casualties on a large proportion of the workers, (b) damaging and rendering unusable (with persistent gas) war production plants and transportation facilities.

It is estimated that attack on the selected targets would affect a large proportion of the war workers. In fifteen cities more than 40% of the war workers would be directly affected through attack on the target areas, while in only five cities would less than 20% of the war workers be directly affected. Many additional workers would also be affected in the nearby areas.

These thirty German cities are the locations for:

(a) 164 out of 245 plants located in cities with populations exceeding 50,000 and rated by the Ministry of Economic Warfare as 'Major plants of major importance' in the production of: liquid fuels; aircraft and aircraft engines; rubber and rubber tires; chemicals and explosives; iron, steel and non-ferrous metals, shipbuilding; and engineering and armaments.

(b) 61 of 104 plants located in Germany and rated by AC/AS, Intelligence as 'Key Targets' in the production of: aircraft and aircraft engines; liquid fuel; rubber and rubber tires; and submarines.

(c) 40 of 58 rail and water transportation facilities which are rated by the Ministry of Economic Warfare as 'Transportation facilities of major importance'.

Within the targets in sixteen of the cities there are important war industries.

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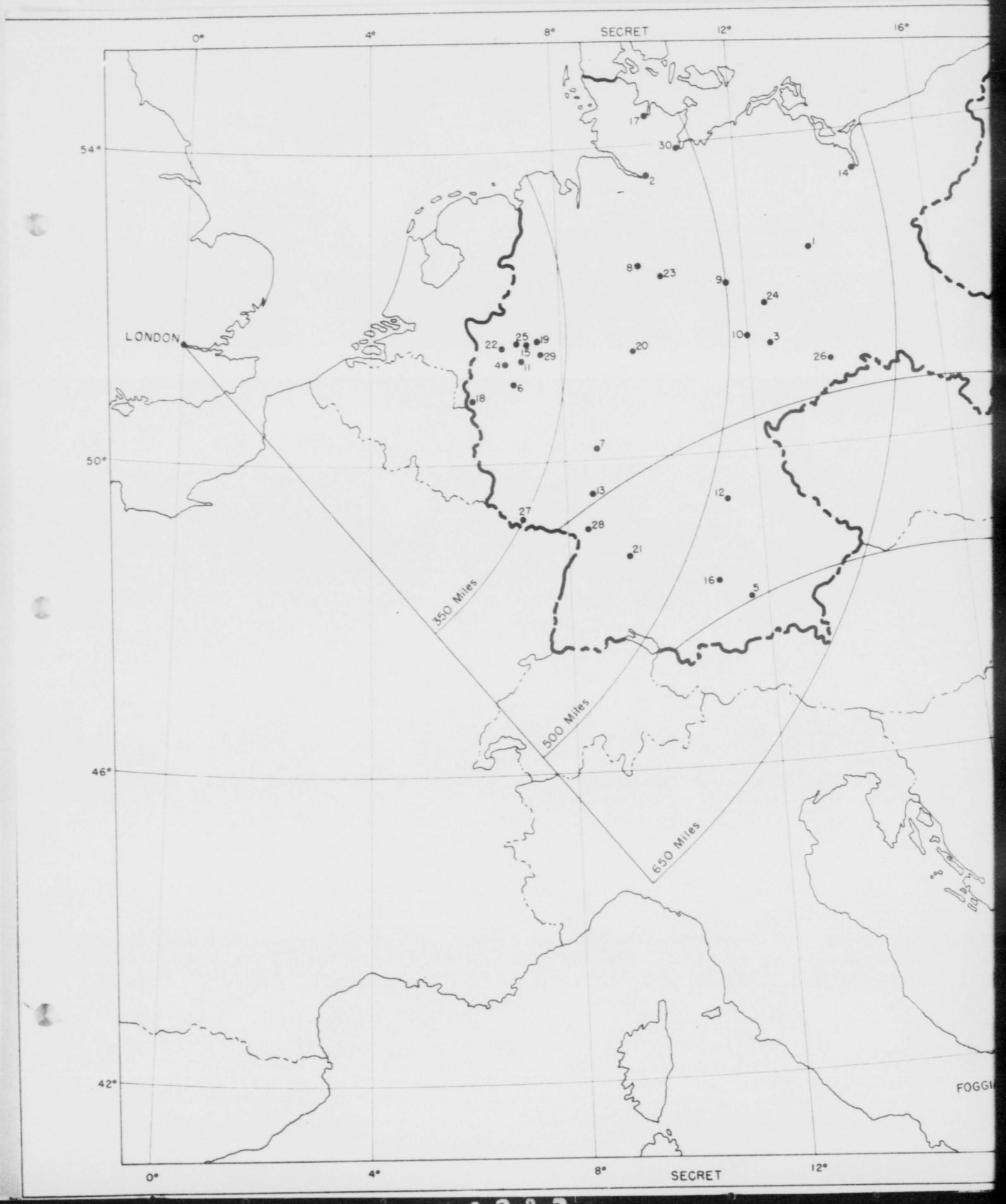

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MAP I

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TARGET CITIES

1 Berlin
2 Hamburg
3 Leipzig
4 Dusseldorf
5 Munich
6 Cologne
7 Frankfurt
8 Hanover
9 Magdeburg
10 Halle
11 Wuppertal
12 Nurnberg
13 Mannheim
14 Stettin
15 Bochum
16 Augsburg
17 Kiel
18 Aachen
19 Dortmund
20 Kassel
21 Stuttgart
22 Duisburg
23 Brunswick
24 Dessau
25 Essen
26 Dresden
27 Saarbrucken
28 Karlsruhe
29 Hagen
30 Lubeck

650 Miles
500 Miles
500 Miles
650 Miles

FOGGIA

SELECTED
RETALIATORY GAS ATTACK
TARGET CITIES
IN GERMANY

0 100 200
Statute Miles

8° SECRET 12° 16°

AC/AS Intelligence 1944

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Table I

Estimate of the Number of Aircraft Required
to Attack a One Square Mile Target
With
Persistent and Non-persistent Gas*

1. The optimum amount of gas that should be used against one square mile of target area is estimated at:
   (a) 4,000 one hundred pound bombs for mustard gas.
   (b) 600 one thousand pound bombs for phosgene gas.

Table 1

2. The bomb load of heavy bombers operating from the United Kingdom has averaged 2.5 tons. The following estimate of gas bomb capacity of heavy bombers shows that capacity loads of non-persistent or persistent gas would be operationally feasible.

	Number of Bombs	Weight of Bombs
(a) Mustard		
B-17	42 at 100 lbs.	2.1 tons
B-24	52 at 100 lbs.	2.6 tons
(b) Phosgene		
B-17 or B-24	6 at 920 # lbs.	2.8 tons

3. Planes Required to Carry:

   (a) 4,000 mustard gas bombs (100 lb. size) - 96 B-17's
   - 77 B-24's

   (b) 600 phosgene gas bombs (1,000 lbs. size) - 100 B-17's or B-24's

4. For purposes of this report, the number of planes required to attack a one square mile target with gas will be estimated at:

   100 heavy bombers or approximately two groups.

---

* Mustard gas bombs are available in adequate quantity. Non-persistent gas bombs are beginning to become available but the quantities required are dependent on the establishment of additional facilities for non-persistent gases. Appreciable facilities for phosgene and cyanogen chloride have already been authorized and the balance is under consideration.

The phosgene gas bomb known as a 1,000 pound size actually weighs approximately 920 pounds.

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TABLE 2

LOCATION, AREA, AND POPULATION OF SELECTED TARGETS

RANK	CITY	CITY POPULATION	DISTANCE FROM LONDON	DISTANCE FROM FOGGIA	TARGET AREA	TARGET POPULATION
1	Berlin	4,400,000	570	790	15.0	1,500,000 -
2	Hamburg	1,130,000	450	860	3.75	530,000 -
3	Cologne	906,000	300	730	4.0	325,000 -
4	Munich	820,000	570	510	5.0	380,000 ≠
5.	Leipzig	720,000	540	700	3.5	430,000
6.	Essen	654,000	300	780	4.5	300,000 -
7	Dresden	640,000	600	670	2.5	120,000 -
8	Frankfurt	570,000	390	690	3.0	190,000 -
9	Dortmund	550,000	330	800	2.0	180,000 ≠
10	Dusseldorf	530,000	300	800	2.0	190,000 -
11	Stuttgart	450,000	460	600	2.0	100,000
12	Hannover	450,000	420	810	3.0	210,000 ≠
13	Nuremburg	450,000	520	600	2.5	185,000
14	Mannheim	430,000	400	660	2.5	145,000
15	Wuppertal	411,000	310	800	2.5	225,000
16	Duisburg	400,000	300	800	1.5	55,000 -
17	Stettin	380,000	630	825	2.5	140,000
18	Magdeburg	320,000	500	770	2.25	160,000
19	Bochum	314,000	320	800	2.0	180,000 -
20	Kiel	235,000	470	940	2.0	100,000
21	Kassel	216,000	410	750	1.75	95,000 ≠
22	Hagen	214,000	330	800	1.5	65,000
23	Halle	210,000	520	720	2.0	180,000 ≠
24	Brunswick	196,000	450	790	0.5	21,000 -
25	Karlsruhe	190,000	410	630	2.0	90,000
26	Augsburg	186,000	540	530	2.5	140,000
27	Aachen	164,000	270	800	1.5	125,000 -
28	Lubeck	133,000	480	900	1.5	55,000
29	Saarbrucken	130,000	350	680	1.0	50,000
30	Dessau	120,000	530	740	2.25	80,000

Explanation of Terms

The cities are ranked in the order of population.
Distances from London and Foggia are approximate statute miles.
The Target Area is in square miles.
The Target Population is the estimated daytime population. The symbol (-) means that the nighttime population is smaller. The symbol (≠) means that the nighttime population is larger.

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TABLE 3

TARGET SELECTION TABLE

RANK	TARGET CITY	TARGET		RATINGS FOR				
		Area	Population	E.P.	E.W.	Ter.	Climate P	Climate NP
1	Berlin	15	1,500,000	1	1	3	1	1
2	Hamburg	3.75	530,000	1	1	3	2	4
3	Leipzig	3.5	430,000	1	1	2	4	2
4	Dusseldorf	2.0	190,000	1	2	3	1	2
5	Munich	5.0	380,000	1	2	4	4	3
6	Cologne	4.0	325,000	2	1	4	3	4
7	Frankfurt	3.0	190,000	2	1	2	1	1
8	Hannover	3.0	210,000	2	1	3	3	4
9	Magdeburg	2.25	160,000	2	1	3	3	4
10	Halle	2.0	180,000	1	3	3	4	3
11	Wuppertal	2.5	225,000	1	3	1	2	2
12	Nuremburg	2.5	185,000	1	3	4	4	1
13	Mannheim	2.5	145,000	3	1	4	1	1
14	Stettin	2.5	140,000	2	3	2	3	2
15	Bochum	2.25	150,000	3	3	2	2	3
16	Augsburg	2.5	140,000	3	3	4	4	2
17	Kiel	2.0	100,000	3	3	2	2	4
18	Aachen	1.5	125,000	2	4	1	3	4
19	Dortmund	2.0	180,000	2	4	2	2	3
20	Kassel	1.75	95,000	4	2	1	3	3
21	Stuttgart	2.0	100,000	4	2	1	1	1
22	Duisburg	1.5	55,000	4	2	2	2	2
23	Brunswick	0.5	21,000	4	2	3	3	4
24	Dessau	2.25	80,000	4	2	4	4	2
25	Essen	4.5	300,000	3	4	1	1	1
26	Dresden	2.5	120,000	3	4	1	4	3
27	Saarbrucken	1.0	50,000	3	4	1	1	1
28	Karlsruhe	2.0	90,000	4	4	4	1	1
29	Hagen	1.5	65,000	4	4	1	2	3
30	Lubeck	1.5	60,000	4	4	4	4	4

Table 3

Explanation of Terms and Rating Procedure

The ratings shown in the columns at the right are derived from the following tables: 'E. P.' from Table 4 on the 'Effect on Civilian Population'; 'E.W.' from Table 5 on the 'Potential Effect on Axis War Effort'; 'Ter.' from Table 6 on 'Terrain'; and 'Climate - P and NP' from Table 7 on the 'Effect of Climate on Target Vulnerability to Persistent and Non-persistent Gas'.

The ranking of target cities is on the basis of the combined ratings for 'E. P.' and 'E. W.'

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TABLE 4

Target Rating Table for EFFECT ON CIVILIAN POPULATION

RANK	TARGET CITY	RATINGS for Density of Target	for Density of City	for Character of Adjacent Area
1	Berlin	1 (150) -	1 (63)	2
2	Dusseldorf	1 (150) -	1 (55)	2
3	Hamburg	1 (220) -	1 (84)	3
4	Halle	1 (145) /	1 (56)	3
5	Wuppertal	1 (140)	2 (48)	2
6	Munich	2 (120) /	1 (53)	2
7	Nuremburg	2 (115)	1 (56)	2
8	Leipzig	1 (150)	1 (60)	4
9	Aachen	1 (140) -	2 (49)	3
10	Dortmund	1 (140) /	4 (28)	1
11	Cologne	2 (125) -	2 (46)	2
12	Frankfurt	2 (110) -	2 (47)	2
13	Stettin	3 (95)	1 (52)	2
14	Hannover	2 (115) /	2 (45)	3
15	Magdeburg	2 (110)	2 (51)	3
16	Essen	3 (105) -	3 (42)	1
17	Dresden	3 (100) -	3 (39)	2
18	Saarbrucken	4 (80)	3 (38)	1
19	Bochum	2 (110) -	4 (36)	3
20	Augsburg	3 (90)	2 (50)	4
21	Mannheim	3 (90)	4 (37)	2
22	Kiel	3 (85)	3 (40)	3
23	Karlsruhe	4 (75)	3 (43)	2
24	Kassel	3 (90) /	3 (44)	4
25	Stuttgart	4 (75)	3 (40)	3
26	Hagen	4 (65)	4 (34)	3
27	Duisburg	4 (60) -	4 (37)	3
28	Brunswick	4 (60) -	4 (36)	3
29	Lubeck	4 (65)	4 (21)	4
30	Dessau	4 (55)	4 (23)	4

Explanation of Terms and Rating Procedure

In measuring the potential effect on civilian population of attack on the thirty target cities, three factors were given equal weight: (a) the population density per acre of target area, (b) the population density per acre of total built-up area in the city, and (c) the built-up or open character of the area adjacent to the target. In this manner, the secondary effects of the attack through drift of the gas cloud and dispersion of bombs is taken into account.

Rating	Density of Target in Persons/Acre	Density of City in Persons/Acre	Character of Adjacent Area *
1	140 to 220	52 to 84	High or medium density residence RR yards and industrial areas on 75% of the target boundary. Less than 10% of boundary open.
2	110 to 125	45 to 51	Medium density residence, RR yards and industrial areas on 40% of the target boundary. Less than 20% of boundary open.
3	85 to 105	38 to 44	Low density residence, RR yards and industrial areas on 70% of the target boundary. Less than 30% of boundary open.
4	55 to 80	21 to 37	Less than 70% of edges surrounded by developed residential, industrial or railroad property.

* Those sides of the target which are open but which have a terrain rating of (1) or (2) are deducted from the percentage of the boundary considered open.

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TABLE 5

Target Rating Table for EFFECT ON AXIS WAR EFFORT

RANK	TARGET CITY	RATINGS for Industrial Importance		for Effect on Workers
1	Hannover	1	(135) *	2
2	Magdeburg	1	(107) *	2
3	Leipzig	1	(230)	3
4	Hamburg	1	(176)	3
5	Frankfurt	1	(124)	3
6	Cologne	1	(103) *	3
7	Mannheim	1	(102)	3
8	Berlin	1	(435)	4
9	Dessau	2	(61) *	1
10	Munich	2	(76) *	2
11	Kassel	2	(69) *	2
12	Dusseldorf	2	(98)	3
13	Stuttgart	2	(100) *	4
14	Duisburg	2	(97) *	4
15	Brunswick	2	(81)	4
16	Augsburg	3	(48) *	1
17	Halle	3	(44)	2
18	Nuremburg	3	(50) *	2
19	Bochum	3	(38) *	2
20	Kiel	3	(60) *	3
21	Stettin	3	(37)	3
22	Wuppertal	4	(33)	1
23	Dresden	3	(59)	4
24	Essen	4	(34) *	2
25	Lubeck	4	(27)	2
26	Karlsruhe	4	(24) *	2
27	Aachen	4	(20)	2
28	Saarbrucken	4	(16)	2
29	Dortmund	4	(35)	3
30	Hagen	4	(30) *	3

Table 5

Explanation of Terms and Rating Procedure

In measuring the potential effect on the Axis war effort of attack on the thirty target cities, the following measurable factors were considered significant: (a) the relative importance of the industrial and transportation activities, and (b) the proportion of industrial workers, (as distinct from clerical and commercial workers) which would probably be affected by attack on the target area.

In estimating the industrial importance of each city, plants were included if rated by the Ministry of Economic Warfare as 'major or minor plants' in the following industries: liquid fuels; aircraft and aircraft engines; rubber and rubber tires; chemicals and explosives; iron and steel; non-ferrous metals; shipbuilding; engineering and armaments; and rail and water transportation. Total points for the first three industries named were doubled in weight because of their relative vulnerability and economic importance. The points are shown in parentheses after the quartile rating and those target cities which include important war industries within the target are also marked with an asterisk (*).

Rating	Industrial Importance Points	Percentage of Workers Affected
1	101 to 433	Over 60%
2	61 to 100	40% to 59%
3	36 to 60	20% to 39%
4	16 to 35	Under 20%

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TABLE 6

Target Rating Table for TERRAIN

RANK	TARGET CITY	RATINGS for Slope	for Conformation
1	Stuttgart	1	1
2	Wuppertal	1	1
3	Hagen	1	1
4	Dresden	1	1
5	Saarbrucken	1	1
6	Kassel	1	2
7	Aachen	1	2
8	Essen	2	1
9	Kiel	2	1
10	Frankfurt	2	1½
11	Dortmund	2	1½
12	Bochum	2	2½
13	Stettin	2	3
14	Duisburg	2	3
15	Leipzig	3	2
16	Hamburg	3	2
17	Brunswick	3	3
18	Magdeburg	3	3
19	Hannover	3	3
20	Dusseldorf	3	3
21	Halle	3	3
22	Berlin	4	4
23	Cologne	4	4
24	Lubeck	4	4
25	Augsburg	4	4
26	Munich	4	4
27	Mannheim	4	4
28	Karlsruhe	4	4
29	Nuremburg	4	4
30	Dessau	4	4

Table 6

Explanation of Terms and Rating Procedure

Under Terrain, two factors are considered measurable and significant: (a) the degree of slope from the target to the crest of hills within two miles of the target boundary, and (b) the formation of hills around the target. The degree of slope is preferable to height as a factor for establishing the significance of hill slopes in directing and containing the gas cloud, because it allows for the difference in effect between two hills of equal height but at unequal distances from the target. The second factor evaluates the degree to which the target is hemmed in by hills.

Rating	Degree of Slope	Hill Conformation
1	More than 5%	Hills on two opposite sides
2	2.5% to 4.5%	Hills on two adjacent sides
3	1% to 2.0%	Hills on one side only
4	Less than 1%	No hills over 50 feet in height and within two miles of the target.

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TABLE 7

Target Rating Table for EFFECT OF CLIMATE ON VULNERABILITY

CITIES BY REGIONS	32° D/M	32° R	Rain D/M	Rain R	Cloudy D/M	Cloudy R	Fog D/M	Fog R	Wind R	Over-All P	Over-All NP
I. Northwest Coastal Region											
Hamburg	10.9	2	16.4	4	10.7	1	5.6	1	4	2	4
Kiel	11.0	2	15.3	3	9.1	1	High	2	4	2	4
Lubeck	11.7	3	15.2	3	7.0	4	2.8	2	(4)	4	4
Bremen *	10.0	1	16.0	3	8.9	2	High	2	4		
Flensburg *	11.0	2	16.0	3	9.0	2	-	-	4		
II. Ruhr - Lower Rhine											
Aachen	8.3	1	16.8	4	8.5	2	1.8	4	(2)	3	4
Cologne	6.3	1	15.5	3	5.3	4	1.4	4	(2)	3	4
Munster *	11.9	3	16.4	4	8.7	2	2.7	2	2		
Bochum	-	(1)	16.4	4	8.6	2	2.4	3	(2)	2	3
Dortmund	8.8	1	16.4	4	10.6	1	2.2	3	(2)	2	3
Essen	8.5	1	15.3	3	9.8	1	3.1	1	(2)	1	1
Wuppertal	8.1	1	16.4	4	10.1	1	1.6	4	(2)	2	2
Hagen	-	-	-	-	-	-	-	-		2	3
Duisburg	-	-	-	-	-	-	-	-		2	2
Dusseldorf	-	(1)	13.7	1	7.7	3	2.6	3	(2)	1	1
Krefeld *	8.0	1	15.4	3	5.8	4	1.1	4	(2)		
III. Hannover-Kassel Magdeburg Region											
Hannover	10.7	2	15.0	2	6.7	4	-	(3)	3	3	4
Brunswick	11.1	3	16.4	4	7.1	4	3	1	(3)	3	4
Magdeburg	11.0	2	15.2	3	7.8	3	2.7	2	(3)	3	4
Kassel	11.2	3	14.6	2	9.1	1	2.3	3	(3)	3	3
IV. Berlin - Leipzig Dresden Region											
Berlin	11.0	2	14.5	2	10.2	1	-	(2)	2	1	1
Dessau	12.3	4	13.0	1	7.1	4	2.8	2	(2)	4	2
Halle	11.0	2	14.4	2	7.3	4	2.0	4	(2)	4	3
Leipzig	12.2	4	13.8	1	8.4	3	2.6	3	(2)	4	2
Dresden	12.5	4	14.4	2	9.1	2	1.9	4	(2)	4	3
Stettin	13.0	4	13.7	1	8.0	3	4.0	1	(3)	3	2
Chemnitz *	14.2	4	15.6	3	8.4	3	4.5	1			
V. Upper Rhine Region											
Frankfurt	10.0	1	13.3	1	4.7	4	-	(1)	1	1	1
Stuttgart	10.3	2	14.2	1	8.1	3	-	(1)	1	1	1
Karlsruhe	10.7	2	14.6	2	8.5	2	2.7	2	(2)	1	1
Mannheim	-	-	-	-	-	-	-	-		1	1
Saarbrucken	-	-	-	-	-	-	2.8	2		1	1
Mainz *	9.0	1	13	1	9.7	1	3.3	1	-		
VI. Bavarian Upland											
Munich	16.4	4	14.5	2	8.9	2	-	(1)	4	4	3
Augsburg	14.3	4	13.8	1	8.1	3	3.3	1	(3)	4	2
Nuremburg	15.0	4	14.5	2	8.4	3	6.1	1	1	4	1

(See next page for Explanation of Terms and Rating Procedure)

Table 7

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TABLE 7
(cont.)

Explanation of Terms and Rating Procedure

/ 32° — In this column are given the average number of days per month from October through April only on which freezing temperatures were recorded.

Rain — In this column are given the average number of days per month on which precipitation occurs.

Cloudy — In this column is given the average number of days per month which are cloudy (more than 8/10 cloud) minus the average number of days per month which are clear (less than 2/10 cloud). Therefore, this single figure takes into consideration the number of clear days as well as the number of cloudy days.

Fog — In this column is given the average number of days per month on which fog occurs.

Over-All — The quartile ratings for each city in relative vulnerability to Persistent (P) and Non-persistent (NP) gas are given in this column. For Persistent gas this is based on a combination of the first four ratings in the table giving double values to the ratings for / 32° which is the most important single factor. For Non-persistent gas, the over-all rating is based on a combination of the last four ratings in the table giving double values to the ratings for Wind which is the most important single factor.

(o) Figures in brackets are estimates based upon data for stations believed comparable.

(*) Stations marked with an asterisk are not target cities but are included because they were useful in determining regional boundaries and in estimating ratings for stations on which data is not available.

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EFFECT OF CLIMATE ON TARGET SELECTION

While day to day weather variations are easily sufficient to affect the success of a proposed gas attack in Germany, there are general climatic considerations based on the frequency of critical weather conditions that may with validity enter into the selection of a target program. The two principal uses of this data are: (1) to determine the type of munition which is most likely to encounter favorable weather conditions at each target, and (2) to determine the relative frequency of favorable and unfavorable weather conditions in choosing between two targets.

It should be emphasized, however, that German cities generally are vulnerable to gas attack and any differences noted in this report are indicative of relative degrees of vulnerability.

Weather conditions at the target are critical factors in determining the success of gas attack and the type of munition to be used. The two principal types of munition are the persistent gases (mustard) and the non-persistent gases (phosgene). Weather factors affecting their use and potential success are not the same for these two types. Satisfactory temperatures for the use of persistent gases are 60° Fahrenheit and higher. Temperatures do not materially affect non-persistent gases but in winds in excess of 15 m.p.h. they disperse rapidly. Non-persistent gases also are impaired in effectiveness at times of meteorological conditions of lapse or excessive turbulence. The order of importance of weather factors is: (1) for persistent gases - Temperature, Rainfall, Cloud and Fog, and Wind; (2) for non-persistent gases - Wind and Lapse, Rainfall, Cloud and Fog, and Temperature.

At temperatures below 50° Fahrenheit, the use of mustard gas (the principal persistent gas) is not recommended, but low temperatures do not significantly affect the use of non-persistent gases. Rainfall washes away both persistent and non-persistent gases thus reducing their effectiveness. Still air conditions are important in the effect of non-persistent gas attack. The most significant air movements are caused by wind, but the direct effect of strong sunlight is to create lapse or strong up-drafts which carry away gas. Clouds which prevent sunlight from reaching the earth are significant in reducing the lapse effect of sunlight. The lower volatility of persistent gases reduces the effect of wind and lapse.

Map II, locates the target cities and indicates relative vulnerability to persistent and non-persistent gases. Also shown on the map are six climate regions into which the thirty target cities can be divided on the basis of uniformity of the climate factors affecting gas attack. The extreme cases for three of these climate factors (number of days of precipitation, wind velocity, and number of days of freezing weather) fall into very definite patterns and the approximate median line of cases for each of these three factors is drawn across the map.

App. A

In Table 7, the target cities are arranged by regions and quartile ratings shown for each of the key climate factors. Quartile ratings for vulnerability to persistent and non-persistent gas attack based on a summary of the pertinent climate factor ratings are also given. These quartile rating for vulnerability are also given in the Summary Target Selection Table.

The following statements summerize the climate conditions affecting the use of gas in each of the six regions while under the description of each target city, any significant deviations from the regional averages are noted.

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I. Northwest Coastal Region

Stations which are grouped under this region are Hamburg on the North Sea, Kiel and Lubeck on the Baltic Sea.

As shown on Map II, these stations are in the high velocity wind zone, above the median in number of days of precipitation and below the median in number of days below freezing in the winter. In general, the climate of this region is slightly more favorable than average for persistent gas atteck in spring and fall but one of the least favorable for non-persistent gas attacks.

Except for Lubeck, fog and cloud conditions are favorable.

II. The Ruhr Region

Stations which are grouped in this region are the Ruhr cities of Duisburg, Essen, Wuppertal, Bochum, Dortmund, Hagen and Dusseldorf and the related cities of Cologne and Aachen.

As shown on Map II, these stations are in the low velocity wind zone, and have the least number of days of freezing weather and the largest number of days with precipitation of any region.

Within this set of common conditions there is, however, a considerable variation in the number of clear, cloudy and foggy days which results in some cities being placed above and others below the average in vulnerability of the target cities. In general, the climate is slightly more favorable than average for persistent gas attacks and slightly less favorable than average for non-persistent gas attack.

The cities outside the Ruhr are comparable to the cities within the Ruhr except that there are fewer cloudy and foggy days.

III. The Hannover-Magdeburg-Kassel Region

Stations which are grouped under this region are Hannover, Brunswick, Magdeburg and Kassel.

As shown on Map II, these stations are near the borderline of the high velocity wind zone and the median for days of rain and number of days with freezing temperatures in the winter. In general, the climate of the region is less favorable to gas attack (especially non-persistents) than other parts of Germany.

IV. The Berlin - Leipzig - Dresden Region

Stations which are grouped under this region are Stettin on the Baltic Sea, Berlin and the more closely grouped cities of Dessau, Halle, Dresden, and Leipzig.

As shown on Map II, most of the stations are in the low velocity wind zone and below the median in number of days of precipitation per month. However, with the exceptions of Berlin and Halle, these stations are above the median in number of days below freezing during the winter. In general, this region is not so favorable to persistent gas attack during the winter months as western Germany but is reasonably favorable to non-persistent gas attack throughout the year.

Berlin is an exception to the region in having weather as favorable for gas attack as any city in Germany. The exceptional factors are a high proportion of cloudy days per month and a low proportion of days with freezing temperatures during the winter.

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V. The Upper Rhine Region

Stations which are grouped under this region are Karlsruhe, Mannheim, Frankfurt, Stuttgart and Saarbrucken.

As shown on Map II, this region is in the low velocity wind zone, and is below the median in number of days of rain and freezing weather per month. In all factors except the number of clear and cloudy days per month this region is more favorable to either persistent or non-persistent gas attacks than any other part of Germany.

No data is available for Mannheim and for Saarbrucken only the number of days of fog per month are known, but conditions throughout the region are so uniform that until data should be available it is assumed that Mannheim and Saarbrucken rank with the other stations in the region.

VI. The Bavarian Upland Region

The stations which are grouped under this region are Munich, Augsburg and Nuremburg.

As shown on Map II, this region is below the median in number of days with precipitation but above the median in the number of days of freezing weather per month. In general, this region is not so favorable to either persistent or non-persistent gas attacks as other parts of Germany. Favorable factors are relatively numerous foggy days and less than the median number of days of rain per month. Unfavorable factors are less than the median number of cloudy days, numerous days below freezing in the winter and (with the exception of Nuremburg) high wind velocities.

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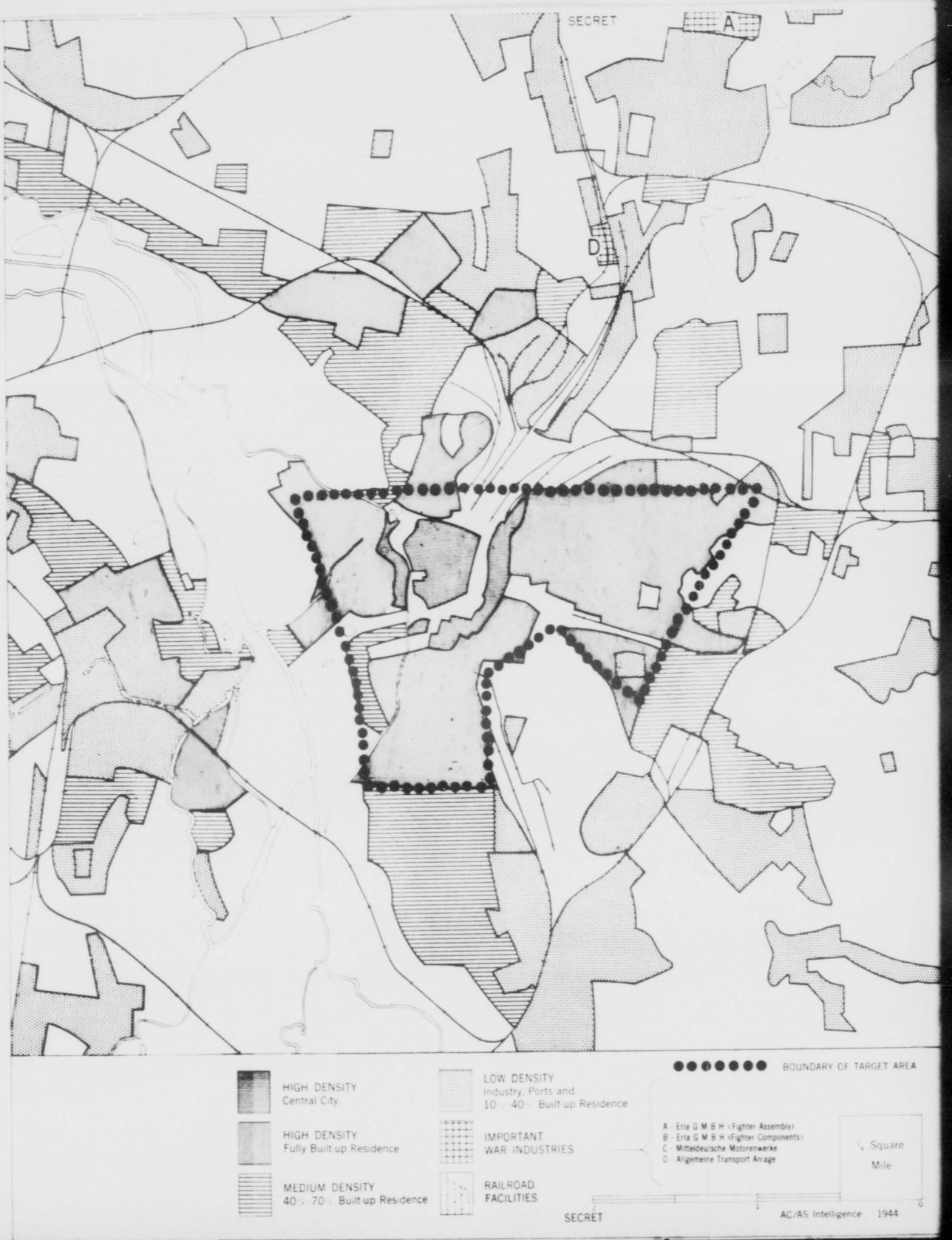

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3. LEIPZIG

(1) Summary of Evaluation Data

a. Location - in north central Germany
540 miles from London
700 miles from Foggia

b. Population - 720,000
Fifth city in Germany

c. Developed Area - 11,700 acres
Density - 60 persons per acre

d. Target Area-3.5 square miles
-2250 acres

e. Rating of Target Area for:

Effect on Population	1
Effect on War Industry	1
Terrain	2
Climate (persistents	4
(non-persistents	2

(2) Strategic Importance

Leipzig is an important industrial, commercial and administrative center of eastern Germany. Railroad lines radiate in all directions, and there are extensive railroad yards both in the center and to the east and west of town to handle the heavy through and local traffic. The Leipzig trade fairs are an important part of the commercial life of Germany, and the city is the trading and manufacturing center of the German book publishing industry. It is the seat of the Supreme Law Courts of Germany, as well as of the University. Leipzig is an important center of the German aircraft and other wartime industries, and includes the following important war plants: Allgemeine Transport Anlagen (bomber assembly), Junkers Flugzeug und Motorenwerke (bomber assembly), Erla Maschinenwerk (fighter assembly, components), Mitteldeutsche Motorenwerke (Jumo aero-engines); DAF Bearing Plant (aero-engine bearings); Bussing N.A.G. (armored fighting vehicles).

(3) Description

a. Layout

Leipzig lies on flat land at the confluence of two small rivers which form a wide flat valley separating the largest part of the city's high density developed areas on the east from the high density residential and industrial district of Lindenau to the west. The principal industrial areas are located to the north of the Central Railway Yards, to the west in Lindenau, and to the south. A number of park spaces and University property cut into the high density areas, and the old town is encircled by a wide belt of boulevards and public buildings.

b. Vulnerability

Streets in the high density areas are regularly laid out on a grid pattern. Multi-storied tenements predominate. The high density districts in Leipzig proper have an area of about 2,000 acres including the belt of public buildings and boulevards surrounding the central city. The high density areas of Lindenau have an area of about 300 additional acres.

c. Weather

Leipzig is in the Berlin-Leipzig-Dresden Region and conforms to all regional characteristics. Weather conditions are less favorable to persistent gas attack in winter and slightly more favorable to non-persistent gas attacks than the average German city.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central high density residential district, and the central city area. Within this target area of 3.5 square miles are: approximately 430,000 persons, the business and administrative centers, and the central railroad station. Adjacent on the north are important railroad yards, but to the west, southeast and east the target is adjoined by half mile wide open spaces. There are no important industrial plants within or adjacent to the target.

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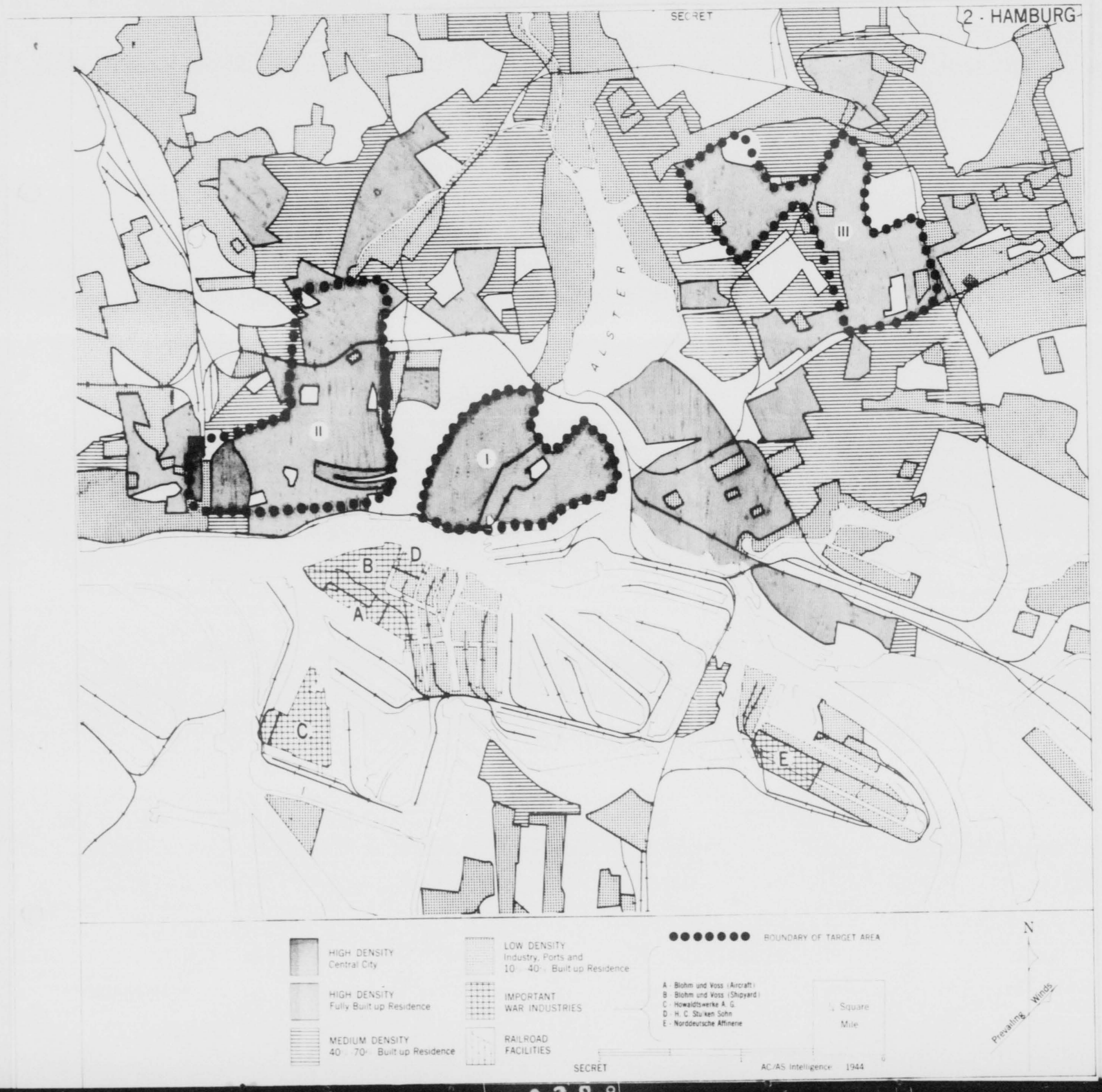

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THIS PAGE I:

(1) Summary of Evaluation Data

a. Location - in northwestern Germany
450 miles from London
860 miles from Foggia

b. Population - 1,130,000
Second city in Germany

c. Developed Area - 13,500 acres
Density - 84 persons per acre

d. Target Area-3.75 square miles
-2400 acres

e. Rating of Target Area for:

Effect on Population	1
Effect on War Industry	1
Terrain	3
Climate (Persistents	2
(non-persistents	4

(2) Strategic Importance

Hamburg is the most important peacetime seaport in Germany, and is an industrial and commercial center of restricted wartime importance. It is connected by the Elbe River and railroads with the rest of Germany. The shipbuilding, oil and aircraft industries include the following important war plants: Blohm und Voss Shipyard (submarines), Howaldtswerke Vulcan Werft Shipyard (submarines), Deutsche Werft Shipyard (submarines), H.C. Stulcken Sohn Shipyard (submarines); Europaische Tanklager Oil Refinery (refining of crude), Rhenania Ossag Oil Refinery (refining of crude); Klockner Aero-engine Plant (BMW 801); Vereinigte Deutschmetallwerke (airplane propellers); Blohm und Voss (aircraft components); Humboldt Deutz (Diesel engines); Norddeutsche Affinerie (copper, lead, sulphuric acid).

(3) Description

a. Layout

Hamburg, and the adjoining cities of Altona and Wandsbeck form a compact urban area on the north side of the Elbe River, grouped around the Alster Lake. The port area is principally on the south side of the river. The high density central city areas south and southwest of Alster Lake are surrounded by a belt of open spaces and public buildings. High density tenement areas lie to the west and east of Alster Lake. The terrain is flat in the area around Hamburg. Heavy industry is located along the river or railways in the port area while light industries are scattered throughout the central city.

b. Vulnerability

Streets are narrow and winding except for occasional wide boulevards which traverse the high density areas. Multi-storied brick commercial or residential buildings and warehouses predominate throughout the high density areas. The high density areas of Hamburg have an area of 3 square miles with average densities of over 200 persons per acre, the highest density of any German city, and equally congested areas are adjacent on the west in Altona.

c. Weather

Hamburg is in the Northwest Coastal Region and conforms to all regional characteristics. In general, weather conditions are slightly more favorable than average for persistent gas attack in spring and fall but among the least favorable for non-persistent gas attacks.

(4) Recommended Areas for Attack

Three areas are recommended for attack: They have been selected with due consideration to the damage inflicted by air attack through August 1943.

I. This target comprises the central city which is one square mile in area. Within this area are: approximately 200,000 persons (nighttime population about 100,000), the business and warehouse center. Adjacent on the south is the port along the Elbe River which includes the submarine construction yards. Adjacent on the northeast is the central railroad station.

II. This target comprises the high density residential district east from Altona railroad station, north from the Elbe, west from the public building and park belt around the central city, and south from Eimsbuttel, the most densely peopled tenement area in Hamburg. Within this one and one-half square mile target are: approximately 190,000 persons. Adjacent on the west is the Altona railroad station. Adjacent on the southeast is the port area including the submarine construction yards.

III. This target comprises the high density residential district in the northeast quarter of the city. Within this one and one-quarter square mile target are approximately 140,000 persons. This area is approximately one mile north of the port and southeast industrial district.

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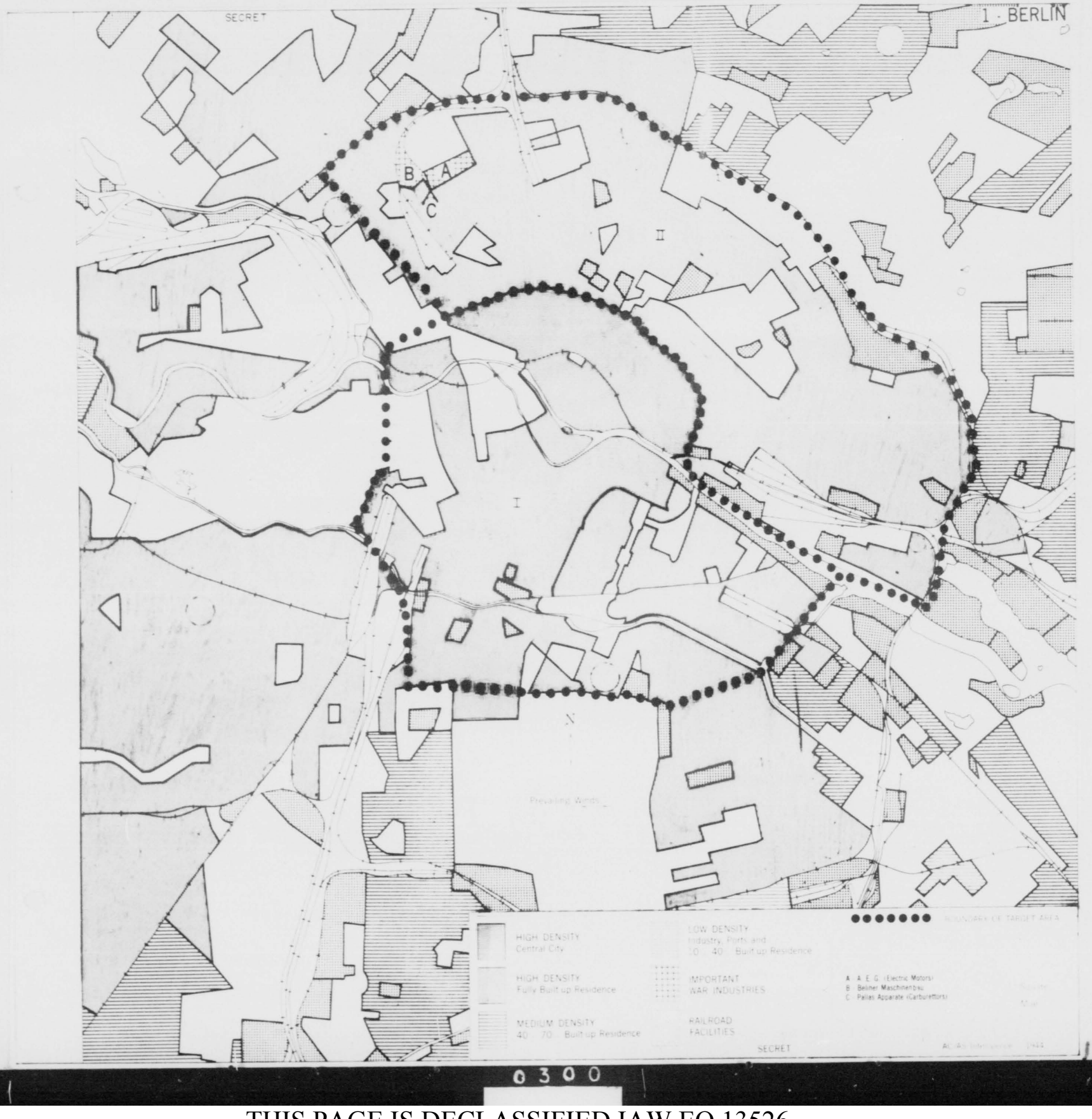

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(1) Summary of Evaluation Data

a. Location - in north central Germany
570 miles from London
790 miles from Foggia

b. Population - 4,400,000
First city in Germany

c. Developed area - 69,100 acres
Density - 63 persons per acre

d. Target Area - 15square miles
-9,600 acres

e. Rating of Target Area for:

Effect on Population	1
Effect on War Industry	1
Terrain	3
Climate (persistents	1
(non-persistents	1

(2) Strategic Importance

Berlin is important as the control center of the German government (despite removal of many administrative offices); as an industrial center, especially for machinery and electrical equipment; and as a rail and highway center on routes leading to all parts of Europe.

Important war plants are: the BMW, Daimler-Benz and Argus aero-engine plants; the Bussing-Nag, Ford and Daimler-Benz truck plants; and the Heinkel, Henschel and Weser bomber assembly plants. Other important plants are: Siemens-Schuckert, Siemens and Halske, and Allgemeine Elektrizitats Gesellschaft (electrical equipment); Ambi-Budd, Deutsche Industrie-Werke, Pallas Apparate, and Rheinmetall-Borsig (machinery and armaments); Borsig Lokomotive-Werke; and the Berliner Maschinenbau.

(3) Description

a. Layout

Berlin is located in the middle of the north German plain, in a shallow depression through which runs the River Spree. The densely built-up part of Berlin is an area of about 35 square miles contained within the ring railway (Ringbahn). In the middle of this elliptical area is the commericial and government center comprising old and new structures. To the west of the city center is the large Tiergarten Park and to the southeast is Templehof Airdrome. Aside from these two large open areas, several smaller parks and small industrial areas, Inner Berlin is densely built-up with crowded apartments. Most of the important industrial plants are located in scattered suburban developments outside the Ringbahn. There are no hills in the vicinity.

b. Vulnerability

The congested multi-storied structures of Inner Berlin are served by narrow streets but many wide boulevards have been opened. The almost universal building material is brick.

Densities in Berlin are the highest in Germany. Densities in the tenement districts range from 150-300 persons per acre, with the average for all of Inner Berlin (within the Ringbahn) at 90 persons per acre. The central city has low night-time densities (10 to 80 persons per acre) but during the day is the most congested part of the city. Of the tenement areas, the most dense lie adjacent to and on the southeast and northeast of the central city. The medium density districts outside the Ringbahn average about 50 persons per acre.

c. Weather

Berlin is in the Berlin-Leipzig-Dresden Region but it is an exception to the region in having weather as favorable to gas attack as any city in Germany. Local conditions of significance are a high proportion of cloudy days per month and a low proportion of days with freezing temperatures in the winter.

(4) Recommended Areas for Attack

Two areas are recommended for attack.

I. The central City

An attack during daytime (early morning to dusk) might be aimed at the City which is a very high density area during these hours. The 7½ square miles contain: about 600,000 persons which would be increased during the day; the principal government buildings and principal railroad stations; the business and commercial center; and many small industrial establishments. Adjacent on the southwest are the Tempelhof marshalling yards.

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(4) Recommended Areas for Attack (Cont'd)

II. Northeast Sector

This sector comprises the residential districts of Prenzlauerburg and Freidrichshain which lie north and east of the central City. The average density is 130 persons per acre over the total area of 7½ square miles. This target area contains 650,000 persons, and the Berliner Maschinenbau, Pallas Apparate, and A.E.G. factories. Adjacent on the west are the Putlitzstrasse and Lehrter marshalling yards.

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APPENDIX B

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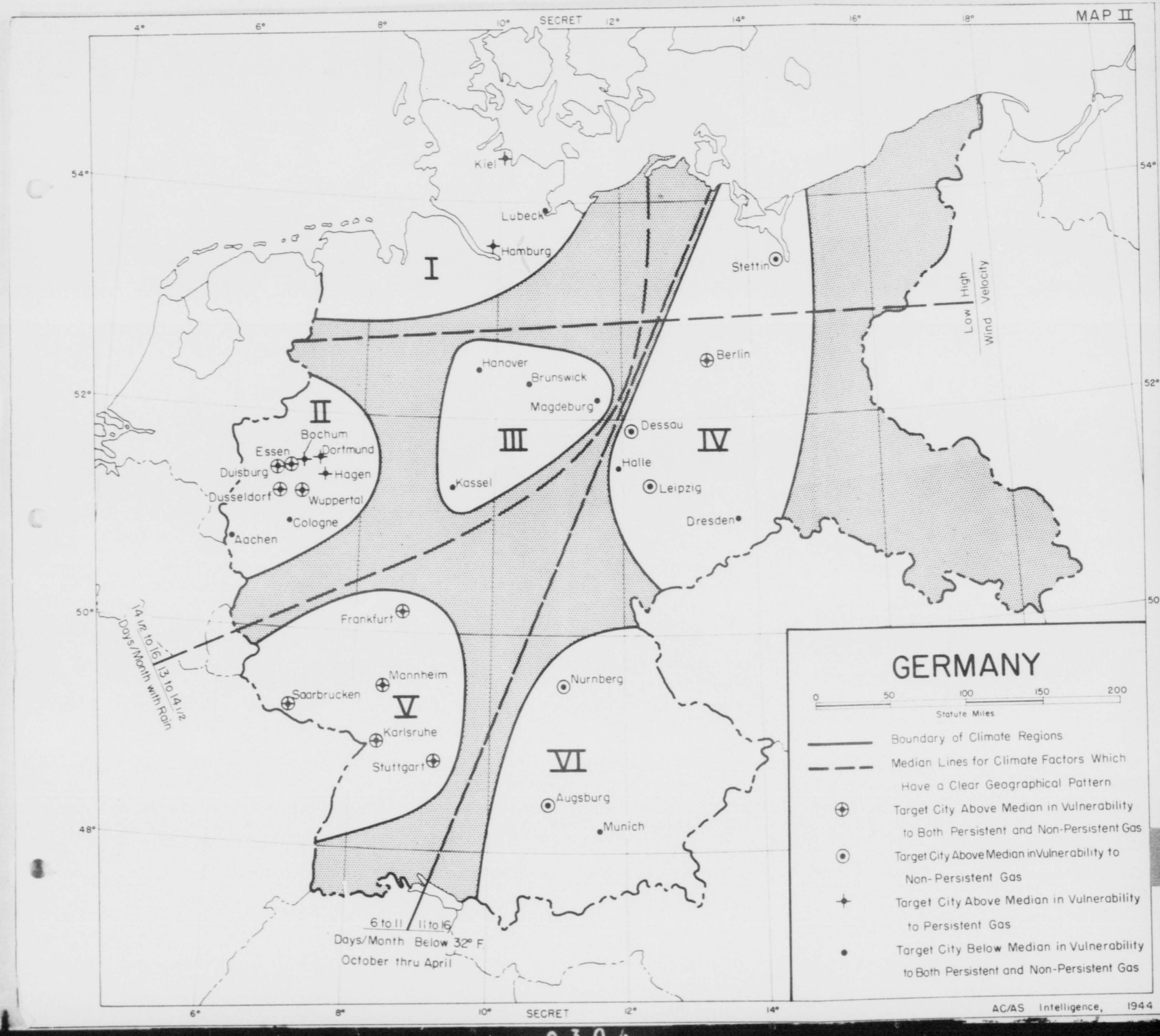

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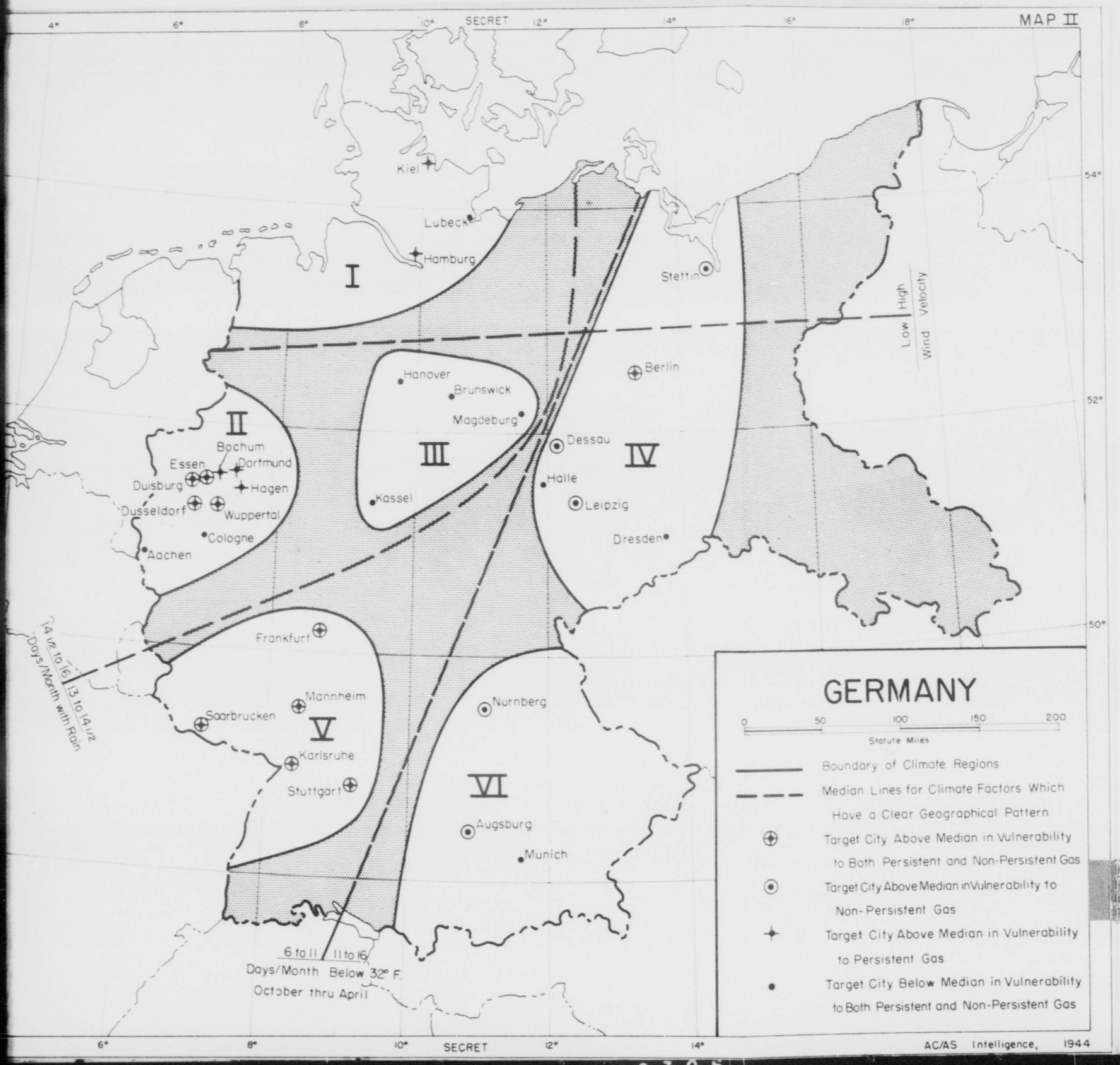

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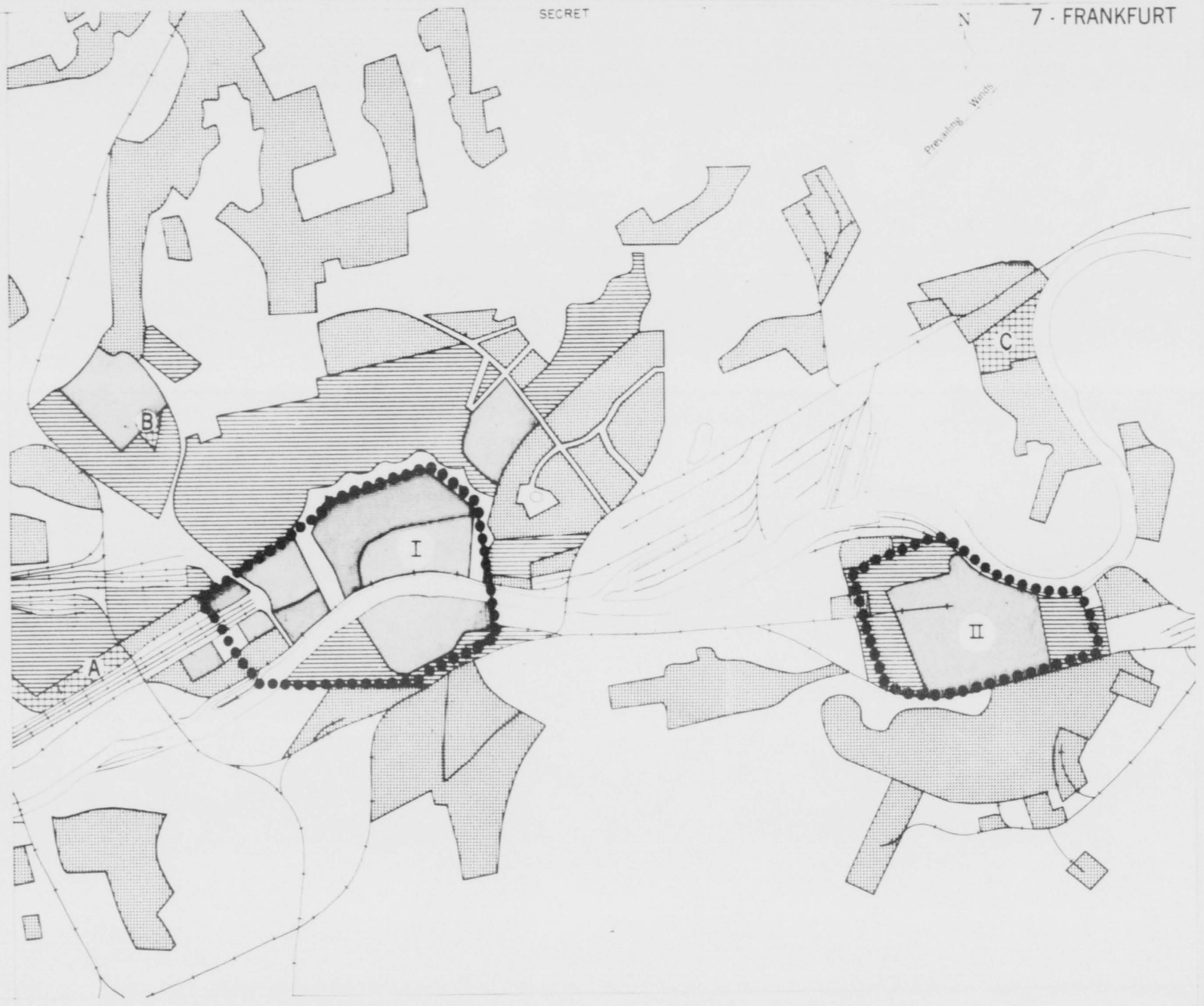
7 - FRANKFURT



HIGH DENSITY
Central City

HIGH DENSITY
Fully Built-up Residence

MEDIUM DENSITY
40%-70% Built-up Residence

LOW DENSITY
Industry, Ports and
10%-40% Built-up Residence

IMPORTANT
WAR INDUSTRIES

A - Adlerwerke
B - Hartman and Braun
C - I. G. Farben

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

¼ Square Mile

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7. FRANKFURT ON MAIN
(including Offenbach)

(1) Summary of Evaluation Data

a. Location - in western Germany
390 miles from London
690 miles from Foggia

b. Population - 570,000
Ninth city in Germany

c. Developed area - 13,750 acres
Density - 47 persons per acre

d. Target area - 3 square miles
- 1900 acres

e. Rating of Target area for:

Effect on Population	2
Effect on War Industry	1
Terrain	2
Climate (persistents	1
(non-persistents	1

(2) Strategic Importance

Frankfurt is the commercial, industrial and transportation center of the Upper Rhineland. The inland port is connected to the Rhine by canal and important rail lines pass through Frankfurt carrying traffic between Central Europe and France and Spain. Industrially, Frankfurt rands high among German cities, especially in war production. The numerous engineering, electrical apparatus, chemical, food and clothing industries include the following important war plants: the Adler Werke (armored fighting vehicles); Farbwerke (explosivis and war gases); Alfred Teves, Hartmann and Braun A.G.,Vereinigte Deutsche Metallwerke (aircraft parts and instruments), and Max Gerner (TEF wings).

(3) Description

a. Layout

Frankfurt's developed areas are stretched for several miles along the north bank of the Main River. South of the river are the high density residential towns of Sachsenhausen directly south of Frankfurt's center and Offenbach two miles east. Hills rise 100 to 300 feet immediately behind Frankfurt and its satellites forming a narrow valley only two miles wide but which widens to the east and west of Frankfurt's built-up districts. Most of the large industrial plants are dispersed along the Main River, but important plants are located between Frankfurt and Offenbach and immediately west of the central area.

b. Vulnerability

Streets in the high density areas are narrow except for a few boulevards. Brick four story tenements predominate but many of the central city buildings are half-timbered. The high density districts in Frankfurt and Sachsenhausen have an area of 800 acres with average densities of 100 to 200 persons per acre. Offenbach has a 400 acre district of equal density.

Adjacent to the high density districts are medium density districts of wide streets and lower buildings totalling 1,500 acres in area and with average densities of 40 to 80 persons per acre.

c. Weather

Frankfurt is in the Upper Rhine Valley Region where weather conditions are more favorable to gas attacks than any other part of Germany. Local conditions include a high percentage of clear days and the effect of the narrow Main valley which channels winds in northeast and southwest directions.

(4) Recommended Areas for Attack

Two areas are recommended for attack.

I. The two square mile high density area comprising Frankfurt and Sachsenhausen. Within this target area are: approximately 130,000 persons (with a decrease to 115,000 at night) and the business and administrative centers. Adjacent on the west are the Adler Werke and Alfred Teves plants, a classification yard and the main railroad station. Adjacent on the east is the port, another classification yard and the gas works.

II. The one square mile high density residential district in Offenbach with a population of approximately 60,000. To the northwest are a Farben plant, the port and classification yard and city gas works.

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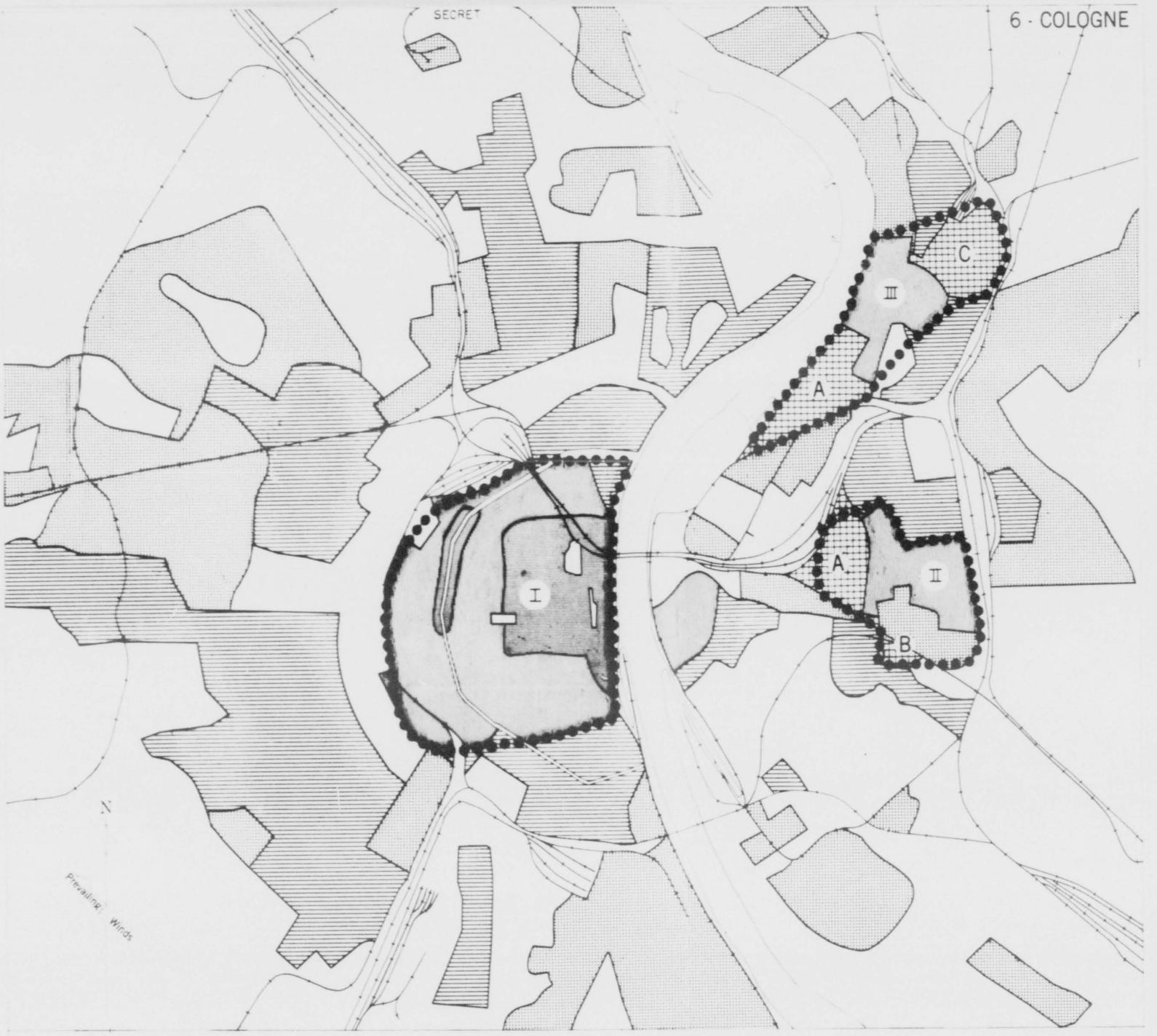

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6. COLOGNE

(1) Summary of Evaluation Data

a. Location - in western Germany
300 miles from London
780 miles from Foggia

b. Population - 906,000
Third city in Germany

c. Developed Area - 16,500 acres
Density - 46 persons per acre

d. Target Area - 4 square miles
- 2,550 acres

e. Rating of Target Area for:

Effect on Population	2
Effect on War Industry	1
Terrain	4
Climate (Persistents	3
(non-persistents	4

(2) Strategic Importance

Cologne is the center of trade, traffic and political activety in the Rhine Province. It possesses important industrial establishments but its greatest significance lies in its situation at the crossing of a number of trade routes. Cologne is the chief railway center of the Rhineland with main lines running north, south, east, and west. It is an inland port of great importance with extensive harbourage on the Rhine for the heavy river traffic. Industrially, Cologne is one of the more important cities in war production. Factories manufacture armaments, machines and machine tools, chemicals, rubber, textiles, iron and steel. Outstanding industries are the Humboldt Deutz truck plant, Felten and Guillaume cable plant (cables and wire); Gottfried Hagen A.G. (submarine batteries); and Humboldt Deutz (Diesel engines).

(3) Description

a. Layout

The city of Cologne is bi-sected by the Rhine. On the west bank of the Rhine lies the central city area surrounded in concentric belts by a ring of boulevards, the compact residential area, the belt of railway tracks, an open belt, and the outer residential - industrial areas. East of the Rhine the layout of the whole area is conditioned by the railroad tracks which converge on the Hohenzollern bridge. Between the tracks are the industrial areas of Deutz, Mulheim and Kalk. There are no hills in the vicinity.

b. Vulnerability

The old town, in the center of Cologne on the west bank, is a very congested district with narrow streets and 4 - 6 story buildings of timber and brick. The high density districts include on the west bank the central city area and the surrounding residential areas. On the east bank the high density districts lie inside the railway belt. The high density districts cover about 1,800 acres and have a density of population of approximately 120 persons per acre. The medium density districts have an acreage of 4,300 and a density of population of about 50 persons per acre.

c. Weather

Cologne is in the Ruhr Region and conforms to all regional characteristics, except that cloudy and foggy days are less numerous. Weather conditions are less favorable for gas attack than in the average target city.

(4) Recommended areas for attack

The following three areas have been recommended for attacks:

I. This area of 2½ square miles comprises the central city and the surrounding high density residential district. Within this area are: approximately 230,000 persons, the main railroad station, and the commercial center. Adjacent on the northwest and southwest are railroad yards.

II. This area of 3/4 square mile comprises the high density residential area of Kalk and the industrial districts to the south and west. Within this area are: approximately 50,000 persons, the Gottfried Hagen plant and the Humboldt Deutz truck plant. Adjacent on the east and west are the railroad yards, and the target is completely encircled by railroad lines.

III. This area of one square mile comprises the high density residential area of Mulheim and the industrial districts to the northeast and southwest. Within this area are: approximately 45,000 persons, the Humboldt Deutz plant and the Fleten and Guillaume plant. Adjacent to the north and southwest are railroad yards and additional industrial districts.

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5 MUNICH

HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 - 70 % Built up Residence

LOW DENSITY
Industry, Ports and
10 - 40 % Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A - B. M. W. Aero-Engine Plant
B - Metzler Gummiwerke
C - Motorenwerke Mannheim

½ Square Mile

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(1) Summary of Evaluation Data

a. Location - in southern Germany
570 miles from London
510 miles from Foggia

b. Population - 820,000
Fourth city in Germany

c. Developed Area - 14,000 acres
Density - 53 persons per acre

d. Target Area - 5 square miles
- 3200 acres

e. Rating of Target Area for:

Effect on Population	1
Effect on War Industry	2
Terrain	4
Climate (persistents	4
(non-persistents	3

(2) Strategic Importance

Munich is the political and commercial capital of Bavaria, the most important transportation center in southern Germany, and an industrial area of considerable wartime importance. There are also several military barracks and depot areas. The railroad yards at Munich handle a large part of the traffic to and from Italy and Austria. About 40% of the population depends upon industry, 27% on trade and transport, and 15% on administrative services. The aircraft, chemical and engineering industries of the area include the following important war plants: B.M.W. aero-engine plant; B.M.W. aero-engine plant at Allach; Metzeler Gummiwerke (rubber tires); Krauss-Maffei at Allach (locomotive); Vorderstemann and Steitz (aluminum foundry).

(3) Description

a. Layout

Munich is situated on the banks of the Isar River with the bulk of the built-up area west of the river. From the central city area there extend in all directions large areas of high density residential blocks broken by public building districts, railroad tracks, the river and park spaces. Low density suburban areas lie at some distance from the city on all sides. The terrain of the city slopes slightly from south to north. Light industries are scattered throughout the city, but larger factories lie along the railroads on the margins of the city with notable industrial concentrations north of town and to the west around the main east-west railroad yards.

b. Vulnerability

The streets in the high density areas are narrow and winding for the most part, but with a more regular grid pattern in some of the residential districts. Four story, solidly built blocks predominate, with a high proportion of old brick and plaster buildings in the central city area. Substantial stone public buildings predominate in the administrative areas. The high density sections have an area of about 2,100 acres with average densities of over 100 persons per acre. In addition, there are about 1,000 acres of public building districts with daytime densities of over 100 persons per acre.

c. Weather

Munich is in the Bavarian Upland Region which is relatively not so favorable to either persistent or non-persistent gas attacks as other parts of Germany. Due to high altitude in the foothills of the Alps, there are numerous days of freezing weather and high wind velocities.

(4) Recommended Areas for Attack

The area recommend for attack comprises the central city and the adjacent high density residential districts. Within this area are: approximately 380,000 persons, the business centers, part of the administrative sections, a barracks, the main railroad station and yards, and the Metzeler Gummiwerke. Adjacent on the west are the main railroad yards, and on the southeast and southwest additional railroad yards. Less than a half mile to the northwest in the Vorderstemann and Steitz aluminum works. The river runs through the eastern part of the target area.

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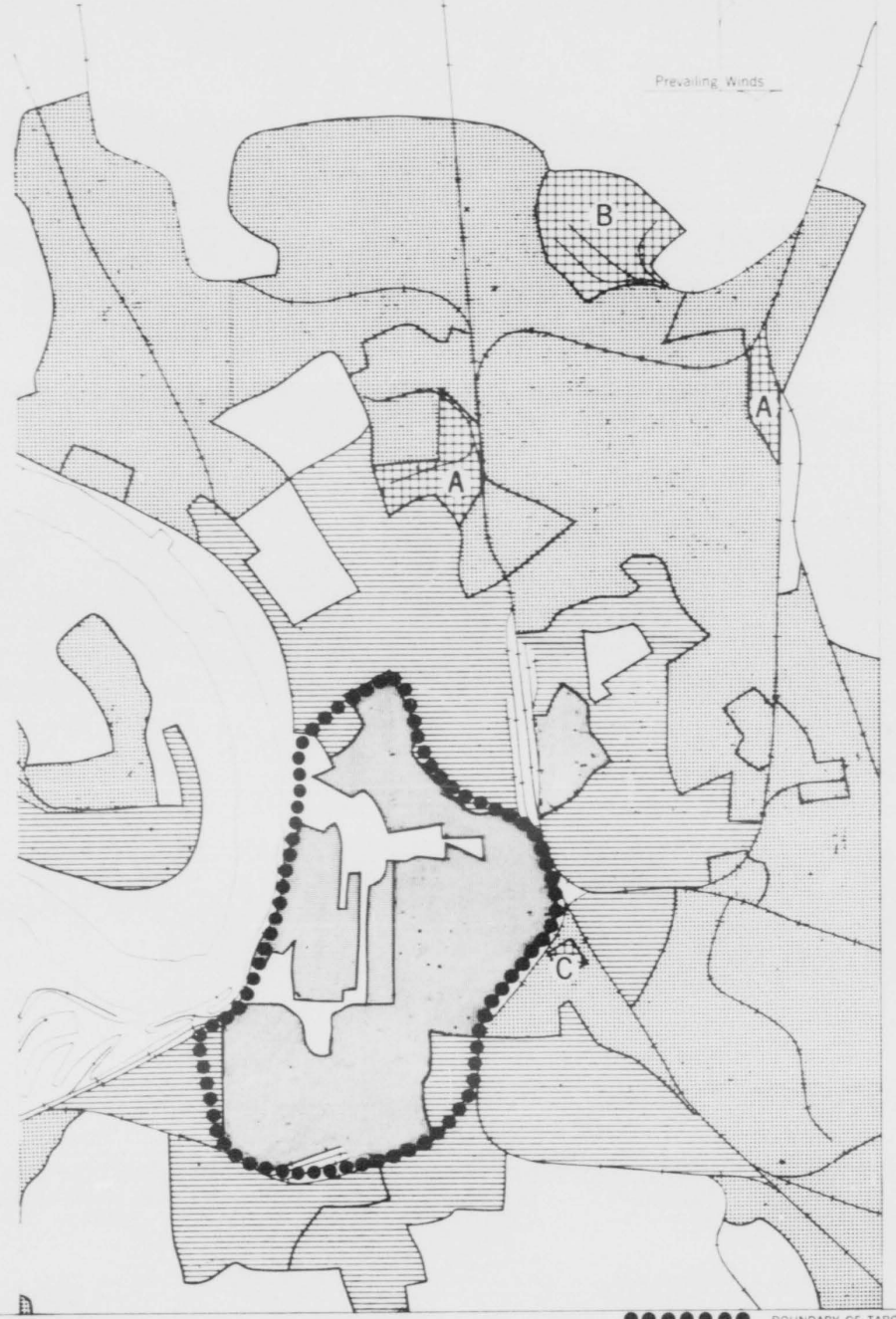
4 - DUSSELDORF



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(1) Summary of Evaluation Data

a. Location - in western Germany
300 miles from London
800 miles from Foggia

b. Population - 530,000
Eleventh city in Germany

c. Developed Area - 10,000 acres
Density - 55 persons per acre

d. Target Area - 2 square miles
- 1280 acres

e. Rating of Target Area for:

Effect on Population	1
Effect on War Industry	2
Terrain	3
Climate (persistents	1
(non-persistents	2

(2) Strategic Importance

Dusseldorf, on the Rhine river, is one of the largest centers of the German steel and machine industry. It has important port areas and railway facilities. Dusseldorf produces electric steel, steel products, munitions, guns, shells, tanks, heavy chemicals, soap, war gases. Special plants are Henkel and company (chemicals), Mannesmann-Rohrenwerke (steel products and munitions), Rheinmetall-Borsig A.G. (armaments and heavy engineering), and Schiess (armaments and machine tools).

(3) Description

a. Layout

Dusseldorf is situated on level land on the right bank of a bend of the Rhine. Across the river is the important industrial suburb of Neuss. The central city area lies along the river bank and the fully-built up residential areas surround it. Hills rise gradually in the northeast. The chief industrial areas lie on the edges of the compact built-up area of the city and on the west bank of the Rhine at Neuss.

b. Vulnerability

Streets are narrow and irregular in the medieval town but wider in the rest of the central city area. There are many commercial and public buildings of the modern multi-storied type. In the residential area there are wide streets and 3 to 5 story tenement blocks. The high density districts cover an area of 1400 acres with a density of population of at least 100 persons per acre. The medium density areas form a belt around the high density districts and cover about 2500 acres. The density of population is from 50 to 75 persons per acre.

c. Weather

Dusseldorf is in the Ruhr Region and conforms to all regional characteristics. However, except for cloud and fog conditions weather factors are unusually favorable for gas attacks and Dusseldorf ranks as one of the most vulnerable German cities.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city and the adjacent high density residential areas to the north, east and south. Within this target area are: approximately 190,000 persons and the main business center. The railroad bounds the target on the south and east, and the port is adjacent on the west and southwest.

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11 - WUPPERTAL

HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 - 70 % Built up Residence

LOW DENSITY
Industry, Ports and
10 - 40 % Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A Joeger Roller Bearing Plant
B Vorwerk Rubber Tire Plant

¼ Square
Mile

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11. WUPPERTAL

(1) Summary of Evaluation Data

a. Location - in western Germany
310 miles from London
800 miles from Foggia

b. Population - 411,000
Sixteenth city in Germay

c. Developed Area - 8,500 acres
Density - 48 persons per acre

d. Target Area - 2.5 square miles
- 1600 acres

e. Rating of Target Area for:

Effect on Population	1
Effect on War Industry	3
Terrain	1
Climate (persistents	2
(non-persistents	2

(2) Strategic Importance

Wuppertal, combining Elberfeld and Barmen, is an industrial city producing textiles, small machinery, tools and rubber. Important war plants include: the Vorwerk rubber tire plant and the Jaeger roller bearing plant.

(3) Description

a. Layout

Wuppertal is situated in the deep valley of the Wupper which flows from southwest to northeast between steep hills 300 to 400 feet high. The valley floor widens at two points and here are sited the centers of the two towns of Elberfeld and Barmen; between them the valley is narrow and the urban belt a very narrow strip. The great majority of the factories are small and they are concentrated on the valley floor alongside the river and the railway. The largest industrial areas in this belt lie at the eastern and western extremities of the valley.

b. Vulnerability

The central city area at Elberfeld is very congested with narrow streets and buildings of 4 - 6 stories. Barmen is much less congested with buildings of 3 - 4 stories. The factories are box-like brick buildings with several stories and have tall chimneys. Density of population of the high density districts is about 100 persons per acre and of the medium density districts about 50 persons per acre.

c. Weather

Wuppertal is in the Ruhr Region and conforms to all regional characteristics. In general, weather conditions are slightly more favorable for gas attack than in the average target city.

(4) Recommended Areas for Attack

The recommended target area comprises the central city areas of Elberfeld and Barmen and the high density residential and industrial districts around and between the two centers. Within this area are: approximately 225,000 persons, the commercial centers and the two main railroad stations. Adjacent to the south and southwest are the railroad lines and railroad yards, with industrial areas adjacent to the southwest and northeast. The Wupper River flows through the target area.

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10. HALLE

(1) Summary of Evaluation Data

a. Location - in north central Germany
520 miles from London
720 miles from Foggia

b. Population - 210,000
Twenty-sixth city in Germany

c. Developed area - 3,500 acres
Density - 56 persons per acre

d. Target area - 2 square miles
-1280 acres

e. Rating of Target Area for:

Effect on Population	1
Effect on War Industry	3
Terrain	3
Climate (persistents	4
(non-persistents	3

(2) Strategic Importance

Halle is a commercial, industrial, and agricultural processing center and is an important junction on a main rail line from Berlin to south Germany. Much of Halle's industry centers around the processing of sugar beet and other agricultural products from the surrounding region, but there are some important war industries in and near Halle which draw heavily on workers from this city. Important war plants include the following: Siebel Flugzeugwerke (Junkers TEF and bomber assembly); I. G. Farben plants at Leuna (synthetic oil and chemicals); Buna G.m.b.H. at Schkopau (buna rubber).

(3) Description

a. Layout

Halle lies on the east bank of the Saale River. The high density central city area along the river is adjoined to the north, south and east by high density residential sections between the river and the railroad yards. Hills rise 100 feet or more to the west and north of the city, but the city itself is located on land which is somewhat higher than the river plain to the east or west. The chief industrial areas are east and southeast of the railroad yards, and south of the town along the railroad running through Merseburg and Leuna.

b. Vulnerability

Streets in the high density areas are narrow and winding except for a boulevard encircling the old city. Old 3 - 5 story buildings predominate throughout the area, with additional tenement blocks adjoining in the medium density areas to the north. The high density districts have an area of 1,220 acres with a density above 100 persons per acre.

c. Weather

Halle is in the Berlin-Leipzig-Dresden Region and conforms to all regional characteristics except that there is a smaller proportion of days with freezing temperatures in winter. In general, weather conditions are less favorable for gas attack than in most of the target cities.

(4) Recommended Areas for Attack

The area recommended for attack comprises the high density residential districts and central city area. Within this target area are: approximately 180,000 persons and the business center. Adjacent on the east is a large classification yard and the railroad station. Adjacent on the west is an industrial district which includes a large gas works and a thermal electric plant. Beyond the industrial area to the west is the open valley of the Saale River.

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9. MAGDEBURG

(1) Summary of Evaluation Data

a. Location - in northern Germany
500 miles from London
770 miles from Foggia

b. Population - 320,000
Twenty-first city in Germany

c. Developed area - 6,000 acres
Density - 51 persons per acre

d. Target area - 2.25 square miles
- 1450 acres

e. Rating of Target Area for:

Effect on Population	2
Effect on War Industry	1
Terrain	3
Climate (persistents	3
(non-persistents	4

(2) Strategic Importance

Magdeburg is a most important wartime industrial town, and is a rail and inland waterway traffic center. Its central position permits communication to the north and south by the Elbe River and to the east and west by rail and the Mittelland Canal, making the city a central collecting and distributing point for raw materials, agricultural products and manufactured goods. The varied industries located in Magdeburg include the following important war plants: Junkers aero-engine plant (Jumo engines), Junkers aircraft plant (bomber airframe components); Braunkohlen Benzin Synthetic oil plant (Bergius process); Krupp Grusonwerke steel plant (engineering and armaments).

(3) Description

a. Layout

The developed areas of Magdeburg extend for several miles along the west bank of the Elbe River. The high density residential and commercial area of the central city is enclosed by the railroad loop and park spaces between the two railroad bridges across the Elbe. Additional high density residential areas adjoin the main city to the north in Neustadt and to the south and Southwest in Buckau and Sudenburg. The city is situated on land which is higher than the surrounding river plain. The industrial areas extend chiefly along the river and railroad to the north and south of the city.

b. Vulnerability

The buildings in the high density areas are brick 3 or 4 story blocks built around courtyards, and strongly built public and commercial buildings. The high density residential areas in Buckau and Neustadt are surrounded by industrial plants. The high density district in the central city has an area of 800 acres and is the most densely populated part of the city. The high density areas in Neustadt and Buckau have an area of 400 acres with average densities above 100 persons per acre. Medium density areas with many single houses and open spaces lie between these high density districts on the outer ring of Magdeburg and in Friedrichstadt to the east of the river.

c. Weather

Magdeburg is in the Hannover-Magdeburg-Kassel Region and conforms to all regional characteristics. Weather conditions are less favorable to gas attack (especially non-persistents) than the average of the target cities.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city and the high density residential districts to the northwest and southwest. Within this target are: approximately 160,000 persons, the business center, and the Junkers aero-engine plant. Adjacent on the northeast are: an important classification yard, the inland port, and a synthetic oil plant. Adjacent on the west is the main railway station. Adjacent on the south are the Krupp works and a second important classification yard.

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8. HANNOVER

(1) Summary of Evaluation Data

a. Location - in northwestern Germany
420 miles from London
810 miles from Foggia

b. Population - 450,000
Twelfth city in Germany

c. Developed area - 10,000 acres
Density - 45 persons per acre

d. Target Area - 3 square miles
- 1900 acres

e. Rating of Target Area for:

Effect on Population	2
Effect on War Industry	1
Terrain	3
Climate(persistents	3
(non-persistents	4

(2) Strategic Importance

Hannover is a well situated city which has served as one of the centers for the development of Germany's new armaments plants. The city is on the main rail line from Berlin to the Ruhr as well as on north-south lines and the Weser-Elbe canal. The engineering, rubber and crude oil industries include the following important war plants: Continental Gummiwerke (rubber tires), Continental Gummiwerke at Limmer (synthetic rubber); Durag-Norag Oil Refinery at Misburg (treating crude from Hannover field); Hanomag Engineering Plant (tractors, half-tracks, locomotives); Leichtmetallwerke (aircraft components); Hackenthal Draht und Kabel Werke (steel wire and cables).

(3) Description

a. Layout

The Leine River and its branch the Ihme flow from southeast to northwest through Hannover, with the central city area located chiefly northeast of the river. The site of the city is flat with no significant hills in the vicinity. Most of the industrial plants are located along the river, the railway, and the Weser-Elbe Canal from a point north of the city to Misburg.

b. Vulnerability

Streets in the high density central city area are narrow in the old part of town, with some wider thoroughfares to the east. Four and five story, half-timbered or brick and sandstone buildings predominate in the central city area with large modern stone structures to the east and south. The high density districts have an area of about 2000 acres with average densities of 80-150 persons per acre. The entire city is compactly built-up with the outlying suburban areas interspersed with factory areas.

c. Weather

Hannover is in the Hannover-Magdeburg-Kassel Region and conforms to all regional characteristics. Weather conditions are less favorable to gas attack (especially non-persistents) than the average of the target cities.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city and the high density residential districts to the north and southeast. Within this area are: approximately 210,000 persons, the central business district, and the Continental Gummiwerke. Adjacent to and extending into the target on the northwest are the principal railroad yards. Within a mile to the southeast is the Hanomag plant.

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15. BOCHUM

(1) Summary of Evaluation Data

a. Location - in western Germany
320 miles from London
800 miles from Foggia

b. Population - 314,000
Twenty-second city in Germany

c. Developed Area - 8,650 acres
Density - 36 persons per acre

d. Target Area - 2.25 square miles
- 1450 acres

e. Rating of Target Area for:

Effect on Population	3
Effect on War Industry	3
Terrain	2
Climate (persistents	2
(non-persistents	3

(2) Strategic Importance

Bochum, situated in the Eastern half of the Ruhr industrial area, is concerned largely with the production of iron and steel. Numerous gas and coke by-products plants, chemical, steel, and engineering plants are located here. Important war plants are the Vereinigte Stahlwerke A. G. (pig iron, high grade steel, armaments) and the Eisen und Huttenwerke (structural steels, sheet metal, high grade steels).

(3) Description

a. Layout

Bochum lies about 5 miles south of the Rhine-Herne canal. The center of the city is the site of the medieval town. The compact residential areas lie around the city center on its western, southwestern and southern sides, between railway yards and factory areas. There are hills rising 150 feet to the east and southeast.

b. Vulnerability

The medieval town is small and congested. The high density residential areas to the south and west of the medieval town have mainly brick built tenements of 3 - 5 stories. Average density of population of these areas is 100 persons per acre. The medium density districts have a density of 50 persons per acre.

c. Weather

Bochum is in the Ruhr Region and conforms to all regional characteristics. In general, the climate is slightly more favorable for persistent and slightly less favorable for non-persistent gas attack than in the average target city.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city, the high density residential area to the south and southwest, and an industrial district to the west. Within this area are: approximately 150,000 persons, the Bochumer Verein metal and armaments plants, and the Bochumer Verein power station. Adjacent on the northeast and northwest are railroad lines, and railroad yards extend into the southwest part of the target. Within a mile of the target to the west is another Bochumer Verein armaments plant, and within a mile to the east is the Eisen und Huttenwerke steel plant.

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14 - STETTIN

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14. STETTIN

(1) Summary of Evaluation Data

a. Location - in northern Germany
630 miles from London
825 miles from Foggia

b. Population - 380,000
Nineteenth city in Germany

c. Developed Area - 8,200 acres
Density - 52 persons per acre

d. Target Area - 2.5 square miles
- 1600 acres

e. Rating of Target Area for:

Effect on Population	2
Effect on War Industry	3
Terrain	2
Climate (persistents	3
(non-persistents	2

(2) Strategic Importance

Since the war reduced traffic to the North Sea ports, Stettin has become the most important port in Germany and an important military headquarters. The sea-port is connected by a system of inland waterways and good railroad connections with Berlin and the rest of Germany. It is a very important terminus for the transshipment of war supplies to the Russian front. The industrial establishments are primarily concerned with naval armaments and shipyards, and include the following important war plants: Stettiner Oderwerke (minesweepers and submarines), and the Stettiner Vulkanwerft shipyard. The Pommersche Aero-Engine plant (Junc engines) is at the northwest edge of town and the Hydrierwerke Synthetic Oil plant (Bergius process) is 10 miles to the north.

(3) Description

a. Layout

Most of the built-up area of Stettin lies along the west bank of the River Oder. The high density residential areas lie to the north and northwest of the central city, with a high density area across the river on a small island. Hills rise 75-100 feet to the south and west of the city, and as much as 360 feet to the north. The port areas and many of the industrial areas are on the eastern side of the Oder and on two islands. Other industrial areas stretch along the west side of the Oder to the north and south of the city and along the railroad which rings the city.

b. Vulnerability

The streets in the high density areas are straight, wide and regularly laid out except in the old city along the waterfront. Multi-storied brick tenements or stone public buildings predominate. The high density districts have an area of about 900 acres with average densities of over 100 persons per acre. Additional medium density residential areas within the railroad ring adjoin the high density areas. Barracks outside the railroad ring to the west cover about 600 acres.

c. Weather

Stettin is in the Berlin-Leipzig-Dresden Region. Stettin is an exception to the region in having more numerous days of fog per month. Data available for Kiel, Lubeck and Koenigsberg indicates that cities along the Baltic have higher than average wind velocities and it is assumed that Stettin is in this category and therefore unlike the rest of the region. Stettin's weather is slightly less favorable to persistent gas attack in the winter and slightly more favorable to non-persistent gas attack than the average target city.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city and the adjacent high density residential districts on the north, west and southeast. Within this area are: approximately 140,000 persons and the central business center. Adjacent on the northeast are the Oderwerke and Vulkanwerft. Adjacent on the southeast are the port, the only classification yard, and the principal electric plant. Adjacent on the south are the gas works and numerous industrial plants.

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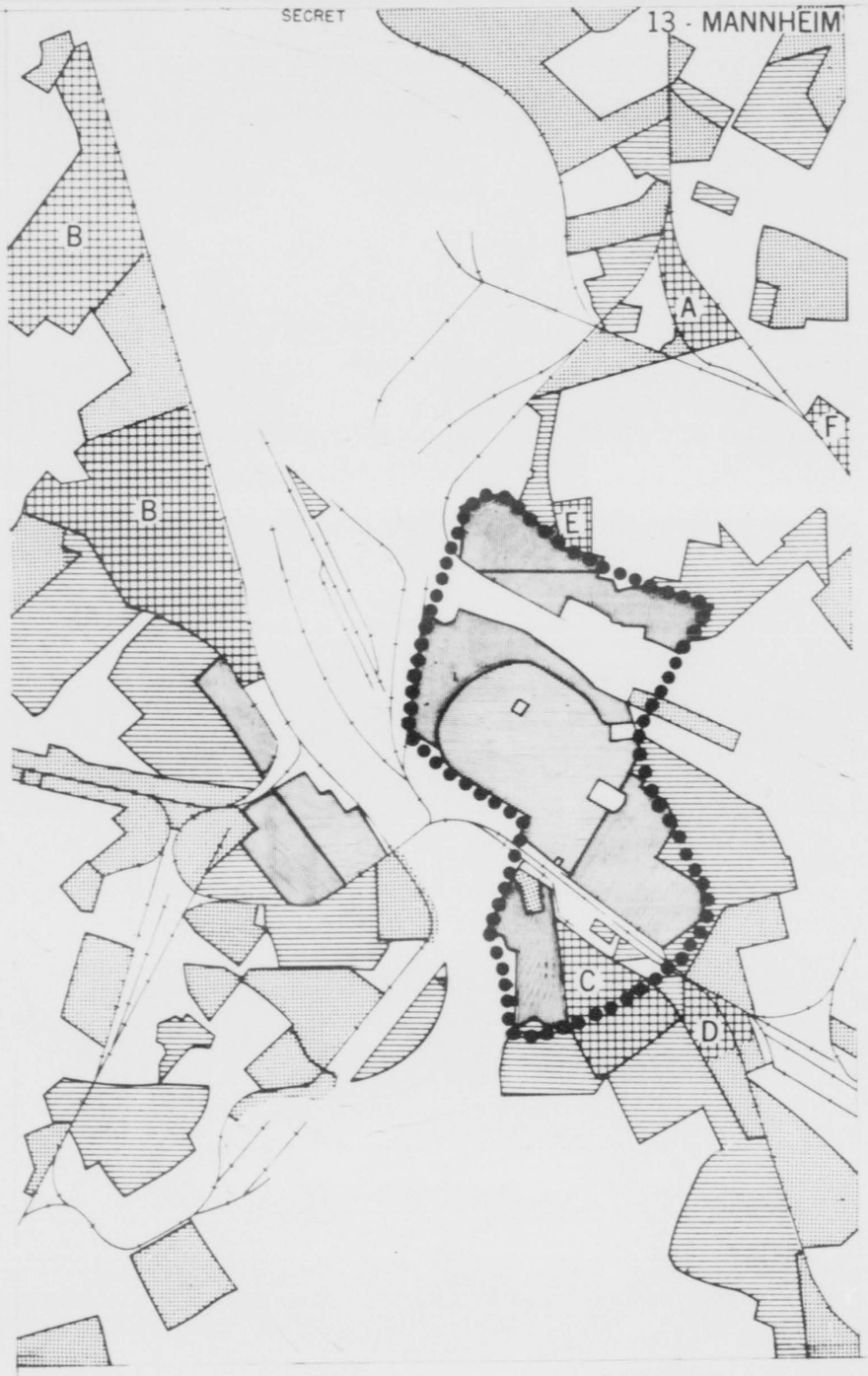
13 - MANNHEIM



HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 - 70 Built up Residence

LOW DENSITY
Industry, Ports and
10 - 40 Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A Daimler Benz
B I. G. Farben Industrie
C Heinrich Lanz
D Joseph Vogele
E Motorenwerke Mannheim
F Brown Boveri

¼ Square Mile

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13. MANNHEIM
(including Ludwigshafen)

(1) Summary of Evaluation Data

a. Location - in south-western Germany
400 miles from London
660 miles from Foggia

b. Population - 430,000
Fifteenth city in Germany

c. Developed Area - 10,200 acres
Density - 37 persons per acre

d. Target Area - 2.5 square miles
- 1,600 acres

e. Rating of Target Area for:

Effect on Population	3
Effect on War Industry	1
Terrain	4
Climate (persistents	1
(non-persistents	1

(2) Strategic Importance

Mannheim, second largest inland port in Europe, is the greatest port and industrial center in south-western Germany. The inland port of Mannheim is the chief transshipment point for bulk goods brought up the Rhine for distribution by rail throughout south Germany. Ludwigshafen is Germany's principal chemical manufacturing center and the largest German harbor on the west bank of the Rhine.

The chemical, general and electro-engineering industries include the following important war plants: Daimler-Benz (trucks); I. G. Farben at Ludwigshafen (chemicals and explosives); I. G. Farben at Oppau (chemicals and explosives).

(3) Description

a. Layout

Mannheim lies on the eastern bank of the Rhine at the confluence of the Neckar, and Ludwigshafen lies on the opposite bank. High density residential areas extend south, southeast, north-west and north of the circular central city area. Across the Rhine west of central Mannheim is the high density area of Ludwigshafen. There are a number of outlying suburban and industrial towns. The terrain in this area is flat. Industrial areas lie chiefly along the river north and south of Ludwigshafen and Mannheim.

b. Vulnerability

Streets in the high density areas are principally wide and regularly laid out. Multi-storied brick or sandstone buildings predominate, though there are some old timber and plaster structures in central Mannheim. The high density areas in Mannheim cover an area of about 1,000 acres with average densities of over 100 persons per acre. There is a high density area of about 130 acres in Ludwigshafen, with average densities of about 100 persons per acre.

c. Weather

Mannheim is in the Upper Rhine Region where weather conditions are more favorable to either persistent or non-persistent gas attacks than any other part of Germany. No data is available for Mannheim but it is assumed in the absence of any indications to the contrary that Mannheim does not differ in any significant way from the average for the region.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city in Mannheim and Ludwigshafen and the adjacent high density residential districts. Within this area are: approximately 145,000 persons, the commercial centers, the main railroad stations, and part of the inland port. Adjacent districts are the main part of the inland port to the north-west, an industrial area along the railroad to the southeast, the railroad and industrial area of Ludwifshafen to the west, and a large open park area to the north. The Neckar and Rhine run through the target area.

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12 - NUREMBURG

HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 70 Built up Residence

LOW DENSITY
Industry, Ports and
10 40 Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A M A N.
B Siemens Schuckert
C Aluminiumwerke Nurenberg

Square
Mile

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12. NUREMBURG

(1) Summary of Evaluation Data

a. Location - in southern Germany
520 miles from London
500 miles from Foggia

b. Population - 450,000
Thirteenth city in Germany

c. Developed Area - 7,600 acres
Density - 56 persons per acre

d. Target Area - 2.5 square miles
- 1600 acres

e. Rating of Target Area for:

Effect on Population	1
Effect on War Industry	3
Terrain	4
Climate (persistents	4
(non-persistents	1

(2) Strategic Importance

Nuremburg is the second largest city in South Germany. It is an important industrial and railroad center as well as the headquarters for the Nazi rallies. It is the junction of six main railway lines radiating to all parts of Germany, Czechoslovakia and Austria including the electrified main line from Munich to Central Germany. Industries include electrical works, air, naval and land armaments, military transport vehicles, aluminum works. Among those especially important are the M.A.N. Works (submarine engines); Siemens Schuckert Works (electrical apparatus), Aluminumwerke Nuremburg; Faun-Werke Truck Plant, and the Maschinenfabrik Augsburg-Nuremburg Truck Plant.

(3) Description

a. Layout

The built-up area, roughly circular in shape, lies astride the east-west course of the Regnitz river. The high density areas are bisected by the Pegnitz. There is no high ground within 2 miles of the city. A main belt of railway tracks runs from east to west through the center of the city on the southern border of the Medieval town. The main modern industrial area forms a compact block on the southern outskirts of the city adjacent to the marshalling yards.

b. Vulnerability

Streets in the inner town are very narrow, and all of the high density area is closely built-up and congested. There are public buildings in the inner town and houses of 4 - 5 stories built of timber and plaster, with steep gabled tile roofs. The districts surrounding the inner town consist mainly of built-up 3 - 5 story brick tenement blocks. The high density areas cover about 1000 acres and have a density of population of well over 100 persons per acre. The medium denisty areas, covering about 200 acres, have tenement blocks with open central courtyards. Density of population is about 50 persons per acre.

c. Weather

Nuremburg is in the Bavarian Upland Region which is relatively not so favorable to either persistent or non-persistent gas attacks as other parts of Germany. However, Nuremburg has low wind velocities and a very high number of days of fog per month. Nuremburg is, therefore, one of the cities most favorable for non-persistent gas.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city area and the fully built-up residential districts. Within this area of 2.5 square miles are: 185,000 people, the business center and the main railway station. Directly adjacent on the south is the Siemens Schuckert electrical apparatus works, and further south the MAN submarine engine works.

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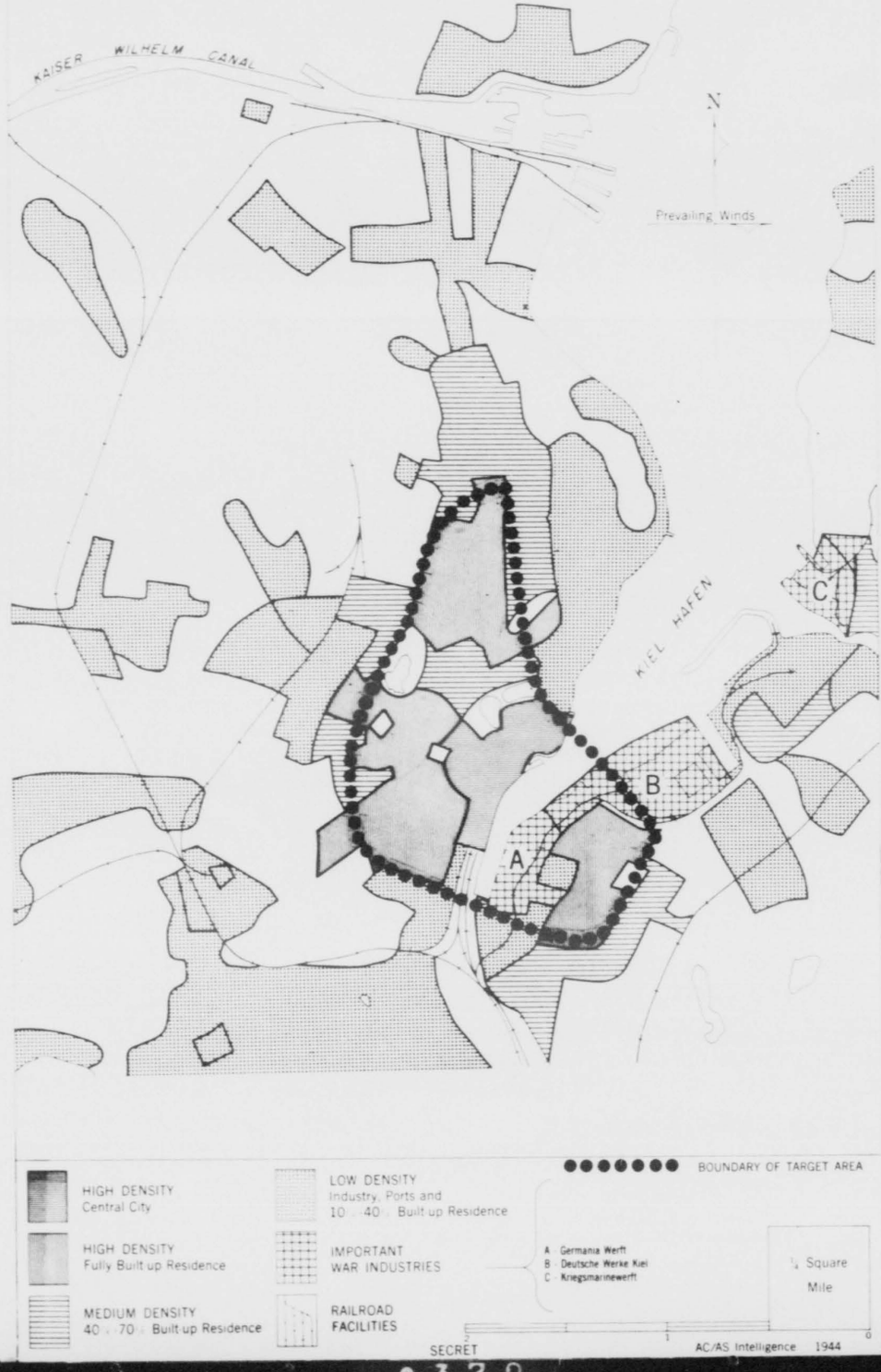
17 - KIEL



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17. KIEL

(1) Summary of Evaluation Data

a. Locations - in northwestern Germany
470 miles from London
940 miles from Foggia

b. Population - 235,000
Twenty-third city in Germany

c. Developed Area - 5,400 acres
Density - 40 persons per acre

d. Target Area - 2 square miles
- 1280 acres

e. Rating of Target Area for:

Effect on Population	3
Effect on War Industry	3
Terrain	2
Climate (persistents	2
(non-persistents	4

(2) Strategic Importance

Kiel is the chief naval base and shipbuilding center in the Baltic, and is the principal naval dockyard in Germany as well as the Headquarters of the Fleet Command. It is at the eastern terminus of the Kaiser Wilhelm Canal, but is not a commercial port. The industries are concerned entirely with the naval base, and include the following important war plants: Germania Werft (submarines); Deutsche Werke Kiel (submarines); Kriegsmarinewerft (submarines); Naval Dockyard (constructional and refitting base for the fleet); and numerous torpedo and marine equipment plants.

(3) Description

a. Layout

The city of Kiel is about 4 miles south of the Kiel Canal terminus at the lower end of Kiel Hafen which clearly divides the built-up areas of the city. To the west is the high density central city area along the waterfront surrounded by fully built-up residential sections, while to the east are the shipyards and the medium or high density workers' residential areas. There are some smaller industrial establishments along the west side of Kiel Hafen in the vicinity of the Kiel Canal terminus. The land rises gradually on all sides from the central city area and the shores of Kiel Hafen to a height of 100-175 feet in a series of small hills along the edge of town.

b. Vulnerability

Streets in the high density areas are narrow and crooked, particularly in the central city area. High buildings and large houses of varied structure extend throughout the built-up areas west of Kiel Hafen and in the fully built-up residential area at the west end of the shipyards, but more open tenement and single family housing areas and lots predominate in some of the other workers' sections east of Kiel Hafen. The high density districts have an area of approximately 800 acres with average densities above 100 persons per acre.

c. Weather

Kiel is in the Northwest Coastal Region and conforms to all regional characteristics. In general, weather conditions are slightly more favorable than average for persistent gas attack but among the least favorable for non-persistent gas attacks.

(4) Recommended Areas for Attack

The recommended area for attack comprises the central city and the high density residential districts to the north, west and southeast. Within this area are: approximately 100,000 persons, the business center and railroad station, and parts of the Deutsche Werke and Germania Werft. Adjacent on the northeast along the shore of the harbor are the naval dockyard and Kriegsmarinewerft. One and one-half miles to the north at the entrance to the Kaiser Wilhelm Canal is an important industrial area which includes the principal gasworks and electric power plant.

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16 AUGSBURG

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Prevailing Winds

BOUNDARY OF TARGET AREA

HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 - 70 Built up Residence

LOW DENSITY
Industry, Ports and
10 - 40 Built up Residence

IMPORTANT
WAR INDUSTRIES

A Messerschmitt Flugzeugwerke
B M. A. N. Diesel Engine Plant

RAILROAD
FACILITIES

Square
Mile

SECRET

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16. AUGSBURG

(1) Summary of Evaluation Data

a. Location - in southern Germany
540 miles from London
530 miles from Foggia

b. Population - 186,000
Twenty-ninth city in Germany

c. Developed Area - 3,500 acres
Density - 50 persons per acre

d. Target Area - 2.5 square miles
- 1600 acres

e. Rating of Target Area for:

Effect on Population	3
Effect on War Industry	3
Terrain	4
Climate (persistents	4
(non-persistents	2

(2) Strategic Importance

Augsburg is important as an industrial and transportation center. It is a junction point on two main rail lines and has important classification yards. The chief industries, which are machinery and armaments, include the following important war plants: Messerschmitt fighter assembly plant, M.A.N. Diesel engine plant.

(3) Description

a. Layout

Augsburg is located on relatively flat land at the junction of two small rivers. The densely built-up old city, surrounded by a ring of industrial plants and high density residential areas, lies in the triangle formed by the two rivers. Three heavily built-up residential areas lie just across the rivers. There are no significant changes in elevation within two miles.

b. Vulnerability

Streets are narrow, even in the newer parts of the city. The typical structures are brick with a preponderance of multi-storied apartments. The high density areas have a density of at least 100 persons per acre and the medium density districts, 50 persons per acre.

c. Weather

Augsburg is in the Bavarian Upland Region which is not so favorable to either persistent or non-persistent gas attacks as other parts of Germany. There are no significant local deviations.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city area, the high density residential section, and most of the industrial district. Within this area of 2½ square miles are 140,000 persons, the business center, the central railroad station, and the M.A.N. Diesel engine plant. A mile to the south of the target area is the Messerschmitt fighter assembly plant.

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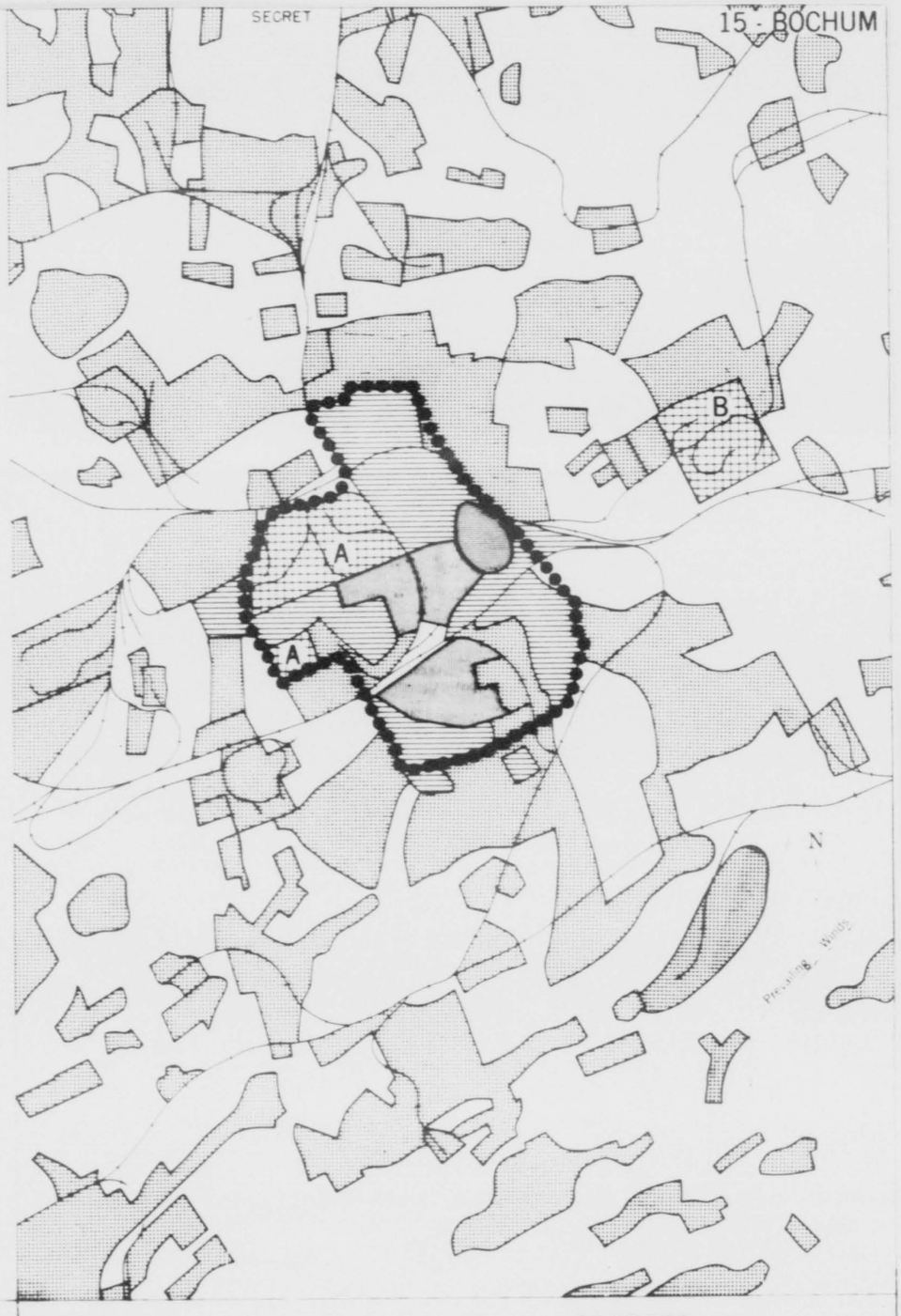
15 - BOCHUM



HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 - 70 Built up Residence

LOW DENSITY
Industry, Ports and
10 - 40 Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A Vereinigte Stahlwerke
B Eisen and Huttenwerke

½ Square Mile

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19. DORTMUND

(1) Summary of Evaluation Data

a. Location - in western Germany
330 miles from London
800 miles from Foggia

b. Population - 550,000
Tenth city in Germany

c. Developed Area - 19,500 acres
Density - 28 persons per acre

d. Target Area - 2 square miles
- 1280 acres

e. Rating of Target Area for:

Effect on Population	2
Effect on War Industry	4
Terrain	2
Climate (persistents	2
(non-persistent	3

(2) Strategic Importance

Dortmund is the easternmost industrial area of the Ruhr and a transportation center. The inland port is the terminus of the Dortmund-Ems canal and there is also connection by canal with the Ruhr. Two of the principal railroad routes to the Low Countries pass through Dortmund. The coal mines, coke-oven batteries, iron and steel works and synthetic oil plants of the area include the following important war plants: Chemische W. Essener Oil Refinery (Fischer-Tropsch process); Vereinigte Stahlwerke (steel, armaments); Vereinigte Stahlwerke at Horde (steel, armaments); Hoesch-Koeln-Neussen Steel Plant (steel, armaments).

(3) Description

a. Layout

Dortmund is in the midst of a predominantly rural area in which there are scattered colliery settlements, with the medium density residential and industrial Horde district southeast of the central city. The city lies in a valley with 100 foot hills to the north and a gradual but steady rise to the 800 foot ridge overlooking the Ruhr five miles south of Dortmund. The built-up area of the city is compact and the chief industrial districts lie on the outskirts northeast, northwest and southeast, with the inland port to the northwest.

b. Vulnerability

Streets in the high density area are narrow except for a few wider thoroughfares radiating from the boulevard ringing the central city area. The area is fully built-up with a mixture of old and modern buildings with tenement blocks predominating. The high density district has an area of 1,600 acres with a density well above 100 persons per acre.

c. Weather

Dortmund is in the Ruhr Region and conforms to all regional characteristics. In general, the climate is slightly more favorable for persistent and slightly less favorable for non-persistent gas attack than in the average target city.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city and the high density residential districts adjacent on all sides. Within this area are: approximately 180,000 persons, the business centers, the main railroad station, and the power plant for the central city. Adjacent to the west is the Vereinigte Stahlwerke steel plant, and to the northwest is the inland port and industrial area. Railroad yards are adjacent to the northeast and southeast, and the Hoesch steel plant is within a mile to the northeast.

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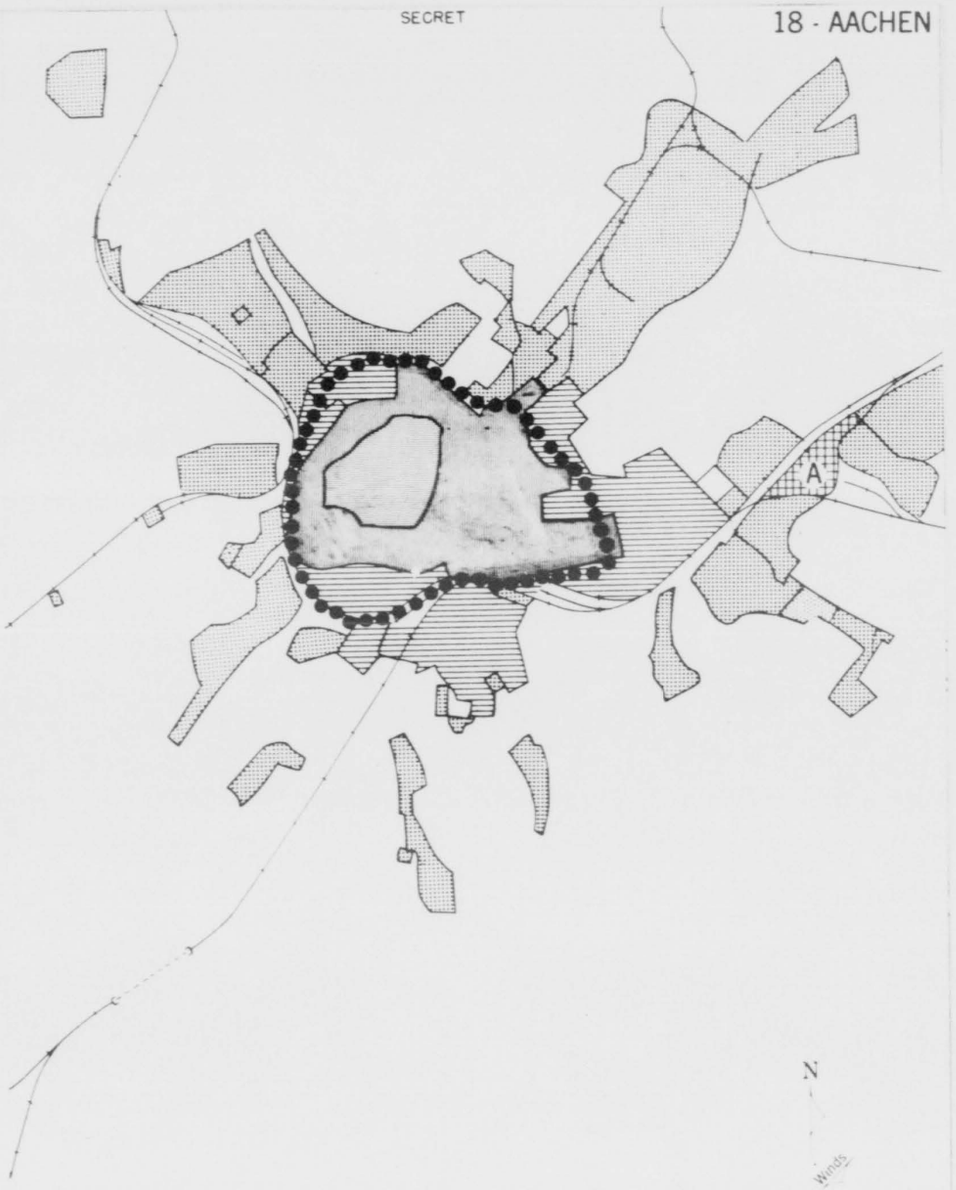
18 - AACHEN



HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 - 70% Built up Residence

LOW DENSITY
Industry, Ports and
10 - 40% Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A - Englebert

¼ Square Mile

SECRET

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18. AACHEN

(1) Summary of Evaluation Data

a. Location - in western Germany
270 miles from London
800 miles from Foggia

b. Population - 164,000
Thirty-second city in Germany

c. Developed Area - 3,300 acres
Density - 49 persons per acre

d. Target Area - 1.5 square miles
- 950 acres

e. Rating of Target Area for:

Effect on Population	2
Effect on War Industry	4
Terrain	1
Climate (persistents	3
(non-persistents	4

(2) Strategic Importance

Aachen is an established industrial city, an important commercial and banking center, and is well located with respect to transportation on the Dutch and Belgian frontiers. The city's commercial position has been favored by the fact that it is the last German station on the international Cologne-Liege railroad line, while the railroad from Dusseldorf and the Ruhr also crosses the border here. Aachen has old established light industries for the most part, but they include most of the German needle factories and the important war plant of Englebert and Co. (automobile tires and tubes).

(3) Description

a. Layout

Aachen is a compact circular shaped city, encircled by boulevards and railroads. The congested central city area is surrounded by high density residential areas and small factory areas. Large factories are scattered on the outskirts of the town, with the principal industrial areas along the railroads northeast, east and northwest of the town. Hills encircle the city to the west and south rising 200-600 feet above the town.

b. Vulnerability

Streets in the fully built-up inner town are narrow and winding, and the same is true of the high density residential areas. Multi-storied buildings dating mainly from the 19th century predominate with many shops and public buildings in the central city area. The high density districts have an area of about 800 acres with a density of population well over 100 persons per acre.

c. Weather

Aachen conforms to all characteristics of the Ruhr Region, except that foggy days are less numerous. Temperature and wind conditions are more favorable for gas attack than in the average target city.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city and the encircling high density residential district. Within this target area are: approximately 125,000 persons and the business center. Adjacent on the northwest and southeast are two classification yards. To the northeast and east are the two principal industrial areas. The Englebert Rubber Tire Plant is approximately 1 mile east of the target.

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22 - DUISBURG

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22. DUISBURG
(Including Hamborn)

(1) Summary of Evaluation Data

a. Location - in western Germany
300 miles from London
800 miles from Foggia

b. Population - 400,000
Seventeenth city in Germany

c. Developed Area - 12,000 acres
Density - 37 persons per acre

d. Target Area - 1.5 square miles
- 900 acres

e. Rating of Target Area for:

Effect on Population	4
Effect on War Industry	2
Terrain	2
Climate (persistents	2
(non-persistents	2

(2) Strategic Importance

The Duisburg-Hamborn area includes the greatest river port in the world which is the main outlet for the Ruhr industrial area, and an important number of industrial plants. Duisburg and Hamborn are located on the Rhine at the point where the Ruhr river, the Emscher and the Rhein-Herne canals terminate, with adequate railroad lines from the Ruhr and to the south. The extensive metallurgical, coke-oven, and oil distillation plants include the following important war plants: Demag (steel and armaments); Ver. Stahlwerke (steel and armaments); Friedrich-Alfred Hutte (steel and armaments); E. Mathes and Weber (sulphuric acid, chemicals); Duisburger Kupferhutte (non-ferrous metals smelting).

(3) Description

a. Layout

Duisburg is located on the east bank of the Rhine south of the Ruhr River, with Hamborn to the north. The inland port lies between the two cities. High density areas are rare outside of the central city area in Duisburg and a few small areas in Hamborn near the Rhine. Widespread suburban settlements are more typical. The land rises about 175 feet to the east and southeast between the developed areas and the Ruhr River. The industrial districts are located principally along the Rhine or along the canals and railroads at some distance from the central city areas.

b. Vulnerability

Streets in the high density areas are of rectangular pattern, except in the medieval town where they are narrow and winding. Buildings of several stories dating from the 19th century or later characterize the high density commercial sections. The few fully built-up tenement sections are surrounded by low density residential areas, open spaces and industrial districts. The high density areas of Duisburg cover about 350 acres with average densities of about 75-100 persons per acre. There is a similar high density area of about 150 acres adjacent to the inland port on the northwest.

c. Weather

Duisburg is in the Ruhr Region and conforms to all regional characteristics. In general, weather conditions are slightly more favorable for gas attack than in the average target city.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city and the industrial and high density residential districts to the southwest. Within this area are: approximately 55,000 persons, the business district, the Demag plant, the E. Mathes and Weber plant, and part of the Duisberger Kupferhutte. Adjacent on the northwest is part of the inland port and on the west are railroad yards.

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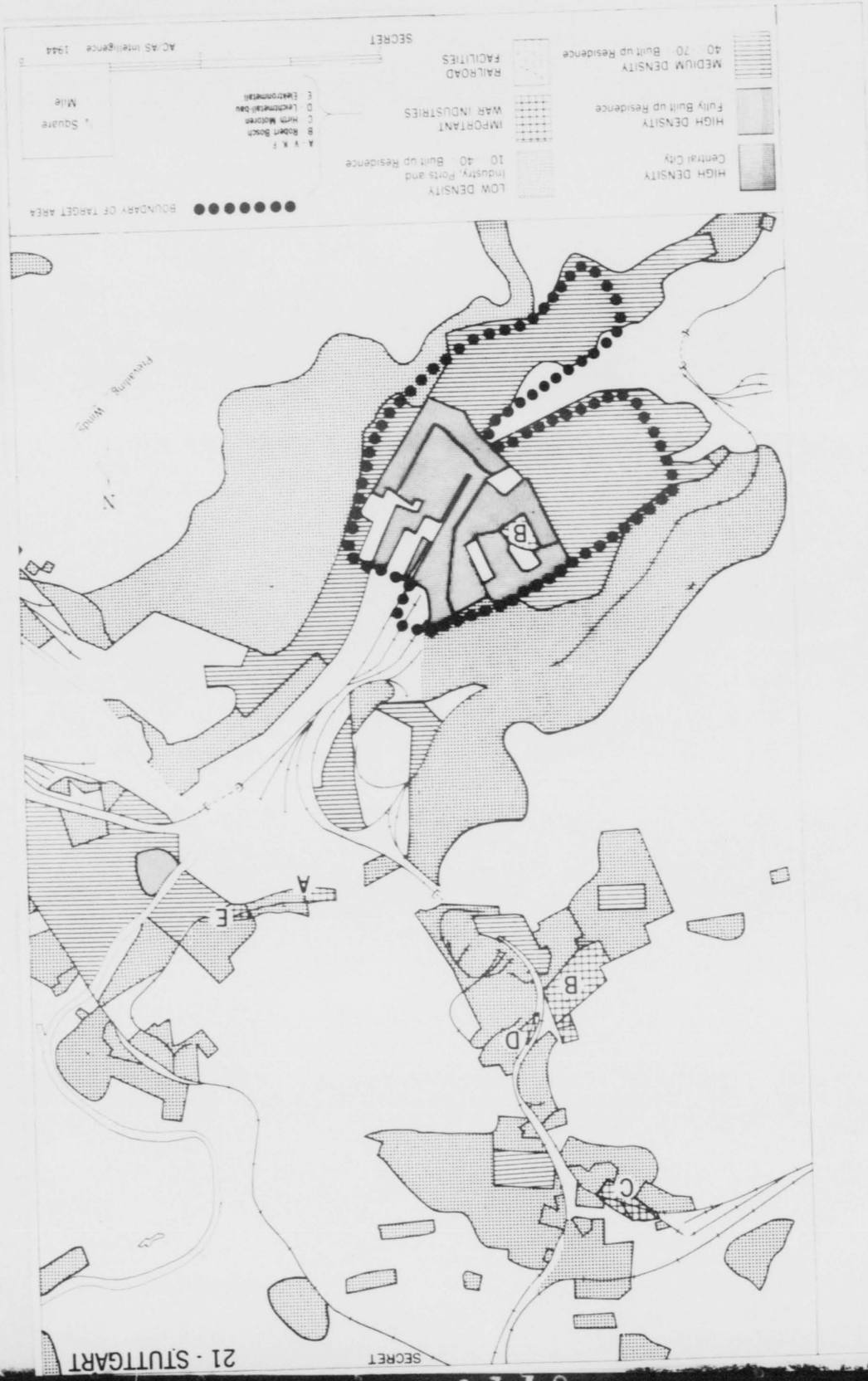

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21 - STUTTGART

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21. STUTTGART

(1) Summary of Evaluation Data

a. Location - in southwest Germany
460 miles from London
600 miles from Foggia

b. Population - 450,000
Fourteenth city in Germany

c. Developed Area - 10,300 acres
Density - 40 persons per acre

d. Target Area - 2 square miles
- 1250 acres

e. Rating of Target Area for:

Effect on Population	4
Effect on War Industry	2
Terrain	1
Climate (persistents	1
(non-persistents	1

(2) Strategic Importance

Stuttgart is important industrially, and as a transportation and administrative center. As a transportation center, Stuttgart possesses important classification yards which handle traffic on the two through rail lines. Industrially, Stuttgart is important for the metal and machine industries. Among the important war plants are: the Daimler-Benz aero-engine plant and truck plant, the V.K.F. ball bearing plant, and the Hirth aero-engine plant. Also of importance are the Robert Bosch engine accessory plants.

(3) Description

a. Layout

Stuttgart lies in a saucer shaped depression which opens toward the northeast into the broad valley of the Neckar River. The built-up area of Stuttgart lies on the floor of the depression. Suburbs are stretched out along the Neckar in a strip about ten miles long. With the exception of the Bosch works there are no large factories in the city of Stuttgart itself. The chief factories follow the railways running from northwest to southeast along the floor of the Neckar Valley. There are steep hills to the northwest, southeast and southwest of the city.

b. Vulnerability

The typical structures in Stuttgart are brick, multi-storied apartments within the central area, and brick two-storied houses in the medium density districts on the hillside slopes to the north and south of the bottom of the depression. The maximum density exceeding 100 persons per acre occurs in the center of the valley and decreases rapidly as the hill slopes are reached. Density of the suburban towns is lower but Cannstatt has an area of 600 acres which is heavily built-up.

c. Weather

Stuttgart is in the Upper Rhine Region where weather conditions are more favorable to either persistent or non-persistent gas attacks than any other part of Germany. Local conditions of significance are the unusually high number of days with fog (reported as more frequent in Stuttgart than any other German city) and the effect of the deep bowl in which Stuttgart lies which channels winds in northwest and southeast directions.

(4) Recommended Area for Attack

The area recommended for attack comprises Stuttgart's central city and high density residential districts which lie on the bottom of the valley. Within this area of approximately 2 square miles are: 100,000 persons, the business center, the main railway station and yards, and the Bosch (central) plant.

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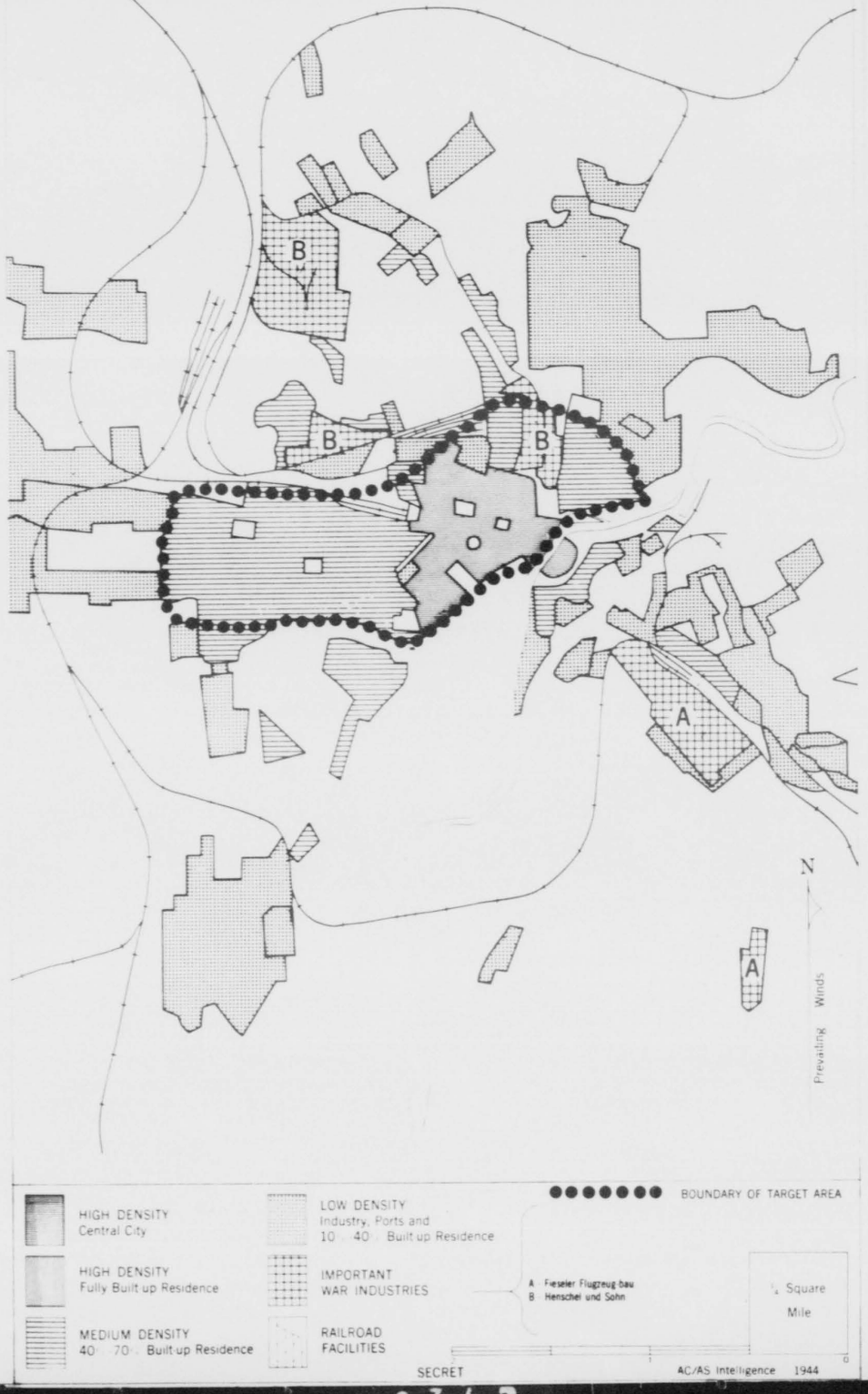
20 - KASSEL



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20. KASSEL

(1) Summary of Evaluation Data

a. Location - in western Germany
410 miles from London
750 miles from Foggia

b. Population - 216,000
Twenty-fourth city in Germany

c. Developed Area - 3,850 acres
Density - 44 persons per acre

d. Target Area - 1.75 square miles
- 1,100 acres

e. Rating of Target Area for:

Effect on Population	4
Effect on War Industry	2
Terrain	1
Climate (persistent	3
(non-persistent	3

(2) Strategic Importance

Kassel is the capital of the Prussian province of Hessen-Nassau and an important railway junction and industrial center. Classification yards northwest of the town cover an area of 300 acres adjoined by large railway workshops. Industrially Kassel is important for its aircraft production, and locomotive and truck works. Important war plants are: Fieseler fighter assembly plant (Waldau), Fieseler fighter components plant (Bettenhausen), Henschel aero-engine plant (Altenbauna), Henschel truck plant, and Henschel locomotive plant.

(3) Description

a. Layout

The main built-up area of Kassel lies on the west bank of the Fulda river on gently sloping land between the river and wooded hills to the west. On the eastern bank of the river lies a small settlement and beyond there are the industrial suburbs of Waldau and Bettenhausen. Hills rise in the northwest and west. The main Henschel works and Fieseler aircraft plant are respectively northwest and southeast of the central district, but there are two Henschel factories within the central district producing locomotives and trucks.

b. Vulnerability

Streets are narrow in the "old town" section of the central district, and wide in other parts of the high density areas. There are many old timbered houses, and in the north of the city, blocks of tenements. The high density districts cover an area of 300 acres with a density of at least 100 persons per acre. Medium density districts cover approximately 750 acres with a density of 50 persons per acre. Houses in this district tend to be large with few tenements.

c. Weather

Kassel is in the Hannover-Magdeburg-Kassel Region and conforms to all regional characteristics, except for a significant increase in the number of cloudy days per month. In general, weather conditions are less favorable to gas attack than the average of the target cities.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city area and the high and medium density residential districts. Within this area of 1.75 square miles are: 95,000 people, the business and administrative centers, and locomotive and truck workshops of Henschel and Sohn. Directly adjacent on the north are the central station and marshalling yards and beyond them another Henschel plant. About one-half mile southeast are the Fieseler aircraft works.

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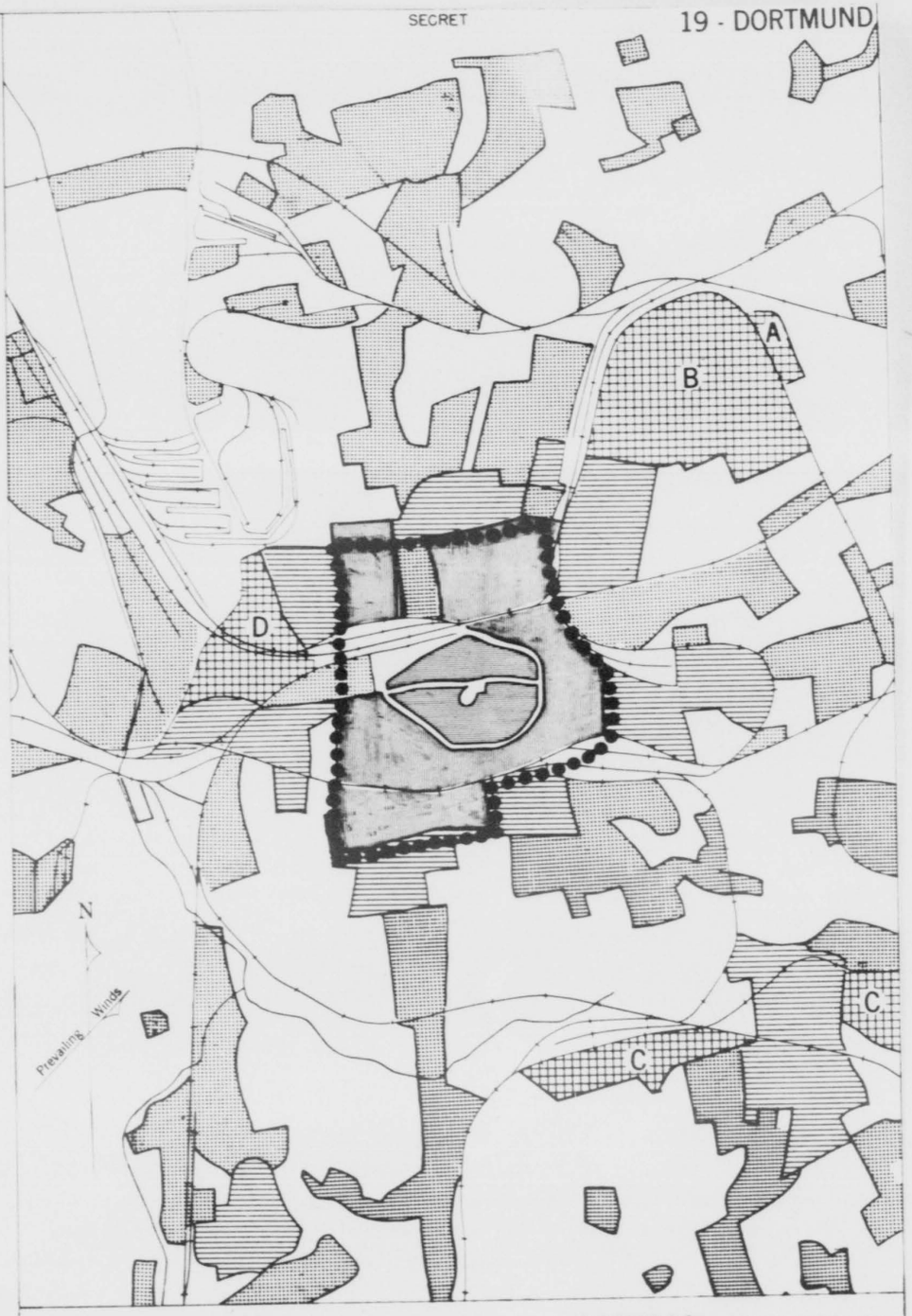
19 - DORTMUND



HIGH DENSITY
Central City

HIGH DENSITY
Fully Built-up Residence

MEDIUM DENSITY
40%-70% Built-up Residence

LOW DENSITY
Industry, Ports and
10%-40% Built-up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A - Hoesch Benzin
B - Hoesch-Koein-Neuessen
C - Ver. Stahlwerke-Horde
D - Ver. Stahlwerke-Dortmund

¼ Square Mile

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26. DRESDEN

(1) Summary of Evaluation Data

a. Location - in south central Germany
600 miles from London
670 miles from Foggia

b. Population - 640,000
Seventh city in Germany

c. Developed Area - 16,500 acres
Density - 39 persons per acre

d. Target Area - 2.5 square miles
- 1,600 acres

e. Rating of Target Area for:

Effect on Population	3
Effect on War Industry	4
Terrain	1
Climate (persistent	4
(non-persistent	3

(2) Strategic Importance

Dresden is the historical capital of Saxony, its present administrative center, and an industrial center of considerable importance. It is also important as a center of communications with very large classification yards and three stations. The industries of Dresden are mainly light industries carried on in small factories. There are numerous machine tool, armament and chemical plants. Of special importance is the Kraftstoffanlagen synthetic oil plant (Bergius process).

(3) Description

a. Layout

Dresden lies in the broad valley of the Elbe river where two small tributary valleys join the Elbe at right angles. Areas of highest density are on either side of the river in the oldest part of the town. High hills rise along the southwest and northeast edges of the valley. The chief industrial areas lie along the railways in the western half of the city.

b. Vulnerability

With the lowest density of population of all the German cities with over 200,000 inhabitants, Dresden is a city of public buildings, villas and gardens. The old town, nucleus of Dresden, has narrow streets, but is bordered by a belt of boulevards on which are many modern commerical buildings. These are largely of the modern multi-storied type. Houses in this section have 3 to 5 stories and accommodate several families. The high density areas cover approximately 3,200 acres. The medium density areas cover about 6,400 acres and have houses of similar structure.

c. Weather

Dresden is in the Berlin-Leipzig-Dresden Region and conforms to all regional characteristics. Weather conditions are less favorable to persistent gas attack in winter and slightly more favorable to non-persistent gas attacks than the average German city.

(4) Recommended Areas for Attack

The recommended target area comprises the central city and the greater part of the high density residential districts. Within this areas of 2.5 square miles are: approximately 120,000 persons and the business and administrative centers. Adjacent on the northwest are the railway yards and workshops, and on the north and west are the chief industrial areas.

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(1) Summary of Evaluation Data

a. Location - in western Germany
300 miles from London
780 miles from Foggia

b. Population - 654,000
Sixth city in Germany

c. Developed Area - 15,800 acres
Density - 42 persons per acre

d. Target Area - 4.5 square miles
- 2,900 acres

e. Rating of Target Area for:

Effect on Population	3
Effect on War Industry	4
Terrain	1
Climate (persistent	1
(non-persistent	1

(2) Strategic Importance

Essen is the greatest city in the Ruhr and one of the most important centers of industry and communication. As a railway center it is provided with a network of railways and a number of classification yards. Essen also has important inland waterway connections: on the south with the navigable Ruhr River; and on the north with the Rhine-Herne Canal, an important connecting link between the Rhine and the Dortmund-Ems Canal. Industrially Essen is important for the steel, arms, locomotive and general engineering works of Friedrich Krupp A.G., large coal mines, coke oven plants, zinc smelters, plastics works, chemical and non-ferrous metals works.

(3) Description

a. Layout

The Krupp works occupy the center of the city. The medieval walled town, now the central city area, lies on their eastern side. The works are enclosed to the east, west and north by a compact built-up area. To the north are colliery districts with open settlements of single family houses in the midst of open country. Hills rise 100 to 300 feet on all sides except the north.

b. Vulnerability

An outstanding feature of Essen as of other Ruhr cities is the low proportion of large tenements. Buildings housing over twenty families are very rare. Throughout the central city area and the compact residential area there are open spaces. The density of the high density area is at least 100 persons per acre and of the mediur density districts, 50 persons per acre.

c. Weather

Essen is in the Ruhr Region and conforms to all regional characteristics. However, except for precipitation all weather factors are unusually favorable for gas attacks and Essen ranks as one of the most vulnerable German cities.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city area, the adjacent high density residential districts and the Krupp works. Within this target area of 4.5 square miles are 300,000 people and the business center. Adjacent on the east are the classification yards.

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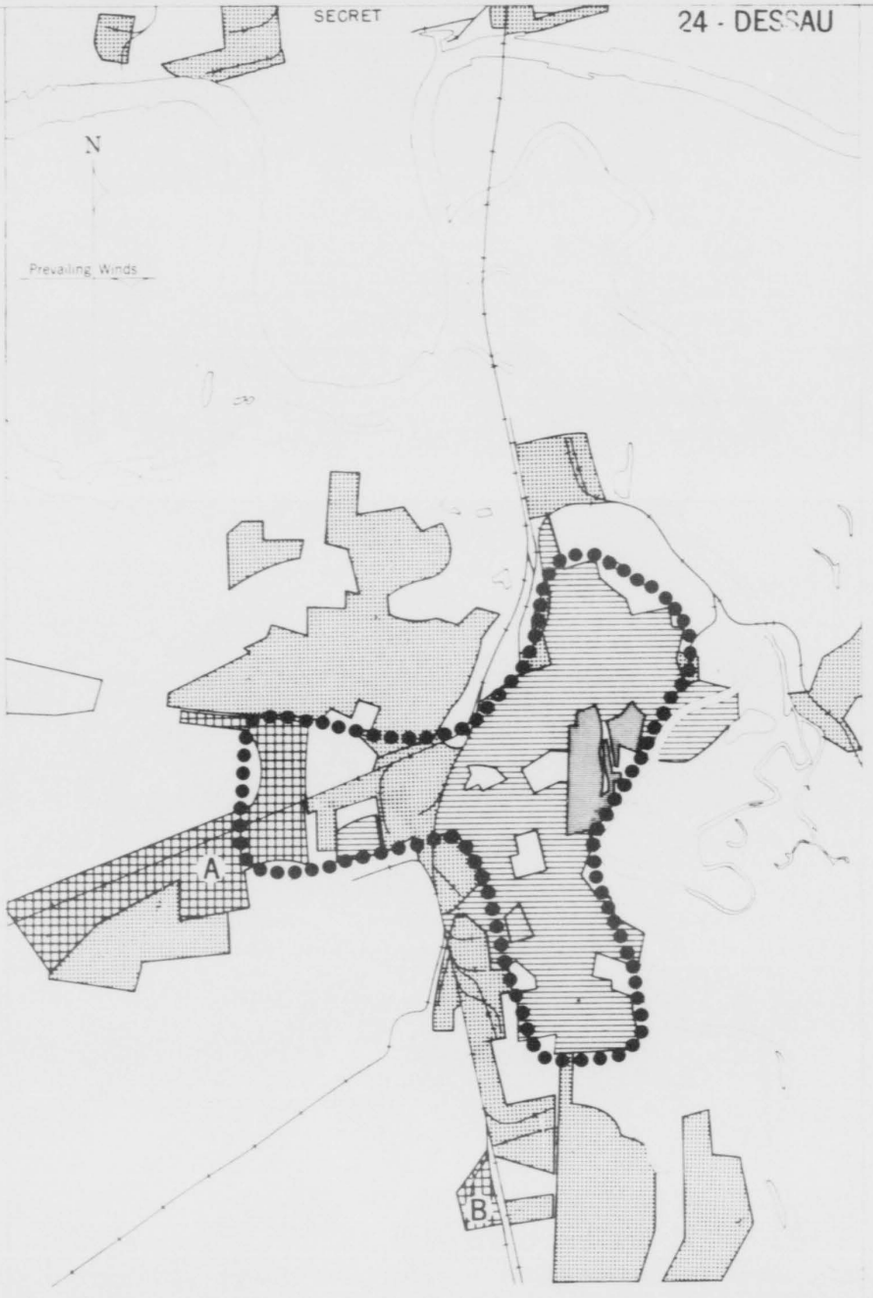
24 - DESSAU



HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 - 70 Built up Residence

LOW DENSITY
Industry, Ports and
10 - 40 Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A - Junkers Assembly and Aeroengine Plant
B - Junkers Airframe Plant

¼ Square Mile

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24. DESSAU

(1) Summary of Evaluation Data

a. Location - in north central Germany
530 miles from London
740 miles from Foggia

b. Population - 120,000
Thirty-eighth city in Germany

c. Developed Area - 5,000 acres
Density - 23 persons per acre

d. Target Area - 2.25 square miles
- 1450 acres

e. Rating of Target Area for:

Effect on Population	4
Effect on War Industry	2
Terrain	4
Climate (persistents	4
(non-persistents	2

(2) Strategic Importance

The economic importance of Dessau is principally associated with the Junkers aircraft work - parent plant and experimental center. Railroad connections are adequate, and the inland port of Wallwitzhafen on the Elbe River is a mile north of Dessau while the port of Rosslau is 2 miles north. There are no important war plants in the city other than the Junkers assembly, aero-engine and airframe plants.

(3) Description

a. Layout

The developed area of Dessau stretches for about two miles along the west bank of the Mulde River just above its confluence with the Elbe River at the inland port of Wallwitzhafen. The terrain in the vicinity of the city is flat. The principal industrial area is at the western edge of the town where the Junkers works are grouped around the airport and along the railroad, but there are additional smaller factories along the railroad to the south.

b. Vulnerability

Having grown recently from the nucleus of a small country capital, Dessau is not closely built-up and does not have any particularly vulnerable congested areas. The streets are not particularly narrow, and the built-up areas include numerous small parks. The compact residential area is characterized by rows of individual houses rather than by tenement blocks. The compact built-up area is about 2000 acres in extent.

c. Weather

Dessau is in the Berlin-Leipzig-Dresden Region and conforms to all regional characteristics. Weather conditions are less favorable to persistent gas attack in winter and slightly more favorable to non-persistent gas attacks than the average German City.

(4) Recommended Areas for Attack

The recommended target area comprises the central city and the medium density residential districts. Within this area are: approximately 80,000 persons, the business center and the Junkers aircraft assembly plant. Adjacent on the west are the airdrome, and Junkers aircraft engine works. Approximately 1 mile south of the target is the Junkers aircraft and aircraft engine components factory.

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23. BRUNSWICK

(1) Summary of Evaluation Data

a. Location - northwest Germany
450 miles from London
790 miles from Foggia

b. Population - 196,000
Twenty-seventh city in Germany

c. Developed Area - 4,700 acres
Density - 36 persons per acre

d. Target Area - 0.5 square miles
- 300 acres

e. Rating of Target Area for:

Effect on Population	4
Effect on War Industry	2
Terrain	3
Climate (persistents	3
(non-persistents	4

(2) Strategic Importance

Brunswick is a small town, but an industrial center of considerable importance. Important war plants include: Bussing-NAG truck plant, MIAG fighter components plant (Wilhelmitor), MIAG Fighter assembly plant (Waggum) and the Niedersachsische aero-engine plant (Querum). Others are: Goering steel plant (Hallendorf) and the MIAG truck plant (half tracks).

(3) Description

a. Layout

Brunswick, in a fertile plain on the river Oker, consists of three concentric belts grouped around a fully built-up area: (a) a belt of open spaces and scattered buildings circling the inner town; (b) the residential areas; (c) an outer belt of scattered factories and railways. Industrial suburbs include Querum and Waggum to the north and Hallendorf to the south. Hills rise gradually to the southeast and southwest. All of the important factories lie outside of the high density districts.

b. Vulnerability

Streets in the greater part of the high density areas are narrow and winding. Buildings have two to five stories, and whole streets of old houses are preserved with steep tile roofs, and built of timber and brick. The high density areas cover 300 acres and have a density of at least 100 persons per acre. The medium density areas which surround the central city cover approximately 1100 acres with a density of at least 50 persons per acre. Housing in these areas includes both large detached buildings and tenement blocks.

c. Weather

Brunswick is in the Hannover-Magdeburg-Kassel Region and conforms to all regional characteristics. Weather conditions are less favorable to gas attack (especially non-persistents) than the average of the target cities.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city. Within this target area are: approximately 21,000 persons, the central business district, and high density residential sections. The target is completely encircled by a belt of open spaces, public buildings and a water-filled moat. Railroad yards, the MIAG and Bussing NAG plants are adjacent to the south.

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26 - DRESDEN

HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40% - 70% Built up Residence

LOW DENSITY
Industry, Ports and
10% - 40% Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

(No important war industries - ap)

¼ Square
Mile

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27. SAARBRUCKEN

(1) Summary of Evaluation Data

a. Location - in southwestern Germany
350 miles from London
680 miles from Foggia

b. Population - 130,000
Thirty-seventh city in Germany

c. Developed Area - 3,500 acres
Density - 38 persons per acre

d. Target Area - 1 square mile
- 650 acres

e. Rating of Target Area for:

Effect on Population	3
Effect on War Industry	4
Terrain	1
Climate (persistent	1
(non-persistent	1

(2) Strategic Importance

Saarbrucken, situated on the river Saar, is the capital and center of the populous industrial belt extending from Nunkirchen to Dillingen. It is important as an iron and steel producing center and also as a center of rail communications. Saarbrucken is a key point in the traffic movement of the Saar, both for through traffic by rail and for the collection of coal for dispatch by canal from its harbour. There are marshalling yards, goods yards and railway workshops. The main industries are metal works and coking plants. Comparable with similar large works in the Ruhr, they are equally as important. Outstanding among them is the Vereinigte Huttenwerke Burbacherhutte.

(3) Description

a. Layout

The built-up area of Saarbrucken forms a belt along the wide valley of the Saar, about 5 miles long and a mile wide. To the west it is linked up with the much smaller town of Volklingen by a group of factories and houses along the valley. There are hills on the north and south which rise 200 to 300 feet above the river. Factories are all situated near the river in the valley.

b. Vulnerability

Buildings in the high density areas have 3 to 4 stories with steep roofs. There are some open spaces. Density of population of these areas is approximately 100 persons per acre. Tenements with open block interiors and houses, with frequent open spaces, characterize all the medium density areas. The density of population is between 40 and 70 persons per acre.

c. Weather

No data is available for Saarbrucken except the number of days of fog per month. Because of its geographic location, the assumption is made in this report that Saarbrucken should be considered a part of the Upper Rhine Region where weather conditions are more favorable to either persistent or non-persistent gas attacks than in any other part of Germany.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city area and the greater part of the compact residential area. Within this area of 1 square mile are 50,000 people, the business center and the coal harbour. Adjacent on the north are the railway marshalling yards. Adjacent on the west is Vereinigte Huttenwerke Burbacherhutte metal works.

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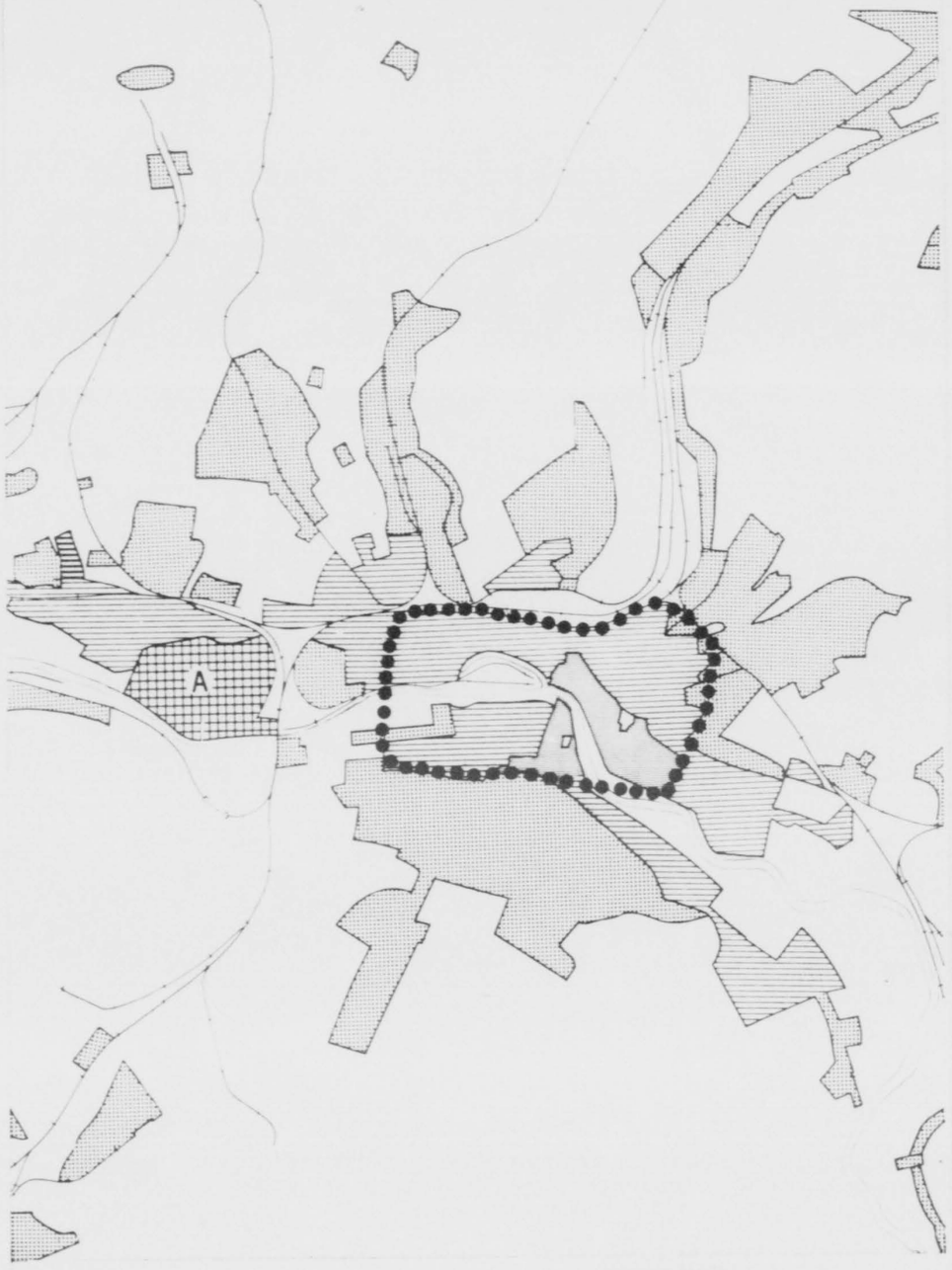
27 - SAARBRUCKEN



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28. KARLSRUHE

(1) Summary of Evaluation Data

a. Location - in southwestern Germany
410 miles from London
630 miles from Foggia

b. Population - 190,000
Twenty-eighth city in Germany

c. Developed Area - 3,850 acres
Density - 43 persons per acre

d. Target Area - 2 square miles
- 1,250 acres

e. Rating of Target Area for:

Effect on Population	4
Effect on War Industry	4
Terrain	4
Climate (persistent	1
(non-persistent	1

(2) Strategic Importance

Karlsruhe is an administrative and industrial cent r as well as being a communic tions center of importance. Situated 4 miles from the Rhine river Karlsruhe has an active inland port and marshalling yards. The chief industries are machine and metal working, food, soaps and fats, wood working, and textiles and clothing. Of particular importance is the Deutsche Waffen und Munitionswerke which produces armaments.

(3) Description

a. Layout

Karlsruhe was laid out with a geometrical plan, with 32 equally spaced streets radiating from the castle as the central point, and 2 circular streets about 500 and 1000 meters from the castle center. The southern half of the circle is the center of the town. The terrain is flat with slight hills to the southeast. The industrial areas lie to the west, south and east of the central city area.

b. Vulnerability

Streets are wide in the high density areas and the buildings consists of modern commercial and public buildings and 3 to 4 story houses. The density of population for these areas is about 150 persons per acre. The medium density districts include many public buildings and a large proportion of park land. The density of population of these medium density areas is at least 50 persons per acre.

c. Weather

Karlsruhe is in the Upper Rhine Region where weather conditions are more favorable to either persistent or non-persistent gas attacks than any other part of Germany. There are no significant deviations from the average for the region.

(4) Recommended Areas for Attack

The area recommended for attack comprises the central city area and about two-thirds of its high density residential districts. Within this area of 2 square miles there are 90,000 people, the business center, the railway workshops, and the Deutsche Waffen und Munitionswerke and another factory producing munitions. Adjacent on the southeast are the marshalling yards and the main station.

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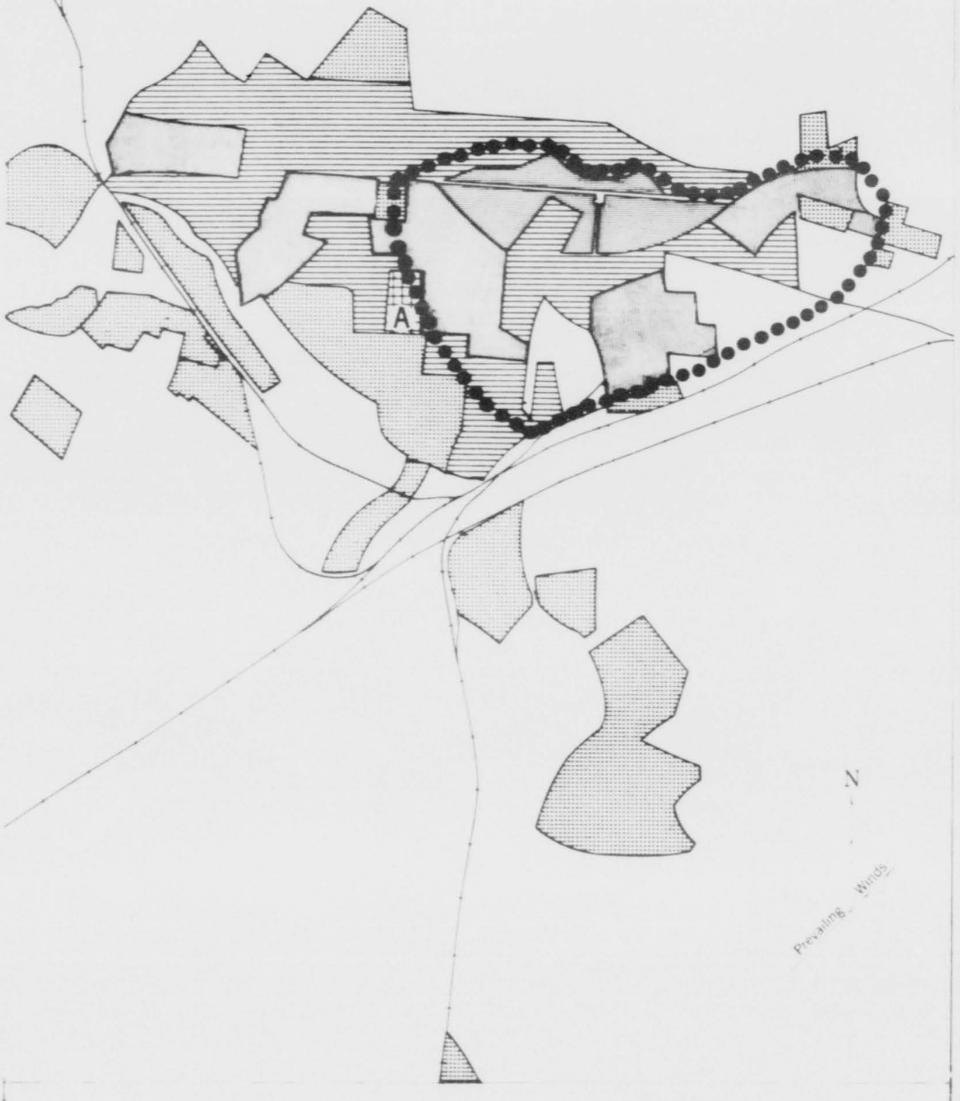
28 - KARLSRUHE



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29. HAGEN

(1) Summary of Evaluation Data

a. Location - in western Germany
330 miles from London
800 miles from Foggia

b. Population - 214,000
Twenty-fifth city in Germany

c. Developed Area - 4,450 acres
Density - 34 persons per acre

d. Target Area - 1.5 square miles
- 950 acres

e. Rating of Target Area for:

Effect on Population	4
Effect on War Industry	4
Terrain	1
Climate (persistent	2
Climate (non-persistent	3

(2) Strategic Importance

Hagen is a north-easterly continuation of the narrow southwest-northeast industrial belt of Wuppertal. It is a center of iron and steel industries. As a railway center, it is important since it commands a low-lying route from north to south across the high plateau. There are classification yards, and a station with repair works. The principal industries are iron and steel works, and engineering plants producing batteries, steel components for aircraft and tanks, foundry machines and precision tools. Of especial importance are the Akkumulatoren-Fabrik A. G. (the most important German works for submarine batteries) and Klockner-Werke A. G. (special steels).

(3) Description

a. Layout

The main built-up area of Hagen lies at the confluence of three valleys - the Ennepe (southwest - northeast), the upper Volme (southeast - northwest), and the lower Volme (north - south). From this center it extends along the narrow floors of these valleys, especially the Ennepe valley. There are steep hills rising 300 to 900 feet from the three valleys. The main factories are concentrated along the valley floors.

c. Weather

Hagen is in the Ruhr Region and conforms to all regional characteristics. In general, the climate is slightly more favorable for persistent and slightly less favorable for non-persistent gas attack than in the average target city.

(4) Recommended Areas for Attack

The recommended target area comprises the central city and the high density residential districts. Within this area of 1.5 square miles are 65,000 persons, the business center, the main railway station, and the Akkumulatoren Fabrik, producing submarine batteries. About one and one-half miles to the southeast is the Klockner Werke A. G., metal works.

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29 - HAGEN

HIGH DENSITY
Central City

HIGH DENSITY
Fully Built up Residence

MEDIUM DENSITY
40 - 70 % Built up Residence

LOW DENSITY
Industry, Ports and
10 - 40 % Built up Residence

IMPORTANT
WAR INDUSTRIES

RAILROAD
FACILITIES

BOUNDARY OF TARGET AREA

A - Akkumulatoren Fabrik
B - Klockner Werke

1 Square Mile

SECRET

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30. LÜBECK

(1) Summary of Evaluation Data

a. Location - in northwestern Germany
480 miles from London
900 miles from Foggia

b. Population - 133,000
Thirty-sixth city in Germany

c. Developed Area - 6,400 acres
Density - 21 persons per acre

d. Target Area - 1.5 square miles
- 950 acres

e. Rating of Target Area for:

Effect on Population	4
Effect on War Industry	4
Terrain	4
Climate (persistent	4
(non-persistent	4

(2) Strategic Importance

Lubeck, situated at the terminus of the Elbe-Trave canal derives its importance from its industry. Lübeck produces armaments, aircraft components, and submarines. It is also the site of iron and steel works and fuel oil storage. The most important industry is the Flenderwerke submarine yard.

(3) Description

a. Layout

The central district of Lübeck is situated on an island at the confluence of the Trave and Wakenitz rivers. On the banks of these rivers are the wharves and chief factories. Residential areas spread in all directions from the central district. The industrial suburb of Herrenwyk, site of the submarine yard and iron and steel works, is northeast of Lübeck five miles down the Trave river. There are no significant rises in elevation. The industrial districts are either on the outskirts of town or well removed from the city itself.

b. Vulnerability

Lübeck is predominantly a town of small houses. The streets in the high density areas are narrow. Buildings in these areas are almost entirely brick with 3 or 4 stories. The high density district covers 300 acres with a density of 58 persons per acre. The medium density areas surrounding the high density district cover approximately 550 acres. The greater part of the buildings in this section have 2 to 4 stories, but there are some 5 to 6 story tenements.

c. Weather

Lübeck is in the Northwest Coastal Region and conforms to all regional characteristics except for a significant decrease in the number of cloudy days per month. In general, weather conditions are slightly more favorable than average for persistent gas attack but among the least favorable for non-persistent gas attacks.

(4) Recommended Areas for Attack

The recommended target area comprises the central city island and the surrounding medium density residential areas. Within this area are: approximately 60,000 persons, the heavily populated central city, and the harbor and warehouses. Adjacent on the west is the main railroad station and yards, and a mile to the north are the Dornier Werke and two armaments plants.

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30 - LUBECK

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142 G11-2
Apr-May 1945

TARGETS IN GERMANY

2554 - 1 To 4

RETURN TO:

Director
Aerospace Studies Inst
ATTN: Archives Branch
Maxwell AFB, Alabama

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HEADQUARTERS ARMY AIR FORCES

ROUTING AND RECORD SHEET

TALLY NO.	
FILE NO.	

SUBJECT: Report on Available High Priority Intelligence Targets in Germany of Interest to AAF

TO: See Distribution

FROM: AC/AS, Intelligence, Collection Division

DATE: 23 MAY 1945

COMMENT NO.

For your information, the following is a list of Technical Intelligence Targets that have become available in ETO for assessment and/or investigation during the week ending 5 May 1945.

Priority	Target Number	Name	Location	Activity
2	25/75	Experimental Establishment	Aichach	radio controlled A/C
3	25/161	Messerschmitt	Ottobeuren airfield	Me 410
2	25/179	Flak Zeit	Gehrenhausen (15.4 Km SE of Ulberndi)	Helicopters
2	5/49	DFS	Trauen Chi...	rocket and jet propulsion
3	5/7	DFS	Ainring	DFS Gliders
3	25/74	Deutsches Institut für Segelflug	Ainring	Glider research
2	5/2	RLM	Munich Ober Wiesenfeld	BMW rocket & CCB units
3	25/32	Dornier	Ober pfaffenhofen	Me 410
1	25/147	Messerschmitt	Oberammergau	Design Office
3	25/160	Messerschmitt	Straubing	Me 109
1	25/162	Messerschmitt	Oberammergau-Main Exp.	Det.
3	25/163	Messerschmitt	Kempten	Me components
3	25/200	Dornier	Aubing Ost	Me 410
3	25/223	Messerschmitt	Dingolfing	Me 109
2	26/1	RLM	Munich Oberwiesenfeld	BMW Engines
2	26/72	RLM	Allach/Munich	BMW Engines
3	27/27	Verlag u Druck Braunschweig	Munich	Oxygen equip for flotation gear
2	5/6	Erprobrungs	Zwischenahn	Me 163, 262
2	5/32	RLM	Zwischenahn	Me 163
1	5/3	Walter	Kiel	rocket unit for Me 163
2	25/125	RLM	Kiel	take off rockets exp. work
2	26/32	RLM	Kiel	Special fuel
3	26/90	Junkers	Rendsburg/ Dudelsdorf	Aero Engines
2	5/10	Dornier	Friedrichshafen lowenthal	jet propulsion experiments
2	5/11	Dornier	Friedrichshafen Manzell	jet propulsion experiments

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2	5/56	[illegible]	Kempten	mfr special jet units
3	25/8	Dornier	Friedrichshafen/ Manzell	DO 217 high altitude fighter
3	25/10	Dornier	Lowenthal	DO 217P high altitude fighter
3	25/33	Zeppelin	Lowenthal	Me Transport A/C
2	25/182	Kopperschmidt	Blumberg	FW 190
3	25/185	Dornier Werke	Friedrichshafen Allmansellor	DO 217
3	25/196	Dornier	Ho.l/Ravensburg	Prototype component construction
3	25/197	Dornier	Ummendorf	Prototype component construction
3	25/198	Dornier	Lindau	Technical staff
3	25/202	Dornier	Uberlingen	dispersal from other plants
2	26/73	RLM	Siemelsdorf	Experimental work on aero engines
2	26/75	Aerodynamic Inst. of Aachen	Ordensburg	Research labs of Luftwaffe
2	25/3	Blohm & Voss	Hamburg/ Finkenwarder	BV 144
3	25/	Blohm & Voss	Osthafe/ Hamburg	BV 222 6 eng flying boat
2	25/54	Blohm & Voss	Hamburg/ Fuhlsbuttel	Me 262
2	25/80	RLM Institute	Hamburg	Seaplane Tank
3	25/193	Blohm & Voss	Hamburg	BV 138, 222
3	25/221	Kopperschmidt	Hamburg	FW 190
3	26/91	Klockner	Hamburg	BMW 801
2	25/77	RLM	Travemunde	Marine A/C research
2	25/186	Priwell	Travemunde	Experimental seaplane base
3	26/43	RLM	Travemunde	Cold starting
3	26/44	RLM	Tarnewitz	Cold starting
1	27/15	Dragewerke	Lubeck	Oxygen breathing apparatus
3	27/48	Howhold & Sohne	Travemunde	Sea rescue dinghies

2. Technical Intelligence Targets of exceptional interest which have been investigated during the week ending 5 May 1945 are:

a. On 29 April information was received to the effect that three each 5 cm BK aircraft cannon had been located at Gottingen, of which two had been turned over to the British. Air disarmament was requested to send the third unit to Wright Field by air. Tech Intelligence, D/I on being advised of action taken requested that the cannon be taken to station Ordnance Officer, AAF 379, so that it could be inspected by the office of D/Tech Serv; D/Armament, and Tech. Int.,prior to preparation for shipment by Station Ordnance Officer to Wright Field by courier escort.

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b. An instrument specialist has been sent to Fattin Aspersal of Gebruder Thiel, Mulhausen where automatic pilots and automatic radio compasses have been discovered.

c. Action has been initiated to send a team to Detmold to investigate target where two TA 152 airframes and engine bearer are on test.

d. At Habern/Tec. in the vicinity of Stuttgart, Flugzeugbau-Wolf-Hirth was discovered to be working on the developement of a man carrying rocket.

e. In the Heinkel-Hirth plant at Zuffenhausen CIOS Target 5/21 it was discovered they had been making plans to turn over jet engine design to the Japs.

f. Action has been initiated to send one each TSA-2A Toss Bombsight and one each Lotfe 7H medium and high level bombsight to Wright Field. Arrangements have been made for the completion of two each TSA-2D bombsights by the Carl Zeiss Co., Jena at which time one of these also will be sent to Wright Field.

g. A BMW experimental 48 cylinder aircraft engine believed to be capable of developing 5200 hp was discovered and action has been initiated to prepare this engine for shipment to Farnborough.

h. The Me 262 was shipped 9 May on Madawaska Victory NY 913. Destination NYC, estimated date of arrival at that port is 14 May. Shipment is covered by Shipping Ticket #45-64111, three boxes numbers CAFID B-5031, B-5032 and B-5033 respectively.

R. W. McClenahan
Colonel, A. C.
Chief, Collection Division

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By Authority
CG AAF 22 May 45

ROUTING AND RECORD SHEET

TALLY NO.	141
FILE NO.	

SUBJECT: Report on available High Priority Intelligence Targets in Germany of interest to AAF

TO: See Distribution (17)

DATE: 23 MAY 1945

FROM: AC/AS, Intelligence, Collection Division

COMMENT NO. Capt. Glowa/jgh/6458

1. For your information, the following is a list of Technical Intelligence targets that have become available in ETO for assessment and/or investigation during the week ending 28 April 1945:

PRIORITY	TARGET #	NAME	LOCATION	ACTIVITY
3	25/159	Messerschmitt	Regensburg	Me 109
2	26/39	Unknown	Lottstadter Hoke	Special fuel
2	26/81	Daimler Benz	Hasladh	Dispersal from Genshagen
2	25/12	Focke-Achgelis	Bremen/Delmenhorst	Fa 223 Helicopter
2	25/16	Focke-Wulf	Bremen/Neulanderfeld	FW aircraft
3	25/26	Weser	Bremen/Industriehafen	Ju 87 F
3	25/164	Weser Flugzeugbau	Nordenham	Dispersal from other plants
3	25/165	Focke-Wulf	Bremen/Wenzendorf	FW 190, 191
3	25/205	Focke-Wulf	Delmanhorst Airfield	FW aircraft
3	27/34	W. Ludolph	Bremerhaven	Aircraft instruments
3	25/5	Blohm & Voss	Menzendorf/Hamburg	BV 238 flying boat
2	25/183	Menibaum Metallwerke Niedersachsen, Brinkman and Meyell	Harburg	Ju 188, 388
3	25/194	Blohm & Voss	Hamburg/Harburg	FW 190
1	5/4	Messerschmitt	Augsburg/Laupheim	Me 163, 262
1	5/5	Erprobrungs	Lechfeld	Me 163, 262
1	5/30	Messerschmitt	Lechfeld	Me 163, 262
2	5/32	Messerschmitt	Leipheim	Me 262
2	5/44	Dornier	Landsberg Amlech	Exp. work on jet aircraft
1	5/52	Messerschmitt	Baumenheir	Me 262
1	5/59	Messerschmitt	Schwarmunchen	Me 262
2	25/29	Messerschmitt	Augsburg	Me 109G

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2	25/30	Messerschmitt	Lechfeld	Me aircraft
2	25/31	Messerschmitt	Leipheim	Me aircraft
3	25/224	Messerschmitt	Burgau	Me aircraft
2	26/28	Messerschmitt	Augsburg	Powerboat equipment
1	5/21	Heinkle Hirth	Stuttgart	He 58A jet propulsion unit, BMW 003 jet propulsion unit
1	5/40	Daimler Benz	Stuttgart	Jumo 004, BMW 003
3	5/42	Wurtembergisches Metallwaren Fabrik	Geislinger Steige	Turbine blades
2	5/45	Bosch	Stuttgart	Dev. & infr. of BMW 003
3	5/60	Messerschmitt	Ulm (partly underground)	Me 262
3	5/61	Heinkle	Stuttgart (Zuffenhausen)	Special jet units
3	25/83	Luftforschungs Institute Graf Zeppelin	Ruit (near Stuttgart)	Statistical research
3	25/110	Elektron	Bad Cannstatt (near Stuttgart)	Aircraft wheels
3	25/203	Elma Fluggerate Gmb H	Bad Cannstatt	Retractable skis for Me 110
3	25/213	Wolf Hirth	Stuttgart/ Kirschein	Me 323 components
3	25/220	Hans Klemm	Boblingen Air field	KL-35
3	25/227	Bohrer	Kirschein/Teck	Control surfaces of Me [illegible]
1	26/4	Daimler Benz	Stuttgart/ Unterturkheim	DM engines all types
2	26/26	Bosch	Stuttgart	Magnetos including pressurized types for high altitudes
2	26/67	Daimler Benz	Backnang/Stuttgart	DB 605E
2	26/70	Daimler Benz	Faurndau (in factory about 100 yards west of railway station)	Tech. offices
2	26/69	Daimler Benz	Eislingen	Engine testing & experimental departments
2	27/43	Mansfeld	Peenzlau	Undercarriage for aircraft
1	5/47	Muldwerke A.G.	Leipzig/Muldenstein	Jumo 004
3	27/45	Th. Horn Geratebau	Leipzig Diesmaurstrasse	Aircraft instruments
3	27/46	Flugel und Poltes	Leipzig Fahnstrasse 81-83	Mae wests

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2. Technical Intelligence targets of exceptional interest which have been investigated during the week ending 28 April 1945, are:

a. A team of investigators, CIOS trip #128, went to investigate Fieseler at Kassel.

b. An officer courier was dispatched to Thionville to accompany Me 262 that is being shipped to Wright Field under instructions of General Arnold.

c. An investigator was dispatched to Jena to investigate bombsights which had been produced in that area. One sample already here of dive bombsight and as many more as possible to be brought here at once.

d. Additional investigators were sent to Brunswick/Volkenrode to carry on exploitation of the Aeronautical Research Center that was taken intact.

e. After assessing I. G. Farben fuel and lubricating oil testing plant at Ungstein, a folder of testing methods and a folder of Wermacht fuel and lubricating oil specifications were evacuated to T-Branch, G-2, 6th Army Group Area. A fuel specialist has been sent to investigate the target.

f. A composite CIOS team was sent to investigate a target of opportunity (Mittel Deutsch Metallwerk) at Erfurt. Colonel Hough, Eight Air Force, will furnish one of his pilots to make all arrangements to fly the TA 152 from Erfurt to Farnsborough for the British.

g. A composite CIOS team was sent to investigate Radar target at Kothen and Signal School at Halle.

h. Three meteorological investigators were dispatched to investigate targets at Gotha, Gottingen, Brunswick and Hamburg.

J. W. McClemahan
Colonel, Air Corps
Chief, Collection Division

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ROUTING AND RECORD SHEET

TALLY NO.

FILE NO.

SUBJECT: Report on Available High Priority Intelligence Targets in Germany of interest to AAF

TO: See Distribution

DATE: 3 May

FROM: AC/AS, Intelligence, Collection Division

COMMENT NO. 1

Capt. Glowa/epc
6458

For your information, the attached lists cover high priority technical intelligence targets which have become available in ETO during the week ending 21 April 1945.

For L. W. Glowa, Capt A.C.
R. W. McCLENAHAN
Colonel, Air Corps
Chief, Collection Division
Office of Asst Chief of Air Staff,
Intelligence

2 Incls.
Tech Intel Targets avail. for assessment week ending 21 April 1945
Tech Intel Targets of interest week ending 21 April 1945

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S E C R E T

Technical Intelligence Targets that have become available for assessment and/or exploitation during the week ending 21 April 1945:

C.I.O.S. TARGET NO.	NAME OF TARGET	LOCATION	ACTIVITY
25/177	Bachmann von Blumenthal	Fürth	Me-110
25/184	Messerschmitt	Bayreuth	Stratosphere A/C
25/232	Messerschmitt	Cham Airfield	Me 109
25/185	Focke Wulf	Mensendorf	FW 190
25/3	Junkers	Köthen	Jumo engines
5/47	Waldwerke A.G.	Leipzi Mölkenstein	Jumo 004
5/43	Arado	Alt. Lommewitz	Arado 234
27/45	T. Horn Gerätebau	Leipzig/Diesdnerstrasse	A/C instruments
27/46	Pittler und Poltes	Leipzig/Fahrstrasse 81-83	Mae Wests

In addition to the above listed by C.I.O.S., targets of opportunity have been discovered at Bitterfeld, Wahla, Wiedergeschwerfen, Salza and Ilfeld. All of these are concerned with jet engines and/or jet powered aircraft and the last three are very small towns in the vicinity of Nordhausen.

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Incl. 1

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S E C R E T

Technical Intelligence Targets of exceptional interest which have been investigated during the week ending 21 April 1945:

KOSBACH: Aircraft Engine (BB003) plant underground. ATI personnel were sent in to investigate on 13 April. C.I.O.S. Lt. Colonel O'Hara who is in area will also investigate. 95 003 engines were obtained.

SALZA: Jet engine plant underground. ATI personnel were sent in to investigate on 14 April. Jumo 004 engines were obtained.

WITZENHAUSEN (Nordhausen): Jet engine plant. C.I.O.S. personnel assessed on 16 April and called for investigators from Group II to cover the target with regard to guided missiles.

GOTTINGEN: Aerodynamic Research - also had Germany's leading Aero Medical authority. C.I.O.S. personnel investigated on 18 April, covering every phase of interest.

FRIEDRICHSHAFEN: Two Horton 299 flying wing aircraft were located by ATI. Instructions were issued to prepare the planes for removal.

[illegible]: 18 Me 163, 10 FW 190 and some Arado 234 in good condition. ATI personnel were requested to investigate and take action to send planes to RAE and F.

ODERTAL: Schuckert Chemical Co. C.I.O.S. Group III investigators went into this target on 19 April.

[illegible]: Me 163 plant underground in salt mine. ATI personnel went in on 18 April.

[illegible]: RLM Aeronautical Research Establishment. ATI and C.I.O.S. personnel investigated on 19 April.

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HEADQU ERS ARMY AIR FORCES

ROUTING AND RECORD SHEET

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By Authority CG AAF

TALLY NO.

FILED 27 Apr 45 HS Lin.Gr.

SUBJECT: Report on Available High Priority Intelligence Targets in Germany of Interest to AAF

TO: See Distribution (#)

DATE 27 Apr

FROM: AC/AS, Intelligence, Collection Division

COMMENT NO. 1
Capt. Glowa/ops6

For your information, the following list covers high priority technical intelligence targets which have become available in ETO during the week ending 14 April 1945:

C.I.O.S. TARGET NO.	TARGET NAME	LOCATION	ACTIVITY
		RUHR AREA	
5/16	Prym Werke	Stolberg	Jumo 004 turbine blades
		MANNHEIM AREA	
5/38	Brown Boveri	Mannheim	Jumo 004 turbine blades
26/71	Daimler Benz	Mosbach	a/c engines
		WURZBURG AREA	
27/32	Streigel & Wagner	Lechtenfels	Flying helmets
27/35	Bekleidungsfabrik Habett	Crailsheim	Flying clothing
		KASSEL AREA	
25/13	Fieseler	Kassel	Fi 256 Obs. a/c High-lift devices
25/82	Aerodynamische Versuchsanstaldt	Göttingen	Aero research
25/111	University	Göttingen	De-icing equipment research
25/217	Junkers	Fritzler-Kassel Airfield	Ju 86
26/78	BMW	Eisenach (No.part of town)	BMW 801
26/79	BMW	Eisenach/Stockhausen (2½ m. east of town)	BMW 801
26/83	Henschel	Kassel/Altenbaum (Probably partly underground)	DB 603 & 605

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Report on Available High Priority Intelligence Targets in Germany of Interest to A.A.F.

TO: See Distribution

DATE: 27 Apr '45

FROM: AC/AS, Intelligence, Collection Division

COMMENT NO. 1 (cont'd)

C.I.O.S. TARGET NO.	TARGET NAME	LOCATION	ACTIVITY
	BRUNSWICK AREA		
25/71	Flying Research Sta.	Brunswick	Flying research
25/76	Technische Hochschule	Brunswick	Aerodynamic Establishment
25/187	Volkswagon	Waggum/Valersleben	Ju 88 also V-1
26/74	Deutsche Forschungsstelle fuen Luftfahrt	Volkenrode (in forest NW of Brunswick)	Dispersal from Berlin
	HANNOVER AREA		
25/15	Focke-Wulf	Bad Nilsen	TA 154 2 eng. a/c
25/18	Focke-Wulf	Hannover/Langenbegen	TA 154, 254, FW-300A
25/19	Focke-Wulf	Detmold	TA 154, 254, FW-200A
25/166	Focke-Wulf	Luneburger Heide/Celle	Underground factory
25/178	Misonwerke/Brink	Hannover	Fighter repair & maint.
	HALLE AREA		
25/34	Siebel	Halle	Siebel a/c
25/36	Synthetic Petroleum Plant	Leuna	Special fuel
	JENA AREA		
3/22	Carl Zeiss	Jena	Bombsights
5/56	William Prym	Gera (Thuringia)	Turbine blades
25/21	Gotha	Langensalza	Gotha Gliders
26/84	Junkers Longwerke	Langenfeld	Jumo 213
27/54	Franz Hering	Jena	a/c instruments
27/54	Siemens & Halske	Arnstadt	a/c instruments

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SUBJECT: Report on Available High Priority Intelligence Targets in Germany of interest to AAF

TO: See Distribution

DATE: 27 Apr '45

FROM: AC/AS, Intelligence, Collection Division

COMMENT NO. 1 (cont'd)

C.I.C.S. TARGET NO.	TARGET NAME	LOCATION	ACTIVITY
		MAGDEBURG AREA	
5/57	Junkers	Magdeburg	Jumo 004
25/214	Junkers	Aschersleben Airfield	Junkers a/c
25/215	Junkers	Bernburg Airfield	Ju 88, 188, 52
25/219	Junkers	Schönbeck (SE of town)	Ju 88, 188, 52
26/7	Junkers	Magdeburg	Jumo 211, 222
26/38	Junkers	Wadmersleben	a/c engines
27/51	Paul Waltstabe Maschinen/Schlosserei	Gardelegen 5 Bismarck Str.	Weapon-dropping & jettisoning gear
27/52	Schaffer & Budenburg	Magdeburg	a/c instruments
27/53	J. Pondschuk GmbH.	Magdeburg	a/c instruments

In regard to targets 25/32 and 25/111 at Göttingen, most records and equipment were captured intact plusphysiological equipment which had been evacuated from Berlin. Professor Struhold, Head of Aviation Medecine of Berlin and his records are being held. The Institute of Physiology, Aerodynamic Institute and the Chemical Ins itute are of particular interest and are under guard.

R. W. McCLINTOCK
Colonel, Air Corps
Chief, Collection Division
Office Asst Chief of Air Staff, Intelligence

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GERMAN PRODUCTION OF HEAVY A.A. GUN BARRELS
AS A TARGET SYSTEM FOR STRATEGIC BOMBING

142.611-3

Summary. On the basis of information available in Washington, it is not possible to reach a definite conclusion regarding the feasibility of strategic bomber attack on heavy A.A. gun barrel production. Such evidence as exists, however, points to a substantial supply of reserve barrels, and a volume of new production which is too small to affect present equipment strength substantially within a reasonably short period. Although little is definitely known about the output of individual armament plants, they are characterized by heavy engineering installations against which aerial attacks have been relatively ineffective. Moreover, the emphasis in German gun design on production of replaceable sectional liners suggests that an extensive list of targets may be involved. From these indications, therefore, enemy tube production does not appear to offer an attractive target system for short-run effects. Before a definite decision can safely be formulated, however, three elements of the problem call for further study based on recent intelligence materials, especially captured equipment, collected in active battle areas. (1) estimation of the enemy's reserve supply and production capacity for tubes and liners; (2) determination of the ratio of monobloc barrels to sectional liners for heavy guns in current use; and (3) identification of important producers. To avoid loss of time, the analysis should be done preferably in London where the necessary materials are accessible and where the findings can be made immediately available.

Nature of the Problem

In the past it has been generally agreed that bombing attacks on artillery production would have little effect on German A.A. strength and would not significantly alter the course of the European war within a reasonably short period.1/ Under the increasing pressure of Allied bombing attacks, however, it is worth inquiring whether the enemy's A.A. defenses, especially in heavy guns with high muzzle velocities, may not be facing critical shortages of spares for replacements and whether concentrated attack on the productive facilities may not have an immediate telling effect on equipment strength. Since, under sustained rates of fire, the critical item requiring most frequent replacement is the gun barrel, the crux of the problem is the adequacy of the enemy's supply of spare barrels and liners. If it is found that current rates of wastage

1/ See Report to Committee of Operations Analysts by Subcommittee on Western Axis A.A. and A.T. Artillery Industry 14 Feb. 1943.

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are diminishing this supply at a rapid rate, and that the productive facilities for spare barrels and liners offer a sufficiently concentrated system of targets, an immediate heavy attack on such installations may be expected to hasten the development of a critical shortage of replacements. The question remains whether the imposition of such a shortage will reduce the effectiveness of A.A. defenses within a significantly brief period.

To examine the problem fully it is necessary to appraise (1) the enemy's A.A. strength for their important types of weapons, and the extent of their supply of replacement tubes, (2) the rate of wastage to which they are currently being subjected, (3) their productive capacity for new guns and tubes of the types required, and (4) the magnitude of the target system offered by the armament plants engaged on their production.

Strength and Reserves

From the best information available in Washington, the Germans are estimated to have a current strength of 15,000 heavy guns, classified as follows:1/

88 mm.	10,000
105 mm.	3,000
127 mm. and larger	2,000

As of the first of November, 1943 these guns were thought by AI 15 to be deployed over the several fronts in the proportions indicated below:2/

Germany (including the protectorate)	52%
France, Belgium & Holland	18%
Norway, Denmark & Finland	5%
Eastern Front (including Poland) & the Baltic States)	14%
Italy	7%
Southeastern Europe	4%
	100%

1/ Estimates prepared by Technical & Tactical Division and quoted in letter of 2 August 1944 from General White to Air Commodore Buckle.

2/ Quoted in Headquarters MAAF Weekly Air Intelligence Summary No. 60 10 January 1944.

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Since these estimates were prepared, two major developments have occurred to affect the disposition of the enemy's flak defenses (1) the intensification of heavy bomber attacks from Italian bases which have called for the strengthening of the heavy flak defenses in Southeastern Europe and (2) the Allied invasion which has caused recent additions to heavy flak in France. It is doubtful that the pressure of these developments has resulted in an abnormal increase in total strength. On the contrary, it is the opinion of M.I. 15 that the bulk of the increase in other vital sectors has had to be made by transfer from points within Germany.

Recent empirical data are not available in Washington by which to question this opinion; the total of 15,000 heavy guns originally quoted has been derived, therefore, by adjusting the M.I. 15 total of 14,050 for November, 1943, by estimated wastage and new production since that time.

Only the scantiest evidence is available as to the enemy's reserve position for gun barrels. American experience furnishes only a very rough guide to possible German practice with regard to reserves and spare equipment, but in the absence of recent enemy intelligence on the subject, and in consideration of known differences in American and German production methods, some indication may be gleaned as to present possibilities.

American practice calls for the production of two spare liners or barrels for each complete gun produced. German practice in this regard is not known and captured equipment probably furnishes little indication of current German practice owing to the possibility that a large proportion of their reserve tubes or barrels is maintained in central depots some distance behind the line of combat and would not be subject to capture. Moreover the increased need for heavy guns has probably given priority to production of complete guns rather than spare equipment. In the absence of definite information it seems reasonable to assume that the enemy's reserves of barrels or liners is at least 5,000 for their heavy guns.

Requirements and New Production

Faced with the existing necessity of increasing the effectiveness of their flak defenses, there is theoretically no upper limit to German requirements for heavy guns. For more than a year moreover, there has been an observed tendency on the part of the enemy to increase the proportion of heavy guns in their anti-aircraft defenses. The 88 mm flak 18 and 36 guns continue to be the basic or standard type of equipment for heavy flak batteries, but recent indications suggest that Germany is now concentrating on production of the 88 mm flak 41 and the 128 mm flak 40, which are comparatively high-velocity guns. The result of this tendency, while increasing the accuracy and effectiveness of flak batteries, is to shorten the average tube or barrel life. Thus the minimum requirement for new tubes as reserves and replacements for guns

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in operation is constantly being raised entirely apart from considerations of the desirability for increased production of complete guns.

Tube life in rounds varies inversely with the rate of fire, muzzle velocity, and size of projectile. The best available estimates of maximum tube life for German heavy guns at practical rates of fire, agreed with the Artillery Division, Office of Chief of Ordnance, are tabulated below:

	Practical Rate of Sustained Fire	Tube Life in Rounds
88 mm flak 18 or 36	15 rounds per minute	2500
88 mm flak 41	20 " " "	3000
105 mm	14 " " "	2000
128 mm and larger	10 " " "	2000

These estimates provide no guide to daily or monthly requirements for replacements of barrels, since this rate obviously varies directly with the continuity of sustained fire. Thus, empirical evidence is called for to show the rate of wastage actually being imposed on the enemy at present.

New production is estimated at roughly 300 complete heavy guns per month. It may be assumed that at least one spare liner is made for each complete gun produced. On this basis, total equipment strength in terms of liners is increasing at the rate of 600 per month. But if 5000 spare liners are available for the 15,000 heavy guns in use, total resources in terms of liners are 20,000, and new production is only 3 per cent of total equipment strength. Thus even a drastic cut in new production would have little effect on the enemy's heavy gun strength within a reasonably short period.

Peculiarities of German Gun Production

At this point certain characteristics of German gun production should be noted, which have a bearing both on intelligence requirements and the evaluation of possible targets.

Marked differences have been noted between the sample German guns and their equivalent American models in regard to the method of their construction. American practice calls for the production, in general, of monobloc barrels which are centrifically cast on a mass production basis. It is believed that few if any of the high velocity guns of German manufacture are equipped with monobloc barrels though some of the smaller sizes in the lower velocities have been so equipped. The more usual German practice is to forge rather than cast the tubes. Recent types have even been provided with sectional liners so that the breech end of the barrel can be renewed more frequently than the more durable forward

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portions. The significance of these differences in manufacturing methods lies in the type of plant equipment required and the opportunities which exist for dispersing the essential processes among small establishments. In the case of sectional liners especially, the factory equipment called for is of such a size that it can be accomodated in smaller establishments and may reasonably be found among a substantial number of firms equipped to make all types of armaments. Monoblockforgings, on the other hand, call for extremely heavy forge equipment which could be accomodated only by the heavy engineering units of a few of the largest armament works.

The proportion of guns equipped with sectional liners is not known, but has been reported by M.I. 15 to be large and increasing. Examination of captured equipment should indicate how the quantities of this type of gun compare with those provided with monobloc barrels among guns recently produced.

If it is found that a substantial proportion of guns in use are equipped with monobloc barrels, the few shops capable of producing such equipment may offer a concentrated target, the destruction of which might prevent further increases in equipment strength. If, on the other hand, the preponderance of heavy guns in use are equipped with sectional liners, as seems likely, it is by no means certain that the enemy's productive facilities are so concentrated.

Target Vulnerability

The number of factories engaged on heavy tube or liner production is not definitely known, and the target potentialities of the industry cannot therefore be assessed in Washington. As a class, however, armament plants are characterized by heavy engineering installations against which aerial bombardment has been relatively ineffective. This fact emphasizes the importance of a high degree of concentration if the target system is to be considered feasible, and strongly suggests that the individual targets may call for an extremely heavy weight of attack.

Office of Assistant Chief of
Air Staff, Intelligence
14 August 1944

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GERMAN AA GUNS

AA Guns 75 mm and larger:

In Germany, France, Belgium, and Holland 1 Nov 43 (M.I. 15 estimate) - - -	8250
Production 1 Nov 43 to 1 Aug 44 (based on MEW) - -	3000
	11,250

Normal loss and wastage (other than losses incident to the invasion, which are unknown) --250

Since reports indicate an increase in the Flak defenses of the area under consideration, it has been assumed that invasion Flak losses have been offset in this area by movement of guns from targets under less concentrated attack. On this assumption, the number of guns in Germany, France, Belgium, and Holland as of 1 Aug 1944 is approximately 11,000.

U.S. practice calls for production of two extra liners (or barrels) for each gun produced. In the case of captured guns, such a reserve of liners or barrels probably does not exist, and the need for heavy guns has probably given priority to the production of complete guns, rather than spare tubes. In the absence of definite information, it seems reasonable to assume that a reserve of at least 5000 tubes is on hand.

The life of a liner or barrel may be taken as 2000 to 3000 rounds for the lower-velocity (and more numerous) guns, and approximately 1000 rounds for the higher-velocity guns such as the 88 mm Flak 41.

The inner tube or liner of the 88 mm Flak 41 was originally made in three parts, the purpose of this construction being to facilitate replacement

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of worn sections. Production difficulties caused a change in design, and the liners for pieces above number 286 are now made in two parts.

Liners of this type do not require the very large presses needed to produce the forgings needed for monoblock barrels, and production of such sectional liners is therefore practicable in a comparatively large number of shops.

The proportion of German guns in which sectional liners are used is not known. An examination of antiaircraft guns captured in Normandy should indicate what method of construction is being used in current production (from forging numbers or code markings) and also where the forgings are produced. If monoblock barrels are used extensively, the few large armament shops capable of producing forgings of the necessary size may offer a concentrated target , the destruction of which would at least prevent further increase in the number of heavy antiaircraft guns.

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The only available estimates of ~~recent~~ wastage and losses (which does not however take account of recent experience on the Normandy front) is that applied by MI 15 to the first 10 months of 1943. During the period wastage and losses were considered to be in the neighborhood of 2½ of strength, ~~[illegible]~~ new production ~~in the neighborhood~~ of 300 heavy guns per month. If wastage and losses during the Normandy campaign have been greater in excess ~~[illegible]~~ of ~~2½~~ the total of 15,000 would probably be too high for present equipment strength. On the other hand such evidence ~~[illegible]~~ exists ~~[illegible]~~ strongly that German efforts to increase new production, especially of the heavier types of guns, ~~[illegible]~~ have succeeded in raising the monthly output of such types considerably above the 300 figure used by MI 15.

Since less than 20% of Germany's heavy flak in November 1943 was located in France, Belgium and Holland it is doubtful if even a high rate of wastage and loss since the Normandy campaign would have affected substantially the German's total strength in heavy guns by this time, ~~[illegible]~~ production during the period would have tended to offset increased wastage. For the future, however, the increased weight of attack on all fronts should lead to heavier inroads on the ~~[illegible]~~ enemy's supply position. The best indication of the effect on the enemy will, of course be provided by ~~[illegible]~~ examination of captured equipment on the several fronts, ~~[illegible]~~

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REQUIREMENTS, NEW PRODUCTION AND RESERVES

Faced with existing necessity of increasing the effectiveness of their frequent defenses there is theoretically upper limits to the German requirements for heavy flak and for more than a year there has been an observed tendency on the part of the enemy to increase the proportion of heavy guns in their anti-aircraft defenses. The 88 mm gun continues to be the basic or standard type of equipment for heavy flak batteries by increasing numbers of 105, 127, & 150 mm guns have been noted and even larger sizes are reported to be in course of production. Moreover recent changes in design have favored the development of types with high muzzled velocities. The result of both tendencies while increasing the accuracy and effectiveness of flak batteries is to shorten the average tube life of equipment in use. Thus the minimum requirement is new tubes as reserves and replacements for guns in operation is constantly being raised entirely apart from considerations of the desirability for increased production of complete guns.

Only the scantiest evidence is available either as to the enemy's reserve position for gun barrels or as to current methods for the production of new and spare barrels and liners. American experience furnishes only a very rough guide to possible German practice with regard to reserves and spare equipment but in the absence of recent enemy intelligence on the subject and in consideration of known differences in American and German production methods some indication may be gleamed as to present possibilities.

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PROCESS OF MANUFACTURE

Marked differences have been noted by the sample German guns and their equivalent American models in regard to a method of their construction. American practice calls for the production in general of monoblock barrels which are centrifically cast on a mass production basis. It is believed that few if any of the high velocity guns of German manufacture are equipped with monoblocked barrels through some of the smaller sizes in the lower velocities have been so equippped. The more usual German practice is to forge rahter than cast barrels and to provide them with replacable liners. Recent types

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STRENGTH, WASTAGE AND LOSSES

The Germans total strength in heavy flak guns is currently estimated at 15,000 for all types above 75 mm. The number of each of the main classes of heavy guns is estimated to be roughly as follows:1/

88 mm	10,000
105 mm	3,000
127 & 150 mm	2,000
	15,000

As of the first of November, 1943 these guns were thought by MI 15 to be deployed over the several fronts in the proportion indicated below:2/

Germany (including the protectorate)	51.8%
France, Belgium & Holland	18.5%
Norway, Denmark & Finland	5.2%
Eastern Front (including Poland)& the Baltic States)	13.7%
Italy	6.7%
Southeastern Europe	4.1%
	100.0%

Since these estimates were prepared, 2 major developments have occurred to affect the disposition of the enemy's flak defenses (1) the intensification of heavy bomber attacks from Italian bases which have called for the strengthening of the heavy flak defenses in Southeastern Europe and (2) the Allied invasion which has caused recent ~~numbers~~ movements of flak into France. It is doubtfull however that these development have resulted in any substantial increase in total strength. On the contrary it is the opinion of MI 15 that the bulk of the increase in the invital sectors has had to be made by transfer from points within Germany.

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Eastern Front (including Poland) & the Baltic States)	13.7%
Italy	6.7
Southeastern Europe	4.1%
	100.0%

Since these estimates were prepared, 2 major developments have occurred to affect the disposition of the enemy's flak defenses (1) the intensification of heavy bomber attacks from Italian bases which have called for the strengthening of the heavy flak defenses in Southeastern Europe and (2) the Allied invasion which has caused recent additions to heavy flak in France. It is doubtful that the pressure of these developments has resulted in any substantial increase in total strength. On the contrary, it is the opinion of MI 15 that the bulk of the increase in other vital sectors has had to be made by transfer from points within Germany.

1/ Estimates prepared by Technical & Tactical Division and quoted in letter of 2 August 1944 from General White to Air Commodore Buckle.

2/ Quoted in Headquarters MAAF Weekly Air Intelligence Summary No. 60 10 January 1944.

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Since recent experience data are not available in Washington by which to question this opinion, the total of 15,000 heavy guns originally quoted has been derived by adjusting the MI 15 total of 14,000 for however, 1943, for estimated wastage and new production since that time.

The only available estimate of wastage and losses (which does not however take account of recent experience on the Normandy front) is that applied by MI 15 to the first 10 months of 1943. During that period wastage and losses were considered to be in the neighborhood of 2% of strength for German-occupied Europe, 12% for Southern Italy and 30% for Tunisia. New production was estimated at 300 heavy guns per month. If wastage and losses during the Normandy campaign have been greatly in excess of these estimates, the total of 15,000 would probably be too high for present equipment strength. On the other hand such evidence as exists suggests strongly that German efforts to increase new production, especially of the heavier types of guns, have succeeded in raising the monthly output of such types considerably above the 300 figure used by MI 15.

Since less than 20% of Germany's heavy flak in November 1943 was located in France, Belgium and Holland it is doubtful if even a high rate of wastage and loss since the Normandy campaign began would have affected substantially the German total strength in heavy guns by this time, especially since increased production during the period would have tended to offset increased wastage and loss. For the future, however, the increased weight of attack on all fronts should lead to heavier inroads on the enemy's supply position. The best indication of the effect on the enemy will , of course be provided by examination of captured equipment on the several fronts.

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Tube life in rounds varies inversely with the rate of fire, muzzle velocity and size of projectile. The best available estimates of tube life for German heavy guns at practical rates of fire, as provided by the Artillery Division, Office of Chief of Ordnance, are tabulated below.

	Practical Rate of fire in rounds per minute	Tube Life in Rounds
88 mm	20 rounds per minute	1500
105 "	15 " " "	1000
127 and 150 "	10 " " "	1000

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Faced with the existing necessity of increasing the effectiveness of their defenses there is theoretically no upper limit to the German requirements for heavy guns. For more than a year, however, there has been an observed tendency on the part of the enemy to increase the proportion of heavy guns in their anti-aircraft defenses. The 88 mm gun continues to be the basic or standard type of equipment for heavy flak batteries, but increasing numbers of 105, 127, & 150 mm guns have been noted and even larger sizes are reported to be in course of production. Recent changes in design have also favored the production of types with high muzzle velocities. The result of both tendencies, while increasing the accuracy and effectiveness of flak batteries, is to shorten the average barrel life of equipment in use. Thus the minimum requirement for new tubes as reserves and replacements for guns in operation is constantly being raised entirely apart from considerations of the desirability for increased production of complete guns.

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These estimates provide no guide to requirements for daily or monthly replacement of barrels, since this rate obviously varies directly with the continuity of sustained fire. ~~[illegible]~~ Thus empirical evidence is called for to show the rate of wastage actually being imposed on the enemy at present.

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Only the scantiest evidence is available either as to the enemy's reserve position in gun barrels or as to current methods for the production of new and spare barrels and liners. American experience furnishes only a very rough guide to possible German practice with regard to reserves and spare equipment, but in the absence of recent enemy intelligence on the subject, and in consideration of known differences in American and German production methods, some indication may be gleaned as to present possibilities.

American practice calls for the production of 2 spare liners or barrels for each complete gun produced. German practice in this regard is not known and captured equipment probably furnishes little indication of current German practice owing to the possibility that a large proportion of reserve

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tubes or barrels maintained in central depots some distance behind the line of combat, moreover the increased need for heavy guns has probably given priority to production of complete guns rather than spare equipment. In the absence of definite information, it seems reasonable to assume that the enemy's reserves of barrels or liners are not less than 5,000 for their heavy guns. New production of these items may be assumed to be at least one for each complete gun produced or somewhat in excess of 300 per month. Since the life of a barrel for heavy guns does not exceed 1500 to 2000 rounds for the higher velocity models, the use of this equipment under sustained heavy attack may easily result in a rapid depletion of reserve stocks and a heavy strain on production capacity. If, for example, the 11,000 or so guns in France, Belgium & Holland were fired at an average rate of 25 rounds per day per gun the result would be equivalent to wearing out barrels at the rate of 137½ per day which would exhaust a reserve supply of 5,000 barrels in slightly over a month, and with new production coming in at the rate of only 10 barrels a day an extremely critical situation would have developed in a matter of 2 to 3 weeks.

PRACTICE OF MANUFACTURE

Marked differences have been noted in the sundle German guns and their equivalent American models in regard to the method of their construction. American practice calls for the production, in general, of monobloc barrels which are centrifically cast on a mass production basis. It is believed that few if any of the high velocity guns of German manufacture are equipped with monobloc barrels though some of the smaller sizes in the lower velocities have been so equipped. The more usual German practice is to forge rather than cast barrels and to provide them with replacable liners. Recent types

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have even been provided with sectional lines so that the breech end of the barrel can be renewed more frequently than the more durable sections. The significance of these differences in manufacturing methods lies in the type of equipment required and the opportunities which exist for dispersing the essential processes among small establishments. In the case of sectional liners especially, the factory equipment called for is of such a size that it can be accommodated in very small establishments and may reasonably be found among a large number of firms equipped to make all types of armaments. Monobloc forgings, on the other hand, call for extremely heavy forge equipment which can be accommodated by the heavy engineering units of a few of the largest armament works. In the selection of targets with a view to limiting gun tube production, with significances attached to the type of equipment currently in use, the most confirmatory evidence of recent trends in this respect lies with the materiel which has been taken in recent weeks on the battle field.

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Target Prioritization. A report to the C.O.S. prepared 14 Jul 43 by the Subcommittee on Western Axis S.A. and S.T. Air Army Industry listed 12 plants believed to be engaged in the production of heavy guns; 5 plants known to be engaged in gun production of unknown caliber; and 6 plants possibly engaged in heavy guns. These plants are listed below.

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PLANTS BELIEVED TO BE ENGAGED ON HEAVY ARTILLERY (Guns, including carriages and mounts).

1. Krupp	Essen	Germany
2. Rheinmetall Borsig	Berlin/Tegel	"
3. " "	Düsseldorf	"
4. Deutsche Waffen-Munitions A.G. (H.Pels-Berlin-Erfurter Maschinenfabrik)	Erfurt	"
5. Deutsche Waffen-Munitions A.G. (Cegielski - Wildau)	Posen	Poland
6. Astra Vagaone	Brasov	Rumania
7. Odero-Terni-Orlando	Fiume	Italy
8. M.A.N.	Augsburg	Germany
9. Kapfenburg Arsenal	Wiener Neustadt	Austria
10. Bohler	Kapfenburg	Austria
11. Statlowa Wola	Sandomiery	Poland
12. Bata	Zlin	Czechoslovakia

Plants Believed to be in Production on A.A.Artillery, but of Unknown Calibre.

1. Royal Italian Arsenal	Venice-Naples	Italy
2. Steyr-Daimler-Puch	Steyr	Austria
3. Souma	Venissieux	France
4. Ansaldo (tubes only)	Turin	Italy
5. Forges de la Marine et d'Homecourt	St, Chamond (Loire)	France

Unconfirmed Plants

1. Polte	Magdeburg	Germany
22. Ansaldo	Genoa	Italy
3. Oberhütten	Gleiwitz	Germany

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4. Fonderie Royal	Herstal	Belgium
5. Wilton Fijenoord (Siderius)	Rotterdam	Holland
6." Oswac"	Silesia	Poland

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No ~~information~~ is available on the output of the individual plants within ~~the~~ either in terms of finished guns or ~~tanks~~ barrels; ~~and~~ nor is information at hand on the specific sizes in which the armed plants specialize. If it can be ascertained that a high proportion of the critical sizes are of ~~the~~ modern design, ~~from~~ targets might be productive of worth-while results:

1. Krupp,
2. Skoda,
3. Rheinmetall Borsig
4. Deutsche Waffen

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If, on the other hand, sectional heads predominate, the list of targets would have to be expanded indefinitely. In the absence of firm information on production practices on plant soil it is impossible to recommend a suitable list of targets for the most promising results.

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STRENGTH, PASTAGE AND LOSSES

The Germans total strength in heavy flak guns is currently estimated at 15,000 for all types above 75 mm. The number of each of the main classes of heavy guns is estimated to be roughly as follows:1/

88 mm	10,000
105 mm	3,000
127 & 150 mm	2,000
	15,000

As of the first of November, 1943 these guns were thought by MI 15 to be deployed over the several fronts in the proportions indicated below:2/

Germany (including the protectorate)	51.8%
France, Belgium & Holland	18.5%
Norway, Denmark & Finland	5.2%
Eastern Front (including Poland) & the Baltic Stetes)	13.7%
Italy	6.7%
Southeastern Europe	4.1%
	100.0%

Since these estimates were prepared, 2 major developments have occurred to affect the disposition of the enemy's flak defenses (1) the intensification of heavy bomber attacks from Italian bases which have called for the strengthening of the heavy flak defenses in Southeastern Europe and (2) the Allied invasion which has caused recent additions to heavy flak in France. It is doubtful that the pressure of these development has resulted in an abnormal increase in total strength. On the contrary, it is the opinion of MI 15 that the bulk of the increase in other vital sectors has had to be made by transfer from points within Germany.

1/ Estimates prepared by Technical & Tactical Division and quoted in letter of 2 August 1944 from General White to Air Commodore Buckle.

2/ Quoted in Headquarters MAAF Weekly Air Intelligence Summary No. 60 10 January 1944.

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Since recent emperical data are not available in Washington by which to question this opinion, the total of 15,000 heavy guns originally quoted has been derived by adjusting the MI 15 total of 14,050 for November, 1943, for estimating wastage and new production since that time.

The only available estimate of wastage and losses (which does not however take account of recent experience on the Normandy Front) is that applied by MI 15 to the first 10 months of 1943. During that period wastage and losses were considered to be in the neighborhood of 2½% of strength for German-occupied Europe, 12½% for Southern Italy and 300 for Tunisia. New production was estimated at 300 heavy guns per month. If wastage and losses during the Normandy campaign have been greatly in excess of these estimates, the total of 15,000 would probably be too high for present equipment strength. On the other hand such evidence as exists suggests strongly that German efforts to increase new production, especially of the heavier types of guns, have succeeded in raising the monthly output of such types considerably above the 300 figure used by MI 15.

Since less than 20% of Germany's heavy flak in November 1943 was located in France, Belgium and Holland it is doubtful if even a high rate of wastage and loss since the Normandy campaign began would have affected substantially the German's <u>total</u> strength in heavy guns by this time, especially since increased production during the period would have tended to offset increased wastage and loss. For the future, however, the increased weight of attack on all fronts should lead to heavier inroads on the enemy's supply position. The best indication of the effect on the enemy will, of course be provided by examination of captured equipment on the several fronts.

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REQUIREMENTS, NEW PRODUCTION AND RESERVES

Faced with the existing necessity of increasing the effectiveness of their flak defenses there is theoretically no upper limit to German requirements for heavy guns. For more than a year moreover, there has been an observed tendency on the part of the enemy to increase the proportion of heavy guns in their anti-aircraft defenses. The 88 mm gun continues to be the basic or standard type of equipment for heavy flak batteries, but increasing numbers of 105, 127, & 150 mm guns have been noted and even larger sizes are reported to be in course of production. Recent changes in design have also favored the production of types with high muzzle velocities. The result of both tendencies, while increasing the accuracy and effectiveness of flak batteries, is to shorten the average tube or barrel life of equipment in use. Thus the minimum requirement for new tubes as reserves and replacements for guns in operation is constantly being raised entirely apart from considerations of the desirability for increased production of complete guns.

Tube life in rounds varies immensely with the rate of fire, muzzle velocity, and size of projectile. The best available estimates of tube life for German heavy guns at practical rates of fire, as provided by the Artillery Division, Office of Chief of Ordnance, are tabulated below:

	Practical Rate of Sustained Fire	Tube Life In Rounds
88 mm	20 rounds per minute	1500
105 mm	15 rounds per minute	1000
127 & 150 mm	10 rounds per minute	1000

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These estimates provide no guide to daily or monthly requirements for replacement of barrels, since this rate obviously varies directly with the continuity of sustained fire. Thus emperical evidence is called for to show the rate of wastage actually being imposed on the enemy at present.

Only the scantiest evidence is available either as to the enemy's reserve position for gun barrels or as to current methods for the production of new and spare barrels and liners. American experience furnishes only a very rough guide to possible German practice with regard to reserves and spare equipment, but in the absence of recent enemy intelligence on the subject, and in consideration of known differences in American and German production methods, some indication may be gleaned as to present possibilities.

American practice calls for the production of 2 spare liners or barrels for each complete gun produced. German practice in this regard is not known and captured equipment probably furnishes little indication of current German practice owing to the possibility that a large proportion of reserve tubes or barrels is maintained in central depots some distance behind the line of combat and would not be subject to capture. Moreover the increased need for heavy guns has probably givenpriority to production of complete guns rather than spare equipment. In the absence of definite information it seems reasonable to assume that the enemy's reserves of barrels or liners does not exceed 5,000 for their heavy guns. New production of these items may be assumed to be at least one for each complete gun produced or somewhat in excess of 300 per month. Since the life of a barrel for heavy guns probably does not exceed 1500 to 2000 rounds for the higher velocity models, the use of this equipment under sustained heavy attack may easily result in

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a rapid depletion of reserve stocks and a heavy strain on production capacity. If, for example, the 11,000 or so guns in France, Belgium & Holland were fired at an average rate of 25 rounds per day per gun the result would be equivalent to wearing out barrels at the rate of 137½ per day which would exhaust a reserve supply of 5,000 barrels in slightly over a month; and with new production coming in at the rate of only 10 barrels a day an extremely critical situation would have developed in a matter of 2 to 3 weeks.

PROCESS OF MANUFACTURE

Marked differences have been noted between the sample German guns and their equivalent American models in regard to the method of their construction. American practice calls for the production, in general, of monobloc barrels which are centrifically cast on a mass production basis. It is believed that few if any of the high velocity guns of German manufacture are equipped with monobloc barrels through some of the smaller sizes in the lower velocities have been so equipped. The more usual German practice is to forge rather than cast barrels and to provide them with replacable liners. Recent types have even been provided with sectional lines so that the breach end of the barrel can be renewed more frequently than the more durable portions. The significance of these differences in manufacturing methods lies in the type of plant equipment required and the opportunities which exist for dispersing the essential processes among small establishments. In the case of sectional liners especially, the factory equipment called for is of such a size that it can be accommodated in very small establishments and may reasonable be found among a large number of firms equipped to make all types of armaments. Monobloc forgings, on the other hand, call for extremely heavy forge equipment which could be accommodated only by the heavy engineering

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units of a few of the largest armament works. In the selection of targets with a view to limiting new tube production, vital significances attached to tye type of equipment currently in use. Again, the best confirmatiory evidence of recent trends in this respect lies with the materiel which has been taken in recent weeks on the battle field.

TARGET POSSIBILITIES

A report to the C.O.A. prepared 14 February 43 by the Subcommittee on the Western Axis A.A. and A.A.T. Artillery Industry listed 12 plants believed to be engaged on the production f heavy guns; 5 plants known to be engaged on gun production of unknown calibre; and 6 plants possibly engaged on heavy guns. These plants are listed below.

PLANTS BELIEVED TO BE ENGAGED ON HEAVY ARTILLERY (Guns, including carriages and mounts).

1.	Krupp	Essen	Germany
2.	Rheinmetall Borsig	Berlin/Tegel	"
3.	Rheinmetall Borsig	Düsseldorf	"
4.	Deutsche Waffen-Munitions A.G. (H.Pels-Berlin-Erfurter Maschinenfabrik)	Erfurt	"
5.	Deutsche Waffen-Munitions A.G.(Cegielski-Wildau)	Posen	Poland
6.	Astra Vagaone	Brasov	Rumania
7.	Odero-Terni-Orlando	Fiume	Italy
8.	M.A.N.	Augsburg	Germany
9.	Kapfenburg Arsenal	Wiener Neustadt	Austria
10.	Bohler	Kapfenburg	Austria
11.	Statlowa Wola	Sandomiery	Poland
12.	Bata	Zlin	Czechoslovakia

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PLANTS BELIEVED TO BE IN PRODUCTION ON A.A. ARTILLERY, but of Unknown Calibre.

1.	Royal Italian Arsenal	Venice-Naples	Italy
2.	Steyr-Daimler-Puch	Steyr	Austria
3.	Souma	Venissieux	France
4.	Ansaldo (tubes only)	Turin	Italy
5.	Forges de la Marine et d'Homecourt	St. Chamond (Loire)	France

Unconfirmed Plants

1.	Polte	Magdeburg	Germany
2.	Ansaldo	Genoa	Italy
3.	Oberhütten	Gleiwitz	Germany
4.	Fonderie Royal	Herstal	Belgium
5.	Wilton Fijenoord (Siderius)	Rotterdam	Holland
6.	"Oswac"	Silesia	Poland

No information is available on the output of the individual plants either in terms of finished guns or barrels; nor is information at hand on the specific sizes in which these several plants specialize. If it can be ascertained that a high proportion of the ertical sizes are of monobloc design, four targets might be production of worth-while results:

1. Krupp
2. Skoda
3. Rheinmetall Borsig
4. Deutsche Waffen

If, on the other hand, sectional barrels predominate, the list of targets would have to be expanded indefinitely. In the absence of firm information on production practice on plant output it is impossible to recommend a suitable list of targets for the most promising results.

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SUMMARY

1. From the best information available in Washington the Germans are estimated to have a current strength of 15,000 heavy guns, classified as follows:

88 mm.	10,000
105 mm.	3,000
128 mm. and larger	2,000

2. New production, projected from K.E.W. estimates for 1943, is believed to be in the neighborhood of 350 complete guns per month for all heavy sizes, and although the distribution of this production among the sizes indicated above is not known, there is an observed tendency to emphasize the larger sizes, and types with high muzzle velocities.

3. Gun life is limited by the life of the tube or barrel and varies inversely with the rate of fire, muzzle velocity and size of projectile. Tube life for the larger sizes and higher velocity types is probably not in excess of 1500 rounds at practical sustained rates of fire.

4. Information is lacking as to (1) the average daily or monthly wastage of tubes for the 15,000 heavy guns currently thought to be in use, (2) the enemy's stocks of spare tubes, and (3) the ratio maintained between the production of complete guns and that of spare tubes.

5. In the absence of such information, it is not possible to appraise the enemy's tube position or estimate the time required for critical shortages to develop. Dependable data of current value can be obtained only by systematic examination of captured equipment, supplies and documents, and by day-to-day observation in the battle areas.

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6. Certain qualitative observations should be noted, nor over, which bear on the selection of targets.

a. German emphasis on larger sizes and higher muzzle velocities tends to shorten tube life, while /differences in production methods restrict the application of mass production methods characteristic of American practice.

b. These factors tend to weaken the enemy's tube position as regards the production of spares, but this tendency may be offset in large measure by innovation in gun barrel design.

c. The essential characteristic of mass-produced guns, following American practice, is the monobloc barrel, German design, on the other hand, seems to favor sectional barrels equipped with replacable liners. Monobloc construction calls for heavy forge equipment available only in the largest armament shops. Sectional construction on the other hand is practicable in a comparatively large number of smaller shops.

d. The proportion of guns equipped with replacable liners is not known, but examination of captured equipment should indicate how the quantities of this type of gun compare with guns equipped with monobloc barrels among those recently produced.

e. If it is found that a substantial proportion of guns in use are equipped with monobloc barrels, the few shops capable of producing such equipment may offer a concentrated target, the destruction of which might present further

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increases in equipment strength.

f. If, on the other hand, the preponderance of heavy guns in use are equipped with sectional barrels, the number of possible targets would be greatly increased.

7. The quantitative investigations as well as the technical evaluations required by this problem can best be performed by M.I. 15 from intelligence materials collected ~~from~~ active battle areas.

8. There remains the problem of evaluating intelligence relating to the German Armaments industry. Information available in Washington on the German Armaments industry is not considered reliable enough to furnish a basis for preparing recommended lists of targets to meet the conditions suggested under 6 e and 6 f above. Target analysis for these purposes can best be prepared by E.C.N., American Embassy in collaboration with the British M.E.W. with data collected from captured equipment and documents.

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Conclusion

From information available in Washington it is not possible to recommend a list of armament plants available as targets for reducing the enemy's heavy A.A. strength substantially within a short period of time. Three elements of the problem call for the collection and analysis of recent intelligence materials especially captured equipment, from active battle areas: (1) estimation of the enemy's supply of spare tubes and liners; (2) determination of the ratio of monobloc barrels to sectional liners for heavy guns in current use; and (3) identification of important producers. To avoid loss of time, the analysis should be done preferably in London where the necessary materials are accessible and where the findings can be made immediate y available. It is suggested that the quanitative and technical analysis be performed by U.S. field ordnance intelligence units in collaboration with M.I. 15, and the target evaluation be done by the Economic Warfare Division, American Embassy in collaboration with the British M.E.W.

Nature of the Problem

It has generally been assumed that bombing attacks on artillery production would have little effect on German A.A. strength and would not significantly alter the course of the European war within a reasonably short period.1/

Under the increasing pressure of Allied bombing attacks, however, it is worth inquiring whether the enemy's A.A. defences, especially in heavy guns with high muzzle velocities, may not be facing critical

1/ See Report to Committee of Operations Analysts by Subcommittee on Western Axis A.A. and A.T. Artillery Industry 14 Feb. 1943.

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shortages of spares for replacements and whether concentrated attack on the productive facilities may not have an immediate telling effect on equipment strength. Since, under sustained rates of fire, the critical item requiring most frequent replacement is the gun barrel, the crux of the problem is the adequacy of the enemy's spare barrels supply. If it is found that current rates of wastage are diminishing this supply at a rapid rate, and that the productive facilities for spare barrles offer a sufficiently concentrated system of targets, an immediate heavy attack on such installations may be expected to hasten the development of a critical shortage of replacements, and reduce the effectiveness of A.A. defenses within a significantly brief period.

To examine this problem fully it is necessary to ascertain (1) the enemy's A.A. strength for their important types of weapons, (2) the extent of their supply of replacement tubes, (3) the rate of wastage to which they are currently being inflicted, (4) their productive capacity for new guns and tubes of the types required, and (5) the magnitude of this target system offered by the armament plants engaged on their production.

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CONCLUSIONS

As a means of imposing a critical shortage of essential items of military equipment, the armanent factories engaged on the production of heavy A.A. tubes do not offer an attractive system for heavy bomber attack. First for any reasonable assumptions which can be made regarding the enemy's tube stocks from information available in Washington, it does not appear likely that even a drastic entailment of new tube production could affect heavy gun strength within a reasonable short period, say three to six months. Second although the number of factories actually engaged on heavy tube production is not definitely known, armament plants as a class are characterized by heavy engineering installations extremely invulnerable to destruction by bombing.

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Of, from examination of intelligence materials collected in active theatre areas, it is found that an adequate supply of replacement tubes for heavy A.A. guns depends on heavy forge and press installations, the few large armament shops capable of producing the forgings might open a concentrated target system. German's [illegible] seamless barrels and replaceable liners [illegible] however, suggests the practicability that production might be dispersed among a fairly large number of smaller shops.

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SUMMARY

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88 mm.	10,000
105 mm.	3,000
128 mm. and larger	2,000

2. New production, projected from M.E.W. estimates for 1943, is believed to be in the neighborhood of 350 complete guns per month for all heavy sizes, and although the distribution of this production among the sizes indicated above is not known, there is an observed tendency to emphasize the larger sizes, and types with high muzzle velocities.

3. Gun life is limited by the life of the tube or barrel and varies immensely with the rate of fire, muzzle velocity and size of projectile. Tube life for the larger sizes and higher velocity types is probably not in excess of 1500 rounds at practical sustained rates of fire.

4. Information is lacking as to (1) the average daily or monthly wastage of tubes for the 15,000 heavy guns currently thought to be in use, (2) the enemy's stocks of spare tubes, and (3) the ratio maintained between the production of complete guns and that of spare tubes.

5. In the absence of such information, it is not possible to appraise the enemy's tube position or estimate the time required for critical shortages to develop. Dependable data of current value can be obtained only by systematic examination of captured equipment, supplies and documents, and by day-to-day observation in the battle areas.

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6. Certain qualitative observations should be noted, mor over, which bear on the selection of targets.

a. German emphasic on larger sizes and higher muzzle velocities tends to shorten tube life, while differences in production methods restrict the application of mass production methods characteristic of American practice.

b. These factors tend to weaken the enemy's tube position as regards the production of spares, but this tendency may be offset in large measure by the use of sectional liners ~~innovation in gun barrel design.~~

c. The essential characteristic of mass-produced guns, following American practice, is the monobloc barrel, German design, on the other hand, seems to favor the use of ~~sectional barrels equipped with~~ replacable sectional liners. ~~Monobloc construction cells for heavy forge equipment available only in the largest armament shops. Sectional construction on the other hand is practicable in a comparatively large number of smaller shops.~~

d. The proportion of guns equipped with ~~replacable~~ sectional liners is not known, but examination of captured equipment should indicate how the quanities of this type of gun compare with guns equipped with monobloc barrels among those recently produced.

e. If it is found that a substantial proportion of guns in use are equipped with monobloc barrels, the few shops capable of producing such equipment may offer a concentrated target, the destruction of which might present further

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increases in equipment strength.

f. If, on the other hand, the preponderance of heavy guns in use are equipped with sectional ~~barrels, the number of possible targets would be greatly increased~~.

7. The quanitative investigations as well as the technical evaluations required by this problem can best be performed by M.I. 15 ~~from intelligence materials collected from active battle areas~~.

8. There remains the problem of ~~evaluating intelligence relating to the German Armaments industry~~. Information available in Washington on the German Armaments industry is not considered reliable enough to furnish a basis for preparing recommended lists of targets to meet the conditions suggested under 6 e and 6 f above. Target analysis for these purposes can best be prepared by E.O.U., American Embassy in collaboration with the British M.E.W. with data collected ~~from captured equipment and documents~~.

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Conclusion

From information available in Washington it is not possible to recommend a list of armament plants available as targets for reducing the enemy's heavy A.A. strength substantially within a short period of time. Three elements of the problem call for the collection and analysis of recent intelligence materials especially captured equipment, from active battle areas: (1) estimation of the enemy's supply of spare tubes and liners; (2) determination of the ratio of monobloc barrels to sectional liners for heavy guns in current use; and (3) identification of important producers. To avoid loss of time, the analysis should be done preferably in London where the necessary materials are accessible and where the findings can be made immediately available. It is suggested that the quanitative and technical analysis be performed by U.S. field ordnance intelligence units in collaboration with M.I. 15, and the target evaluation be done by the Economic Warfare Division, American Embassy in collaboration with the British M.E.W.

Nature of the Problem

It has generally been assumed that bombing attacks on artillery production would have little effect on German A.A. strength and would not significantly alter the course of the European war within a reasonably short period.1/

Under the increasing pressure of Allied bombing attacks, however, it is worth inquiring whether the enemy's A.A. defences, especially in heavy guns with high muzzle velocities, may not be facing critical

1/ See Report to Committee of Operations Analysts by Subcommittee on Western Axis A.A. and A.T. Artillery Industry 14 Feb. 1943.

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shortages of spares for replacements and whether concentrated attack on the productive facilities may not have an immediate telling effect on equipment strength. Since, under sustained rates of fire, the critical item requiring most frequent replacement is the gun barrel, the crux of the problem is the adequacy of the enemy's spare barrels supply. If it is found that current rates of wastage are diminishing this supply at a rapid rate, and that the productive facilities for spare barrles offer a sufficiently concentrated system of targets, an immediate heavy attack on such installations may be expected to hasten the development of a critical shortage of replacements, and reduce the effectiveness of A.A. defenses within a significantly brief period.

To examine this problem fully it is necessary to ascertain (1) the enemy's A.A. strength for their important types of weapons, (2) the extent of their supply of replacement tubes, (3) the rate of wastage to which they are currently being inflicted, (4) their productive capacity for new guns and tubes of the types required, and (5) the magnitude of this target system offered by the armament plants engaged on their production.

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Summary. On the basis of information available in Washington, it is not possible to reach a definite conclusion regarding the feasibility of strategic bomber attack on heavy A.A. gun barrel production. Such evidence as exists, however, points to a substantial supply of reserve barrels, and a volume of new production which, ~~though small~~ is sufficient to balance wastage at current rates, ~~is only a small proportion of present equipment strength~~. Although little is definitely known about the output of individual armament plants, they are characterized by heavy engineering installations against which aerial attacks have been relatively ineffective. Moreover, the emphasis in German gun design on production of replaceable sectional liners suggests that an extensive list of targets may be involved. Before a definite decision can safely be formulated, three

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~~Conclusion~~

~~On the basis of~~ ~~the information available in Washington it is not possible to recommend~~ ~~the production of some bombs or explosives suitable for~~ ~~effect on concrete~~ ~~for reducing the German heavy A.A. strength substantially within a short period of time.~~ ~~Three~~ elements of the problem call for ~~the collection and analysis~~ a further study based on recent intelligence materials, especially captured equipment, collected in active battle areas: (1) estimation of the enemy's supply of spare tubes and liners; (2) determination of the ratio of monobloc barrels to sectional liners for heavy guns in current use; and (3) identification of important producers. To avoid loss of time, the analysis should be done preferably in London where the necessary materials are accessible and where the findings can be made immediately available. ~~It is suggested that the quantitative and technical analysis be performed by U.S. field ordnance intelligence units in collaboration with M.I. 15, and the target evaluation be done by the Economic Warfare Division, American Embassy in collaboration with the British M.E.W.~~

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~~It has generally been assumed~~ that bombing attacks on artillery production would have little effect on German A.A. strength and would not significantly alter the course of the European war within a reasonably short period.1/

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1/ See Report to Committee of Operations Analysts by Subcommittee on Western Axis A.A. and A.T. Artillery Industry 14 Feb. 1943.

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shortages of spares for replacements and whether concentrated attack on the productive facilities may not have an immediate telling effect on equipment strength. Since, under sustained rates of fire, the critical item requiring most frequent replacement is the gun barrel, the crux of the problem is the adequacy of the enemy's spare barrels and liners supply. If it is found that current rates of wastage are diminishing this supply at a rapid rate, and that the productive facilities for spare barrels offer a sufficiently concentrated system of targets, an immediate heavy attack on such installations may be expected to hasten the development of a critical shortage of replacements, and reduce the effectiveness of A.A. defenses within a significantly brief period.

To examine the problem fully it is necessary to ascertain (1) the enemy's A.A. strength for their important types of weapons, and the extent of their supply of replacement tubes, (2) the rate of wastage to which they are currently being subjected, (3) their productive capacity for new guns and tubes of the types required, and (4) the magnitude of the target system offered by the apparent plants engaged on their production.

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Strength and Reserves

From the best information available in Washington the Germans are estimated to have a current strength of 15,000 heavy guns, classified as follows: 1/

88 mm.	10,000
105 mm.	3,000
128 mm. and larger	2,000

As of the first of November, 1943 these guns were thought by MI 15 to be deployed over the several fronts in the proportions indicated below: 2/

Germany (including the protectorate)	51.8%
France, Belgium & Holland	18.5%
Norway, Denmark & Finland	5.2%
Eastern Front (including Poland) & the Baltic States)	13.7%
Italy	6.7%
Southeastern Europe	4.1%
	100.0%

Since these estimates were prepared, major developments have occurred to affect the disposition of the enemy's flak defenses (1) the intensification of heavy bomber attacks from Italian bases which have called for the strengthening of the heavy flak defenses in Southeastern Europe and (2) the Allied invasion which has caused recent additions to heavy flak in France. It is doubtful that the pressure of these development has resulted in an abnormal increase in total strength. On the contrary, it is the opinion of MI 15 that the bulk of the increase in other vital sectors has had to be made by transfer from points within Germany.

1/ Estimates prepared by Technical & Tactical Division and quoted in letter of 2 August 1944 from General White to Air Commodore Buckle.

2/ Quoted in Headquarters MAAF Weekly Air Intelligence Summary No. 60 10 January 1944.

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~~Since~~ recent emperical data are not available in Washington by which to question this opinion, the total of 15,000 heavy guns originally quoted has been derived, therefore, by adjusting the ~~MI 15~~ total of 14,050 for November, 1943, ~~for~~ estimating wastage and new production since that time.

Only the scantiest evidence is available ~~either~~ as to the enemy's reserve position for gun barrels, ~~or as to current methods for the production of new and spare barrels and liners.~~ American experience furnishes only a very rough guide to possible German practice with regard to reserves and spare equipment, but in the absence of recent enemy intelligence on the subject, and in consideration of known differences in American and German production methods, some indication may be gleaned as to present possibilities.

American practice calls for the production of 2 spare liners or barrels for each complete gun produced. German practice in this regard is not known and captured equipment probably furnishes little indication of current German practice owing to the possibility that a large proportion of reserve tubes or barrels is maintained in central depots some distance behind the line of combat and would not be subject to capture. Moreover the increased need for heavy guns has probably given priority to production of complete guns rather than spare equipment. In the absence of definite information it seems reasonable to assume that the enemy's reserves of barrels or liners ~~does not exceed 5,000 for this heavy guns.~~

is at least 5 000 for these heavy guns.

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REQUIREMENTS, NEW PRODUCTION, AND RESERVES

Faced with the existing necessity of increasing the effectiveness of their flak defenses there is theoretically no upper limit to German requirements for heavy guns. For more than a year moreover, there has been an observed tendency on the part of the enemy to increase the proportion of heavy guns in their anti-aircraft defenses. The 88 mm gun continues to be the basic or standard type of equipment for heavy flak batteries, ~~but increasing numbers of 105, 128, & 150 mm guns have been noted and even larger sizes are reported to be in course of production. Recent changes in design have also favored the production of types with high muzzle velocities.~~ The result of this tendency, while increasing the accuracy and effectiveness of flak batteries, is to shorten the average tube or barrel life, ~~of equipment in use~~. Thus the minimum requirement for new tubes as reserves and replacements for guns in operation is constantly being raised entirely apart from considerations of the desirability for increased production of complete guns.

Tube life in rounds varies ~~immensely~~ with the rate of fire, muzzle velocity, and size of projectile. The best available estimates of tube life for German heavy guns at practical rates of fire, as ~~provided by~~ the Artillery Division, Office of Chief of Ordnance, are tabulated below:

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	Practical Rate of Sustained Fire	Tube Life in Rounds
88 mm Flak 18 or 36	15 rounds per minute	2500
88 mm Flak 41	20 " " "	1000
105 mm	15 " " "	2000
128 mm and larger	10 " " "	2000

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These estimates provide no guide to daily or monthly requirements for replacements of barrels, since this rate obviously varies directly with the continuity of sustained fire. Thus, empirical evidence is called for to show the rate of wastage actually being imposed on the enemy at present.

In regard to new production, it may be assumed that at least one spare liner is made for each complete gun produced. On this basis, total equipment strength in terms of liners is increasing at the rate of 600 per month. But if 5000 spare liners are available for the 15,000 heavy guns in use, total resources in terms of liners are 20,000, and new production is only 3 per cent of total equipment strength. [redacted] Thus even a drastic cut in new production would have little effect on the enemy's heavy gun strength within a reasonably short period.

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Penetration of German Gun ~~Design~~ Production. At this point certain ~~data~~ characteristics of German ~~tactics~~ gun production should be noted, which have a bearing both ~~on the collection of information~~ on intelligence requirements and the evaluation of possible targets.

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Marked differences have been noted between the sample German guns and their equivalent American models in regard to the method of their construction. American practice calls for the production, in general, of monobloc barrels which are centrifically cast on a mass production basis. It is believed that few if any of the high velocity guns of German manufacture are equipped with monobloc barrels ~~through~~ through some of the smaller sizes in the lower velocities have been so equipped. The more usual German practice is to forge rather than cast ~~barrels and to provide them with replacable liners~~ the tubes. Recent types have even been provided with sectional lines so that the breach end of the barrel can be renewed more frequently than the more durable portions. The significance of these differences in manufacturing methods lies in the type of plant equipment required and the opportunities which exist for dispersing the essential processes among small establishments. In the case of sectional liners especially, the factory equipment called for is of such a size that it can be accommodated in ~~many~~ small establishments and may reasonable be found among a ~~large~~ substantial number of firms equipped to make all types of armaments. Monobloc forgings, on the other hand, call for extremely heavy forge equipment which could be accommodated only by the heavy engineering units of a few of the largest armament works.

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The proportion of guns equipped with sectional liners is not known, but has been reported by M.I.15 to be large and increasing. Examination of captured equipment should indicate how the quantities of this type of gun compare with those provided with monobloc barrels among guns recently produced.

If it is found that a substantial proportion of guns in use are equipped with monobloc barrels, the few shops capable of producing such equipment may offer a concentrated target, the destruction of which might prevent further ~~substantial~~ increases in equipment strength. If, on the other hand, the preponderance of heavy guns in use are equipped with sectional liners, as seems likely, it is by no means certain that the enemy's productive facilities are so concentrated, ~~since sectional construction may be carried out in a comparatively large number of shops.~~

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Target Vulnerability. ~~Although~~ The number of factors engaged on heavy tube a line production is not definitely known, and the target potentialities of the industry cannot therefore be assessed in Washington. As a class, however, armament plants are characterized by heavy engineering installations against which aerial ~~is believed incommensurate to~~ has been relatively ineffective bombardment. This fact emphasizes the importance of a high degree of concentration if the target system is to be considered feasible, and

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suggests strongly that the individual
rights may call for an extremely
heavy weight of attack.

Office of Assistant Chief of Staff
Intelligence 14 August 1974

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STRENGTH, WASTAGE AND LOSSES

The Germans total strength in heavy flak guns is currently estimated at 15,000 for all types above 75 mm. The number of each of the main classes of heavy guns is estimated to be roughly as follows:1/

88 mm	10,000
105 mm	3,000
~~128 - 150 mm~~	2,000
	15,000

As of the first of November, 1943 these guns were thought by MI 15 to be deployed over the several fronts in the proportions indicated below:2/

Germany (including the protectorate)	51.8%
France, Belgium & Holland	18.5%
Norway, Denmark & Finland	5.2%
Eastern Front (including Poland) & the Baltic States)	13.7%
Italy	6.7%
Southeastern Europe	4.1%
	100.0%

Since these estimates were prepared, 2 major developments have occurred to affect the disposition of the enemy's flak defenses (1) the intensification of heavy bomber attacks from Italian bases which have called for the strengthening of the heavy flak defenses in Southeastern Europe and (2) the Allied invasion which has caused recent additions to heavy flak in France. It is doubtful that the pressure of these development has resulted in an abnormal increase in total strength. On the contrary, it is the opinion of MI 15 that the bulk of the increase in other vital sectors has had to be made by transfer from points within Germany.

1/ Estimates prepared by Technical & Tactical Division and quoted in letter of 2 August 1944 from General White to Air Commodore Buckle.

2/ Quoted in Headquarters MAAF Weekly Air Intelligence Summary No. 60 10 January 1944.

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Since recent empirical data are not available in Washington by which to question this opinion, the total of 15,000 heavy guns originally quoted has been derived by adjusting the MI 15 total of 14,050 for November, 1943, for estimated wastage and new production since that time.

The only available estimate of wastage and losses (which does not however take account of recent experience on the Normandy Front) is that applied by MI 15 to the first 10 months of 1943. During that period wastage and losses were considered to be in the neighborhood of 2½% of strength for German-occupied Europe, 12½% for Southern Italy and 30% for Tunisia. New production was estimated at 300 heavy guns per month. If wastage and losses during the Normandy campaign have been greatly in excess of these estimates, the total of 15,000 would probably be too high for present equipment strength. On the other hand such evidence as exists suggests strongly that German efforts to increase new production, especially of the heavier types of guns, have succeeded in raising the monthly output of such types ~~considerably~~ above the 300 figure used by MI 15.

Since less than 20% of Germany's heavy flak in November 1943 was located in France, Belgium and Holland it is doubtful if even a high rate of wastage and loss since the Normandy campaign began would have affected substantially the German's <u>total</u> strength in heavy guns by this time, especially since increased production during the period would have tended to offset increased wastage and loss. For the future, however, the increased weight of attack on all fronts should lead to heavier inroads on the enemy's supply ~~position~~. The best indication of the effect on the enemy will, of course be provided by examination of captured equipment on the several fronts.

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REQUIREMENTS, NEW PRODUCTION AND RESERVES

Faced with the existing necessity of increasing the effectiveness of their flak defenses there is theoretically no upper limit to German requirements for heavy guns. For more than a year moreover, there has been an observed tendency on the part of the enemy to increase the proportion of heavy guns in their anti-aircraft defenses. The 88 mm gun continues to be the basic or standard type of equipment for heavy flak batteries, but increasing numbers of 105, 128, & 150 mm guns have been noted, and even larger sizes are reported to be in course of production. Recent changes in design have also favored the production of types with high muzzle velocities. The result of this tendency, while increasing the accuracy and effectiveness of flak batteries, is to shorten the average tube or barrel life of equipment in use. Thus the minimum requirement for new tubes as reserves and replacements for guns in operation is constantly being raised, entirely apart from considerations of the desirability for increased production of complete guns.

Tube life in rounds varies inversely with the rate of fire, muzzle velocity, and size of projectile. The best available estimates of tube life for German heavy guns at practical rates of fire, as provided by the Artillery Division, Office of Chief of Ordnance, are tabulated below:

	Practical Rate of Sustained Fire	Tube Life In Rounds
88 mm	20 rounds per minute	2500
105 mm	15 rounds per minute	1500
128 & 150 mm	10 rounds per minute	1000

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These estimates provide no guide to daily or monthly requirements for replacement of barrels, since this rate obviously varies directly with the continuity of sustained fire. Thus empirical evidence is called for to show the rate of wastage actually being imposed on the enemy at present.

Only the scantiest evidence is available either as to the enemy's reserve position for gun barrels or as to current methods for the production of new and spare barrels and liners. American experience furnishes only a very rough guide to possible German practice with regard to reserves and spare equipment, but in the absence of recent enemy intelligence on the subject, and in consideration of known differences in American and German production methods, some indication may be gleaned as to present possibilities.

American practice calls for the production of 2 spare liners or barrels for each complete gun produced. German practice in this regard is not known and captured equipment probably furnishes little indication of current German practice owing to the possibility that a large proportion of reserve tubes or barrels is maintained in central depots some distance behind the line of combat and would not be subject to capture. Moreover the increased need for heavy guns has probably given priority to production of complete guns rather than spare equipment. In the absence of definite information it seems reasonable to assume that the enemy's reserves of barrels or liners does not exceed 5,000 for their heavy guns. New production of these items may be assumed to be at least one for each complete gun produced or somewhat in excess of 300 per month. Since the life of a barrel for heavy guns probably does not exceed 1500 to 2000 rounds for the higher velocity models, the use of this equipment under sustained heavy attack may easily result in

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a rapid depletion of reserve stocks and a heavy strain on production capacity. If, for example, the 11,000 or so guns in France, Belgium & Holland were fired at an average rate of 25 rounds per day per gun the result would be equivalent to wearing out barrels at the rate of 137½ per day which would exhaust a reserve supply of 4,000 barrels in slightly over a month; and with new production coming in at the rate of only 10 barrels a day an extremely critical situation would have developed in a matter of 2 to 3 weeks.

PROCESS OF MANUFACTURE

Marked differences have been noted between the sample German guns and their equivalent American models in regard to the method of their construction. American practice calls for the production, in general, of monobloc barrels which are centrifically cast on a mass production basis. It is believed that few if any of the high velocity guns of German manufacture are equipped with monobloc barrels though some of the smaller sizes in the lower velocities have been so equipped. The more usual German practice is to forge rather than cast barrels and to provide them with replaceable liners. Recent types have been provided with sectional lines so that the breach end of the barrel can be renewed more frequently than the more durable portions. The significance of these differences in manufacturing methods lies in the type of plant equipment required and the opportunities which exist for dispersing the essential processes among small establishments. In the case of sectional liners especially, the factory equipment called for is of such a size that it can be accommodated in many small establishments and may reasonably be found among a large number of firms equipped to make all types of armaments. Monobloc forgings, on the other hand, call for extremely heavy forge equipment which could be accommodated only by the heavy engineering

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units of a few of the largest armament works. In the selection of targets with a view to limiting new tube production, vital significance is attached to the type of equipment currently in use. Again, the best confirmatory evidence of recent trends in this respect lies with the materiel which has been taken in recent weeks on the battle field.

TARGET POSSIBILITIES

A report to the C.O.S. prepared 14 February 43 by the Subcommittee on the Western Axis A.A. and A.F.V. Artillery Industry listed 12 plants believed to be engaged on the production of heavy guns; 5 plants known to be engaged on gun production of unknown calibre; and 6 plants possibly engaged on heavy guns. These plants are listed below.

PLANTS BELIEVED TO BE ENGAGED ON HEAVY ARTILLERY (Guns, including carriages and mounts).

1.	Krupp	Essen	Germany
2.	Rheinmetall Borsig	Berlin/Tegel	"
3.	Rheinmetall Borsig	Düsseldorf	"
4.	Deutsche Waffen-Munitions A.G. (H.Pels-Berlin-Erfurter Maschinenfabrik)	Erfurt	"
5.	Deutsche Waffen-Munitions A.G.(Cegielski-Wilden)	Posen	Poland
6.	Astra Vagaone	Brasov	Rumania
7.	Odero-Terni-Orlando	Fiume	Italy
8.	M.A.N.	Augsburg	Germany
9.	Kapfenburg Arsenal	Wiener Neustadt	Austria
10.	Bohler	Kapfenburg	Austria
11.	Statlowa Wola	Sandomiery	Poland
12.	Bata	Zlin	Czechoslovakia

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PLANTS BELIEVED TO BE IN PRODUCTION OF A.A. ARTILLERY, but of Unknown Calibre.

1.	Royal Italian Arsenal	Venice-Naples	Italy
2.	Steyr-Daimler-Puch	Steyr	Austria
3.	Souma	Venissieux	France
4.	Ansaldo (tubes only)	Turin	Italy
5.	Forges de la Marine et d'Homecourt	St. Chamond (Loire)	France

Unconfirmed Plants

1.	Polte	Magdeburg	Germany
2.	Ansaldo	Genoa	Italy
3.	Oberhütten	Gleiwitz	Germany
4.	Fonderie Royal	Herstal	Belgium
5.	Wilton Fijenoord (Siderius)	Rotterdam	Holland
6.	"Oswac"	Silesia	Poland

No information is available on the output of the individual plants either in terms of finished guns or barrels; nor is information at hand on the specific sizes in which these several plants specialize. If it can be ascertained that a high proportion of the critical sizes are of monobloc design, four targets might be production of worth-while results:

1. Krupp
2. Skoda
3. Rheinmetall Borsig
4. Deutsche Waffen

If, on the other hand, sectional barrels predominate, the list of targets would have to be expanded indefinitely. In the absence of firm information on production practice on plant output it is impossible to recommend a suitable list of targets for the most promising results.

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1

~~Summary~~ Conclusions. On the basis of information available Tim in Washington, it is not possible to ~~conclude~~ reach a definite conclusion ~~recommendation~~ regarding the ~~suitability~~ ~~in view with regard to the suitability~~ feasibility of attacking A.A. gun barrel production. regarding the feasibility of ~~destroying~~ bomber attack on A.A. gun barrel productions.

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[illegible] known.
[illegible] evidence [illegible] point to a
substantial supply of some metals
and a volume of new production which, though
it may be sufficient to balance wastage at current
rates, is only a small proportion of present
equipment strength.

Although little is known [illegible] about
the output of individual armament plants,
they are thought to be using only existing
stocks which could explain
[illegible] have been relatively high. However,
the emphasis in [illegible] on production
replacement
[illegible] of overhead lines suggests that an
extensive list of targets may be
involved. Before a definite decision
can easily be formulated, three

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These estimates provide no guide to daily or monthly requirements for replacement of barrels, since this rate obviously varies directly with the continuity of sustained fire. Thus emperical evidence is called for to show the rate of wastage actually being imposed on the enemy at present. In regard to wire production, however, it may be assumed that at least one spare tube or liner is made for ~~each~~ ~~may be assumed to be at least one for~~ each complete gun produced, or somewhat in excess of 300 per month. Since the life of a barrel for heavy guns ~~probably does not exceed~~ 1500 to 2000 rounds for the higher velocity models, the use of this equipment under sustained heavy attack ~~may easily result in~~

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~~[illegible]~~

[illegible] would mean a [illegible]
of 35 hours per day. At 150 to
200 rounds per hour, this means
an average rate of five to seven
per gun per day. [illegible]
heavy guns in use.

25

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~~Doc 1000~~

If, for example, it were possible
to cut new production to zero, depletion
of a recent supply of two barrels ~~[illegible]~~
by, say, 60 per cent, in 30 days, would
require a rate of average ~~[illegible]~~
of 15 barrels per day. ~~[illegible]~~
~~[illegible]~~ rate of 15 ~~[illegible]~~
2 ~~[illegible]~~. Allowing
~~[illegible]~~
Best allowance must be made
for hauls in use. If then we say
we half spent, the supply of available
barrels would be increased by only
the present equipment at say the re-
750 or barrels. To do this ~~[illegible]~~ supply as well as

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Before a duplicate draft ~~[illegible]~~ can be submitted

To compile the savings ~~[illegible]~~ production

~~[illegible]~~ known records at ~~[illegible]~~ per month, it would be necessary to impose a wastage rate substantially in excess of that ~~[illegible]~~ to make a simple comparison of the ~~[illegible]~~ fund ~~[illegible]~~ a month's output of the armaments industry would alone

15 000

~~[illegible]~~

15 000 : 2 000

1

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6. Certain qualitative observations should be noted, moreover, which bear on the selection of targets.

a. German emphasis on larger sizes and higher muzzle velocities tends to shorten tube life, while differences in production methods restrict the application of mass production methods characteristic of American practice.

b. These factors tend to weaken the enemy's tube position as regards the production of spares, but this tendency may be offset in large measure by ~~innovation in gun barrel design~~ the use of sectional liners.

c. The essential characteristic of mass-produced guns, following American practice, is the monobloc barrel. German design, on the other hand, seems to favor ~~sectional barrels equipped with~~ replacable sectional liners. ~~Monobloc construction calls for heavy forge equipment available only in the largest armament shops. Sectional construction on the other hand is practicable in a comparatively large number of smaller shops.~~

d. The proportion of guns equipped with ~~replacable~~ sectional liners is not known, but examination of captured equipment should indicate how the quanities of this type of gun compare with guns equipped with monobloc barrels among those recently produced.

e. If it is found that a substantial proportion of guns in use are equipped with monobloc barrels, the few shops capable of producing such equipment may offer a concentrated target, the destruction of which might present further

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increases in equipment strength.

f. If, on the other hand, the preponderance of heavy guns in use are equipped with sectional ~~barrels, the number of possible targets would be greatly increased.~~ liners, as seems likely, it is by no means certain that the number of possible targets would be greatly increased, productive facilities and DO considered,

7. The quanitative investigations as well as the technical evaluations required by this problem can best be performed by M.I. 15 from intelligence materials collected from active battle areas.

8. There remains the problem of evaluating intelligence relating to the German Armaments industry. Information available in Washington on the German Armaments industry is not considered reliable enough to furnish a basis for preparing recommended lists of targets to meet the conditions suggested under 6 e and 6 f above. Target analysis for these purposes can best be prepared by E.O.U., American Embassy in collaboration with the British M.E.W. with data collected from captured equipment and documents.

liner sectional ~~liners~~ construction is practicable in a comparatively large number of smaller ships.

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The only available estimate of wastage and losses (which does not however take acc t of recent experience on the mandy Front) is that applied by MI 15 to the first 10 months of 1943. During that period wastage and losses were considered to be in the neighborhood of 2½% of strength for German-occupied Europe, 12½% for Southern Italy and 300 for Tunisia. New production was estimated at 300 heavy guns per month. If wastage and losses during the Normandy campaign have been greatly in excess of these estimates, the total of 15,000 would probably be too high for present equipment strength. On the other hand such evidence as exists suggests strongly that German efforts to increase new production, especially of the heavier types of guns, have succeeded in raising the monthly output of such types considerably above the 300 figure used by MI 15.

Since less than 20% of Germany's heavy flak in November 1943 was located in France, Belgium and Holland it is doubtful if even a high rate of wastage and loss since the Normandy campaign began would have affected substantially the German's <u>total</u> strength in heavy guns by this time, especially since increased production during the period would have tended to offset increased wastage and loss. For the future, however, the increased weight of attack on all fronts should lead to heavier inroads on the enemy's supply position. The best indication of the effect on the enemy will, of course be provided by examination of captured equipment on the several fronts.

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units of a few of the largest armament works. In the selection of targets with a view to limiting new tube production, vital significances attached to tye type of equipment currently in use. Again, the best confirmatiory evidence of recent trends in this respect lies with the materiel which has been taken in recent weeks on the battle field.

TARGET POSSIBILITIES

A report to the C.O.A. prepared 14 February 43 by the Subcommittee on the Western Axis A.A. and A.A.T. Artillery Industry listed 12 plants believed to be engaged on the production of heavy guns; 5 plants known to be engaged on gun production of unknown calibre; and 6 plants possibly engaged on heavy guns. These plants are listed below.

PLANTS BELIEVED TO BE ENGAGED ON HEAVY ARTILLERY (Guns, including carriages and mounts).

1.	Krupp	Essen	Germany
2.	Rheinmetall Borsig	Berlin/Tegel	"
3.	Rheinmetall Borsig	Düsseldorf	"
4.	Deutsche Waffen-Munitions A.G. (H.Pels-Berlin-Erfurter Maschinenfabrik)	Erfurt	"
5.	Deutsche Waffen-Munitions A.G.(Cegielski-Wildau)	Posen	Poland
6.	Astra Vagaone	Brasov	Rumania
7.	Odero-Terni-Orlando	Fiume	Italy
8.	M.A.N.	Augsburg	Germany
9.	Kapfenburg Arsenal	Wiener Neustadt	Austria
10.	Bohler	Kapfenburg	Austria
11.	Statlowa Wola	Sandomiery	Poland
12.	Bata	Zlin	Czechoslovakia

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PLANTS BELIEVED TO BE IN PRODUCTION ON A.A. ARTILLERY, but of Unknown Calibre.

1.	Royal Italian Arsenal	Venice-Naples	Italy
2.	Steyr-Daimler-Puch	Steyr	Austria
3.	Souma	Venissieux	France
4.	Ansaldo (tubes only)	Turin	Italy
5.	Forges de la Marine et d'Homecourt	St. Chamond (Loire)	France

Unconfirmed Plants

1.	Polte	Magdeburg	Germany
2.	Ansaldo	Genoa	Italy
3.	Oberhütten	Gleiwitz	Germany
4.	Fonderie Royal	Herstal	Belgium
5.	Wilton Fijenoord (Siderius)	Rotterdam	Holland
6.	"Oswac"	Silesia	Poland

No information is available on the output of the individual plants either in terms of finished guns or barrels; nor is information at hand on the specific sizes in which these several plants specialize. If it can be ascertained that a high proportion of the crtical sizes are of monobloc design, four targets might be production of worth-while results:

1. Krupp
2. Skoda
3. Rheinmetall Borsig
4. Deutsche Waffen

If, on the other hand, sectional barrels predominate, the list of targets would have to be expanded indefinitely. In the absence of firm information on production practice on plant output it is impossible to recommend a suitable list of targets for the most promising results.

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51.8
13.5
703

703
15000
3515000
703
10545000

Strength, Wastage & Losses.

15000

W & L Minimum —
(M 9.15 2½ %)

Requirements & New Production & Reserves

Upper Unlimited
Minimum to maintain strength = W & L.

Practice in Production & Losses.
Allied practice
German " ?

Concern is with high minus figures.

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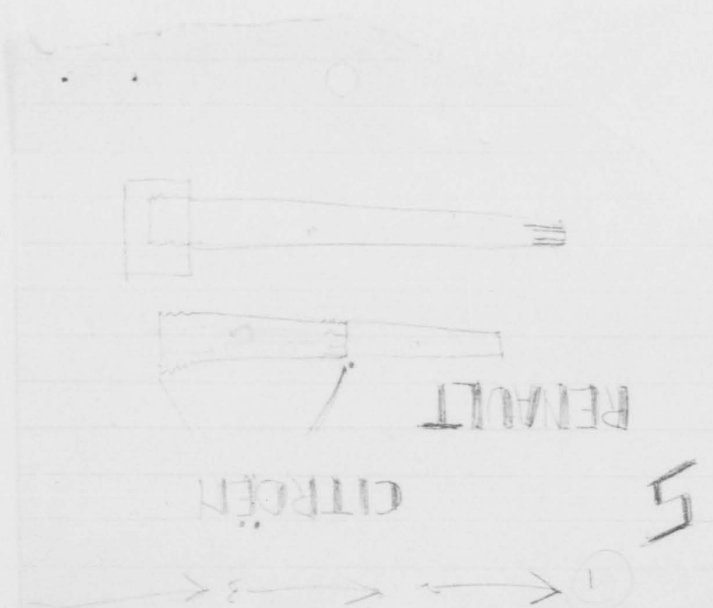

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20,484 Maj Wittfeld
Col Gen Taylor

Recoil systems?
Precision equipment?

	Rate of fire	
	max	Sustained
	5 oz	70 per minute
105	1000	15 "
150-70	1000	10 per minute

U.S. practice.
75 rounds per gun per day (but average 20 rounds)
750 " " " month
means a new tube per each gun every 6 weeks to two months

@ 7 guns for each gun ~~=~~ reserve capacity must be ~~5~~ 3 to 4 mos.

Spares are empld, furnished and in storage depots ready for installation
1 in battery vicinity
1 in rear echelon ~~=~~

1 in process of mfr. (presumably) to replace original as it wears out.

Once a tube is struck new production capacity provides a capacity

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Resources

Available 1 Nov 43 17000

New Production 1 Nov 43
to 1 Aug 44 @ 300 t/mo. 3000

17,000

Wastage and Losses

Operations envisaged here
(including S.E. Europe but
excluding Balkans,
Italy and Normandy)
@ 2½% of 7550 190

~~Italy through Rotterdam~~
~~@ 15% of 3400~~

Italy @ 12½% of 900 115

Normandy (2 months
only) @ 5% of 2500 125

430

900
12½
450
1800
900
11250

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How many rounds will a gun firing 1 min?

9000 rds ?

3

24000 tubes

133 tubes per day

3

399 " " min Th

Source: Letter from Springfield to Aberdeen Proving Ground.
Prepared by Ord Research, Tac & Tech

81S	10,000	- 15 rounds per minute	min. 2690
105	3 min.	- 2-10 " "	min 2290
127 [illegible]	2,000	- 6-8 " "	min. 3450

15 min

Typing dept by Monday + go over with
Lt Bowers 5365

166
6 | 1000

166
120
40

100
60

100
15 | 1500

125
8 | 1000

2

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Resources

Available 1 Nov 43 14000

New Production 1 Nov-43
to 1 Aug 44 @ 310t/mo. 3000

17,000

Wastage and Losses

Operational Required Loss
(including S.E. Europe but
excluding Italy and Normandy)
@ 2½% of 7550 190

~~Italy, Balkans, Eastern and Middle
East, and Normandy
@ 15% of 3400~~

Italy @ 12½% of 900 115

Normandy (2 months
only) @ 5% of 2500 125

430

900
12½
450
1800
900
11250

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Hq. Mid. Allied Air Forces
S-2 Section
W. Air S. Summary No 60
10 Jan 44
A. S.

Lith No. K-45066

Deployment of Enemy Flak. 1/11/43

	Heavy %	Light %	Personnel %
Ger. (incl. protectorate)	51.8	46.7	49.7
Holland, Bel + Holl.	18.5	24.0	18.9
Norway, Den. + Finland	5.2	6.7	4.8
East. Fr. (incl. Poland + Baltic States)	13.7	16.5	19.1
Italy	6.7	3.2	4.0
S.E. Eur.	4.1	2.9	3.5
	100.0	100.0	100.0

[over]

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Totals by Types.

	Heavy	Lt.
Air.	11,800	34,100
Navy	1,700	3,400
Army + S.S.	550	12,000
	14.050	49,500

Monthly production est. 300 heavy, 500 light guns. Est. considered low, esp for whole guns.

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MEW - I.W.
No 112/23-3-44

Stahlwerke Braunschweig GmbH., Watenstedt
(part of Reichswerke Hermann Goering)
Gun barrel and liner boring carried out in
2 shops. Shortage of materials reported to
prevent operation of time of more than 25 % of
machines. Normal output per lathe
is 1½ barrels or liners per day. (No state-
ment on number of machines).

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Heavy A.A. Strength

The Germans' total strength in heavy flak guns available to A.A. batteries is currently estimated at 15,000, classified as follows: [1]

88 m.m.	10,000
105 m.m.	3,000
127 and 150 m.m.	2,000
	15,000

[1] Estimates prepared by Tactical and Technical Division and quoted in letter 22 Aug 1944 from Genl. White to Alden Buckle.

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As of the first of ~~the year 1944~~ November 1943 ~~the~~ ~~disposition of~~ these guns were thought by M.D. 15 to be deployed ~~among~~ over the ~~several~~ ~~fronts~~ ~~defense areas~~ in the proportions indicated below: ~~in the following table:~~

	~~Percent of Heavy AA Strength~~ Total
Germany (including the protectorate)	51.8
France, Belgium and Holland	18.5
Norway, Denmark and Finland	5.2
Eastern ~~Front~~ (including Poland and the Baltic States)	13.7
Italy	6.7
S.E. Europe	4.1
	100.0

~~An increased weight of heavy bomber attacks from Italian bases~~

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Since these estimates were prepared ~~[illegible]~~ two major developments have occurred, ~~[illegible]~~ which have ~~[illegible]~~ doubtless had a profound effect on the disposition of the enemy's flak defenses: (1) the intensification of heavy bomber attacks from Italian bases, which have necessitated strengthening heavy flak batteries ~~[illegible]~~ in Southern Germany, Austria in South Eastern Europe, and (2) the Allied invasion of France which has caused ~~the movement~~ recent movements of heavy flak into France. It is the opinion of M.I.S. ~~[illegible]~~

(PTO)

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A.

~~Since the Commander Norman~~

is that war production has not been adequate to meet these requirements for added strength and that the bulk of the increase in vital sectors must have been met by transfer from ~~within~~ points within Germany

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Information is not ~~[illegible]~~ available in Washington, ~~[illegible]~~ to show the ~~[illegible]~~ magnitude of these changes; thus only the total strength figures, estimated by adjusting ~~subsequent~~ the 1 Nov. 43 ~~[illegible]~~ totals for enlargement wastage and production can be taken as having current significance. ~~It should be noted,~~

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flak ~~defenses~~ in to ~~Northern~~ France.

Despite these facts, the home front still ~~absorbs a~~ accounts for a greater proportion of U.S. strength than any other quarter, and because of the decreasing effectiveness of GAF fighter defenses, the heavy flak allocated to the ~~defense~~ protection of vital areas ~~in the~~ deep in Germany and occupied territories cannot be greatly diminished.

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Requirements and Navy Production.

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M.A. 639, X
13 pp. attachment
Application No. 180

Radio equipment, resources and deployment as of 1 Nov. 43
dated 17 Dec '43

CA Memorandum 5865

23910 Capt. Glover

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Hq. S-E Asia Air Cd. Library No. K 46015 ~~2 8817~~
W. I. S. No. 10
23 Jan 44
pp. 8-9. — 'adapted from a W/O Paper'

1. Estimated what to prepare for sustained heavy attacks from N. as well as U.K. bases, Germans will require A.A. reinforcements of 1500 heavy guns (75 m.m. and upwards).

2. Only immediate means of meeting requirements to change disposition within Germany.

a. 250 might be got from Italy where are have at present 750 Gr guns & 500 Ft. guns & need 1000. Not strategic risk of 250.

b. But not thought likely to withdraw from Eastern front, for despite shorter lines, losses have been heavy & require replacements.

c. Defence of vital targets in France, Belg & Holland precludes withdrawals there

d. Effect of complete evac. of Germany, more considerable there.

3. Est new production (figures not quoted) could bridge gap in 6-8 months provided not interfered with by bombing.

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100-4970 - orig. filed under
8th F.F. Intl Middle Summary #17

100-59505 - orig. filed under
8th F.F. Intl. Winkler.

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Revised estimates from Col Taylor 5/8/44

	#1	#2
Wastage	1500	2000
New Construction	2500	2500
Net change in Res. Position	+1000	+500

	#3	#4
Wastage	2000	2000
New Const.	2000	1250
Net change	0	-750

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	Assumption #1	Assumption #2
Wastage	7500/month	7500/month
New Production	7500/month	0
Net change in Reserve Position	0	-7,500/month
Period for depletion of Reserves	Infinite	4 months

	#3	#4
Wastage	7500/month	15000/month
New Production	3750/month	3750/month
Net change in Reserve Position	-3750/month	-11,250/month
Period for depletion of Reserves	8 months	2¾ months

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3. As ~~practical~~ assumed practical sustained rates of fire ~~based on~~ ~~rates of~~ 3 information contained in captured German training documents, the life of these guns is computed in hours as follows:

	Rate of fire	Tube life in hours & minutes
88 mm.	15 rounds/minute	1:40
105 m.m.	8-10 rounds/minute	1:40 - 2:05
127 & 150 m.m.	6-8	2:05 - 2:46

3/ Based on information contained in captured German training documents, and ~~reprinted~~ ACofS, ~~Reprinted~~ in part in, Information Intelligence Summary, 30 July 44, Wash. D.C. pp. 17-26. Rate of fire is the practical rate for sustained fire.

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~~3. The life in time of~~

3. To translate these ~~figures~~ estimates of life in rounds into costing

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Because of the short tube life of this type of gun, replacements in an active battery are frequent and ~~necessitate for maintenance of~~ ~~operability~~ necessitate a substantial supply of spare tubes. ~~American~~ although ~~the~~ replacement rates differ* widely among individual batteries, depending on their activity, American practice calls for an initial production of two spares for each gun produced, and a rate of new production of tubes, ~~thereafter~~ at least sufficient to ~~replace~~ balance current

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~~wasta~~ rates of wastage. Nothing is definitely known concerning current German ~~opinions~~ practise in this regard, but considered opinion holds that the ratio of spares to actual strength for the Germans is substantially the same as for the allies. If this assumption is correct, a strength of 15,000 guns would ~~mean that wastage will call for spares~~ call for 30,000 spares. ~~which~~ Under ~~spares normal conditions of service, a anticipated operation~~ anticipated operating conditions, this stock would provide ~~a considerable~~ cushion ~~exists from which spares~~ a substantial cushion for meeting

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~~kinds in teams to meet abnormal~~ higher than average wastage in active combat areas without affecting the overall reserve position. Given sufficient time, ~~to the effects~~ Abnormal rates of wastage coupled with a sharp decline in ~~new~~ new tube production could ~~cripple us~~ deplete reserves ~~so as~~ to the point at which active battalions were seriously handicapped. The size of the reserve, however, makes it doubtful if ~~it would be~~ even a sharp decline in new production, brought about by the bombing of tube factories, would ~~be reflected quickly in the home front and would have effect on~~ have an immediate effect on the combat strength of active battalions.

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Wastage and New Production. The period required for the bombing of tube factories to ~~to take effect depends on~~ effect front line strength, depends on ~~the ability of each~~ the margin by which the rate of wastage can be made to exceed new production. Because a substantial proportion of the reserves ~~supply~~ of tubes is normally maintained in central depots, ~~rather~~ it can be assumed that the pipe line provides a high degree of flexibility, enabling the enemy to allocate deliveries from central depots to front-line reserves as required by the activ-

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one held in reserve in the vicinity of the heating and one held in store in a central depot. A total strength of 15 000 guns, therefore, means ~~a supply~~ an additional supply of 30 000 tubes. [4]

[4] Although this assumption is based on American practice it is considered to be applicable to German experience as well, since, under less favourable conditions, an adequate flow of replacements could not be assured ~~without an~~ except by ~~exercising~~ an equivalent potential in excess manufacturing capacity.

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ity of individual batteries

~~Accu cac is~~ the dependable informa-

tion ~~upon~~ is at hand on which to

base estimates of current rates of

wastage. American practice, however,

may again provide a guide ~~to~~ the

magnitude of the replacement problem

and provide a rough guide to the

~~probable~~ lengths of the ~~this~~ period in

question.

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~~the intensity of their activity.~~

~~a total strength of 15 000 guns,~~

~~therefore~~

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American production schedules both for ammunition and common assemblies are based on an assumed average rate of fire of 25 rounds per gun per day, or 750 rounds per gun per month. On this basis, each gun of the type used by the Germans would, on the average, require a new tube once in each 6-weeks to 2 months, and to maintain a ~~total~~ ~~constant reserve~~ constant supply of reserve tubes, new tubes ~~production would~~ would be required at the rate of 5500 to 7500 per month.

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for all sizes.

If new production were reduced to zero, the average rate of wastage assumed by American practice would require, ~~then~~ to four months for complete depletion of reserves.

(in addition to the life of tubes actually in service,

An increased ~~rate~~ rate of wastage would obtain this period, and it may further be assumed that critical shortages would ~~not~~ develop before reserves were exhausted (say when they reached a level 50 per cent of normal). Thus, ~~several~~

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assumptions may be made which would show practical limits for the length of the period in question. These possibilities are ~~interested~~ summarized in the following table. Assumption #1 ~~codes the situation~~ reflects the conditions customary in American practice, and is based on new production requirements necessary to keep reserves in balance at an annual mortage rate of 75 ~~per~~ two ~~per~~ tubes per month. Assumption #2 reflects the condition if, ~~and for all other~~ caeteris paribus, new production were cut off entirely. Assumption #3 shows the effect under

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assumption #2 if our production was reduced by 50%. Assumption # 4 shows the result of combining a 50% reduction in tube output with a 100% increase in overall wastage.

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In each case, if it be assumed that a critical shortage would ~~be~~ develop when reserves had been depleted by 50 per cent the period required to impose such a shortage would be half the time required to ~~be~~ exhaust the full reserve. As an offset to this, however,

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~~[illegible]~~

~~[illegible]~~

	Assumption #1
New Production	7500/month
Wastage (@ 1 tube per good engine change)	7500/month
Net Change in Reserve Position	0
Period for depletion of Reserves	∞ - limit

2500 t/mo.

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~~Space travels~~

Supply position

~~Blood products~~

Wastage

New production

Restriction

6/100 16

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~~2. The effective life of these guns is dependent on the supply of~~

2. The effective life of these guns is limited by the life of the barrel, or tube, and varies, for a given rate of fire, with the size of the projectile, ~~and~~ muzzle velocity. ~~and rate of fire~~

Based on American experience, and information compiled from ~~analysis~~ examination of captured German equipment (88's and 105's only) the tube life for each class of gun is estimated roughly as follows:

	Life in Rounds [2]	Fire Rate in Rounds per Minute [3]	Life in Minutes
88 m.m.	1500	15 ~~Rounds~~	100
105 m.m.	1000	8-10	100-125
127+150 m.m.	1000	6-8	125-166

[2] These estimates, hitherto unpublished, are ac-

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cepted ~~from~~ - from the Asst Leg Division, Office of the Chief of Ordnance, as the most available ~~source~~ estimate of supply of heavy AA guns in combat defense units.

tube life. They are considered to be ~~probably on the~~ conservative, ~~side~~ since there is no direct obvious relation between ~~the general projectile~~ variables and tube life, ~~weight, muzzle velocity~~, figures for projectile weight, and muzzle velocity, ~~and rate of fire~~ have been omitted from this presentation, although they have been considered in arriving at the estimates quoted above.

[3] [See footnote, see next page.]

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JAPANESE TARGET DATA

MARCH 1943

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Part I. Directive

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S E C R E T

SUBJECT: Japanese Target Data

TO: Assistant Chief of the Air Staff, A-2 February 24, 1943

FROM: Assistant Chief of the Air Staff, Operational Plans
Comment No. 1
AW/hlg/5835

1. For planning purposes this Division is in immediate need of an overall target study of Japan Proper, Chosen and Japanese-occupied Manchukuo 1/, to form one of the bases of, and to be integrated in, a study of the requirements for a United Nations air offensive against the vital military and industrial centers of the Japanese Empire.

2. In addition to the types, numbers, locations and general descriptions of industrial targets essential to the Japanese war effort, which are to be shown, it is desired that the study include, in limited detail but sufficient for strategic planning purposes, such data as is available as to the location, type, and estimated strength of enemy defensive installations and forces which may be expected to be encountered, particularly from the point of view of an air attack conducted from Chinese bases.

3. It is also desired to have your evaluation of the relative importance to the Japanese war effort of the various industrial targets which will be enumerated in the report; on the basis of which evaluation it may be practicable to reach a conclusion as to the extent of destruction of such targets which may be required to overcome effective Japanese resistance, and the time factors involved.

4. It is requested that such a study be prepared under your direction and five (5) copies thereof submitted to this Division on the earliest practicable date, making use of such material as is now on hand or is promptly available without delaying for such additional material as might be obtained by delay running into weeks.

5. It is requested that in the prosecution of this work liaison be maintained through this Division with Colonel Adrian Williamson, Army Extension 5835, Room 3E-1088, Pentagon Building. Before completion of the report, it may be desired to have the Director of Bombardment, or other staff agencies, furnish data to be incorporated in the final drafts.

/s/ RANDOLPH WILLIAMS
for
O. A. ANDERSON,
Brig. General, U. S. A.

1/ Also China Coast and Taiwan per conversation with Colonel Williamson.

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Part II. Answering Memo &
Outline of Report

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AFDIS-OD/2

March 20, 1943

MEMORANDUM FOR THE CHIEF OF THE AIR STAFF, A-2.

SUBJECT - Japanese Target Data.

1. Pursuant to the directive from Brigadier General O. A. Anderson, dated February 24, 1943, an overall target study has been made of Japan Proper, Chosen, Manchukuo, the China Coast and Taiwan as one of the bases for a study of the requirements for a United Nations air offensive against vital military and industrial centers of the Japanese Empire.

2. In this study the Japanese position is evaluated and summarized to show:

a. The estimated relative importance to the total Japanese war effort of the principal industries and other target systems in Japan and in Japanese controlled areas.

b. The plants or installations which are of chief importance in each principal industry or function.

c. The geographical dispersion of targets in each principal industry.

d. The distances of all targets from Wanan, a presently-held China base.

e. Data available as to the location, type and estimated strength of enemy defense installations and forces which may be expected to be encountered, particularly from the point of view of an air attack conducted from China bases.

3. Each section of this study comprises an overall discussion of a principal industry, including its war significance, character of operations, productive capacity and the dispersion of plants or installations.

4. In each category a selection has been made of the more significant plants or installations. These have been designated as Key Targets. From the Key Targets a further selection has been made of those installations of outstanding importance. These have been designated as Priority Targets. The numbers, distances from Wanan, and geographical dispersion of Priority and Key Targets discussed in the separate sections are summarized in Part III.

5. A special section deals with Japanese Shipping (commodity movements, ship concentrations, the Japanese merchant marine position, shipbuilding and repair).

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6. A special section deals with Defenses (including an Airports sub-section). Under separate cover are Airport Directories covering Japan, China and Chosen (Korea), South East Asia, East Indies and Philippine Islands.

7. This study is based primarily on material contained in the Air Objective Folders on the Far East published by the Directorate of Intelligence Service. For this study, the objective folder material has been supplemented by the latest information available at military, naval and civilian agencies engaged in the study of bombing objectives.

8. All targets referred to in this study are identified by the Target Numbers used in the Air Objective Folders. At the end of each industry section of this study is an index of all known targets in that industry. These targets are grouped by Objective Areas. The corresponding Air Objective Folders provide photographs, plans and detailed information as to structural characteristics, plant size and other factors required in the determination of bombing requirements.

9. Study of the vulnerability to air attack of the economic and industrial sources and supports of Japan's ability to wage war is being continued. Results of such study will be presented from time to time as they become available.

A. W. BROCK, JR.,
Colonel, G. S. C.,
Director of Intelligence Service.

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OUTLINE OF THE REPORT

Part I.	Air War Plans Directive of February 24, 1943.	
Part II.	Answering Memo and Outline of Report.	
Part III.	Report.	
Part IV.	Annexes.	
	Tab AA-1.	Defenses - General.
	Tab AA-2.	Defenses - Airports.
	Tab BB-1.	Shipping - General.
	Tab BB-2.	Shipping - Naval Bases and Shipyards.
	Tab A.	Aircraft.
	Tab B.	Arms and Munitions.
	Tab C.	Automobiles and Motors.
	Tab D.	Chemicals.
	Tab E.	Communications.
	Tab F.	Electric Power.
	Tab G.	Iron and Steel.
	Tab H.	Machines and Machine Tools.
	Tab I.	Non-Ferrous Metals.
	Tab J.	Petroleum.
	Tab K.	Rubber.
	Tab L.	Transportation - Rail.
	Tab M-1.	Miscellaneous - General.
	Tab M-2.	Miscellaneous - Building Materials.
	Tab M-3.	Miscellaneous - Textiles.
	Tab M-4.	Miscellaneous - Water Supply.
	Tab N.	Summary of All Targets Objective Area Maps.

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Part III. Report

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March, 1943

FAR EAST TARGETS

Order of Priority	Classification	Priority Targets		Key Targets	
		No.	Significance	No.	Significance
1	Aircraft	8	50% engine capacity 50% plane "	16	73% engine capacity 73% plane "
2	Non-ferrous Metals	5	60% alumina (equiv. of aluminum) 40% copper 90% lead, 40% zinc	11	67% alumina, 40% aluminum 45% copper 90% lead, 40% zinc
3	Naval Bases & Shipyards	9	60% subbuilding 75% ship repairing 67% marine engines	17	94% new ships over 60% repairs 67% marine engines
4	Iron & Steel	6	61% of steel capacity 66% of pig iron capacity	17	81% steel capacity 94% pig iron capacity
5	Petroleum	6	57% crude refinery capacity 61% synthetic capacity	16	71% crude refinery capacity 77% synthetic capacity
6	Chemicals	8	65% coke by-products 45% nitrogen 60% soda ash, 45% caustic	16	84% coke by-products 66% nitrogen 73% soda ash, 56% caustic 62% acetone
7	Automobiles, Motors	2	80% capacity, largely converted to war production	9	86% capacity, largely converted to war production
8	Rubber	3	67% of tire production	8	96% of tire production
*	Airports	-		-	
*	Arms, Munitions	-		16	
*	Communications	-		0	
*	Defenses	-		-	
*	Electric Power	-		22	Relative importance of these targets cannot be expressed in statistical terms
*	Harbor Facilities & Wharves	-		-	
*	Machines, Machine Tools	-		15	
*	Railroad Transportation	-		16	
*	Miscellaneous	-		-	
	TOTAL	49		199	
9	Ship Concentrations	10	Largest concentrations in Far East	17	Largest concentrations in

* No Priority Targets

Priority Targets are included in Key Targets above and are identified in the Key-Target lists in each industry section.

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Order of Priority	Classification	Priority Targets		Key Targets		All Targets
		No.	Significance	No.	Significance	
1	Aircraft	8	50% engine capacity 50% plane "	14	73% engine capacity 73% plane "	43
2	Non-ferrous Metals	5	60% alumina (equiv. in aluminum) 47% copper 60% lead, 40% zinc	11	60% aluminum, 47% alumina 48% copper 60% lead, 47% zinc	66
3	Naval Bases & Shipyards	7	66% shipbuilding 72% ship repairing 67% marine engines	17	94% new ships over 60% repairs 67% marine engines	106
4	Iron & Steel	6	41% of steel capacity 66% of pig iron capacity	17	41% steel capacity 44% pig iron capacity	87
5	Petroleum	8	37% crude refinery capacity 61% synthetic capacity	16	71% crude refinery capacity 77% synthetic capacity	139
6	Chemicals	5	65% coke by-products 100% nitrogen 60% soda ash, 45% caustic	16	68% coke by-products 66% nitrogen 73% soda ash, 56% caustic 62% acetone	120
7	Automobiles, Motors	2	80% capacity, largely converted to war production	9	86% capacity, largely converted to war production	20
8	Rubber	3	67% of tire production	8	95% of tire production	11
*	Airports	-		-		207
*	Arms, Munitions	-		16		91
*	Communications	-		8		79
*	Defenses	-		-	Relative importance of these targets cannot be expressed in statistical terms	44
*	Electric Power	-		29		196
*	Harbor Facilities & Bases	-		-		255
*	Machines, Machine Tools	-		15		74
*	Railroad Transportation	-		15		291
*	Miscellaneous	-		-		137
	TOTAL	49		199		1964
9	Ship Concentrations	10	Largest concentrations in Far East	17	Largest concentrations in Far East	57

* No Priority Targets

Priority Targets are included in Key Targets above and are identified in the Key-Target lists in each industry section.

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JAPANESE INDUSTRIAL TARGETS

Schedule I indicates the pattern for air attack to destroy Japan's industrial power.

First in the schedule, ranged in order for attack, are the 49 Priority Targets, the destruction of which would have the greatest per-target effect upon Japanese industrial production.

These Priority Targets are selected, without reference to accessibility, from a total of 199 Key Targets evaluated in this study. The Priority Targets are the major plants or installations in the nine categories which warrant priority in air attack upon the Japanese war economy.

First in order of priority for attack is the Aircraft industry, followed by Non-Ferrous Metals primarily because of the importance of aluminum for aircraft. Naval Bases & Shipyards are ranked high; ship building and repair capacity is one of the most critical phases of the Japanese war effort. Japan's steel position has always been tight, and any substantial loss of production would be immediately felt. The war importance of Petroleum, Chemicals and Rubber Tires is evident. Two automobile plants are included because they represent 80% of the industry's capacity, almost entirely converted to war production. The bases for this order of priority are indicated in the detailed evaluation in each industry section of the study.

An important category included in priority objectives is Ship Concentrations. As discussed in a special section of this study, shipping is one of the most vital links in Japan's war economy and is the link most exposed to air attack from presently-held bases.

The 199 Key Targets are selected from a total of 1964 Far East targets. They comprise all known plants or installations which are of major significance, including the categories of Electric Power, Arms-Munitions, Machine Tools and Railroad Transportation. While these industries are of unquestioned significance, and there are certain particularly important individual objectives, they are not included in Priority Targets because conclusive damage to these industries would require large-scale and sustained attacks on widely dispersed, numerous objectives. Several other categories (Building Materials, Textiles, etc.) do not warrant major consideration as objectives in terms of the total Japanese war effort.

The following map indicates the geographical dispersion of Priority Targets and Key Targets. There are five principal areas of industrial concentration -- Tokyo, Kobe-Osaka, Nagoya, Yawata, Mukden. It is to be noted that factors other than the number of targets determine the relative importance of any one area. The Yawata, Kobe-Osaka and Tokyo areas may be considered of generally comparable significance to the Japanese war effort as a whole, although the map shows a decided preponderance of targets for the general Tokyo area. These five principal areas are all in Japan's "inner triangle", within which are most of the basic materials required for Japan's heavy industry and virtually all of the processing capacity.

Schedule II shows the dispersion of Priority Targets and Key Targets in terms of progressive distances from a presently-held China base.

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March 1943

FAR EAS
(PRIORITY

Order of Priority	CLASSIFICATION	(Each Radius Inclusive 500 Pr'ty	500 Key	750 Pr'ty	750 Key	1000 Pr'ty	1000 Key	Pr
1	Aircraft	-	-	-	-	-	-	
2	Non-Ferrous Metals	-	-	-	-	-	-	
3	Naval Bases & Shipyards	-	-	-	1	-	1	
4	Iron and Steel	-	-	-	-	-	-	
5	Petroleum	-	-	-	-	-	1	
6	Chemicals	-	-	-	-	-	-	
7	Automobiles, Motors	-	-	-	-	-	-	
8	Rubber	-	-	-	-	-	2	
*	Airports	-	-	-	-	-	-	
*	Arms, Munitions	-	-	-	-	-	-	
*	Communications	-	-	-	-	-	-	
*	Defenses	-	-	-	-	-	-	
*	Electric Power	-	4	-	4	-	5	
*	Harbor Facilities & Whses	-	-	-	-	-	-	
*	Machines, Machine Tools	-	-	-	-	-	1	
*	Railroad Transportation	-	-	-	-	-	4	
*	Miscellaneous	-	-	-	-	-	-	
	TOTAL	-	4	-	5	-	14	
9	Ship Concentrations	-	1	1	2	4	5	

* No Priority Targets

Priority Targets are included in Key
in the Key-Target lists in each

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FAR EAST TARGETS
(PRIORITY AND KEY TARGETS)

SCHEDULE II

	MILES FROM WANAN (Each Radius Inclusive, and Cumulative in Number of Targets)													
	500		750		1000		1250		1500		1750		OVER (TOTAL)	
	Pr'ty	Key	Pr'ty	Key	Pr'ty	Key	Pr'ty	Key	Pr'ty	Key	Pr'ty	Key	Pr'ty	Key
	-	-	-	-	-	-	-	-	5	7	8	16	8	16
	-	-	-	-	-	-	2	4	3	8	5	14	5	14
	-	-	-	1	-	1	3	5	7	12	9	15	9	17
	-	-	-	-	-	-	2	6	5	13	5	15	6	17
	-	-	-	-	-	1	2	7	4	10	7	14	8	16
	-	-	-	-	-	-	8	12	8	15	8	18	8	18
	-	-	-	-	-	-	-	-	-	-	2	9	2	9
	-	-	-	-	-	2	1	4	2	5	3	7	3	8
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	7	-	9	-	16	-	16
	-	-	-	-	-	-	-	-	-	-	-	8	-	8
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	4	-	4	-	5	-	10	-	21	-	29	-	29
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	1	-	3	-	5	-	15	-	15
	-	-	-	-	-	4	-	8	-	9	-	13	-	16
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	4	-	5	-	14	18	66	34	114	47	189	49	199
	-	1	1	2	4	5	6	10	8	13	10	15	10	17

Priority Targets are included in Key Targets above and are identified in the Key-Target lists in each industry section

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TIME FACTOR

The time required for Japan to restore capacity lost through conclusive destruction of the various types of Priority Targets and Key Targets is contingent upon a large number of variable factors, such as availability of materials, skilled labor, etc.

Aircraft plant structures are not believed to be a major problem. In view of the estimated stringent Japanese position in machine tools, however, specialized machinery (especially in engine plants) could not be replaced in volume within a minimum of a year.

Destroyed alumina capacity (upon which the production of aluminum and alloys depends) could not be replaced in volume in less than six months. Such destruction would neutralize the large stockpile of bauxite ore with which the Japanese are credited.

Under ideal conditions, it is estimated that a minimum of six months would be required to replace destroyed drydocks. The situation in marine engine capacity would be generally comparable to that in aircraft plant equipment.

Iron and steel works equipment is heavy. While blast furnaces or open hearths might be repaired or replaced in 3-6 months, a considerably longer time would be required to provide new rolling mills, etc.

A minimum of a year would be necessary to replace major crude refining or synthetic oil plants.

It is estimated that modern by-product coke oven capacity could not be replaced in less than 9-12 months, and trade comment indicates that coke oven batteries might be de-commissioned for 3-6 months even though not completely destroyed. Except for probable stringency in highly specialized equipment, other types of chemical plants on average would require less replacement time.

The replacement time factor for automobile, armament, machine tool, communications equipment and tire-making capacity would be comparable to that in aircraft. A limited amount of other rubber-products capacity is available for conversion to tires, but such conversion would require an estimated six months.

Electric power plants are multi-unit targets. Replacement of a major power generating plant (hydro or steam) would require a minimum of a year. Penstocks, switchgear, etc., could be replaced within a shorter period of time.

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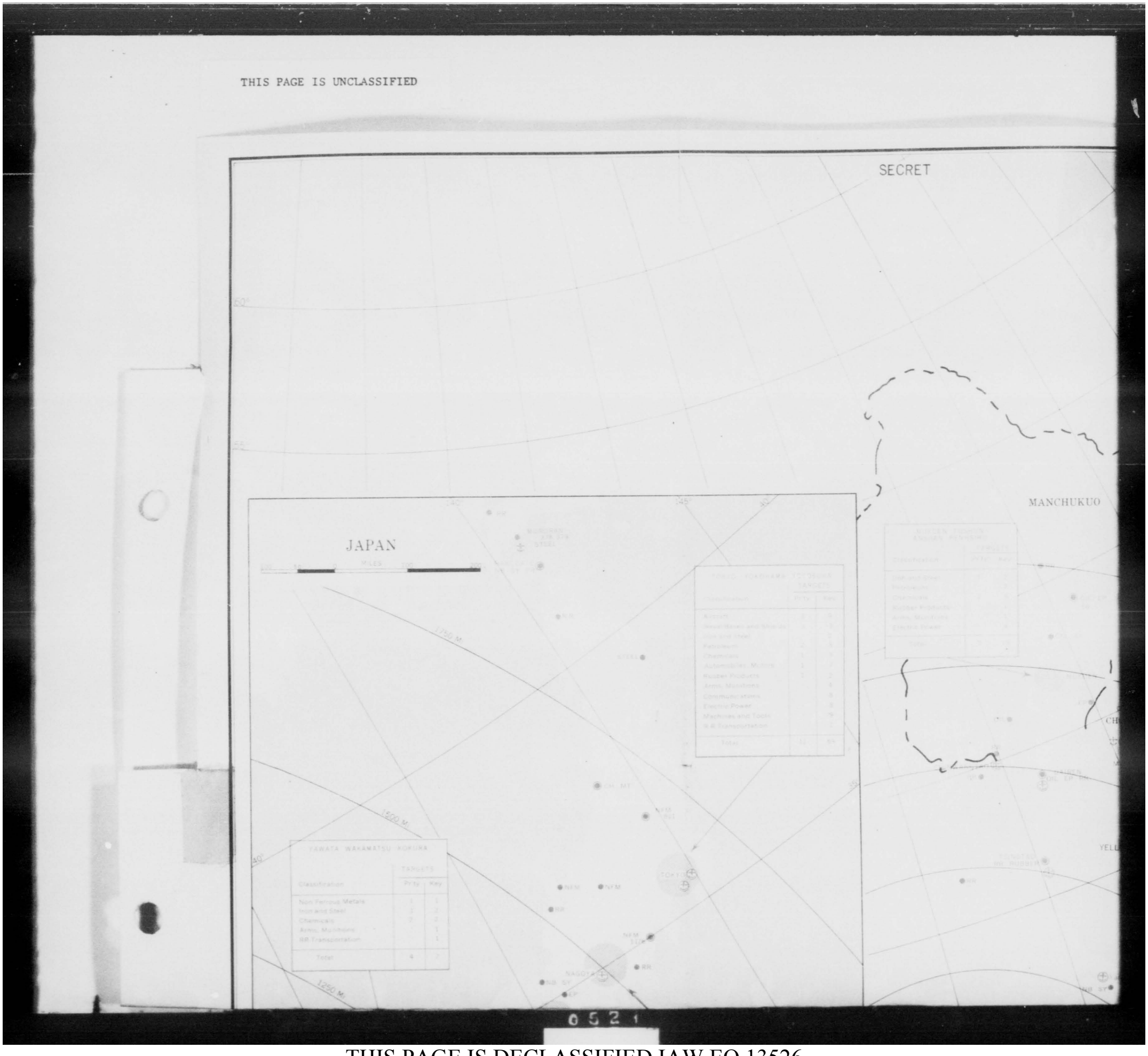

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SAKHALIN

KARAFUTO

HOKKAIDO

MANCHUKUO

Vladivostok

JAPAN

SEA OF JAPAN

HONSHU

CHOSEN

SHIKOKU

YELLOW SEA

KYUSHU

SEE INSET JAPAN PROPER

TOKYO - YOKOHAMA - YOKOSUKA TARGETS		
Classification	Key	Rec
Aircraft	1	4
Naval Bases and Shipping	1	2
Iron and Steel		1
Petroleum	2	3
Chemicals	1	3
Automobiles, Motors	1	1
Rubber Products	1	2
Arms, Munitions		4
Communications		8
Electric Power		5
Machines and Tools		9
R R Transportation		3
Total	11	44

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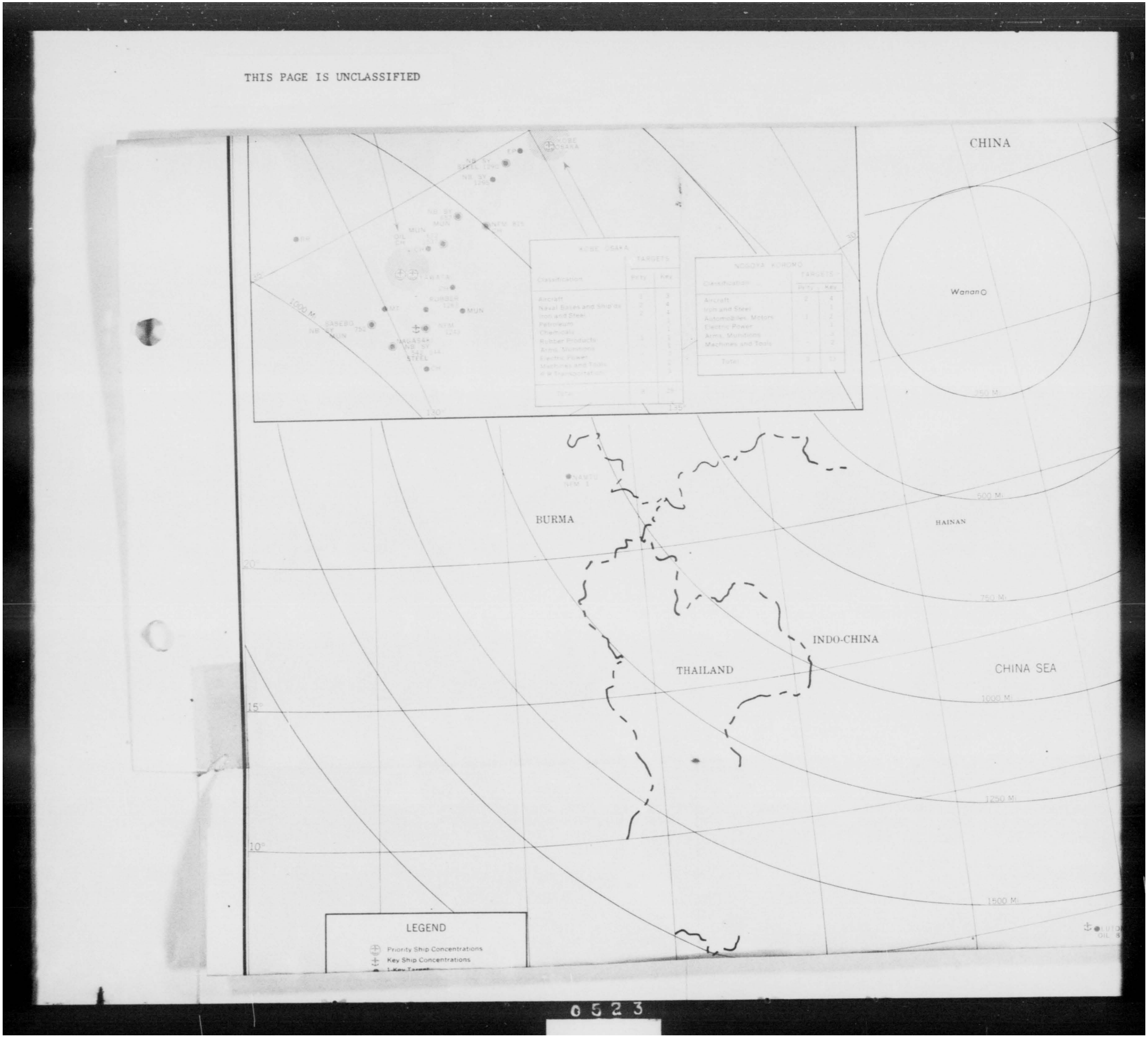

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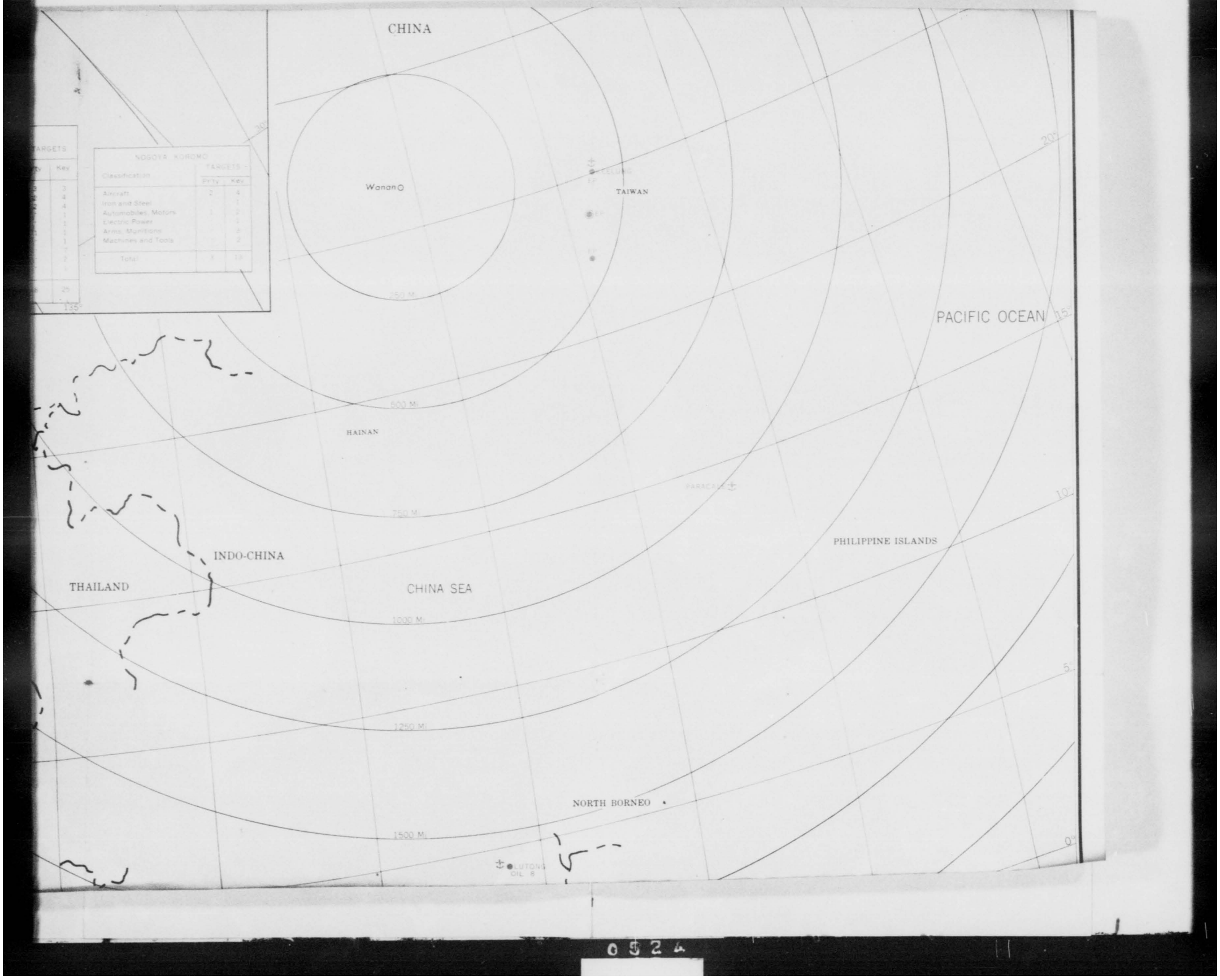

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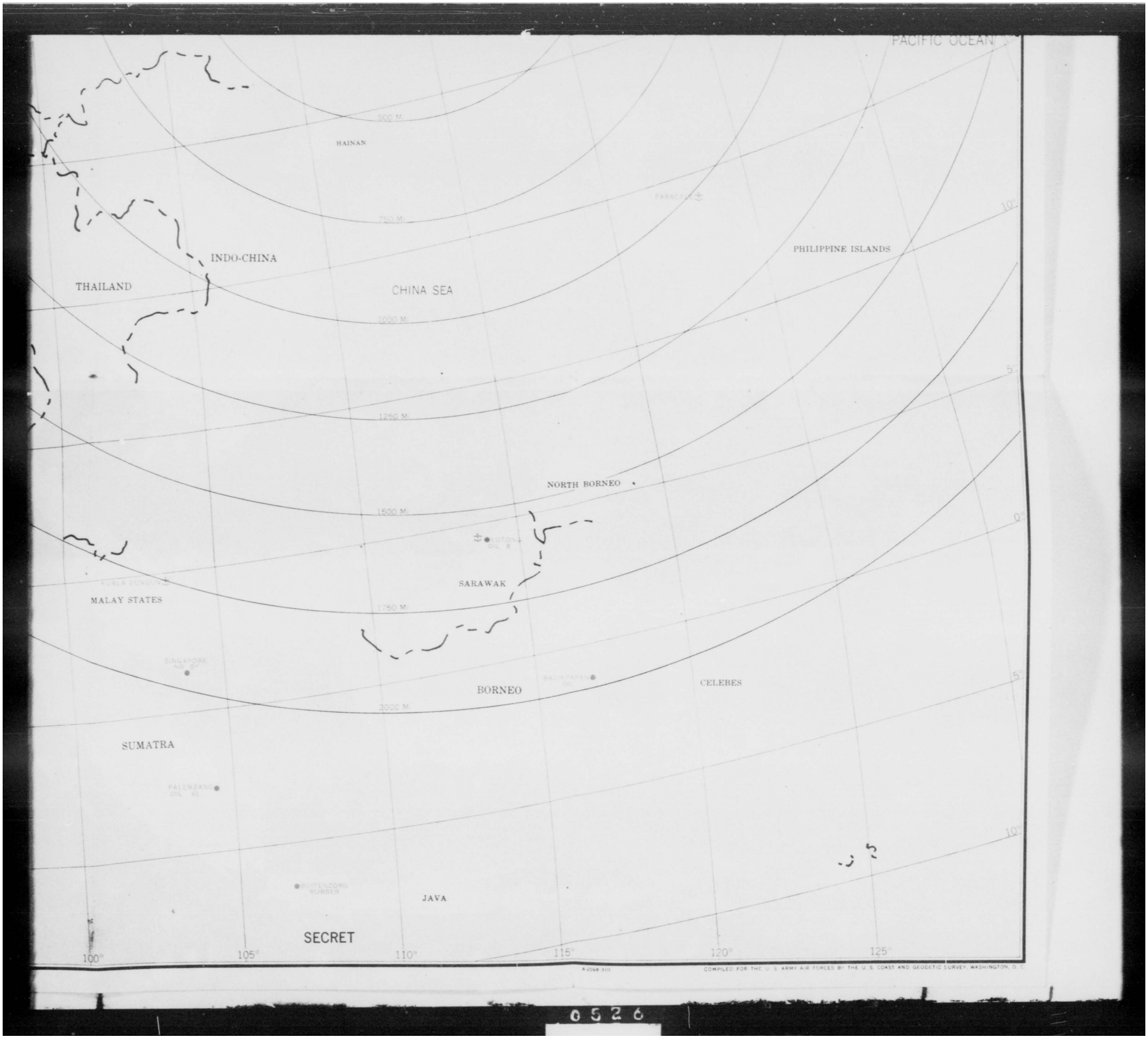

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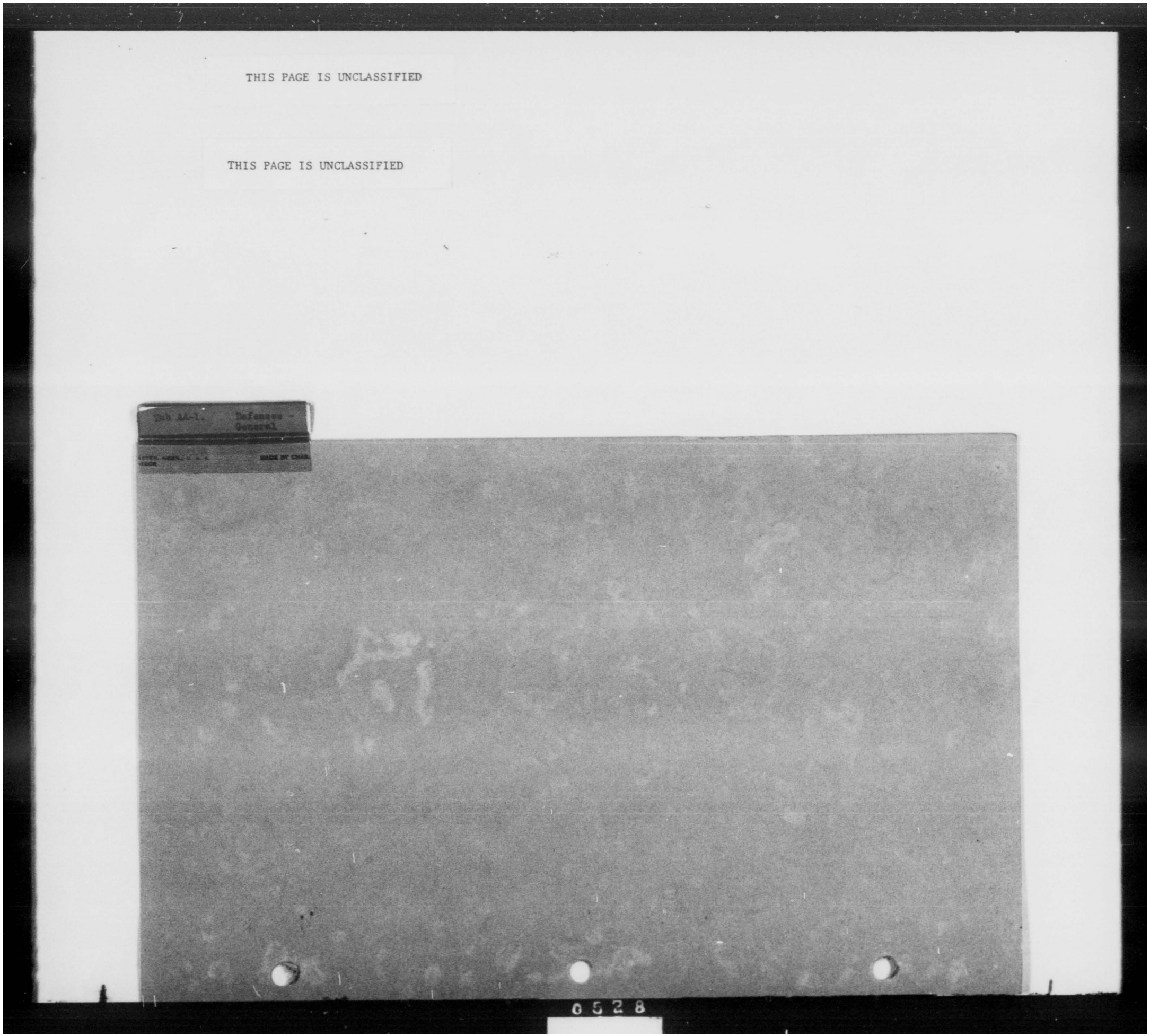

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March 1945

D E F E N S E S

Data available as to the location, type and estimated strength of enemy defence installations and forces, which may be expected to be encountered, particularly from the point of view of an air attack conducted from China bases. (Directive abstract)

- -

Over 200 airports listed as targets in Objective Folders and several hundred other fields ranging from landing strips to completely equipped fields are located on the following map, which covers Japan Proper-Taiwan-Chosen, Occupied China, the Philippines, Southeast Asia.

Since the significance of individual airfields is highly fluid, this map does not undertake to evaluate the defensive importance of fields either as units or by areas. Detailed comment on some of the more important bases will be found in the following sub-section on AIRPORTS, with an accompanying index of all airport targets in Objective Folders.

Our advanced bases in China are in an exposed position, subject to both air and ground attack. Japanese seizure of China territory from which present operational aircraft can reach Japan Proper would remove a major threat. Attack on this territory, in which our present advanced bases are located, is an enemy capability.

The enemy air order of battle in all areas covered by this report follows:

	F	B	O	FP	FB	TOTAL A	TOTAL N
1. Japanese Empire, Karafuto, Kuriles							
Army	135	120	48	-	-	303	-
Navy							
Ship-based	93	105	-	49	-	-	247
Land-based	108	203	6	33	24		374
2. Manchukuo-Korea	240	216	36	-	-	492	
Army							
Navy							
Ship-based	-	-	-	-	-	-	-
Land-based	-	-	-	-	-	-	-
3. Formosa and Pescadores							
Army	36	18	-			54	
Navy	18	18	-	-	6		42
4. Formosa-Philippines							
Army	30	24	24	-	-	78	-
Navy							
Ship-based	-	-	-	-	-	-	-
Land-based	18	27					45

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	F	B	O	FP	FB	A	N
5. China-Hainan							
Army	75	120	36	-	-	231	-
Navy							
Ship-based	-	-	-	-	-	-	-
Land-based	-	-	-	-	-	-	-
6. Burma-Thailand Indo-China							
Army	120	120	36	-	-	246	-
Navy							
Ship-based	-	-	-	-	-	-	-
Land-based	-	-	-	-	-	-	-
7. Malaya, Sumatra, Java, Andamans							
Army	30	24	24	-	-	78	-
Navy							
Ship-based				7	-	-	7
Land-based		21		9			30

The order of battle for Formosa and Pescadores was prepared by Allied Air Headquarters SWPA as of January 18, 1943 and for all other areas jointly by M.I.S. and O.N.I., as of February 28, 1943.

Details of ground defenses in Japan are limited. April, 1942, raiders found all types of AA artillery in the Tokyo, Nagoya, Osaka-Kobe areas and balloon barrages at Tokyo. The enemy is known to be producing radar equipment. It can be assumed that all important military and industrial objectives are protected by these ground defenses as well as by aircraft based in the vicinity. The Japanese are reported to have much mobile heavy AA artillery which can be shifted to threatened areas.

The principal enemy naval bases and arsenals are considered under these respective sections of this report. Unconfirmed, but apparently reliable, reports indicate extensive development of naval and air defenses in southern Kyushu centering around Ariake Bay and the City of Kagoshima.

The enemy ground order of battle by areas as of March 4, 1943 (prepared by M.I.S.) follows:

	Numbered Divisions	Unidentified but considered essential for garrisoning the area	Total
Manchuria, Sakhalin & Korea	15	9	24
China	20	-	20
Philippines	—	2	2
Indo-China, Thailand, Burma & Malay	7	1	8
N.E.I. (incl. Timor)	5	-	5

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	Numbered Divisions	Unidentfied but considered essential for garrisoning the area	Total
New Guinea, New Britain, Solomons	6	-	6
Mandated Is.	1	1	2
Unlocated	4	-	4
	58	13	71

The map following shows all enemy army stations found in the target folders and all known coastal defenses. It can be said generally that the important coastal areas are strongly defended.

Most of the targets in the Defenses target tabulation following are army training centers in which large numbers of troops may be expected. None are among the key targets and there is little information concerning the forces currently at these stations.

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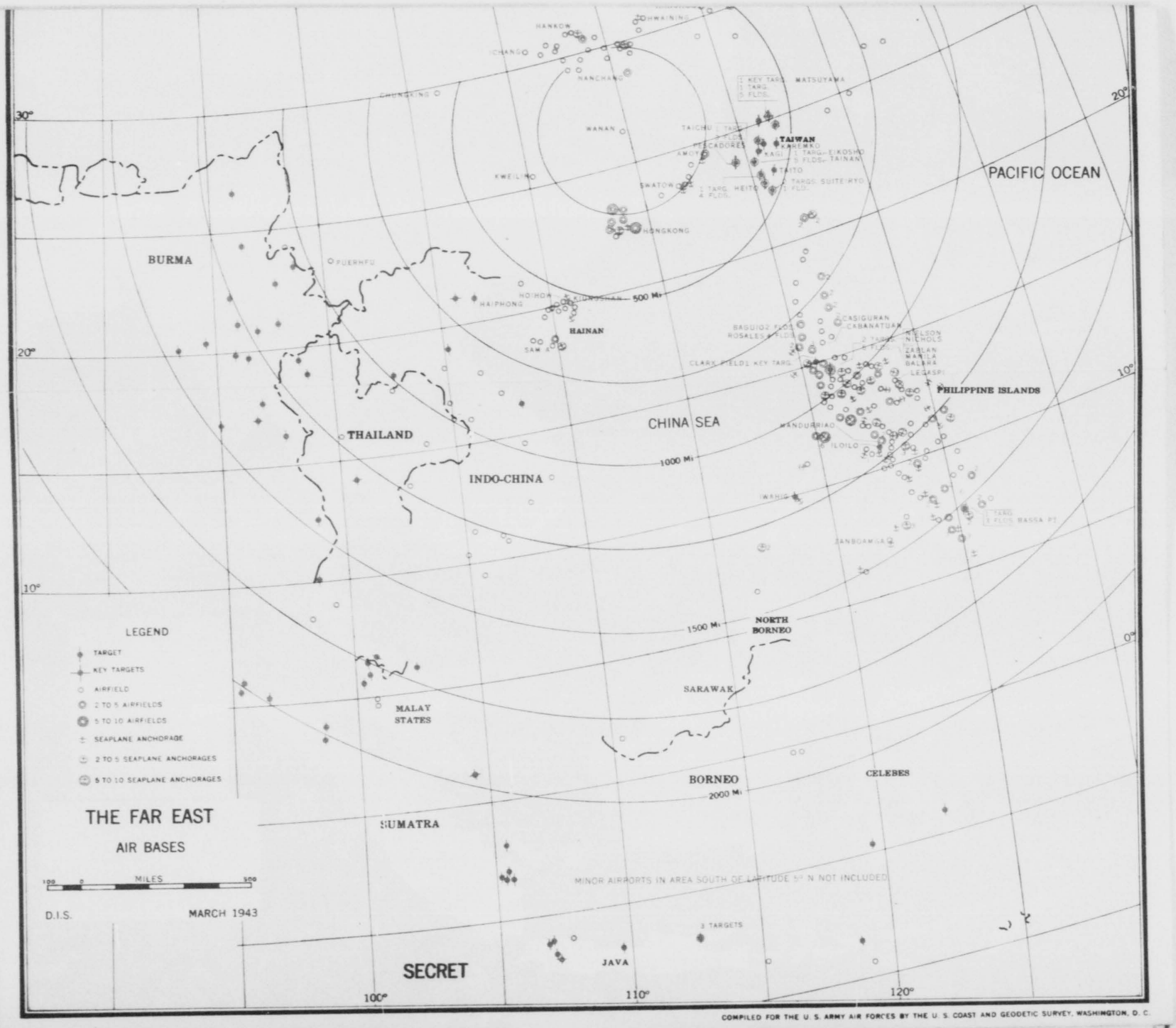

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JAPAN - DEFENSES

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	AKITA (90.6)			
1071	Akita Barracks	Minor	39°45'N 140°17'E	1071
	FUKUSHIMA (90.10)			
1080	Infantry, 32nd Inf Regiment Post	No details	38°15'N 140°20'E	1082
	TAKASAKI (90.13)			
1062	Army Regiment #15	Also arsenal	36°19'N 139°00'E	1051
1063 a,b,c,&d	Utsunomiya Military Installations	Large	36°34'N 139°52'E	1056
	MITO (90.14)			
304	Futtsu Point Forts	Defend channel into Tokyo Bay	35°19'N 139°46'E	304
	TOKYO (90.17)			
1494	Kannon Point Fortifications	Strong fortification commanding Tokyo Bay entrance	35°15'N 139°44'E	N A
	NAGOYA (90.20)			
252	Third Division Military HQ	Minor	35°10'N 136°54'E	250a
	KYOTO (90.23)			
1170	16th Division Barrack Area & Drill Ground	Large	34°57'N 135°46'E	1170

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JAPAN - DEFENSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OKAYAMA (90.27)			
1291	Himeji Barracks #1	Extensive barracks, paratroop school	34°51'N 134°42'E	1291
1292	Himeji Barracks #2	Extensive barracks	34°50'N 134°42'E	1291
1293	Marugame Barracks	Extensive barracks, storehouses	34°17'N 133°48'E	1303
1294	Okayama Barracks & Ordnance Depot	Extensive barracks, stores	34°41'N 133°55'E	1294
	KYUSHU EAST (90.33)			
1319	Oita Barracks	Minor	33°14'N 131°35'E	1329
	SHIMONOSEKI (90.34)			
47	Shimonoseki Military HQ	Minor	33°58'N 130°56'E	99
534	District Command HQ	Secondary	33°53'N 130°53'E	168
	KURUME (90.35)			
1247	Kurume Military Zone	Secondary barracks & ordnance depot	33°17'N 130°32'E	1263
1248	Kumamoto Military Zone	Minor barracks & military stores	32°48'N 130°43'E	1248
	SASEBO (90.36)			
853	Nagasaki Defense Command	Minor	32°45'N 129°52'E	542

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	YATSUSHIRO (90.37) KYUSHU SOUTH (90.38)			
1380	Kagoshima Army Post	Training center, rptd bomb, torpedo loading	31°37'N 130°33'E	-
1381	Miyakonojo Army Post	Important training center	31°43'N 131°12'E	-
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
17	Keelung Artillery Barracks	Minor	25°08'N 121°44'E	15a
48	Taihoku Barracks	Secondary	25°03'N 121°31'E	47
	TAIWAN WEST (91.4)			
112	Tainan Barracks	Secondary	23°00'N 120°12'E	112
113	South Tainan Barracks	Minor	22°56'N 120°11'E	-
114	Kagi Barracks	Secondary	23°28'N 120°25'E	-
115	Taichu Barracks	Secondary	24°08'N 120°42'E	98
	TAIWAN EAST (91.5)			
73	HQ & Barracks (Karenko)	Secondary	23°59'N 121°36'E	66

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
23	Rashin Barracks	Accommodate over 100,000 men	42°13'N 130°18'E	14
24	Ranan Barracks	Base, rptd greatly enlarged	41°43'N 129°41'E	22
	HEIJO (84.3)			
71	Heijo Barracks	In large military center	39°01'N 125°44'E	71
72	South Heijo Camp	Large training camp	38°59'N 125°46'E	71
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
75	Garrison, Antung	-	40°10'N 124°20'E	72
	MUKDEN (93.3)			
69	Garrison	-	41°47'N 123°23'E	50
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
16	Japanese Army Camp	Rptd quarters Bangkok occupation troops	13°44'N 100°33'E	26
18	Naval Station & Ammunition Dump	Important	13°40'N 100°35'E	31

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	THAILAND (98.1,98.2,98.3)(Continued)			
19	Fort Pisuasmut Naval Station	Rptd well fortified	13°35'N 100°35'E	19
20	Military Installations (Lop Buri)	One of largest military centers in Thailand	N limit 14°48'N S limit 14°47'N E limit 100°41'E W limit 100°38'E	20
58	Ministry of Defense & Oil Stores	Central QM storage	13°45'N 100°30'E	26
	BURMA (82)			
	BURMA SOUTH (82.2)			
9	AA Emplacement (Rangoon)	"Old Racecourse" AA position	16°47'N 96°09'E	14
	PHILIPPINES (96)			
	PHILIPPINES NORTH (96.1)			
	PHILIPPINES SOUTH (96.2)			
29	Fort Wint (Grande Island)	Principal defense of Subic Bay	14°46'N 120°14'E	-
43	Fort Mills (Corregidor Island)	Principal defense Manila harbor	14°23'N 120°35'E	-
44	Fort Hughes (Caballo Island)	Fortified island Manila harbor	14°22'N 120°36'E	-
45	Fort Drum (El Fraile Island)	Fortified island Manila harbor	14°19'N 120°36'E	-
46	Fort Frank (Carabao Island)	Fortified island Manila harbor	14°17'N 120°36'E	-

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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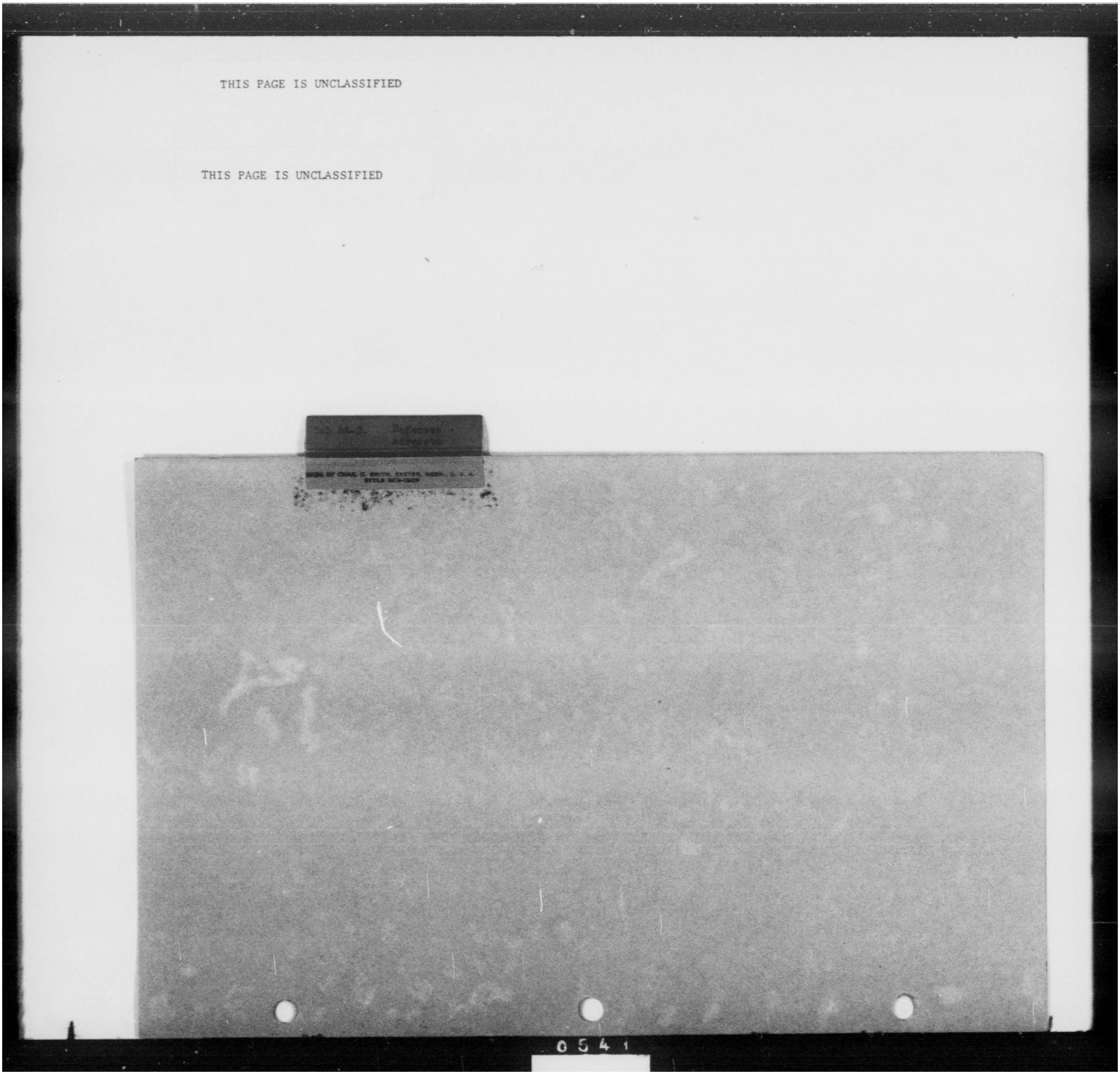

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March 1943

A I R P O R T S

KEY AIRPORTS					Miles radius from Wanan (inclusive)						
	TARGET				500	750	1000	1250	1500	1750	over
	No.	Name	Importance	Obj. Area							
1	1466 &1491	Kasumigaura Naval Air Sta.	One of most imp.; probably mfg.	Mito (90.14)						X	
2	298	Oppama Naval Air Station	Protects Yokosuka Naval Base	Tokyo (90.17)						X	
3	N A	Chitose	Largest air base in N. Japan	Hokkaido (90.2)							X
4	1404	Tachikawa Army Air Base	Imp. Tokyo Bay defense; also mfg.	Tokyo (90.17)						X	
5	1406	Tokorozawa Army Air Base	One of largest; repairs, training	Tokyo (90.17)						X	
6	373	Kisarazu Naval Air Station	Land and sea planes; depot	Mito (90.14)						X	
7	249	Kagamigahara Army Air Base	Major defense of Nagoya region	Nagoya (90.20)						X	
8	1236	Tachiarai Army Air Base (Fukuoka)	Defends western Japan	Kurume (90.35)				X			
9	52	Matsuyama	Main base of Taiwan (Formosa)	Taihoku (91.3)	X						
10	69	Heijo	Major operat. & training base	Heijo (84.3)				X			
11	47	Tin Ho (Canton)	Major base in S. China	Canton (83.4)	X						
12	5	Gialam (Hanoi)	Major base for Burma campaign	Indo-China (85.1)		X					
13	6	Don Muang (Bangkok)	Largest in Thailand	Thailand (98.1)						X	
14	3	Mingaladon (Rangoon)	Main Jap base in Burma	Burma (82.2)						X	
15	7	Seletar (Singapore)	Largest of 5 on Singapore island	Singapore (92.2)							X
16	76	Andir (Bandung, Java)	Major N.E.I. air base; repairs	Java (94.3)							X
17	26	Kainei Army Air Base	Major base near Siberian border	Sei shin (84.1)						X	
18	16	Clark Field	Largest in P.I.	P.I.(96.1)				X			

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March, 1943

A I R P O R T S

CHINA BASED OPERATIONS

Key air bases of Japan and occupied territories are so classified because of factors additional to large installations such as hangars, repair and refuelling facilities. Each is a past concentration point for Japanese planes over a considerable period. However, new construction or shifts in strategy may place emphasis on other centers. Every Japanese-held airport throughout the Pacific and, particularly along the China coast, is defensively important.

Four key Japanese air bases (and scores of other almost equally important flying fields) are within a 1,000 mile radius of Wanan: Matsuyama near Taihoku (Formosa) from which large-scale bombing attacks were launched against Canton and other Chinese cities at the start of the "China incident"; Tin Ho Air Base outside Canton, vital point in Japan's control of land and sea routes to other parts of China; Gialam Airport at Hanoi (French Indo-China) an important clearing point for planes going S and SW during the Singapore and Burma campaigns; and Clark Field, largest military airport of the Philippine Islands. Each has satellites and auxiliaries.

A 1,250 mile radius includes two more key targets, Tachikai Army Air Base outside Fukuoka, former terminal of Japan's international air lines to Manchukuo, Chosen (Korea), Taiwan (Formosa) and occupied China; and Heijo, major operational and training base of Chosen, which would increase in importance in event of operations against Soviet Russia.

Three more key bases are added by extending the radius to 1,500 miles; Mingaladon at Rangoon, capital of Burma; Don Muang outside Bangkok, and Kainei Army Air Base in NE Chosen, an operations base near the Siberian border.

A 1,750 mile radius includes six of the largest and oldest air bases in the strategic Nagoya-Tokyo Bay industrial area of Japan, heart of the war effort. These are Kasumigaura, Oppama and Kisarazu Naval Air Stations and Tachikawa, Tokorazawa and Kagamigahara Army Air Bases. All have important training, repair and probable large manufacturing activities.

Key air base targets outside a 1,750 mile operating radius are Chitose, largest air base on Hokkaido, the northernmost Japanese Island at the base of the Kurile chain; Seletar, former main British Royal Air Force base on Singapore Island at the shipping crossroads of Asia; and Andir at Bandung, former chief operations and repair headquarters of the Netherlands East Indies Air Force, before the fall of the Indies.

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March 1943

AIRPORTS

Before December, 1941, Japan completed a network of strategically-located air bases which made possible the rapid movement of Army and Navy aircraft to all war theatres and were important in early victories. Since then the Japanese have been industrious airport builders. Swift construction of new fields and enlargement of old airports has been a prime objective in every invasion. In Japanese cities baseball grounds and parks are reported to be equipped for small numbers of fighter aircraft. Every Japanese-held base throughout the Pacific is a potential defense against air attack.

Topography influenced Japan's choice of air base sites during peace and still is a factor. The mountainous terrain of the main Japanese islands was a handicap to air operations, so most of the largest and oldest fields are in the vicinity of Tokyo on the edge of one of the few extensive level areas of Japan. The nearness of aircraft supply sources in the Tokyo-Yokohama-Nagoya industrial districts was a further influence. Airports tended to adjoin population centers and most large Japanese cities are coastal.

Both the Philippine Islands and the Netherlands East Indies have topography generally similar to Japan. Most of the airports in these regions are located in coastal or small inland plain or valley areas. The Bandung district of Java, the Manila Bay area of the Philippines and the Huon Gulf Region of south New Guinea proved excellent for airport development.

The Great Plains of China extending from 150 to 500 miles inland and the vast level stretches of Manchukuo (Manchuria) encouraged airport building. However, mountainous Taiwan (Formosa) and Chosen (Korea), a country with no plains, have numerous air bases. Here strategic considerations were a spur similar to peacetime demands for mining machinery and other supplies in remote Pacific interior regions, which caused airport building in poor terrain.

Profusion of Japanese airports and limitless amount of cheap labor for quick repairs to airports, particularly in occupied territories, makes it impossible for even a severe and simultaneous blow at all Japanese air bases classified as "key" to cripple Japan's air power. The importance of large air bases with elaborate installations has been decreasing constantly with repeated demonstration of the value of dispersing planes and facilities. But military necessity for concentrating large numbers of aircraft in certain areas has made it impractical for Japan to disperse repair and refuelling facilities from many large established bases.

Key air bases were selected as known concentration points for Japanese military and Naval aircraft. Some adjoin key aircraft manufacturing targets (See Aircraft section) or serve as links in the defenses of such targets.

Note accompanying Airport Directories of Japan (including Formosa, Karafuto and the Kansei Islands); the East Indies and the Philippine Islands; South East Asia (Burma, Indo-China, Malaya and Thailand); and China and Korea (including Manchukuo) prepared by Air Movements Section, AFDIC, U.S. Army Air Forces.

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JAPAN-AIRPORTS

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
955	Toyohara Landing Ground	-	46°58'N 142°45'E	967
956	Otomari Seaplane Anchorage	-	46°37'N 142°45'E	966
957	Ochiai Civil Landing Ground	-	47°18'N 142°48'E	970
958	Nairo Civil landing Ground	-	49°06'N 142°58'E	958
	NIIGATA (90.9)			
1028	Niigata Airport	Large, Naval air base & training school	37°57'N 139°08'E	1028
	TOYAMA (90.11)			
864	Toyama Airport	Secondary military	36°45'N 137°11'E	864
872	Kanazawa Airdrome	Three runways; 600 yards each	36°38'N 136°38'E	872
	NAGANO (90.12)			
1102	Nagano Airport	Rptd 700 x 200 yard runways	36°38'N 138°12'E	1098
1103	Takata Airport	Minor	37°05'N 138°14'E	1103
	TAKASAKI (90.13)			
1057	Kumagaya Airdrome	One of most important in Japan; heavy bombers	36°10'N 139°18'E	1057
1058	Kawakishi Testing Airfield	Assembly & testing for Nakajima Aircraft	36°14'N 139°23'E	789

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MITO (90.14)			
371	Tateyama Naval Air Station	Important; land and sea planes, depot	34°59'N 139°50'E	371
373	Kisarazu Navy Airbase	Important; land and sea planes, depot	35°24'N 139°55'E	373
1409	Narashino Army Airdrome	Tokyo inner defense unit	35°42'N 140°00'E	1519
1463	Anju Seaplane Base	Satellite of Target 1466	36°01'N 140°20'E	-
1464	Choshi Army Airdrome	Secondary	35°50'N 140°45'E	-
1465	Kashima Navy Airbase	Satellite of target 1466	35°59'N 140°39'E	-
1466	Kasumigaura Naval Air Station Airfield	Important; also rptd plane production	36°02'N 140°13'E	1466
1468	Mito Army Airdrome	Secondary, military	36°23'N 140°36'E	-
1470	Shimoshizu Army Airbase	One of oldest Army bases	35°39'N 140°09'E	-
1472	Tsukuba Navy Airdrome	Satellite of target 1466	36°12'N 140°06'E	-
1473	Tsuchiura Navy Airdrome	Satellite of Target 1466	36°05'N 140°15'E	1466
1474	Yatabe Navy Airdrome	Satellite of target 1466	36°02'N 140°05'E	-
1487	Hokoda Airdrome	Secondary, military	36°10'N 140°30'E	-
1488	Kioroshi Army Airdrome	Rptd large, fighter base	35°52'N 140°12'E	-
1489	Tomobe Navy Airdrome	Secondary, military	36°20'N 140°19'E	-
1490	Tsudanuma Airdrome	Secondary	35°41'N 140°05'E	1519
1491	Kasumigaura Naval Air Station Seaplane Base	Important; also rptd plane production	36°03'N 140°13'E	1466
	TOKYO (90.17)			
82	Totsuka	Important; paratroop training, Japan aircraft testing	35°24'N 139°33'E	NA
298	Oppama Naval Air Station	Very important; protects Yokosuka naval base	35°19'N 139°39'E	"
337	Haneda	Large; also research & manufacturing	35°34'N 139°46'E	"
1402	Yokohama Naval Air Station	Flying boat patrols	35°25'N 139°38'E	"

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
1403	Tomioka Sea plane Base	Repairs; adjoins plane factory	35°23'N 139°38'E	NA
1404	Tachikawa	One of largest Army bases; adjoining aircraft plant	35°42'N 139°25'E	"
1405	Sunamachi	Important, new	35°39'N 139°50'E	"
1406	Tokorazawa	Important; also training center	35°48'N 139°29'E	"
1407	Showa	Flight testing	35°44'N 139°22'E	"
1408	Sayama	Training field of Toyooka air academy	35°47'N 139°23'E	"
1409	Narashino	Paratroop training; inner Tokyo defense base	35°43'N 140°00'E	"
1410	Shinosaki	Training center	35°43'N 139°54'E	"
1411	Susaki	Large, formerly commercial	35°39'N 139°48'E	"
1412	Chofu	Large, rptd 600 acres	35°40'N 139°30'E	"
1413	Shinagawa	Land & seaplanes; paratroops, flight testing	35°36'N 139°45'E	"
1414	Urawa	Full facilities	35°51'N 139°40'E	"
1415	Takahagi	Medium bomber base	35°51'N 139°24'E	"
1416	Matsudo	Fighter & heavy bomber base	35°46'N 139°54'E	"
1417	Otawa Bay	Secondary importance	35°13'N 139°38'E	"
	SHIZUOKA (90.18)			
1183	Airfield (Shimizu)	Large, seaplane base adjoining	35°00'N 138°32'E	1176
	NAGOYA (90.20)			
248	Nagoya Civil Airport	Minor	35°04'N 136°51'E	194
249	Kagamigahara Military Airport	Major Airbase	35°23'N 136°51'E	240
1130	Suzuka Naval Airbase	Important, land and seaplanes	34°55'N 136°39'E	1152
1131	Tomita Airbase	Minor, glider training	35°01'N 136°41'E	1134a
	HAMAMATSU (90.21)			
1222	Mikatahara Army Airfield	Major Operational & training	34°47'N 137°42'E	1222

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MAIZURU (90.22)			
1046	Naval Air Station	Important, seaplane base	35°32'N 135°14'E	1046
1047	Aerodrome	Primary military	35°27'N 135°28'E	1039
	KYOTO (90.23)			
1168	3rd Air Regiment Airdrome	-	35°06'N 136°12'E	1168
	KUMANO (90.24)			
1213	Akeno Military Aviation School & Field	Military field, aerial gunnery	34°32'N 136°40'E	1213
	OSAKA (90.25)			
1187	Osaka Airdrome	Substantial	34°38'N 135°28'E	325
	KOCHI (90.28)			
1523	Ino Island Airport (I Shima)	Secondary, military	33°51'N 134°49'E	1523
	KURE (90.30)			
656	Kure Naval Air Station	Major; part of Kure Naval Base	34°13'N 132°36'E	656
731	Otake Naval Airfield	Minor, land planes only	34°13'N 132°14'E	731
732	Iwakuni Naval Air Station	Major, land and seaplane base	34°08'N 132°14'E	732
734	Nakamita Airdrome	Rptd paratroop training center	34°31'N 132°36'E	734
795	Hiroshima Airfield	Civil landing field	34°24'N 132°29'E	739

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JAPAN-AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KYUSHU EAST (90.33)			
1306	Saeki Naval Air Station	Major operational airbase	32°57'N 131°55'E	1306
1307	Usa Naval Air Station	Secondary operational airbase	33°34'N 131°25'E	1307
1308	Oita Naval Air Station	Secondary operational airbase	33°15'N 131°37'E	1329
1309	Tomitaka Naval Airfield	Auxiliary field	32°24'N 131°38'E	1309
	SHIMONOSEKI (90.34)			
1117	Shimonoseki Airport	Rptd auxiliary	35°58'N 130°57'E	44a
1120	Oura Naval Air Station	Secondary seaplane base	34°24'N 130°58'E	1120
1121	Ozuki Airport	Secondary	34°04'N 131°02'E	1121
1125	Onga Army Airfield	New army field, rptd important	33°54'N 130°41'E	1125
	KURUME (90.35)			
663	Fukuoka Naval Air Station	Large airbase	33°41'N 130°24'E	664
1236	Tachiarai Army Airfield	Major military airbase	33°24'N 130°37'E	1236
1237	Najima Seaplane Base (Fukuoka)	Terminal Japan-Korea-Taiwan airline	33°39'N 130°25'E	664
	SASEBO (90.26)			
754	Sasebo Naval Air Station	Important	33°08'N 129°43'E	754
849	Omura Naval Air Station	Important	32°56'N 129°56'E	849
850	Nagasaki Airport	Minor	32°43'N 129°50'E	-

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	YATSUSHIRO (90.37) KYUSHU SOUTH (90.28)			
1378	Kanoya Naval Air Station	Vital southern airbase, supplies, major repairs	31°23'N 130°52'E	NA
1379	Miyakonojo Army Airfield	Important army airbase, supplies, repairs	31°44'N 131°03'E	"
1380	Kagoshima Airfield	Large - built since war began	[illegible]	"
	JAPANESE ISLANDS (91)			
	KURILE ISLANDS (91.1)			
124	Seaplane Anchorage	On Lake Toshimoye	45°02'N 147°43'E	124
143	Shimushu Airbase	Possible large airbase	50°45'N 156°20'E	143
	TAIHOKU (91.3)			
52	Matsuyama Airport	A primary operational airbase	25°03'N 121°33'E	32
53	Koko Airport	Major military base	24°52'N 121°03'E	53
54	Itahashi Airport	Secondary, military	24°59'N 121°27'E	50
	TAIWAN WEST (91.4)			
96	Kagi Airbase	Important	23°27'N 120°23'E	96
97	Eikosho Airport (Tainan)	Secondary	23°02'N 120°12'E	97
98	Taichu Airport	Secondary	24°10'N 120°41'E	91
99	Jitsugetsutan Seaplane Anchorage	No details	23°52'N 120°55'E	-
	TAIWAN EAST (91.5)			
74	Karenko Airport	Rptd principal Taiwan military base	24°01'N 121°38'E	61

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JAPAN-AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAIWAN EAST (91.5) (Continued)			
75	Taito Airport	Secondary	22°46'N 121°05'E	67
76	Giran Airport	Military	24°45'N 120°45'E	69
77	Suo Airport	Military	24°35'N 121°52'E	-
78	Garambi Airport (Koshun)	Military	21°58'N 120°48'E	78
	TAKAO (91.6)			
57	Heito Airport	Rptd most important operational base in area	22°40'N 120°27'E	55
58	Okayama Airport	Recently enlarged	22°48'N 120°16'E	58
59	Suiteiryo Airport (Takao)	Believed secondary	22°27'N 120°27'E	59
	PESCADORES (91.7)			
154	Keimo-U Airdrome	Principal airport of Pescadores, all facilities	23°34'N 119°36'E	148
155	Risei-Kaku Airdrome	Secondary Airport in Pescadores	23°33'N 119°41'E	148
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
25	Seishin Airfield	Commerical, Korea-Siberia border defense unit	41°47'N 129°45'E	25
26	Kainei Airfield	Strategic base in border area	42°25'N 129°44'E	26
	HEIJO (84.3)			
69	Heijo Airdrome	Important, military, training center	39°02'N 125°47'E	71

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HEIJO (84.3) (Continued)			
70	Ryuko Airdrome	Chinnampo defense unit	38°56'N 125°13'E	-
	GENZAN (84.4)			
86	Genzan Naval Air Base	Large, new, sea and land planes	39°10'N 127°29'E	88
	CHOSEN EAST (84.5)			
48	Koryo Airfield	Auxiliary	37°44'N 128°53'E	48
	KEIJO (84.6)			
36	Heitaku Airport	Auxiliary	36°58'N 127°05'E	36
37	Hakusen Airfield (Keijo)	Probable large airbase	37°57'N 126°19'E	37
38	Keijo Airfield	Probable airbase	37°31'N 126°56'E	42
39	Koshu Airfield	Auxiliary	36°26'N 127°08'E	39
40	Bunzan Airfield	Auxiliary	37°52'N 126°43'E	40
41	Tyotiin (Chochiin) Airfield	Auxiliary	36°36'N 127°18'E	41
	FUSAN (84.7)			
93	Chinkai Naval Air Station	Seaplane base for Chinkai naval Base	35°08'N 128°40'E	101
94	Urusan Airfield	Military	35°32'N 129°21'E	94
95	Taikyu Airfield	Military	35°54'N 128°39'E	95

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (MANCHURIA) (93)			
	MUKDEN (93.3)			
48	Military & Commercial Airport	Important	41°47'N 123°30'E	46
49	Military Airfield	Important, possibly same plane assembly	41°45'N 123°21'E	49
	DAIREN (93.5)			
12	Dairen Airport	Military & commercial	38°57'N 121°32'E	12
	CHINA (83)			
	CANTON (83.4)			
45	**Kaitak Airport**	Only major airport Hong Kong-Kowloon district	22°20'N 114°12'E	35
46	White Cloud Airdrome	Large, rptd improved by Japs	23°09'N 113°18'E	47
47	Tin Ho Airdrone	Rptd main Jap base, handles all types	23°08'N 113°20'E	47
62	Sanchau Island Airdrome	Major, on staging route to southern area	22°02'N 113°24'E	62
	HAINAN (83.6)			
30	Hungshan Aerodrome	Important military aerodrome	20°02'N 110°20'E	30
31	Sama Aerodrome	Important	18°17'N 109°25'E	31
32	Sama Seaplane Base	Important base	18°15'N 109°30'E	32

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	FRENCH INDO-CHINA (85)			
	FRENCH INDO-CHINA NORTH (85.1)			
4	Tourane	Major land-seaplane, bomber school, refuels N-S traffic	16°02'N 108°12'E	N A
5	Gialam	Major bomber base	21°03'N 105°53'E	"
6	Bach Mai	Main French army field for defense Hanoi; bomber base	21°00'N 105°49'E	"
9	Haiphong	Secondary	20°53'N 106°42'E	"
10	Haiphong Seaplane Base	Major seaplane base	20°32'N 106°40'E	"
15	Tong	Very important military field	21°08'N 105°30'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
6	Don Muang Airdrome	Rptd largest in Thailand; military	13°55'N 100°37'E	6
7	Koke Kathiem Airdrome	Large, military	14°50'N 100°38'E	7
8	Korat Airdrome	Rptd bomber base	14°58'N 102°07'E	8
9	Mesod Airdrome	All-weather	16°41'N 98°31'E	9
10	Pitsamuloke Airdrome	Rptd two fields consolidated	16°49'N 100°16'E	10
11	Prachuab Kirikhan Airdrome	On coast, land and seaplanes	11°46'N 99°48'E	11
12	Satahib Airdrome	Navy station	12°39'N 100°53'E	12
13	Singora Airdrome	Land & seaplanes	7°11'N 100°38'E	13
14	Udorn Airdrome	Rptd small	17°24'N 102°40'E	14
65	Nontaburi Seaplane Base	Rptd best seaplane base in Thailand	13°54'N 100°30'E	65

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES NORTH (92.1)			
1	Alor Star Airfield	Military	6°12'N 100°25'E	1
2	Butterworth Airfield	Military	5°27'N 100°23'E	2
3	Gong Kedah Airfield	Military	5°48'N 102°29'E	3
4	Penang Airfield	Military airbase	5°17'N 100°16'E	4
	SINGAPORE (92.2)			
5	Singapore (Buloh) Airfield	Large RAF base	1°26'N 103°42'E	5
6	Singapore (Kalang) Airdrome	Large civil & military base	1°18'N 103°53'E	52
7	Singapore (Seletar) Airdrome	Large RAF base, land & seaplane	1°25'N 103°52'E	7
8	Singapore (Sembawang) Airdrome	Large RAF base	1°25'N 103°49'E	7
9	Singapore (Tengah)	Large RAF base	1°23'N 103°43'E	9
	BURMA (82)			
	BURMA NORTH (82.1)			
30	Heho Airdrome	All-weather; facilities & bomb storage	20°45'N 96°48'E	30
31	Lashio Airdrome	All-weather; facilities & bomb storage	22°59'N 97°45'E	31
32	Magwe Airdrome	All-weather; 3 runways, facilities	20°10'N 94°57'E	32
33	Myitkyina Airdrome	Rptd one metal runway, two others	25°23'N 97°21'E	33
34	Namsang Airdrome	All-weather, facilities, bomb storage	20°54'N 97°44'E	34
35	Shwebo Landing Ground	Approximately 50 miles from Mandalay	22°35'N 95°42'E	35

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BURMA NORTH (82.1) (Continued)			
36	Kutkai Landing Ground	Approximately 40 miles from Lashio	23°27'N 97°56'E	-
37	Bhamo Landing Ground	No details	24°16'N 97°14'E	-
38	Akyab Airdrome	All-weather, facilities	20°08'N 92°53'E	38
39	Pakokku Airdrome	Rptd new Jap built field, approx 70 mi Mandalay	21°21'N 95°07'E	39
40	Meiktila Landing Ground	Rptd being expanded	20°52'N 95°54'E	40
	BURMA SOUTH (82.2)			
1	Bassein Landing Field	Small field rptd being extended	16°49'N 94°47'E	1
2	Mergui Landing Field	All-weather, rptd important	12°27'N 98°41'E	2
3	Mingaladon Airdrome (Rangoon)	Largest in Burma	16°54'N 96° 8'E	3
4	Moulmein Airdrome	All-weather, facilities, important	16°26'N 97°39'E	4
5	Tennant Landing Field	All-weather	10° 4'N 96°22'E	5
6	Toungoo Airdrome	All-weather, facilities, important	19°00'N 96°24'E	6
7	Victoria Point Airdrome	All-weather	10° 3'N 98°33'E	7
8	Zayatkwin Landing Field	Approximately 30 miles NE Rangoon	17° 7'N 96°20'E	8
	NETHERLANDS EAST INDIES (94)			
	NORTH SUMATRA (94.1)			
1	Sabang Airfield	Military, near Sabang Harbor	5°53'N 95°20'E	1
2	Lho' Nga Airfield (Koetaradja)	Small	5°30'N 95°17'E	2
3	Bireuen Airfield	Small	5°12'N 96°44'E	3
4	Lho' Seumaweh Airfield	Small	5°12'N 97°07'E	4
5	Medan Airfield	Large military airbase	3°34'N 98°40'E	5

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NORTH SUMATRA (94.1)(Continued)			
6	Brastagi Airfield	Small	3°11'N 98°30'E	6
8	Labuan Roekoe Airfield	Small	3°11'N 99°28'E	8
9	Rantau Prapat Airfield	Small	2°09'N 99°50'E	9
10	Kota Pinang Airfield	Small	1°48'N 100°02'E	10
11	Kota Tengah Airfield	Small	1°04'N 100°32'E	11
12	Pakan Baroe Airfield	Small military airbase	0°28'N 101°26'E	12
	SOUTH SUMATRA (94.2)			
36	Palembang Airfield #1	-	02°54'S 104°42'E	36
37	Palembang Airfield #2	-	03°20'S 104°24'E	37
38	Palembang Airfield #3	-	03°22'S 104°17'E	38
39	Palembang Airfield #4	-	03°18'S 104°38'E	39
40	Muntok Airfield (Banka Island)	-	02°03'S 105°13'E	57
	JAVA (94.3)			
76	Bandung (Andir) Airdrome	Military, major facilities	06°54'S 107°35'E	159
77	Batavia (Kemajoran) Airdrome	Military, 3 mi E of Batavia	06°09'S 106°51'E	166
78	Batavia (Tjilitian) Airdrome	Military, 8 mi SSE of Batavia	06°16'S 106°54'E	78
79	Surabaya (Tandjong Perak) Airdrome	Military, 2 mi NW of Surabaya	07°12'S 112°43'E	174
80	Surabaya (Dermo) Airdrome	Was Secondary	07°18'S 112°43'E	174
81	Madium Airfield	Military	07°40'S 111°24'E	81
84	Kalidjati Airfield	Military	06°32'S 107°40'E	84
85	Malang Airfield	Military	07°54'S 112°42'E	85

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TARGET NO.	TARGET	OBJECT	Geographical Coordinates	Chart No.
	JAVA (94.3) Continued			
86	Bandung (Tjitarur) Airfield	Military	06°55'S 107°30'E	-
123	Surabaya (Morokrembangan) Naval Air Sta	At harbor	07°13'S 112°43'E	174
	CELEBES-TIMOR (94.5)			
197	Kendari Airfield, Celebes	Military	04°06'S 122°26'E	197
198	Macassar (Mendai) Airfield, Celebes	Major	05°04'S 119°33'E	198
199	Bima Airfield, Soembawa	Civil airfield	08°30'S 118°44'E	199
200	Den Pasar Airfield, Bali	Military	08°45'S 115°10'E	200
201	Koepang (Penfoei) Airfield, Timor	Military	10°10'S 123°35'E	201
	PHILIPPINES (96)			
	PHILIPPINES NORTH (96.1) PHILIPPINES SOUTH (96.2)			
16	Clark Field	Largest airport in Philippines, enemy base	15°10'N 120°33'E	N A
17	Nichols Field	Important in defense of Manila, enlarged	14°31'N 121°00'E	"
18	Nielson Airport	Energy bomber base near Manila	14°34'N 121°01'E	"
55	Burnside Field	Important defense of enemy base at Iloilo	10°42'N 122°35'E	"
63	Malabang Field *	Enemy base in Mindanao	7°37'N 124°04'E	"
68	Sanborn Field	Base for defense of S Luzon	13°10'N 123°44'E	"
69	Iwahag Field	Rptd one of principal Philippine bases	9°45'N 118°30'E	"

* New Target to be included in Folder revision

N A No number yet assigned when this list prepared

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Tab EB-1. Shipping -

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March 1943

S H I P P I N G

Shipping is emphasized in this report because (1) it is one of the most vital links in Japan's war economy and (2) it is the link most exposed to air attack.

This situation is significant with reference to air operations from presently-held China bases. A radius of approximately 1000 miles from Wanan will include a number of important harbors, where ships will be found loading coal, iron ore and other commodities indispensable to the Japanese war effort and directly affecting the war production of major plants at a considerably greater distance. Vessel appearance in these ports is not intermittent, but rather is of a constant character, in a number of cases handling very hand-to-mouth movement of basic commodities. Such a radius will also include the inner sea lanes most frequently used by Japanese ships engaged in transporting raw materials from, and military supplies to, the Southwest Pacific.

It is indicated that air attacks on these ship concentrations will directly affect Japan's war potential by:

a) Increasing her rate of ship losses, which already exceeds replacement capacity,

b) Forcing her shipping into more circuitous lanes,

c) Forcing resort to slow, heavily-escorted convoys, thereby greatly reducing tonnage efficiency,

d) Reducing the flow of essential raw materials, and

e) Interfering with military operations in the Southwest Pacific theater.

Three related aspects of Japanese shipping are summarized in detail in this section:

1) Tonnage and origin of sea-borne commodities,

2) The status of the Japanese merchant fleet as of January 1943, and

3) Japanese shipbuilding and ship repair capacity.

In this study, ship concentrations in key ports are treated as important objectives in themselves, without reference to such harbor facilities as warehouses, loading equipment, etc., to be found in these ports. Harbor facilities at these ports are listed in the index of Objective Folder targets (HARBOR FACILITIES AND WAREHOUSES) at the end of this section.

Shipbuilding and repair facilities targets also will be found following the sub-section on Naval Bases and Shipyards. In addition to repairs as such, these installations have a direct relation to ship concentrations. In the case of Hong Kong, aerial reconnaissance has disclosed that unusually large (800,000 tons estimated on one occasion) concentrations in the Port of Hong Kong from time to time because of the repair facilities and importance as a convoy control point.

The following sub-section indicates the vast sea-borne tonnage of basic commodities which Japan must move and the resultant ship concentrations (with table of distances from Wanan).

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COMMODITY TONNAGES, SHIPS

Japan's war effort depends upon the seaborne movement of a vast tonnage of raw materials. Japan has available to her sufficient supplies of food (principally rice) and of most raw materials. A major proportion of these commodities must be shipped, either from overseas ports to the Japanese Islands, or between the various harbors of the Japanese Islands themselves.

In order to transport the requisite amounts of basic raw materials and food from their sources to centers of consumption, Japan must ship a total annual cargo of approximately 69,000,000 tons. This figure represents the amount which she must obtain from overseas and which she must move from one place to another within the Japanese Islands in order to ensure an adequate program of industrial production. Shipments of many miscellaneous semi-manufactured and finished goods, military supplies, and troops are excluded. Of the total cargo of 69,000,000 tons, 77% is represented by coal, iron ore and pig iron, and 85% by coal, iron ore, pig iron, and petroleum.

The general geographical distribution of shipments is as follows:

a) 35,265,000 tons, or 51% of the total, originate in ports in Japan proper and go to Japanese destinations.

b) 20,628,000 tons, or 30%, originate in Chosen, Manchukuo, China and Taiwan.

c) Thus 55,893,000 tons, or 81% of total shipments to Japan originate within the "inner zone". (Japan, Chosen, Manchukuo, North China, and Taiwan)

d) The remaining 13,147,000 tons, or 19%, originate in latitudes south of Taiwan. While this tonnage is relatively small it includes the bulk of Japan's supplies of non-ferrous ores and metals, and petroleum. Of all the petroleum shipped from Indies ports only 40% will go to Japan proper; 60% will go to other destinations in the Far East, principally to combat zones.

Table I on the following page shows the source of each basic commodity, giving the estimated amounts coming from every country and from each major harbor during 1942. While Japan has stockpiles of many materials sufficient to last from 1 to 3 years or more, it is believed that she will endeavor to maintain and increase these and that their presence will not cause a reduction in the movement of commodities until the military situation or a shipping stringency causes a curtailment. In any case, no inventories of iron ore and coal, which constitute the bulk of shipments, have been accumulated and their consumption is on a hand-to-mouth basis. Any interruption of their flow is an immediate blow to Japanese industry.

The movement of 69,000,000 tons of cargo will result in a certain number of ships being in each harbor from which commodities flow and in each harbor at which they arrive, at any one time. On the basis of the commodity shipment statistics and supplementary data not included in this report, the table presented below has been constructed. This table shows the number of ships per week in each harbor, the average size of these ships, and their total tonnage. In order to avoid figures showing a fraction of a ship, a week has been chosen as the unit of time rather than a day. (See Table II.)

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(all figures in metric tons)

JAPAN 1943 - - COMMODITY SHIPMENTS F

HARBOR	TOTAL	BAUXITE	CHROMIUM	COAL		COPPER	COTTON	FERTILIZER		
				Coking	Non-Coking			Nitrogenous	Phosphate	Soybea
JAPAN	30,465,300			2,000,000	27,100,000			200,000		
Esutoru	800,000			600,000						
Fukuoka	1,000,000				1,000,000					
Honto	600,000			400,000						
Karatsu	1,000,000				1,000,000					
Kushiro	1,000,000				1,000,000					
Maoka	700,000			500,000	-					
Miike	3,100,000				3,100,000					
Moji	2,600,000				2,600,000					
Muroran	5,500,000				5,500,000					
Okha a)	131,600									
Otaru	2,500,000				2,500,000					
Otamari	500,000			300,000						
Shikuka	400,000			200,000						
Ube	1,400,000				1,400,000					
Wakamatsu	9,000,000				9,000,000					
Yokohama	233,700							200,000		
CHOSEN	5,021,200				2,000,000			300,000		
Chinnampo	2,805,000				2,000,000			30,000		
Fusan	146,200									
Konan	270,000							270,000		
Rashin	500,000									
Seishin	1,300,000									
MANCHUKUO	3,995,000				1,200,000			80,000		850,00
Dairen	3,623,750				1,200,000			80,000		750,00
Tashito b)	371,250									100,00
CHINA	9,026,200			5,300,000	1,200,000		200,000		80,000	
Chinwangtao	3,600,000			3,300,000	300,000					
Tientsin	1,400,000				350,000		150,000			
Tsingtao	2,900,000			2,000,000	550,000		50,000			
Yangtze	1,126,200								80,000	
TAIWAN	2,585,000				500,000	100,000				
Kealung	1,671,000				500,000	100,000				
Niitaka	237,000									
Takao	677,000									
PHILIPPINES	1,560,000		180,000			80,000				
Masinloc	180,000		180,000							
Pambujan Sur (Samar)	200,000									
Paracale (Calumbayanga Is)	1,100,000									
San Fernando La Union	80,000					80,000				
INDO-CHINA	2,284,900				1,300,000				160,000	
Campha	500,000				500,000					
Haiphong	249,900								160,000	
Hongai	500,000				500,000					
Port Redon	300,000				300,000					
Saigon	735,000									
THAILAND	319,400									
Bangkok	319,400									
MALAYA	1,522,000	100,000								
Batu Pahat	450,000	100,000								
Endau	100,000									
Kemaman	100,000									
Kota Bahru & Tumpat	172,000									
Kuala Dungun	700,000									
NETHERLANDS EAST INDIES e)	6,272,800	300,000								
Balikpapan	391,400									
Kolaka (Padamarang)	180,000									
Lutong	2,536,400									
Palembang	1,269,000									
Pankalan Susu	771,900									
Surabaya	560,500									
Tandjong Pinang	300,000	300,000								
Tarakan	263,600									
BURMA	219,000									
Rangoon	219,000									
TOTAL TONNAGE ASSIGNABLE TO SPECIFIED HARBORS	63,270,800	400,000	180,000	7,300,000	33,300,000	180,000	200,000	580,000	240,000	850,000
ADD: NON-ASSIGNABLE TONNAGE	5,769,000	100,000			4,800,000				750,000	
JAPAN	4,800,000				4,800,000					
CHINA	54,000									
PHILIPPINES	60,000									
MISCELLANEOUS SOURCES	855,000	100,000 c)							750,000 d)	
GRAND TOTAL	69,039,800	500,000	180,000	7,300,000	38,100,000	180,000	200,000	580,000	990,000	850,000

a) Russian Saghalien
b) In Korea, just across Manchurian border.
c) Man
e) Java

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JAPAN 1943 - - COMMODITY SHIPMENTS FOR ESSENTIAL INDUSTRIAL REQUIREMENTS BY PORT OF ORIGIN

PPER	COTTON	FERTILIZER Nitrogenous	FERTILIZER Phosphate	FERTILIZER Soybean	IRON ORE & PIG IRON Iron Ore	IRON ORE & PIG IRON Pig Iron	LEAD	LUMBER PAPER PULP	MANGAN-ESE	NICKEL	PETROLEUM	RICE	RUBBER	SALT	SUGAR
		200,000						1,000,000			165,300				
								200,000							
								200,000							
								200,000							
											131,600				
								200,000							
								200,000							
		200,000									93,700				
		300,000			2,080,000	495,000						146,200			
		30,000			280,000	495,000						146,200			
		270,000													
					500,000										
					1,300,000										
		80,000		850,000	180,000	1,085,000								600,000	
		80,000		750,000	180,000	813,750								600,000	
				100,000		271,250									
	200,000		80,000		1,100,000	100,000						146,200		900,000	
	150,000				200,000	100,000								600,000	
	50,000													300,000	
			80,000		900,000							146,200			
0,000												585,000		200,000	1,200,
0,000												351,000			720,
												117,000			120,
												117,000		200,000	360,
0,000					1,300,000										
					200,000										
					1,100,000										
0,000															
			160,000						3,000					100,000	
			160,000						3,000					25,000	
												585,000	75,000	75,000	
												219,400		100,000	
												219,400		100,000	
					1,400,000				22,000						
					350,000										
					100,000										
					100,000										
					150,000				22,000						
					700,000										
										180,000	5,692,800			100,000	
											391,400				
										180,000					
											2,536,400				
											1,269,000				
											771,900				
											460,500			100,000	
											263,600				
							80,000			5,900		73,100			
							80,000			5,900		73,100			
0,000	200,000	580,000	240,000	850,000	6,060,000	1,680,000	80,000	1,000,000	25,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,200,
			750,000				54,000		65,000						
							54,000								
									60,000						
			750,000[d]						5,000	[e]					
0,000	200,000	580,000	990,000	850,000	6,060,000	1,680,000	134,000	1,000,000	90,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,200,

Manchurian border. c) Mandated Islands & Carolines: 60,000; Indo-China & Hainan: 40,000 d) Christmas Is., Luchu & Mandate

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ITY SHIPMENTS FOR ESSENTIAL INDUSTRIAL REQUIREMENTS BY PORT OF ORIGIN

FERTILIZER		IRON ORE & PIG IRON		LEAD	LUMBER PAPER PULP	MANGANESE	NICKEL	PETROLEUM	RICE	RUBBER	SALT	SUGAR	ZINC
Phosphate	Soybean	Iron Ore	Pig Iron										
					1,000,000			165,300					
					200,000								
					200,000								
					200,000								
								131,600					
					200,000								
					200,000								
								23,700					
		2,060,000	495,000						146,200				
		250,000	495,000										
									146,200				
		500,000											
		1,300,000											
	850,000	180,000	1,085,000								600,000		
	750,000	180,000	813,750								600,000		
	100,000		271,250										
80,000		1,100,000	130,000						146,200		900,000		
		200,000	100,000								600,000		
											300,000		
80,000		900,000							146,200				
									585,000		200,000	1,200,000	
									351,000			720,000	
									117,000			120,000	
									117,000		200,000	360,000	
		1,300,000											
		200,000											
		1,100,000											
160,000						3,000					100,000		61,900
160,000						3,000					25,000		61,900
									585,000	75,000	75,000		
									219,400		100,000		
									219,400		100,000		
		1,400,000				22,000							
		350,000											
		100,000											
		100,000											
		150,000				22,000							
		700,000											
							180,000	5,692,800			100,000		
								391,400					
							180,000						
								2,536,400					
								1,269,000					
								771,900					
								460,500			100,000		
								203,600					
				80,000			5,900		73,100				60,000
				80,000			5,900		73,100				60,000
240,000	850,000	6,060,000	1,680,000	80,000	1,000,000	25,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,200,000	121,900
750,000				54,000		65,000							
				54,000									
						60,000							
750,000[d]						5,000	[e]						
990,000	850,000	6,060,000	1,680,000	134,000	1,000,000	90,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,200,000	121,900

c) Mandated Islands & Carolines: 60,000; Indo-China & Hainan: 40,000

d) Christmas Is., Luchu & Mandated Islands.

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TABLE II.

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SELECTED HARBORS ARRANGED ACCORDING TO SHIPS IN PORT PER WEEK

HARBOR	SHIPS IN PORT PER WEEK	AVERAGE SIZE (TONS)	TOTAL TONNAGE PER WEEK	DISTANCE FROM WANAN						
				0-500	500-750	750-1000	1000-1250	1250-1500	1500-1750	1750&over
Wakamatsu	630	2,400	1,512,000				x			
Osaka	364	2,300	837,200					x		
Tokyo	336	2,100	705,600						x	
Moji	144	3,700	532,800				x			
Nagoya	140	2,100	294,000					x		
Muroran	120	2,200	264,000							x
Yokohama	102	5,000	510,000						x	
Yangtze	96	3,600	345,600		x					
Dairen	66	4,700	310,200			x				
Tsingtao	61	3,700	225,700			x				
Miike	60	2,000	120,000				x			
Ube	52	1,000	52,000				x			
Otaru	48	2,000	96,000							x
Keelung	48	4,000	192,000	x						
Chinwangtao	45	4,700	211,500			x				
Chinnampo	43	5,000	215,000				x			
Karatsu	38	2,000	76,000				x			
Fukuoka	38	2,000	76,000				x			
Kuala Dungun	37	5,000	185,000							x
Shimizu	35	2,000	70,000						x	
Paracale	34	5,000	170,000				x			
Esutoru	25	2,500	62,500							x
Maoka	22	2,500	55,000							x
Tientsin	21	3,000	63,000			x				
Lutong	20	10,000	200,000						x	
Takao	20	4,000	80,000	x						
Honto	19	2,500	47,500							x
Kushiro	19	2,000	38,000							x
Otamari	15	2,500	37,500							x
Seishin	15	5,000	75,000					x		
Saigon	14	5,000	70,000					x		
Batu Pahat	14	5,000	70,000							x
Palembang	13	10,000	130,000							x
Shikuka	12	2,500	30,000							x
Bangkok	12	5,000	60,000					x		
Tandjong Pinang	9	5,000	45,000							x
Campha	8	5,000	40,000		x					
Hongai	8	5,000	40,000		x					
Konan	7	3,000	21,000				x			
Tashito	7	4,000	28,000				x			
Rashin	6	5,000	30,000					x		
Niitaka	6	4,000	24,000	x						
Masinloc	6	5,000	30,000			x				
Endau	6	5,000	30,000							x
Kota Bahru-Tumpat	6	5,000	30,000						x	
Kolaka (Padamarang)	6	5,000	30,000							x
Pankalan Susu	6	10,000	60,000							x
Surabaya	5	5,000	25,000							x
Port Redon	5	5,000	25,000		x					
Haiphong	4	5,000	20,000		x					
Rangoon	4	5,000	20,000					x		
Kemaman	3	5,000	15,000							x
Balikpapan	3	10,000	30,000							x
San Fernando La Union	2	5,000	10,000			x				
Pusan	2	3,000	6,000				x			
Tarakan	2	10,000	20,000						x	
Pambujan Sur	1	5,000	5,000					x		

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Seventeen harbors from Table II are listed as key ports, because of the large amount of shipping which can be expected in them at any one time, and because of the importance of the commodities handled. These harbors are:

	Objective Area No.		Objective Area No.
Wakamatsu	90.34	Tsingtao	83.11
Osaka	90.25	Miike	90.35
Tokyo	90.17	Keelung	91.3
Moji	90.34	Chinwangtao	83.12
Nagoya	90.20	Chinnampo	84.3
Muroran	90.3	Kuala Dungun	92.1
Yokohama	90.17	Paracale (Calumbayanga Is.)	96.1
Yangtze			
Dairen	93.5	Lutong	81.1

(Priority targets are underlined)

Within 500 miles of Wanan operations base is the Taiwan port of Keelung, from which rice, sugar, and non-coking coal are the chief exports. The 500-mile radius also includes the lesser ports of Takao and Niitaka on Taiwan, and a small part of the Yangtze.

In the 500-750 mile band lies most of the Yangtze, an increasing source of iron ore and a major military port. Other harbors in this band are Campha, Hongai, Port Redon, and Haiphong in Indo-China.

The 750-1000 mile band contains the large Chinese harbors of Chinwangtao, and Tsingtao, through which flow steady streams of coking coal, iron ore, cotton and salt. Dairen is the outlet for Manchurian coal, pig iron, salt, and fertilizer. Although not a key harbor, Tientsin is Japan's chief source of cotton. Other harbors in this band are Masinloc and San Fernando La Union in the Philippines.

A radius of 1000-1250 miles is required to reach harbors in Japan proper. Wakamatsu is the busiest harbor in the Far East and over 600 ships will be found here during any week of the year. This harbor is the greatest coal shipping port and is also the destination of many ships bound for Japan. Moji is likewise both the source and destination of large shipments, and Miike is a source of non-coking coal. Considerable pig iron and coal cargoes are moved from Chinnampo in Chosen. Paracale (Calumbayanga Is.) in the Philippines is a harbor for vessels carrying over 1,000,000 tons of high-grade iron ore a year. Lesser harbors in the 1000-1250 mile band are Ube, Fukuoka, Karatsu, Konan, Tashito, and Fusan.

Beyond 1250 miles are Osaka, Tokyo, Nagoya, and Yokohama, all of which are important destination points; Muroran, a coal port; Kuala Dungun (used only in the SW monsoon, April - November) in Malaya, a source of iron ore; and Lutong, in British North Borneo. Lutong is Japan's greatest single source of petroleum, particularly fuel oil, and the 10,000 ton tankers to be found here are extremely valuable ships.

It should be noted that at all Karafuto ports and at Muroran in Hokkaido, shipping is virtually at a standstill from December through March.

On the accompanying map all the harbors, key and non-key, discussed in this report are spotted and the flow of commodities from each of them to Japanese destinations is indicated in broad outline. Shipping offers a number of opportunities, within range of China bases, for substantial damage to Japan. In particular, the key ports of the Yangtze, Dairen,

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Tsingtao, Chinwangtao, and Keelung are included by the 1000-mile radius. From these harbors flow most of Japan's coking coal and considerable iron ore, which she must have in continuous streams, as well as large quantities of rice, cotton, sugar, and salt. Any reduction in the flow of these commodities resulting from aerial attack is, however, probably far less important than the loss of ships involved. The ships are the targets, for without ships Japan cannot exist and each one sunk represents a definite curtailment of her war effort.

Listed below are a number of harbors, some of which are not included in Table II, whose importance rests largely on other factors than commodity volume. A brief indication is given of the function of each harbor.

Aomori	Port for ferries between Honshu and Hokkaido.
Batavia	Large N.E.I. harbor; export point for miscellaneous commodities.
Fusan	Port for ferries between Chosen and Japan.
Hakodate	Port for ferries between Hokkaido and Honshu.
Kagoshima	Possibly a base for naval task forces.
Karenko	Busy commercial port.
Nagasaki	Military embarkation point: ferries and miscellaneous shipping to China and Chosen.
Okayama (Uno, Takamatsu, Tokushima)	Inland Sea transit points; connections with Shikoku; naval base.
Penang	Transit point and submarine base.
Shimonoseki	Military shipping; ferries to Chosen.
Singapore	Large harbor and transit point. Major naval base on north side of island.
Surabaya	Naval base; miscellaneous shipping.
Toyama	Destination of much bauxite ore.
Yawata	Destination of considerable coal and iron ore.
Yokkaichi	Naval supply depot.

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MERCHANT FLEET POSITION

There is ample indication that, as a result of military transport requirements, the necessity for moving a vast tonnage of raw materials, and ship losses to date, (see Addenda at end of this sub-section), the Japanese merchant marine is in a stringent position.

JAPANESE SHIPPING POSITION AS OF JANUARY 1, 1943

Tonnage available Dec. 1, 1941 (Vessels of 100 gross tons or over, including those under Chinese and Manchurian flags, but excluding fishing craft, barges, etc.)	6,700,000	
New construction to Jan. 1, 1943	320,000	
Axis and French tonnage available	250,000	
Allied tonnage captured	250,000	
Allied sunken vessels raised and repaired	80,000	
Total		7,600,000
Vessels sunk by Allied action to Jan. 1, 1943	1,600,000	
Ordinary marine losses	70,000	
Vessels seriously damaged in the War	400,000	
Vessels laid up for ordinary repairs	400,000	
Vessels captured which do not add to Japanese shipping potential (i.e. in essential local trade, etc.)	80,000	
Ferries, floating canneries, etc. not suitable for ordinary commercial use	80,000	
Total		2,650,000
Net Total		4,950,000

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Japan's shipbuilding capacity does not appear adequate to better her adverse ship tonnage position in the near future.

As shown in the table on the preceding page, Japan's losses up to January 1, 1943 were approximately 1,600,000 tons of merchant shipping. Estimated new construction for this period was 320,000 tons. Merchant ship construction for 1943 is estimated to be approximately:

Steel ships	650,000 gross tons
Wooden ships (in terms of steel ship efficiency: 3 tons of wood = 1 ton of steel)	200,000 gross tons
Total	850,000 gross tons

Reference is made to the following sub-section on Naval Bases and Shipyards.

It is evident that, despite an accelerated program of new construction, Japan's current rate of ship loss exceeds her replacement capacity. Any additional losses imposed on Japan through air attack from China bases will not only increase the ratio of loss to replacement, but will make increasingly difficult the continuance of her stockpiling program.

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ADDENDA

The following are estimated minimum Japanese merchant shipping losses since Dec. 7, 1941: (See notes below.)

	Freight & Pass Vessels		Tankers		TOTAL	
	No.	Gr. Tons	No.	Gr. Tons	No.	Gr. Tons
December, 1941	19	88,714	2	16,000	21	104,714
January, 1942	24	115,922	3	24,000	27	139,922
February	18	84,756	-	-	18	84,756
March	18	91,834	4	38,142	22	129,976
April	17	81,360	1	7,000	18	88,360
May	24	144,345	3	18,900	27	163,245
June	8	39,895	1	19,425	9	59,320
July	16	93,282	1	8,000	17	101,282
August	31	169,472	1	5,000	32	174,472
September	17	108,612	2	29,217	19	137,829
October	19	98,907	3	32,210	22	131,117
November	28	141,035	3	32,050	31	173,085
TOTAL	239	1,258,134	24	229,944	263	1,488,078

NOTES:

The above tabulation includes only those vessels of 1,000 or more gross tons which are known to have sunk plus a few whose total destruction by bombs or shellfire appears unquestionable.

No allowance is made in the above tabulation for the considerable proportion of damaged shipping, in all probability, failed to make port.

Unidentified "transports" and "supply ships" are estimated at 4,000 gross tons apiece -- the average for Japanese blue water freighters and passenger ships. Unidentfied tankers are estimated at 8,000 gross tons apiece -- the average for sea-going Jap tankers.

It is emphasized that the above figures, especially for recent months, are subject to extensive revision as fuller information becomes available.

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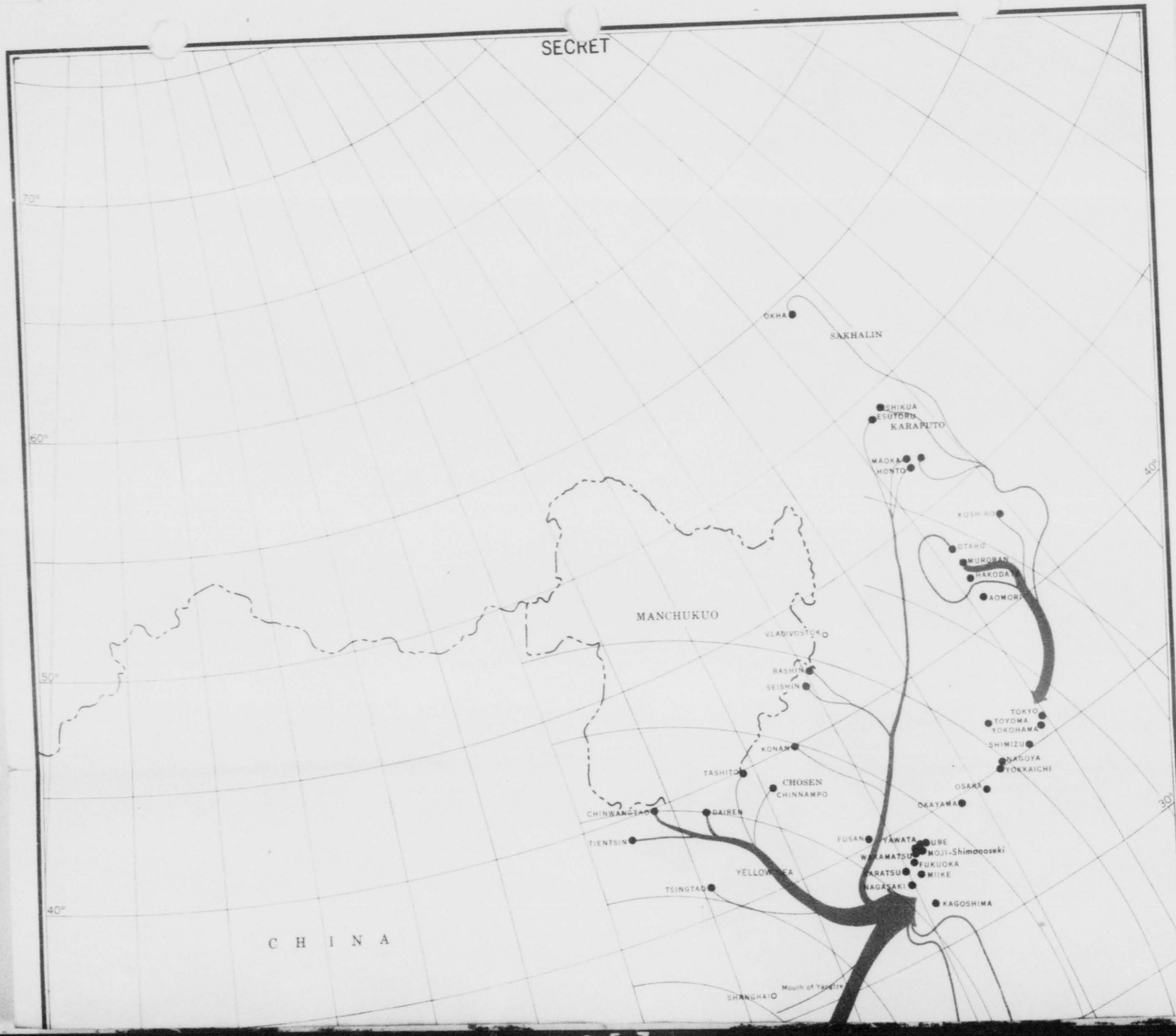

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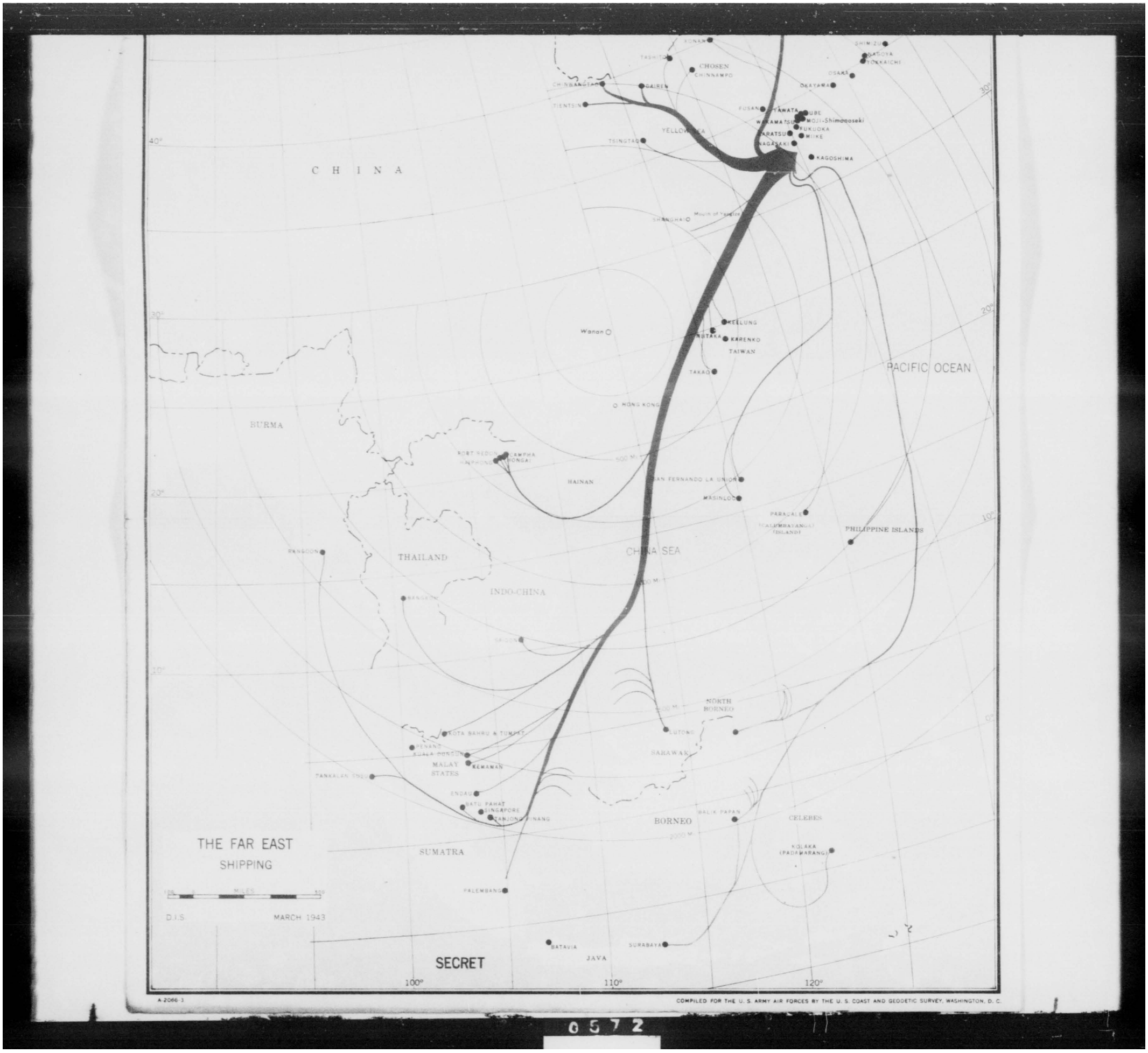

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All targets in folders to 3/1/43, grouped by Areas

JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
951	Port of Esutoru	One of 2 largest coal ports in Karafuto	49°08'N 142°02'E	973
952	Port of Maoka	One of Karafuto's two chief ports	47°03'N 142°03'E	968
953	Port of Otomari	One of Karafuto's two chief ports	46°38'N 142°46'E	966
954	Port of Honto	Only ice-free port in Karafuto	46°41'N 141°51'E	954
	HOKKAIDO NORTH (90.2)			
1048	Train Ferry Dock, Wakkanai	Terminal for train ferry Hokkaido-Karafuto	45°24'N 141°40'E	1048
	MURORAN (90.3)			
381a-d	Muroran Harbor Facilities	Important coaling piers	42°19'N 140°59'E	378
992a,b	Port of Otaru Facilities	Important coaling piers	43°12'N 141°00'E	992a
	HAKODATE (90.4)			
975	Western Wharf & Warehouses	Minor	41°46'N 140°43'E	974
976	Eastern Wharves & Warehouses	Minor	41°46'N 140°43'E	974
	AOMORI (90.5)			
993	Train Ferry Terminus (Aomori)	Important; terminus RR car ferry	40°50'N 140°44'E	993

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	AOMORI (90.5) (Continued)			
994	Warehouse Area (Aomori)	Minor	40°50'N 140°44'E	993
	AKITA (90.6)			
1069	Tsuchizaki Wharf	Port for Akita, small	39°45'N 140°04'E	1066
	KAMAISHI (90.8)			
190	Kamaishi Harbor	Important for area	39°16'N 141°54'E	189
	NIIGATA (90.9)			
1021	Wharves 1 & 2	Large warehouses; RR feeder lines	37°57'N 139°05'E	998
1022	Wharves 4 & 5	Large warehouses; feeder lines	37°56'N 139°04'E	998
1025	Wharf #3	Central warehouse	37°57'N 139°05'E	1005
	TOYAMA (90.11)			
862	Higashi Iwase Docks & Harbor	Rptd facilities for 10,000-ton vessels	36°46'N 137°14'E	862
867	Fushiki Docks & Harbor	No details	36°47'N 137°04'E	867
870	Nanao Docks & Harbor	Large, transhipment port, seaplane anchorage	37°02'N 137°00'E	870
	TOKYO (90.17)			
191	Mitsubishi Coal Depot	Only large coal depot in Kawasaki-Yokohama	35°30'N 139°43'E	NA

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
885	Takeshiba Pier	New construction	35°39'N 139°46'E	NA
886	Hinode Cho Pier	New, can handle six 2,000-ton ships	35°39'N 139°46'E	"
887	Shibaura Wharf	Accommodates seven 6,000-ton ships	35°38'N 139°46'E	"
1432	Yokohama Harbor Passenger Wharves	Can handle 50,000-ton ships	35°27'N 139°39'E	"
1433	Yokohama Main Pier	Largest pier in Yokohama	35°27'N 139°39'E	"
1434	Fukagawa Pier)		35°39'N 139°48'E	"
1435	Tsukishima Pier)	3 piers can handle 18 ships-2,000 to 6,000 tons	35°39'N 139°47'E	"
1436	Tsukishima East Wharf)		35°39'N 139°47'E	"
1437	Mitsubishi Piecegoods Wharf, Warehouses	Handle war supply shipments	35°30'N 139°43'E	"
1438	Kyoritsu Warehouse	Stores frozen foods	35°27'N 139°38'E	"
1439	Yokohama Central Wholesale Market	Stores fresh food & fish	35°28'N 139°38'E	"
1440	Mitsubishi Warehouse	Handles war supplies	35°27'N 139°39'E	"
1441	Yokohama Warehouse, North	Important storage	35°29'N 139°40'E	"
1442	Yokohama Warehouse, South	Important storage	35°28'N 139°39'E	"
1443	National Silk Conditioning House	Large, present use unknown	35°27'N 139°39'E	"
1444	Yokohama Harbor Timber Basin	Large	35°26'N 139°40'E	"
1445	Yokohama Harbor Co-op Purchasing Whses	Important warehouses	35°29'N 139°39'E	"
1446	East Asia Development Co Whses	Present use unknown	35°29'N 139°39'E	"
1447	Hiraidzumi Drug Depot	Present use unknown	35°29'N 139°40'E	"
1448	Tsukiji Market & Wholesale Warehouse	Important food distributing center	35°40'N 139°46'E	"
1449	Kanda Market (Tokyo)	Supplements Tsukiji Market	35°42'N 139°47'E	"
1450	Koto Market (Tokyo)	Supplements Tsukiji Market	35°41'N 139°48'E	"
1451	Naniwa Warehouse	Present use unknown	35°28'N 139°39'E	"
1485	South Manchurian Wharf & Whses	Large, has two travelling cranes	35°30'N 139°44'E	"
1493	Toshin & Shinko Warehouses	War shipping	35°27'N 139°39'E	"

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIZUOKA (90.18)			
1178	Docks & Harbor Facilities (Shimizu)	No details	35°00'N 138°30'E	1176
	NAGOYA (90.20)			
251	Nagoya Harbor	Important; 4th largest peace-time port	35°05'N 136°53'E	194
	MAIZURU (90.22)			
1032	Wharf 1-Tsuruga	Part of important military transhipment port	35°40'N 136°05'E	1033
1033	Wharf 2-Tsuruga	Part of important military transhipment port	35°40'N 136°05'E	1033
1034	Wharf 3-Tsuruga	Part of important military transhipment port	35°39'N 136°04'E	1033
1044	Maizuru Docks & Harbor Facilities	Rptd recent expansion	35°27'N 135°20'E	1039
	OSAKA (90.25)			
22	Kobe Harbor District #1	Most important section of Kobe Harbor	34°41'N 135°12'E	5
34	Kobe Harbor District #2	Important for coast-wise shipping	34°40'N 135°11'E	10
53	Osaka Harbor	One of Japan's important harbors	24°39'N 135°27'E	263
	OKAYAMA (90.27)			
1289	Uno Transport Base	Important port of embarkation	34°29'N 133°57'E	1295
	KURE (90.30)			
657	Kure Naval Base	Primary naval base	34°14'N 132°33'E	657

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURE (90.30) (Continued)			
658	Kure Submarine Base	Submarine base, school, depot	34°15'N 132°32'E	658
735	Army Transport Base	Ujina Port, principal military harbor	34°21'N 132°28'E	735
	SHIMONOSEKI (90.34)			
31	Port of Yawata	Important	33°52'N 130°48'E	28
32	Port of Wakamatsu	Very important coal & ore port	33°53'N 130°48'E	28
33	Port of Tobata	Secondary	33°54'N 130°49'E	29
42	Port of Shimonoseki	Important, port of embarkation	33°57'N 130°56'E	43a
44a	Moji Central Wharf	Important	33°57'N 130°58'E	44a
44b	Moji Southern Wharf	Important, takes ocean-going ships	33°58'N 130°57'E	43a
44c	Moji Coaling Station	Important	33°56'N 130°58'E	43a
44d	Komoriye Wharf	Secondary	33°55'N 130°57'E	43a
	KURUME (90.35)			
1254	Miike Harbor (Mikawa)	Important coal export port	33°00'N 130°25'E	1243
1255	Hakata Harbor (Fukuoka)	Secondary	33°36'N 130°24'E	664
	SASEBO (90.36)			
835	Nagasaki Wharves & Freight Yd	Important military traffic, terminus Shanghai run	32°45'N 129°52'E	835
836	Dejima Wharf, Nagasaki	Secondary	32°44'N 129°52'E	835
845	Sasebo Outfitting Wharf	Important, navy supply point	33°10'N 129°43'E	752

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SASEBO (90.36) (Continued)			
837	Imari Naval Harbor	Rptd minor naval station	33°16'N 129°53'E	-
	JAPANESE ISLANDS (91)			
	KURILE ISLANDS (91.1)			
120	Kakumabetsu Harbor	Base for seaplanes, submarines, destroyers	50°23'N 155°37'E	120
121	Buroton Harbor	Small vessels & seaplane base	47°09'N 152°13'E	121
122	Hitokappu Harbor	Possibly air & submarine base	44°59'N 147°43'E	122
123	Matsugahama Harbor	Rptd best harbor in Kurile group	43°44'N 146°42'E	123
125	Shiranuka Anchorage	More data required	44°21'N 146°27'E	125
126	Chinomiji Hakuchi Anchorage	More data required	44°15'N 146°10'E	126
127	Tomari Anchorage	More data required	43°43'N 145°31'E	127
128	Inemoshiri Anchorage	More data required	43°48'N 146°50'E	128
129	Shakotan Anchorage	More data required	43°52'N 146°49'E	129
130	Nemo Anchorage	More data required	49°36'N 154°48'E	130
131	Kuroishi Anchorage	More data required	49°25'N 154°49'E	131
132	Kashiwabara Anchorage	Possibly developed for destroyers or sea-planes	50°41'N 156°08'E	132
133	Otamaye Anchorage	More data required	50°11'N 155°39'E	133
134	Musashi Anchorage	More data required	50°00'N 155°23'E	134
135	Kujira Anchorage	More data required	50°17'N 155°21'E	135
136	Yotsuiwa Anchorage	More data required	50°17'N 155°55'E	136
137	Tokotan Anchorage	More data required	45°52'N 149°48'E	137
138	Tsurigane Anchorage	More data required	46°06'N 150°10'E	138

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURILE ISLANDS (91.1)(Continued)			
139	Shimushiru Anchorage	More data required	46°52'N 151°51'E	139
140	Moyoro Anchorage	More data required	45°26'N 148°51'E	140
141	Tannemoye Anchorage	More data required	44°33'N 146°57'E	141
142	Naibo Anchorage	More data required	44°44'N 147°11'E	142
144	Bettobu Anchorage	More data required	45°17'N 148°03'E	144
	TAIHOKU (91.3)			
15a	Northwest Keelung Wharves	Important	25°09'N 121°44'E	15a
15c	Southwest Keelung Wharves	Important	25°08'N 121°44'E	15a
16	Eastern Keelung Wharves	Minor	25°08'N 121°44'E	15a
	TAIWAN WEST (91.4)			
100	Gosei Harbor	Expanded, believed important	24°15'N 120°32'E	100
101	Anping Harbor (Tainan)	Secondary	22°55'N 120°09'E	89
	TAIWAN EAST (91.5)			
64	Karenko Wharves	Most important harbor E coast Taiwan	24°00'N 121°38'E	61
65	Suo Basin	Rptd development into naval station	24°35'N 121°52'E	65

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAO (91.6)			
8a	Military Storehouses (Takao)	Important	22°37'N 120°17'E	8a
8b	Military Storehouses (Takao)	New; more data required	22°37'N 120°17'E	8a
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
13	Seishin Harbor	Important commercial, military port	41°47'N 129°50'E	13
14	Rashin Harbor	Major military & commercial port	42°13'N 130°18'E	14
15	Yuki Harbor	Important military & commercial port	42°20'N 130°24'E	15
	HEIJO (84.3)			
76	Chinnampo Harbor	Second largest tonnage handled in Chosen	38°43'N 125°25'E	76
77	Chinnampo Naval Fuel Depot	Coal storage	38°43'N 125°25'E	76
78	Rice Warehouses (Chinnampo)	One of largest rice storage depots in Chosen	38°44'N 125°25'E	76
79	Kenjiho Harbor	Serves Japan Iron Co Takes ships to 5,000 tons	38°44'N 125°38'E	66
80	Hosan Harbor	New, for ships to 4,000 tons	38°53'N 125°35'E	80
	GENZAN (84.4)			
89	Gensan Harbor	Growing modern all-purpose port	39°10'N 127°26'E	88
	CHOSEN EAST (84.5)			
49	Chumonshin Harbor	Small	37°54'N 128°50'E	49

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN EAST (84.5) (Continued)			
50	Hosui Harbor	Small	38°40'N 128°22'E	50
51	Sokuso Harbor	Small	38°12'N 128°36'E	51
52	Teira Harbor	Small	37°26'N 129°12'E	52
53	Koho Harbor	Small	36°41'N 129°28'E	53
54	Koko Harbor	Small	36°22'N 129°24'E	54
55	Hoko Harbor	Rptd submarine base	36°03'N 129°23'E	55
57	Taiho Harbor	Small	38°10'N 128°37'E	51
58	Bokuko Harbor	Small	37°33'N 129°07'E	58
	KEIJO (84.6)			
45	Jinsen Harbor	Large W Coast harbor	37°28'N 126°37'E	44
	FUSAN (84.7)			
97	Fusan Harbor	Principal commercial port in Chosen	35°06'N 129°03'E	97
	KOSHU (84.8)			
98	Reisui Harbor	Recently constructed port	34°44'N 127°44'E	98
99	Moppo Harbor	Growing importance, for small & medium ships	34°46'N 126°23'E	99
100	Kunsan (Gunzan) Harbor	One of primary Chosen rice shipping ports	35°59'N 126°41'E	100

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
85	Tashito Harbor Facilities	New, rptd large	39°50'N 124°25'E	85
	DAIREN (93.5)			
13	South Manchurian RR Piers	Very important facilities	38°56'N 121°40'E	1
14	Oil Piers	Major oil shipment point	38°55'N 121°41'E	2
15	Coal Pier	Major shipping point Manchukuo coal	38°58'N 121°38'E	1
	CHINA (83)			
	CANTON (83.4)			
50	Kowloon Wharves	Main wharfage; handles vessels of all sizes	22°18'N 114°10'E	55
51	Whampoa Wharves	New deepwater port for Canton; Jap transport point	23°06'N 113°26'E	51
52	Typhoon Refuge Harbor	Large protected junk harbor	22°19'N 114°10'E	55
	TSINGTAO (83.11)			
78	Piers & Whses (Tsingtao)	Largest concentration shipping between Chinwangtao & Yangtze River	36°05'N 120°19'E	78
79	Piers (Laoyao)	Rptd Japs dredging to handle output Tsaochwang mines (#65)	34°44'N 119°27'E	79

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TIENTSIN (83.12)			
1	New Japanese Coal & Ore Wharf	New, important, iron ore transhipment	39°01'N 117°39'E	4
3	Butterfield & Swire Co Wharves	Important shipping target	39°00'N 117°41'E	4
7	General Wharf Area	Important shipping target	39°00'N 117°40'E	4
14	Jardine Matheson Wharves	Important shipping target	39°07'N 117°12'E	11
22	Anchorage (Taku Bar)	Important shipping target	38°50'N 117°50'E	-
24	Piers (Chinwangtao)	Important shipping target, ice-free coal port	39°55'N 119°37'E	26
	FRENCH INDO-CHINA (85)			
	INDO-CHINA NORTH (85.1)			
28	Haiphong Docks	Second most important Indo-China port	20°52'N 106°41'E	N A
29	Coaling Station - Haiphong Harbor	Small	20°52'N 106°41'E	"
30	Port Redon Coal Storage & Dockyards	Handle approx 20% all Indo-China coal	20°59'N 106°45'E	"
31	Hongai Docks & Loading Facilities	Handle approx 35% Indo-China coal trade	20°57'N 107°04'E	"
32	Campha Port & Loading Facilities	Handle approx 30% Indo-China coal trade	21°01'N 107°21'E	"
33	Soc Anonyme d Const' Mecaniques	Only N Indo-China ship repair & heavy mach shop	20°51'N 106°40'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
28	New Government Port Area	New, extensive	13°42'N 100°35'E	31
29	Borneo Co Wharves	Also warehouses	13°43'N 100°31'E	26
30	China Thai Wharf Co	Cargo	13°43'N 100°31'E	26

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
24-32	Penang Harbor	Malaya's second largest harbor; see targets below	5°25'N 100°21'E	
24	Government Pier (Penang)	Government marine depot	5°22'N 100°19'E	27
25	Shell Oil Pier, Penang	Fueling jetty	5°24'N 100°19'E	27
26	Church Street & RR Wharves	2 piers for small vessels	5°25'N 100°21'E	27
27	Swettenham & Victoria Piers, Penang	Main piers of harbor; ocean-going vessels	5°25'N 100°21'E	27
28	Mitchell's Piers, Penang	Small	5°24'N 100°22'E	27
29	Lighter Pier, Penang	Small	5°23'N 100°23'E	27
30	Coal Wharf Area, Penang	Coaling quay for lighters	5°23'N 100°23'E	27
31	Penang Harbor Board Area	Workshops, graving dock, slipway	5°24'N 100°23'E	27
32	Straits S.S. Dockyard, Penang	Small slipway, shops	5°24'N 100°23'E	27
33-36	Port Swettenham	Malaya's third largest harbor; see targets below	3°00'N 101°24'E	
33	Shell Oil Pier	Fueling pier, small storage	3°00'N 101°23'E	35
34	Northern Wharves Area	Small Wharves	3°00'N 101°23'E	35
35	Southern Wharves Area	Large Wharves	3°00'N 101°23'E	35
36	Standard Oil Co Pier	Fueling pier storage	3°00'N 101°23'E	35
37	Kuala Dungun Harbor	Iron ore export; million tons during S W monsoon	4°47'N 103°26'E	37
39	Tumpat Harbor	Iron & manganese ore exports	6°13'N 102°11'E	39
40	Kota Bahru Harbor	Iron ore export	6°09'N 102°14'E	40
41	Endau Harbor	Iron ore export, April-Oct.	2°40'N 103°38'E	41
42	Kemaman Harbor	Iron ore export	4°15'N 103°26'E	42

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SINGAPORE (92.2)			
10-14	Singapore Harbor	One of world's largest; see targets below	1°16'N 103°51'E	52
10	Singapore Harbor Board Area	Wharves & shops, two large drydocks, power plant	1°16'N 103°49'E	52
11	P-O & West Wharf Area	Large wharves & warehouses	1°16'N 103°50'E	52
12	Empire Dock Area	Ship basin, wharves, warehouses	1°16'N 103°50'E	52
13	Victoria & Albert Dry Dock Area	Two large drydocks, wdrkshops	1°16'N 103°51'E	52
14	Telok Ayer Basin Area	Lighter basin	1°17'N 103°51'E	52
38	Batu Pahat Harbor	Iron & bauxite ore export	1°52'N 102°55'E	38
	BURMA (82)			
	BURMA SOUTH (82.2)			
11	Dock area (Rangoon)	Facilities for 20-30 deep-sea ships	16°46'N 96°10'E	14
12	Port Comm. Shops (Rangoon)	Maintains dredges, tugs, etc for port	16°46'N 96°10'E	14
13	Moulmein Harbor	Small wharves, light construction	16°29'N 97°37'E	4
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
13	Sabang Harbor	Jap fueling station & naval base	5°53'N 95°19'E	1
14	Belawan-Deli Harbor (Port Belawan)	Chief harbor of Sumatra	3°47'N 98°41'E	23
15	Pankalan Brandon Harbor	Oil export harbor	4°02'N 98°17'E	15
16	Pankalan Susu Harbor	Major oil export harbor	4°07'N 98°12'E	16

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SUMATRA NORTH (94.1) (Continued)			
17	Tanjoeng Oeban Harbor	Oil fueling station	1°04'N 104°12'E	17
18	Tanjoeng Pinang Harbor	Bauxite export harbor	0°55'N 104°27'E	18
19	Olehleh Harbor	Harbor for connection to Sabang Island	5°34'N 95°18'E	19
20	Lho' Seumaweh Harbor	Small	5°11'N 97°08'E	4
21	Bengkalis Harbor	Fishing port	1°28'N 102°06'E	21
22	Sibolga Harbor (Tapanuli Bay)	Main W coast harbor	1°44'N 98°45'E	22
	SUMATRA SOUTH (94.2)			
53	Palembang Harbor	Large; oil export	2°59'S 104°47'E	53a
53a	Palembang Harbor Coaling Wharf	-	3°01'S 104°45'E	53a
53b	Government Wharf & Warehouses	-	2°59'S 104°46'E	53a
53c	Small Tanker Dock	At Pladjoe refinery	2°59'S 104°48'E	61
53d	Large Tanker Dock - Shell	For Pladjoe refinery	2°59'S 104°50'E	61
53e	Large Tanker Dock - Standard	For Standard refinery	2°59'S 104°50'E	61
53f	N.V. Industrieele Mij	Small shipyard at Palembang	2°59'S 104°45'E	75
54	Emma Haven Harbor	Main W coast harbor	1°00'S 100°22'E	54
54a	Wharves & Warehouses	Four wharves at Emma Haven	1°00'S 100°22'E	54
54b	Emma Haven Coaling Quay	Outlet for Umbilan coal mines	1°00'S 100°22'E	54
54c	Wharf Workshop	Minor repairs	1°00'S 100°22'E	54
55	Oosthaven Harbor	Nearest harbor to Java	5°28'S 105°19'E	55
56	Tandjoeng Pandan Harbor	Tin ore export, Billiton Island	2°45'S 107°38'E	56
57	Muntok Harbor	Tin export	2°04'S 105°10'E	57
58	Pangkal Pinang Harbor	Tin export	2°08'S 106°09'E	58

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SUMATRA SOUTH (94.2) (Continued)			
59	Blinyu Harbor (Banka Island)	Minor	1°38'S 105°47'E	59
60	Sungei-Liat Harbor (Banka Island)	Minor	1°51'S 106°08'E	60
	JAVA (94.3)			
145a	Surabaya Commercial Harbor	Largest in N E I	7°12'S 112°43'E	174
145b	Surabaya Naval Harbor	Largest in N E I	7°12'S 112°44'E	174
146	Tandjong Priok Harbor	Batavia's harbor	6°06'S 106°53'E	177
147	Cheribon Harbor	Small N coast harbor	6°43'S 108°34'E	147
148	Semarang Harbor	Medium sized N coast harbor	6°57'S 110°25'E	148
149	Tjilatjap Harbor	Only good S coast harbor	7°44'S 109°00'E	149
150	Tegal Harbor	Small	6°51'S 109°08'E	150
151	Pekalongan Harbor	Small	6°51'S 109°41'E	151
152	Rembang Harbor	Small	6°41'S 111°21'E	152
153	Pasuruan Harbor	Small	7°42'S 112°56'E	153
154	Probolingo Harbor	Small	7°43'S 113°13'E	154
155	Panarukan Harbor	Small	7°41'S 113°56'E	155
156	Kalianget Harbor	Salt export	7°03'S 113°57'E	156
157	Banyuwangi Harbor	Nearest to Bali	8°13'S 114°23'E	157
158	Merak Harbor	Nearest to Sumatra	5°56'S 106°00'E	158
	BORNEO SOUTH (94.4)			
220	Balikpapan Harbor	Oil export; suitable for large naval base	1°16'S 116°49'E	219
221	Tarakan (Linkas) Harbor	Fuel Oil export point	3°17'N 117°36'E	221
222	Pontianak Harbor	Main W coast harbor	0°01'N 109°20'E	222

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BORNEO SOUTH (94.4)(Continued)			
223	Banjermasin Harbor	Main S coast harbor	3°20'S 114°35'E	223
	CALEBES - TIMOR (94.5)			
205	Ampenan Harbor	Small; Lombok's main trading center	8°34'S 116°04'E	205
206	Amoerang Harbor	Minor	1°12'N 124°34'E	206
207	Buleleng Harbor, Singaradia	Small; Bali's main trading center	8°06'S 115°06'E	207
208	Dilly Harbor	Main port of Portuguese Timor	8°34'S 125°37'E	208
209	Gorontalo Harbor	Minor	0°30'N 123°08'E	209
210	Kema Harbor	Minor	1°22'N 125°05'E	210
211	Kendari Harbor	Believed to be Jap base	4°02'S 122°40'E	211
212	Kolaka Harbor	Nickel ore export point	4°03'S 121°25'E	212
213	Koepang Harbor	Main port of Dutch Timor	10°10'S 123°35'E	213
214	Koeandang Harbor	Minor	0°51'N 122°55'E	214
215	Labuan Haji Harbor	Minor	8°42'S 116°34'E	215
216	Macassar Harbor	Main harbor in Celebes	5°08'S 119°24'E	202
217	Manado Harbor	Minor	1°30'N 124°50'E	217
218	Pare Pare Harbor	Minor	3°59'S 119°37'E	218
	PHILIPPINES (96)			
	P. I. (NORTH 96.1, SOUTH 96.2)			
2	Portmbayanga	Port for largest iron mine in Philippines	14°19'N 122°40'E	N A
3	Malaguit Bay	Port for third largest iron mine in Philippines	14°17'N 122°48'E	"
5	Masinloc	Port largest chrome production Philippines	15°33'N 119°56'E	"

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	PHILIPPINES (96.1,96.2)(Continued)			
7	Balurute	Port for high grade chrome ore shipment	15°45'N 119°53'E	N A
9	San Fernando la Union	Shipping point 90% Philippine copper ore	16°37'N 120°19'E	"
11	Manila piers, Port district	Center Manila shipping & storage	14°35'N 120°58'E	"
51	Pambujan Sur	Port for second largest iron ore producer	11°19'N 125°40'E	"
61	Cebu Port	Port of second largest city in Philippines	10°20'N 123°55'E	"
66	Santa Anna	Port of Davao; southern enemy base	7°04'N 125°36'E	"
67	Legaspi	Southern Luzon shipping, RR terminus	13°10'N 123°44'E	"
	BRITISH PACIFIC ISLANDS (81)			
	BORNEO NORTH (81.1)			
1	Kuching Harbor	Fuel, repair facilities	1°34'N 110°21'E	1
2	Sadong Harbor	Small coal port	1°23'N 110°45'E	2
3	Miri Harbor	Oil export	4°24'N 114°00'E	3
4	Jesselton Harbor	N terminus of RR	5°59'N 116°05'E	4
5	Kudat Harbor	Small	6°53'N 116°51'E	5
6	Sandakan Harbor	Large; fuel, repairs	5°50'N 118°07'E	6
7	Jesselton RR Repair Shops			
8	Lutong Oil Installations			

*New target to be included in Folder revision

N A No number yet assigned when this list prepared

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Lab RR-2. Shipping -
Naval Bases & Shipyds

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March 1943 **NAVAL BASES AND SHIPYARDS**

KEY TARGETS					Miles radius from Wanan (inclusive)						
	TARGET No.	TARGET Name	Importance	Obj. Area	500	750	1000	1250	1500	1750	over
1	171	Kawasaki Dockyard Co.	Ships - 18.3% Engines - 19.8%	Osaka (90.25)					X		
2	542-544	MitsubishiShpyd & Eng. Wks.	Ships - 12.2% Engines - 14.6%	Sasebo (90.36)				X			
3	1295	Mitsui Tama Shipyard	Ships - 11.6% Engines - 6.5%	Okayama (90.27)					X		
4	69	Yokohama Dockyard	Ships - 8.9% Engines - 5.7%	Tokyo (90.17)						X	
5	1460-1461	Uraga Dockyard	Ships - 5.5% Engines - 6.9%	Tokyo (90.17)						X	
6	169	Mitsubishi Dockyard, Kobe	Ships - 5.3% Engines - 2.8%	Osaka (90.25)					X		
7	657	Kure Naval Base	Ships - 1.5% Engines - 1.5%	Kure (90.30)				X			
8	752	Sasebo Naval Base	Ships - 1.2% Engines - 5.9%	Sasebo (90.36)				X			
9	274	Yokosuka Naval Base	Ships - 1.6% Engines - 3.1%	Tokyo (90.17)						X	
10	860	Koyagi Shima Shipyard	Ships - 2.6% Engines - 1.2%	Sasebo (90.36)				X			
11	1296	Harima Shipyard	Ships - 8.6% Engines - 1.0%	Okayama (90.27)					X		
12	1037-1043	Maizuru Naval Base	Ships - 0.6% Engines - 6.9%	Maizuru (90.22)					X		
13	272-699	Osaka Iron Works	Ships - 6.5% Engines - 2.2%	Osaka (90.25)					X		
14	273	Fujinagata Shipyard	Engines - 8.4%	Osaka (90.25)					X		
15	N A	Dockyards at Shanghai	Important bldg. and repairs	Shanghai (83.1)			X				
16	974	Hakodate Dockyard	Important repair yard some building	Hakodate (90.4)							X
17	20-22	Singapore Naval Base	Fueling, supply, and repair base	Singapore (92.2)							X

(Priority targets are underlined)

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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NAVAL BASES AND SHIPYARDS

CHINA BASED OPERATIONS

Within a 1000-mile radius of Wanan operations base, there is one key target in the shipbuilding and repairing industry, the dockyards at Shanghai. Other building and repair yards within this range will warrant attention, in view of the present Japanese shipping position. This is especially true of the yards at Hong Kong, which are doing repair work and may be building wooden vessels.

Extending the radius to 1250 miles would bring a significant portion of the Japanese-held shipbuilding facilities within range. Four key targets, including the huge naval bases at Kure and Sasebo and the Mitsubishi yards at Nagasaki, account for about 18% of all new ships launched and over 23% of the marine engines.

A radius of 1500 miles would take in the bulk of the ship construction and repair facilities available to the Japanese, including three major naval bases. Located in this area is the target of prime importance, the Kawasaki Dockyard in Kobe, which alone builds about 18% of the ships and about 20% of the marine engines. The totals within a 1500-mile radius would probably represent at least 70% of the ships and propulsion machinery and a comparable proportion of the ship repair work.

A circle of 1750 miles would include all but a fraction of such facilities, with the exception of repair docks at Singapore and in Hokkaido.

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NAVAL BASES AND SHIPYARDS

The indicated dependence of Japan upon water-borne transportation and the comparative stringency of her present shipping position give critical importance to the fact that the drydocks and other repair facilities are necessary in order to maintain and restore vessels damaged in action, and the further fact that the shipbuilding yards have the capacity to launch an annual tonnage equal to one-fifth of the total vessel tonnage afloat.

It is estimated that the shipbuilding yards in Japan Proper and Japanese-controlled territory are capable of constructing 800,000 - 1,000,000 gross tons of commercial and naval ships in 1943. This figure represents the capacities of the known building yards, as demonstrated by past achievement or reliable information concerning current capacities. (Since the private yards are used extensively for naval construction and repair, the naval yards and commercial yards are considered together in this report.)

It seems clear from information coming out of Japan, however, that the shipbuilding industry was unable to operate at any level close to capacity in 1940 and 1941. The failure of the shipbuilding industry to reach capacity output has been variously attributed to shortages of materials, lack of skilled labor, and delays in transportation of supplies. Undoubtedly, all these factors have been at work in the years 1940-1942, and will persist to some extent in 1943. The drainage of manpower into the armed forces has impaired the output in this as in other industries. Since steel is the principal material used in the shipbuilding industry, the possibility of reaching capacity in the shipyards is dependent upon the availability of an adequate quantity of steel plate. As brought out in the section of this report dealing with iron and steel, the steel rolling mills in the Far East appear to be capable of rolling nearly three times the quantity of steel plate which would be required in the shipbuilding industry if it were operating at a rate of a million tons per year. It seems probable, therefore, that any shortage of steel plate cannot be attributed to lack of plate-making capacity, but rather to the general steel shortage which makes it necessary for the Japanese to limit the amount which may be allocated to the shipbuilding industry.

It seems possible that by resorting to wooden ship construction, by stimulating steel plate production, and by assuring an adequate skilled labor supply to the shipbuilding trade, the quantity of shipping tonnage launched in 1943 may exceed that in recent years and may even approach the indicated capacity mentioned above.

The yards engaged in the building and repairing of ships are widely scattered throughout the Far East but those which are significant contributors to the total shipbuilding output are comparatively few. The five leading shipyards, all located in the western half of Japan, account for about 60% of the bottoms launched and 48% of the marine engines built. Since the facilities for repairing vessels are in most cases connected with the shipbuilding yards, the targets important in ship construction are also significant in the repairing branch of the industry. The seventeen key targets listed in the accompanying table appear to construct about 84% of the vessels and 87% of the marine engines, and they perform perhaps 50-60% of the repair work.

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The four major naval bases in Japan Proper and the Singapore base constitute key targets because of their important repair, fueling, and supply facilities. The four Japanese Navy Yards are important also in the construction of naval vessels and the machinery and ordnance therefor. Damage to the facilities at the naval bases or to warships lying at anchor there would interfere with operations necessary to keep the fleet in combat condition.

The engine works and machine shops at shipyards warrant special attention as targets. This is true not only because the marine engine industry is highly centralized in a few large plants, but also because it would be difficult and time-consuming to replace these plants. The drydocks used for repairing vessels are perhaps the least vulnerable because of their heavy concrete construction. Considerable interruption could be achieved in the work of the shipyard by hitting ships which are still on the building ways but are nearly completed. Such destruction would not only demolish the ship itself but would tie up the way for several weeks or months.

It is estimated by shipbuilding engineers that a building way can be constructed in about two months and a drydock in about six months, given conditions of available building materials and construction labor. Successful air attack upon a shipbuilding and repair yard would therefore create a considerable and costly delay before the facilities could be restored. So far as damage to building ways is concerned, the effects of air attack would be more temporary and more easily remedied than the damage from attacks which concentrated on plants important in the marine engine business. Any substantial curtailment of the output of these plants would be directly effective in cutting the output of new ships, inasmuch as there is almost certainly no stockpile or inventory of ship propulsion machinery.

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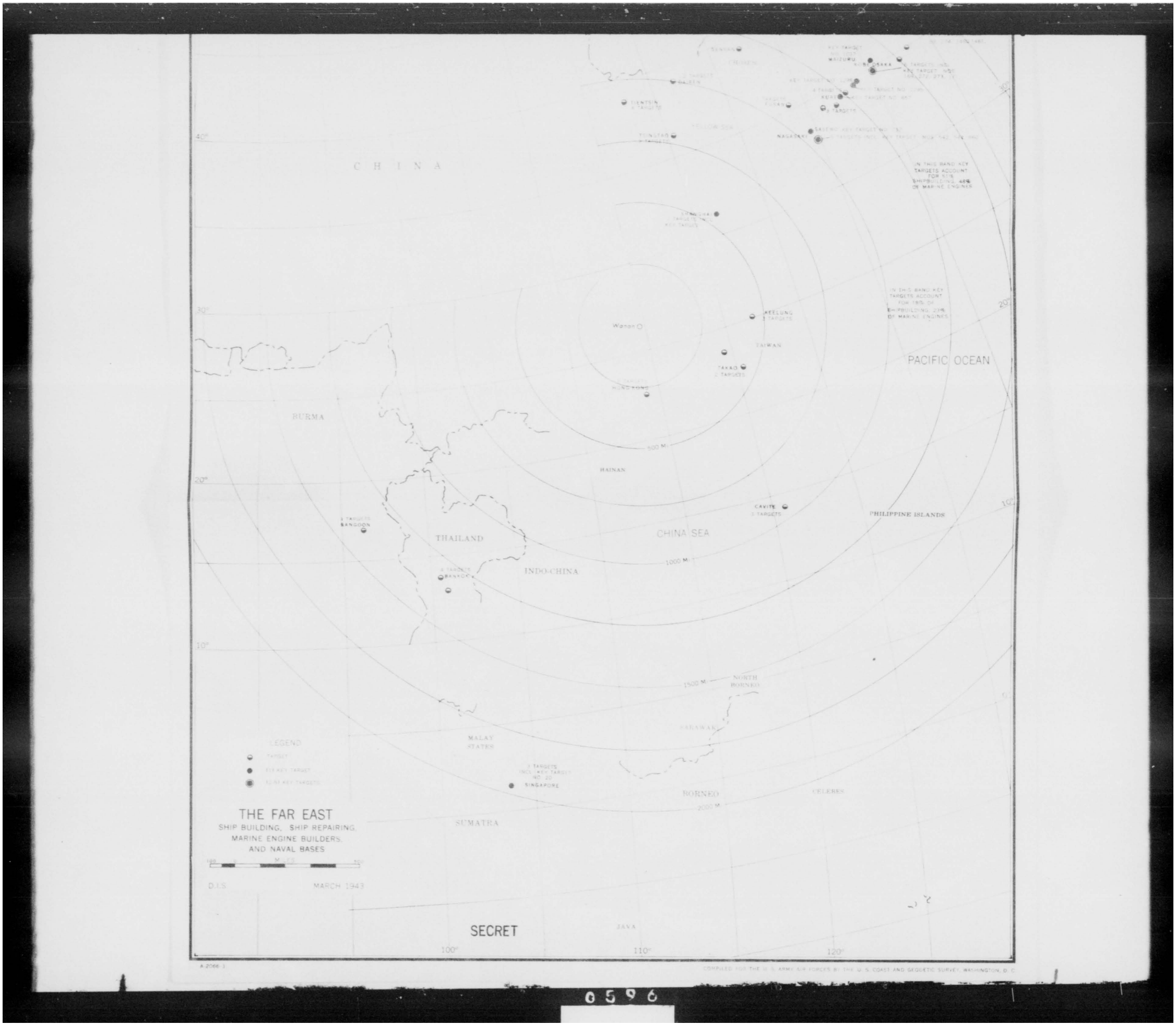

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JAPAN - NAVAL BASES AND SHIPYARDS

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TARGET NO.	TARGET	COMMENT	AIR ROUTE AND COORDINATES	CHART NO.
	JAPAN PROPER (90)			
	HAKODATE (90.4)			
974	Hakodate Dock Yard	Secondary ship repair yard	41°47'N 140°42'E	974
	AOMORI (90.5)			
996	Naval Base and Air Sta (Ominato)	Secondary base for destroyers, aircraft, etc.	41°16'N 141°09'E	996
	MITO (90.14)			
1477	Kisarazu Fleet Fueling Base	Important; Tokyo Bay fueling base for fleet	35°23'N 139°55'E	303
	TOKYO (90.17)			
	NAVAL BASES			
	Yokosuka Naval Base	Targets 274-1486 Navy Adm Bldg, capital ship bldg	35°17'N 139°40'E	
274	Shipyard & Docks, Yokosuka Naval Base	(See Shipyards)	35°17'N 139°40'E	N.A.
276	Experimental Laboratories & Ordnance Plants	Very important	35°17'N 139°40'E	"
277	Outfitting Berths for Battleships & Cruisers	Large capacity	35°17'N 139°40'E	"
278	Yokosuka Naval Barracks	Base personnel	35°17'N 139°40'E	"
282	Yokosuka Arsenal & Armaments Works	Large, important	35°15'N 139°39'E	"

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	NAME	COMMENT	AIM POINT COORDINATES	ACCURACY REQUIRED
	YOKOSUKA (CONT'D)			
295	Yokosuka [illegible] Station Oil Tanks	Surface tanks	[illegible]	"
296	Kinugasa Aircraft Stores	Large & important	[illegible]	"
297	Nako Point Oil Tanks (Yokosuka)	Surface & underground tanks	[illegible]	"
298	Yokosuka Naval Air Station	(See Airports)	[illegible]	"
1392	Naval Aircraft Factory & Research Center	Key naval air experimental center	[illegible]	"
1452	Base Headquarters	Includes residence C-in-C	[illegible]	"
1453	Gunnery & Navigation Schools	Training center	[illegible]	"
1454	Dunare Drydock	Large, new drydock	[illegible]	"
1455	Oyama Point Ammunition & Powder Stores	Large	[illegible]	"
1456	Torpedo & Wireless School	Important source fleet personnel	[illegible]	"
1457	Kontonosu Inlet Oil Tanks (Yokosuka)	7 or more oil tanks	[illegible]	"
1458	Yokosuka Naval Radio	Range 1500-2000 nautical miles	[illegible]	"
1486	Old Aircraft Center	Supplements #1392	[illegible]	"
	SHIPYARDS			
69	Yokohama Dockyard Mitsubishi Heavy Industries	One of largest in Japan	35°29'N 139°38'E	C.A.
70	Asano Dockyard (Yokohama)	Almost entirely a repair yard	35°28'N 139°39'E	"
71	Uraga Dockyard #3 (Yokohama)	Small branch of Uraga Shipbuilding Yard	35°27'N 139°38'E	"
122	Tsurumi Steel & Shipbuilding (Yokohama)	Ocean-going tankers, other ships; rptd also cruisers	35°29'N 139°42'E	"
274	Shipyard of Yokosuka Naval Base	Very important; among largest yards in Japan	35°17'N 139°40'E	"
330	Ishikawajima Dockyard Ishikawajima Shipbldg & Engineering	Important engineering works, shipbuilding yard	35°40'N 139°47'E	"

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JAPAN - NAVAL BASES AND SHIPYARDS

INDEX NO.	TARGET	COMMENT	APPROXIMATE GEOGRAPHICAL	JAPAN TARGET CHART NO.
	TOKYO (90.17) (Continued)			
1459	Suzuki Dkyd Ishikawajima Shipbldg & Engineering	At least one 20,000-ton drydock, 3-4 bldg slips, cranes	35°39'N 139°48'E	N.A
1460	Uraga Dockyard #1 (Yokosuka)	Can build all types naval vessels up to large cruisers	35°15'N 139°43'E	"
1461	Uraga Dockyard #2 (Yokosuka)	Integrated operation with Dockyard #1	35°15'N 139°43'E	"
1462	Shinagawa Shipyard (Tokyo)	Repairs merchant ships; 4 ways, 3000-ton drydock	35°36'N 139°45'E	"
	SHIZUOKA (90.18)			
1135	Shipyard (Shimizu)	Minor shipyard	35°00'N 138°31'E	1176
	MAIZURU (90.22)			
037-1043	Maizuru Naval Base	Rptd 4th largest in Japan	35°29'N 135°22'E	1039
	KOBE (90.24)			
1216	Tobu Dockyard	Builds small fishing & coastwise boats	34°28'N 136°51'E	1215
	OSAKA (90.25)			
169	Mitsubishi Dockyard	Important; building & repair, capital ships	34°39'N 135°11'E	10
171	Kawasaki Dockyard Co	Important; can build capital ships	34°40'N 135°11'E	10
272	Osaka Iron Works Unit #1	Important; can build ships of 12,000-ton class	34°40'N 135°27'E	263
273	Fujinagata Shipyard	Light cruisers, destroyers, submarines	34°37'N 135°28'E	325
699	Osaka Iron Works Unit #2	Operates in conjunction #272	34°38'N 135°28'E	325

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OKAYAMA (90.27)			
1295	Mitsui Tama Shipyard	Major shipyard	34°28'N 133°56'E	1295
1296	Harima Shipyard	Rptd more than 10% commercial shipbuilding	34°47'N 134°28'E	1296
	NIIHAMA (90.29)			
927-a	Habu Works of Osaka Iron Works Innoshima Shipyards	One of largest repair yards, also bldg	34°16'N 133°11'E	927-a
927-b	Shannosho Works of Osaka Iron Works Innoshima Shipyards	One of largest repair yards, also bldg	34°16'N 133°11'E	927-a
928	Mukaishima Drydock Co	Repairs, possibly some bldg	34°24'N 133°13'E	928
929	Mihara Shipyards	Rptd new yard, no details	34°23'N 133°05'E	933
930	Saizaki Dockyard	Rptd new yard, no details	34°20'N 133°02'E	None
	KURE (90.30)			
657-b	Kure Naval Shipyard	Largest in Japan	34°14'N 132°33'E	657
	TOKUYAMA (90.32)			
668	Kasado Jima Dock Co & Osaka Iron Works	2 docks & at least 2 drydocks	33°57'N 131°51'E	672

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	JNIOBT CHART NO.
	SHIKOKU (90.34)			
43-a	Niko J Shipyards & Engine Works	Important; patrol boats, repairs ships to 6,000 tons	33°56'N 130°56'E	43-a
43-b	Osaka Iron Works Drydocks	Important ship repair	33°56'N 130°56'N	43-a
558	Tochigi Shipbuilding Yards	Rptd secondary but expanding	33°55'N 130°49'N	29
	SASEBO (90.36)			
542	Akunoura Engine Works (Nagasaki)	Very important, marine engine production	32°44'N 129°52'E	542
543	Mitsubishi Dockyard (Nagasaki)	Important repair dockyard	32°44'N 129°52'E	544
544	Nate and Shipyard (Nagasaki)	Very important naval & commercial shipbuilding	32°44'N 129°52'E	544
752	Sasebo Naval Dockyard	Very important; bldg, principal navy repair base	33°10'N 129°42'E	752
828	Matsuo Engine Works (Nagasaki)	Secondary, marine engine production	32°45'N 129°52'E	542
860	Koyagi Shima Shipyard, Matsuo Iron Works	Secondary shipbuilding	32°42'N 129°46'E	542
	JAPANESE PACIFIC ISLANDS (91)			
	TAIWAN (91.3)			
15-b	Kyucho Harbor Dockyard, Taiwan Dockyard Co	Important; only large dockyard in Taiwan	25°09'N 121°44'E	15-a
23	Shanyo To Shipyard	Small shipyard	25°10'N 121°45'E	15-a
24	Keelung Submarine Base	Rptd converted to submarine base	25°09'N 121°45'N	15-a

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAO (91.6)			
7	Higo Naval Dockyard (Takao)	Only shipyard southern Taiwan	22°37'N 120°16'E	7
56	Toshien Dockyard (Toshien)	New yard, size not known	22°41'N 120°16'E	56
	PESCADORES (91.7)			
145-147	Ansan Naval Base	Key to naval defense of Taiwan	23°33'N 119°34'E	148
149-153				
156,158				
148	Kotei Naval Anchorage	Cruisers, submarine, motor-torpedo boat base	23°35'N 119°38'E	148
	CHOSEN (84)			
	GENZAN (84.4)			
87	Genzan Submarine Base	New submarine base	39°12'N 127°29'E	88
	FUSAN (84.7)			
101	Chinkai Naval Base	Fleet anchorage, minor naval sta, mine base	35°09'N 128°38'E	101
102	Chinkai Naval Shipyard	Small ships, minor repairs to destroyer class	35°09'N 128°38'E	101

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (93)			
	DAIREN (93.5)			
10	Manchuria Dockyard Co	Most important dockyard in Manchukuo	38°56'N 121°39'E	1
11	Naval Dockyard	2 graving docks; one building slip	38°48'N 121°16'E	11
	CHINA (83)			
	CANTON (83.4)			
53	Taikoo Dockyard	Large yd, drydock, slipways, all repairs	22°17'N 114°13'E	55
54	Royal Navy Yard	Small but modern & well equipped	22°17'N 114°10'E	55
55	Kowloon Dockyard	Large yd, builds ships to 10,000 tons, repairs	22°18'N 114°10'E	55
56	Cosmopolitan Dock	Large, all types repairs, builds medium freighters	22°19'N 114°10'E	55
57	Aberdeen Dock	Small	22°17'N 114°09'E	55
	HAINAN (83.6)			
33	Yulinkan Harbor Naval Base	Important submarine base	18°13'N 109°32'E	33
	TSINGTAO (83.11)			
93	Drydock (Tsingtao)	Can handle destroyers; repairs	36°04'N 120°18'E	78
94	Jap Naval Repair Shop (Tsingtao)	Small navy yard	36°05'N 120°19'E	78

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TIENTSIN (83.12)			
2	Taku Tug & Lighterage Co (Taku)	Important; repairs, concentration tugs, lighters	39°00'N 117°42'E	4
6	Chinese Naval Dockyard (Taku)	Repairs for local shipping	38°59'N 117°40'E	4
20	Hai Ho Conservancy Board Dockyard (Tientsin)	Harbor maintenance equipment	39°06'N 117°13'E	11
29	Tientsin Lighter Co (Taku)	Important; repairs, concentration tugs, lighters	39°00'N 117°41'E	4
	THAILAND (98)			
	THAILAND (98.1, 98.2, 98.3)			
53	Bangkok Dock Co	Chief commercial ship repairs in Bangkok	13°43'N 100°31'E	26
54	Ministry of Marine Compound	Naval dockyard, machine shops; fortified	13°45'N 100°29'E	26
55	Fort Chulachomklao (Bangkok)	Rptd main fort, also drydocks, workshops	13°32'N 100°35'E	55
56	Royal Irrigation Dept	Repairs large diesel dredgers	13°47'N 100°31'E	26
57	Satahib Naval Base	Rptd new main naval base of Thai Navy	12°40'N 100°53'E	12
	BRITISH MALAYA (92)			
	SINGAPORE (92.2)			
15-23	Singapore Naval Base	Very important; see targets below	01°28'N 103°50'E	

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	CHART NO.
	SINGAPORE (92.2) (Continued)			
15	Shell Oil Co Facilities	Storage & fueling jetty	01°27'N 103°46'E	17
16	Ammunition Depot Jetty Area	Military stores; jetty	01°28'N 103°48'E	17
17	Fourth Senoko Oil Depot	Rptd 39 tanks 3,275,000 bbls capacity	01°27'N 103°48'E	17
18	Naval Base Radio Station	Powerful; oversees communication	01°28'N 103°49'E	17
19	Sembawang River Area	Piers, warehouses, cement plant	01°28'N 103°49'E	17
20	Drydock and West Wall Area	1000 ft graving dock, large berthing space, cranes	01°28'N 103°50'E	17
21	Workshop Area	Shops for all repairs to largest ships	01°28'N 103°50'E	17
22	North Wharf Area	2200 ft dock, 50,000 ton & 5000 ton floating drydocks	01°28'N 103°50'E	17
23	Naval Stores Basin Area	Large basin, warehouses	01°28'N 103°50'E	17
51	Tandjong Rhu Shipyards	Three shipyards for bldg, repairing small ships	01°18'N 103°52'E	52
	BURMA (82)			
	BURMA SOUTH (82.2)			
14	Dalla Dockyard (Rangoon)	Repairs some ocean ships, builds river boats	16°46'N 96°10'E	14
15	Ahlone Foundry (Rangoon)	Castings for river boats	16°47'N 96°08'E	14
16	Pazundaung Foundry (Rangoon)	Rptd expanded by Japs for truck repair	16°46'N 96°11'E	14

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	PHILIPPINES (96)			
	PHILIPPINE ISLANDS NORTH (96.1) PHILIPPINE ISLANDS SOUTH (96.2)			
19	Cavite	Naval base restored by enemy	14°29'N 120°54'E	NA
33	Philippine Slipways	Small wooden boat construction	14°35'N 120°59'E	"
34	Varedero Slipways	Small wooden boat construction	14°35'N 120°59'E	"

N A - No number yet assigned when this list prepared

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Tab A. Aircraft

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March 1943

A I R C R A F T

	KEY TARGETS				Miles radius from Wanan (inclusive)						
	TARGET No.	TARGET Name	Importance	Obj. Area	500	550	1000	1250	1500	2250	over
1	10	Kawasaki Aircraft	15% of engine cap. 15% " plane "	Osaka (90.25)					X		
2	11	Kawasaki Dkyd Aircraft Plant		Osaka (90.25)					X		
3	193	Mitsubishi Engine Plant	16% of engine cap. 15% " plane "	Nagoya (90.20)					X		
4	194	Mitsubishi Aircraft		Nagoya (90.20)					X		
5	356	Nakajima Airc, Ogikubo plant	15% of engine cap.	Tokyo (90.17)						X	
6	357	Nakajima Airc, Musashino plant		Tokyo (90.17)						X	
7	789	Nakajima, Ota Plant	15% of plane cap.	Takasaki (90.13)						X	
8	18	Kawanishi Airplane	5% of engine cap. 5% " plane "	Osaka (90.25)					X		
9	198	Aichi Aircraft	3% of engine cap. 3% " plane "	Nagoya (90.20)					X		
10	791	Showa Aircraft	3% engines, planes; probably more	Tokyo (90.17)						X	
11	331	Tokyo Gas & El Engineering	4% engines, planes	Tokyo (90.17)						X	
12	792	Tachikawa Aircraft	3% engines, planes; probably more	Tokyo (90.17)						X	
13	1391	Ishikawajima Engine plant	3% engines, planes	Tokyo (90.17)						X	
14	799	Mitsubishi, Oimachi plant	At least 2% engines	Tokyo (90.17)						X	
15	240	Kawasaki Kagamigahara plant	Large plane prod.	Nagoya (90.20)					X		
16	539	Nakajima Airc, Tanashi fndry	Key aluminum castings, foundry	Tokyo (90.17)						X	
			(Priority targets underlined)								

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March, 1943

A I R C R A F T

CHINA BASED OPERATIONS

Within a 1000-mile radius from Wanan operations base, as shown in the preceding table, there are no airplane or engine targets.

A 1250-mile radius includes 6 plants, none of them key targets. Within 1250 miles the plants at Mukden and Heijo are undoubtedly the most important and warrant consideration as objectives even though there is not sufficient information to justify including these two plants among the key targets. Of related aircraft importance within this range are (see Non-Ferrous Metals) two key aluminum targets, the Japan Aluminum alumina plant at Kurosaki (20% of total capacity) and Manchukuo Light Metals at Fushun (10% of aluminum, 10% alumina).

A 1500-mile radius includes both the Kobe-Osaka and Nagoya areas, 7 key targets and 16 others. Possibly 50% of total airplane engines and 25% of airplanes are produced within this radius.

A 1750-mile radius includes the Tokyo area, a cumulative total of 16 key targets, and all but a negligible fraction of Japanese aircraft production.

The significance of these key targets in relation to the Japanese war effort as a whole is indicated in the summary following.

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AIRCRAFT

The indicated annual production of the Japanese industry is approximately 10,000 airplanes of all types and 25,000 engines.

Capacity estimates range from 5,000 airplanes to more than 20,000. Factors against such high volume are (aside from strategic policies, pilot personnel, etc.) supply of skilled labor and specialized production of equipment, particularly engines. Well-organized Japanese engine maintenance tends to reduce total power plant requirements, but supply of engines is believed to be a principal limitation on plane production. In turn, this is controlled by availability and production of machine tools, bearings, etc., to an extent indicating around 10,000 airplanes as a reasonable present capacity.

Over 60% of engine production is concentrated in the Nagoya and Tokyo areas (approximately 25% each) and the Kobe-Osaka area (20%). This production is principally from 6 plants.

15% of total engines is credited to the two adjacent Kawasaki plants at Kobe. Another combined 15% is estimated for the newer Mitsubishi plant (ostensibly a spinning mill) and the nearby older Mitsubishi plant at Nagoya. Nakajima's Musashino and Ogikubo plants at Tokyo are rated 12-15% of total engines. Nakajima's Tanashi foundry at Tokyo is a key supplier to these and other aircraft plants. Capacity of the established plants has been considerably supplemented by conversion of automobile plants, use of spinning-mill type structures, etc. This expansion has been in these same general areas of engine production. Production in the Nagoya area, for example, reportedly has been considerably increased by construction of a new Aichi plant and conversion of the Toyoda Automobile plant at Koromo.

Over 60% of plane production also is in the Tokyo (including Ota) and Nagoya areas (approximately 25% each) and the Kobe-Osaka (20%) area. The largest known assembly capacity is Nakajima at Ota, approximately 15% of the Japanese total. The combined output of the two Kawasaki plants at Kobe and of the two Mitsubishi plants at Nagoya (see engines, above) is around 15% in each case. Kawanishi at Kobe and the Kawasaki plant at Kagamigahara near Nagoya probably each produce 5% of planes; of comparable importance are Showa, Tachikawa and Tokyo Gas & Electric Engineering, all at Tokyo. There are known to be new and important plane plants in Mukden (Manchukuo) and Heijo (Chosen); partly supplied with equipment from plants in Japan proper, they have been reported to each have assembly capacity comparable to the larger plants in Japan but there is no accurate information.

Many other plants, listed in the Automobile, Machine Tool and other sections of this report, are of known but not closely determinable importance in Japanese aircraft production. There are also hundreds of "backyard industry" units. This type of capacity is widely dispersed.

Of major importance in aircraft production are Japan's capacities in alumina and aluminum. As indicated in the Non-Ferrous Metals section, the aluminum position is estimated to be such (allowing for stockpiles, etc.) that it is not currently a limiting factor in aircraft production. Aircraft requirements should be comfortably covered by 50% of estimated present aluminum production. Reduction of aluminum output below this level, which could be accomplished by destruction of the two largest alumina plants, would give critical leverage to direct impairment of plane and engine capacity.

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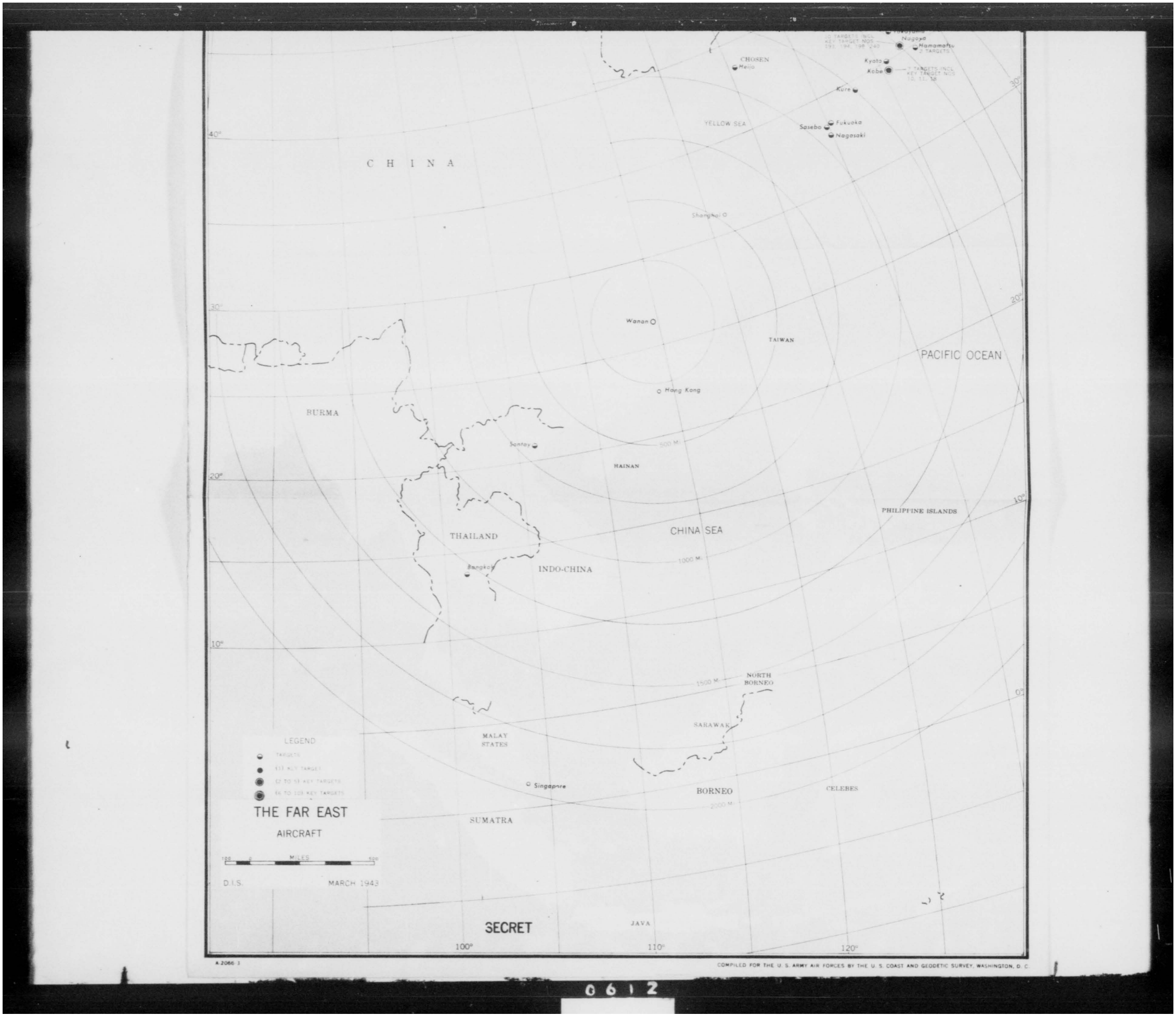

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - AIRCRAFT INDUSTRY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	TOYAMA (90.11)			
941	Fuji Special Steel Co.	Parts, tools	36°41'N 137°14'E	941
	TAKASAKI (90.13)			
789	Nakajima Aircraft, Ota plant	One of largest; estimated 15% Jap planes	36°18'N 139°22'E	789
	MITO (90.14)			
1519	Ito Aircraft	Secondary production planes	35°49'N 140°08'E	1519
	TAKAYAMA (90.15)			
1480	Hida Hokko Co (Takayama)	Minor production planes	36°08'N 137°16'E	1480
	TOKYO (90.17)			
327	Mitsubishi Aircraft, Shibaura plant	Engines, parts	35°38'N 139°45'E	N.A
331	Tokyo Gas & Elec Engineering	Important production planes, engines, parts	35°36'N 139°44'E	"
332	Nakajima Seaplane Works	Little known	35°36'N 139°44'E	"
356	Nakajima Aircraft, Ogikubo plant	With #357, estimated 15% engine production	35°42'N 139°37'E	"
357	Nakajima Aircraft, Musashino plant	With #356, estimated 15% engine production	35°42'N 139°35'E	"
368	Aeronautical Instruments plant	No details	35°36'N 139°44'E	"
539	Nakajima Aircraft, Tanashi plant	Key foundry for area aircraft industry	35°44'N 139°34'E	"
791	Showa Aircraft	Important engine, plane production	35°44'N 139°22'E	"

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JAPAN - AIRCRAFT INDUSTRY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	JAPAN CHART NO.
	TOKYO (90.17) (Continued)			
792	Tachikawa Aircraft	Important production planes, engines	35°42'N 139°24'E	N A
799	Mitsubishi Aircraft, Oimachi plant	Important production engines, parts, instruments	35°30'N 139°44'E	"
919	Tokyo Measuring Works	Rptd largest instrument plant Far East	35°33'N 139°44'E	"
1390	Hitachi-Solex Aircraft	Engines, parts, ordnance	35°24'N 139°32'E	"
1391	Ishikawajima Engine plant	Engines, components	35°22'N 139°38'E	"
1392	Yokosuka Naval Aircraft plant	Navy engine, plane production, research	35°18'N 139°39'E	"
1393	Aeronautical Experimental plant	Research, some plane production	35°40'N 139°41'E	"
1394	Kanegafuchi Spinning Mill	Large, rptd converted to plane production	35°44'N 139°43'E	"
1395	Shoda Aircraft	Little known	35°41'N 139°35'E	"
	NAGOYA (90.20)			
193	Mitsubishi Aircraft Engine plant	One of most important engine plants	35°11'N 136°57'E	196
194	Mitsubishi Aircraft	Important research; also planes, engines	35°05'N 136°54'E	194
196	Nagoya Arsenal, Chigusa plant	Engines, instruments, ordnance	35°10'N 136°55'E	196
197	Nagoya Arsenal, Atsuta plant	Ordnance, also aircraft components	35°08'N 136°55'E	197
198	Aichi Aircraft	Planes, engines, instruments	35°07'N 136°54'E	194
199	Aichi Aircraft, Mizuho plant	Parts, possibly engines	35°08'N 136°55'E	197
240	Kagamigahara Aircraft	Plane production, major repair	35°23'N 136°52'E	240
242	Okamoto Industrial Co	Parts	35°08'N 136°55'E	197
1129	Okamoto Industrial Co, Kasadera Branch	Parts	35°05'N 136°57'E	194
	HAMAMATSU (90.21)			
1219	Japan Musical Instrument Co	Rptd one of 2 largest propeller plants	34°43'N 137°44'E	1219
1220	Hamamatsu Airplane Mfg Co	Primarily repairs	34°45'N 137°43'E	1219
	KYOTO (90.23)			
1167	Int'l Aeronautical Indus Co.	No details	34°57'N 135°46'E	N A

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JAPAN - AIRCRAFT INDUSTRY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
10	Kawasaki Aircraft	One of largest plane, engine plants	34°39'N 135°10'E	10
11	Kawasaki Dockyard, aircraft plant	One of largest plane, engine plants	34°39'N 135°10'E	10
18	Kawanishi Airplane	Important production planes, engines	34°43'N 135°23'E	18
210	Kawasaki Dockyard, Point Kawa plant	Rptd under construction, more data required	34°40'N 135°11'E	10
775	Yamamoto Airplane Implements	No details	34°39'N 135°08'E	10
793	Kukada Light Airplane Co	Light planes, gliders	34°43'N 135°27'E	695
1188	Kawanishi Airplane Co new plant	New, rptd large, but no details	34°43'N 135°23'E	18
	KURE (90.30)			
660	Hiro Naval Aircraft factory	Planes, engines, believed small	34°13'N 132°36'E	656
	KURUME (90.35)			
662	Watanabe Aircraft	Major repair, parts, some plane production	33°32'N 130°28'E	662
	SASEBO (90.36)			
802	Mitsubishi Aircraft, Nagasaki plant	Secondary production engines	32°45'N 129°52'E	542
834	Sasebo Aircraft	Important repairs, secondary production	33°10'N 129°43'E	757
	CHOSEN (84)			
	HEIJO (84.3)			
65	Showa Aircraft, Heijo plant	Rpt new, large; production not known	39°02'N 125°47'E	71

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JAPAN - AIRCRAFT INDUSTRY

TARGET No.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (93)			
	MUKDEN (93.3)			
45	Manchukuo Airplane Mfg Co	Rptd important, largest in Manchukuo	41°50'N 123°30'E	45
	INDO-CHINA (85)			
	INDO-CHINA NORTH (85.1)			
1	Tong Aircraft Factory (Sontay)	Planes, engines, depends on imported materials	21°08'N 105°30'E	N A
	THAILAND (98)			
	BANGKOK (98.2)			
1	R A F shops	Assembly, secondary production	13°48'N 100°32'E	37

* New Targets to be included in Folder revision
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Tab B. Arms and Munitions

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March 1943

ARMS, MUNITIONS

	KEY TARGETS				Miles radius from Wanan (inclusive)							
	TARGET											
	No.	Name	Importance	Obj. Area	500	750	1000	1250	1500	1750	over	
1	201-9 217-18 1335	Tokyo Arsenal Area	Heart arsenal area large & important	Tokyo (90.17)							X	
2	1334	Asano Kasito Co.(Yokohama)	Explosives	Tokyo (90.17)							X	
3	1336	Naval Arsenal (Hiratsuka)	Explosives for Navy	Tokyo (90.17)							X	
* 4	282	Yokosuka Arsenal & Works	Naval ordnance	Tokyo (90.17)							X	
5	200	Toriimatsu Fcty, Nagoya Arsenal	Ordnance	Nagoya (90.20)							X	
6	241	Nihon Vehicle Co.	Tanks & munitions	Nagoya (90.20)							X	
* 7	197	Atsuta Fcty, Nagoya Arsenal	Ordnance	Nagoya (90.20)							X	
8	382	Osaka Arsenal	One of principal arsenals	Osaka (90.25)						X		
9	657a	Kure Naval Arsenal	Principal naval arsenal	Kure (90.30)					X			
10	671	Hikari Naval Arsenal	Ordnance and munitions	Tokuyama (90.32)					X			
11	1310	Asahi Bemberg Gunpowder Plant	Powder	Kyushu (90.33)					X			
12	168	Kokura Arsenal	Principal ordnance arsenal; gas	Shimon'ki (90.34)					X			
13	758	Naval Arsenal & Eng. Dept.	Major naval arsenal	Sasebo (90.36)					X			
14	60	Japan Explosives Co.	Largest in Chosen	Heijo (84.3)					X			
15	61	Heijo Army Arsenal	Ordnance	Heijo (84.3)					X			
16	46	Mukden Arsenal	Most important in Manchukuo	Mukden (93.3)						X		

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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* Also listed under another category.

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March 1943

ARMS, MUNITIONS

CHINA BASED OPERATIONS

Within a 1000-mile radius from Wanan operations base, as shown in the preceding table, there are no arms and munitions targets.

A 1250-mile radius includes the Kure, Tokuyama, Nobeoka, Shimonoseki-Kokura, Sasebo, and Heijo areas, 7 key targets and 30 others. A majority of the most important production is within this radius.

A 1500-mile radius includes the Osaka and Mukden areas, 2 key targets and 14 others.

A 1750-mile radius includes the Tokyo-Yokohama-Yokosuka and Nagoya areas, 18 key targets, 12 of which are grouped into one target area, and 19 others.

The significance of these key targets in relation to the Japanese war effort as a whole is indicated in the summary following.

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ARMS, MUNITIONS

Arms and Munitions production in Japan is widely dispersed. Although her peacetime plants numbered but approximately 90, of which 25 might be considered important or vital, there has been wartime conversion of much of the Machine Tool, Automobile and Motors, Chemicals, Textiles, and other industries. While the areas of concentration of these industries roughly coincide with those of Arms and Munitions, a careful study of these installations should be made in their respective sections of this report.

The majority of the established Arms and Munitions plants were government owned or controlled and so cloaked in official secrecy that they cannot be accurately evaluated and wartime conversion has changed their relative importance. Production has been dispersed.

Japan does not appear to be vulnerable in either the production of explosives or arms. Because of their small size and type of construction, explosives plants are difficult to destroy. The structures are easily and cheaply rebuilt, and the machinery simple and not difficult to replace. As pointed out in the chemical section, the sources of raw material would be hard to disrupt.

Because the production of arms and all types of ordnance is now distributed among many industries, large-scale attacks would be required. This production can be most effectively attacked by destruction of the steel industry supplying it.

As the available information will not serve as a basis for a proper evaluation of the component parts of the Arms and Munitions industry, it is possible only to list the chief plants by areas of concentration. As nearly as can be ascertained, these installations are of somewhat equal importance and may be considered as the heart of the established industry.

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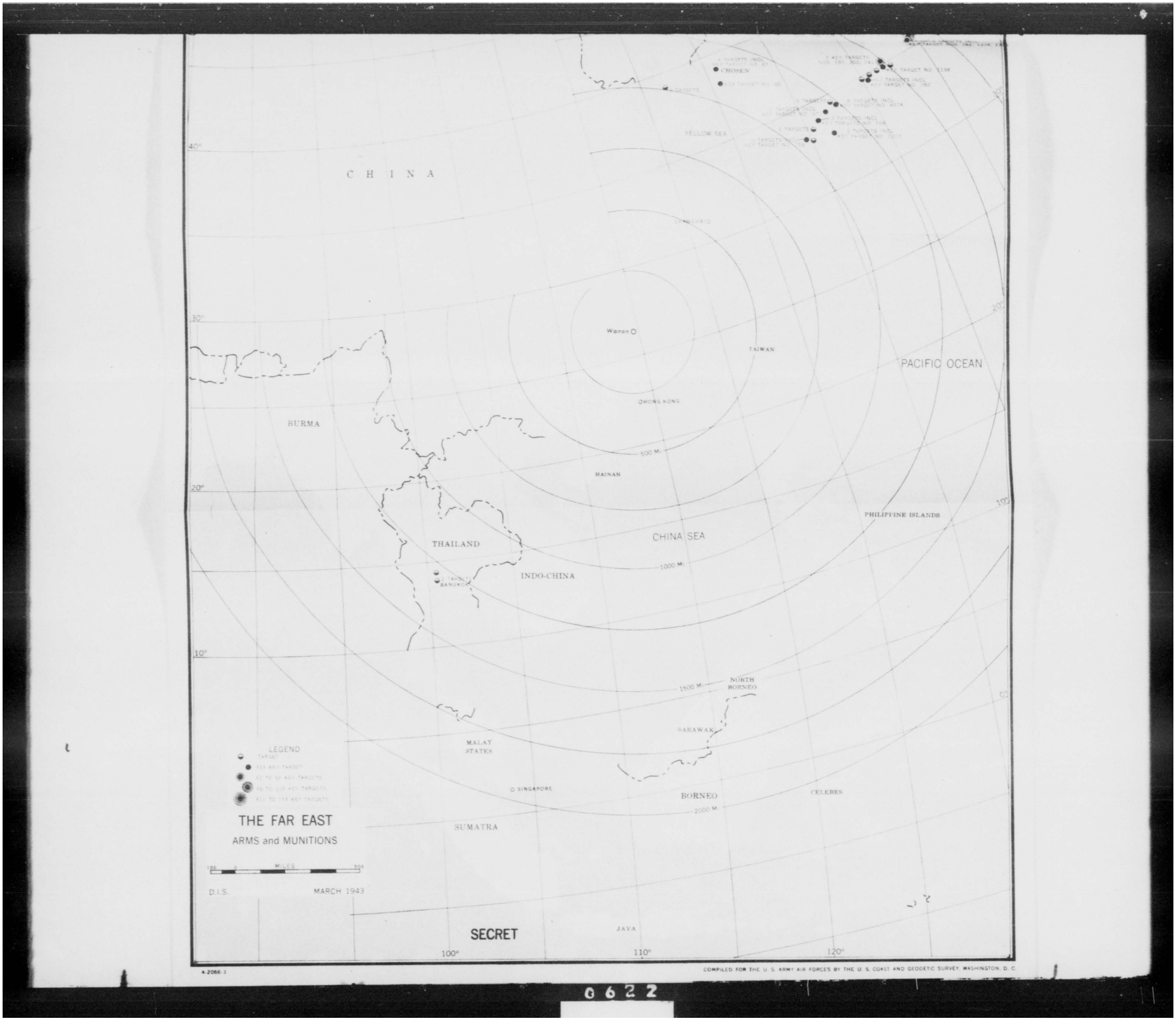

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TOKYO - AREA, DIVISIONS

Area No.	Name	Content	Approximate Coordinates	Tab Chart
	JAPAN PROPER (90)			
	TOKYO (90.1)			
70	Hino Firecracker Factory	Anti converted to munitions	35°26'N 139°36'E	"
202	Ind entified Army II (Unidentified)	Guns, aircraft motors	35°32'N 139°45'E	"
	Ammunition & Stores, Old Yard, Tokyo	Heart of "Arsenal Area"; very important & large: Operate through 1335 produce ordnance, ammunition, bombs, instruments & include major stores & Hq		
200	Ordnance Storehouse, Ammunition		35°46'N 139°43'E	"
202	Army Central Clothing Depot		35°46'N 139°43'E	"
203	(Ordnance Supply Depots (Lower Yamanose)		35°45'N 139°43'E	"
206	Army Arsenal		35°45'N 139°44'E	"
207	Military Gunpowder Works		35°45'N 139°45'E	"
208	Army Arsenal Powder Factory		35°45'N 139°45'E	"
209	Military Works		35°45'N 139°44'E	"
210	Powder Factory		35°46'N 139°43'E	"
211	Ordnance Storehouse		35°46'N 139°43'E	"
212	Powder Magazine		35°45'N 139°43'E	"
1335	Naval Ammunition Depots		35°44'N 139°45'E	"
	Ammunition & Stores, Included Yard, Tokyo	Restricted area around #205 includes Army Ordnance Supply, Tokyo #2 Army Arsenal etc, producing ordnance	35°45'N 139°43'E	"
205	Army Arsenal & Military Gunpowder Wks			

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TABLE - AREA LIMITS

[illegible]	[illegible]	CONTENT	ATTACK AIR OBJECTIVES	
	TOKYO (90,17) (Continued)			
	Arsenals & Stores, Koishikawa Area	Includes Targets 214, 352 probably others not identified		
214	Armory		35°43'N	139°44'E
352	Army Academy & Engineering School		35°42'N	139°45'E
355	Army Provisions Depot, Tokyo	Depot near Ishikawajima Dockyard	35°40'N	139°48'E
366	Steel Ens & Rolling Stock Wks	Converted to ordnance, armored trains, tanks	36°40'N	139°40'E
490	Kurose Iron Wks (Yokohama)	Builds steel hulls	35°29'N	139°31'E
515	Three Powder Magazines (Yokohama)	In low hills	35°26'N	139°30'E
516	Powder Magazines (Yokohama)	No details	35°26'N	139°37'E
541	Oriental Otis Elev Cor (Tokyo)	Converted to bomb racks, gun turrets & mountings	35°33'N	139°43'E
606	Japan Military Goods Explosives Pl	Produces Oerlikon ammunition	35°21'N	139°39'E
809	Japan Military Goods (Tomioka)	Oerlikon air cannon, explosives, ordnance	35°32'N	139°33'E
1331	Hayabe Engineering Co (Tokyo)	Oerlikon cannon, airplane parts, flotation gear	35°38'N	139°40'E
1332	Rolling Stock Co (Tokyo)	Converted to tanks, ordnance	35°34'N	139°43'E
1333	Nippon Typewriter Co (Tokyo)	Conv rted to small gun parts	35°40'N	139°41'E
1334	Asano Narite Co, Ltd	Highly important explosives plant	35°27'N	139°35'E
1336	Navy Arsenal (Hiratsuka)	Important production explosives for Navy	35°20'N	139°21'E
1337	Tsuruui Army & Navy Stores (Yokohama)	Rptd tarpaulin-covered stores, heavily defended	35°29'N	139°41'E
1338	Inflammable Storage Docks (Yokohama)	Powder and/or gasoline, low whses in fire area	35°26'N	139°40'E
1339	Ammunition Storage (Yokohama)	Storage in hill	35°25'N	139°37'E
	NAGOYA (90,20)			
200	Toriimatsu Fctry, Nagoya Arsenal	New, large, important ordnance production	35°13'N	136°58'E
241	Nihon Vehicle Co	Important tank & munitions production	35°07'N	136°55'E
1138	Imperial Explosives Works	Large cordite plant	34°52'N	136°55'E

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JAPAN - ARMS MUNITIONS

ENGINEER NO.	PLANT	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HAMAMATSU (90.21)			
1024	Army Base & Arsenal (Toyohashi)	Secondary	34°44'N 137°23'E	1034
	KYOTO (90.23)			
1169	Mi Seizojo Powder Factory & Ammunition	More data required	34°55'N 135°43'E	1170
	OSAKA (90.24)			
1014	33rd Infantry Regiment & Arsenal	-	34°40'N 136°20'E	1014
	NAGOYA (90.26)			
382	Atsuta Arsenal	One of most important arsenals	34°41'N 135°32'E	382
384	Aichi Aero Factory	No details	34°40'N 135°31'E	661
385	Aichi Locomotive & Arms Factory	No details	34°42'N 135°30'E	661
386	Toyoda Electric Machinery Co	Projectiles	34°40'N 135°33'E	382
387	Nippon Steel Pipe Co	No details	34°42'N 135°32'E	382
388	Nagoya Machinery Co (Arms)	No details	34°42'N 135°30'E	655
389	Nagoya Iron Works	Army & Navy Ordnance	34°41'N 135°29'E	263
390	Mitsubishi Works	Petrol war conversion; no details	34°40'N 135°33'E	382
391	Nippon Machinery	Ordnance, no details	34°39'N 135°28'E	661
392	Toyokuni Machinery	Arms & aircraft parts	34°40'N 135°29'E	661

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JAPAN - ARMS, MUNITIONS

TARGET No.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CIRCUIT NO.
	OSAKA (90.25) (Continued)			
333	Iron Works for Army & Navy	No details	34°40'N 135°28'E	263
648	Locomotive Mfg Co	Large, rptd converted to ordnance	34°40'N 135°27'E	263
645	Osaka Hohi	Arms, munitions & machinery	34°41'N 135°28'E	263
703	Army Ordnance Manufacture	No details	34°40'N 135°09'E	10
	KURE (90.30)			
657a	Kure Naval Arsenal	Principal naval arsenal	34°14'N 132°33'E	657
657c	Torpedo Boat & Mine Depot	Supplies Kure Naval Base	34°14'N 132°33'E	657
657d	Victualling & Clothing Depot	Supplies Kure Naval Base	34°14'N 132°33'E	657
657e	Naval Ordnance Stores	Supplies Kure Naval Base	34°14'N 132°33'E	657
736	Army Ordnance Depot	Large army depot for Hiroshima-Ujina port	34°23'N 132°27'E	736
737	Army Food Depot	Same - Large army depot for Hiroshima-Ujina port	34°22'N 132°28'E	737
738	Army Clothing Depot	Large army depot for Hiroshima-Ujina port	34°23'N 132°27'E	738
739	Army Division Ordnance Stores	Large army depot for Hiroshima-Ujina port	34°23'N 132°27'E	739
750	Kato-Cho Warehouse	Large army depot for Hiroshima-Ujina port	34°23'N 132°27'E	739
704	Hiro Arsenal	Extension of Kure Naval Arsenal	34°13'N 132°36'E	656
	TOKUYAMA (90.32)			
671	Hikari Naval Arsenal	Rptd large ordnance & munitions development	33°57'N 131°57'E	671
820	Japan Powder Mfg Co, Asa	Dynamite, safety explosives	34°03'N 131°10'E	820

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	[illegible] (00.33)			
1310	[illegible]	Important power production	32°35'N 131°40'E	1311
1311	Kawadine II, Higashi Hirose Explosives	Explosives; extensive mine mines	32°37'N 131°42'E	1311
1312	Imamtendaru II, Higashi Hirose Explosives	Secondary explosives production	32°33'N 131°42'E	1311
	[illegible] (00.34)			
47	Shigenobu Ordnance Store	Minor	33°50'N 130°50'E	44a
49	Ofi Ordnance Store	Secondary	33°57'N 130°58'E	44a
168	Kokura Arsenal	Japan's principal ordnance, poison gas arsenal	33°53'N 130°53'E	168
	[illegible] (00.36)			
1238	Asano Iron Works, Plt #1	Naval munitions, machinery, direct ft ports	33°36'N 130°25'E	1238
1239	Asanoiko Iron Works, Plt #2	Naval munitions, direct ft ports	33°33'N 130°22'E	662
1240	Asano Iron Works, Plt #3	Naval munitions, etc	33°36'N 130°25'E	664
	[illegible] (00.36)			
546	Mitsubishi Steel & Arms Works	Important, naval munitions	32°45'N 129°52'E	546
757	Sasebo Ordnance Depot	Secondary	33°09'N 129°42'E	757
758	Naval Arsenal, Sasebo	Major naval arsenal	33°10'N 129°43'E	752
762	Sasebo Naval Munitions Depot	Secondary	33°09'N 129°43'E	755

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Table - Army Installations

	CHINA (84)			
	MUKDEN (84.3)			
60	Japan Explosives Co	Large; explosives, shell filling	38°03'N 125°42'E	-
61	Heijo Army Arsenal	Large; produces all types ordnance	39°00'N 125°44'E	74
62	Nanshe Hills, Heijo	Rptd converted to munitions	38°59'N 125°45'E	71
63	Japan Corn Products, Heijo	Large alcohol production	38°59'N 125°46'E	71
64	Sugar Refinery, Heijo	Alcohol	39°00'N 125°46'E	72
	FUSAN (84.7)			
103	Chinhai Mine Storage	Rptd primarily mine laying base	35°08'N 128°38'E	107
	MANCHUKUO (93)			
	HSINKING (93.3)			
46	Minden Arsenal	Most important ar encl in Manchukuo	42°47'N 123°39'E	46
67	Military Stores	---	41°47'N 123°39'E	50
	DAIREN (93.5)			
21	Explosive Storage	More data required	38°55'N 121°42'E	2
22	Military Stores	More data required	38°55'N 121°39'E	1
24	Army Stores	More data required	38°56'N 121°39'E	1
	THAILAND (98)			
	BANGKOK (98.1,98.2,98.3)			
2	Royal Ordnance Factory	Large, rptd best equipped in Thailand	13°43'N 100°32'E	26

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THAILAND - ARMS, MUNITIONS

TARGET NO.	TARGET	OBJECTIVE	ATTACK COORDINATES	MAP/CHART SHEET NO.
	THAILAND (01.1, 20.2, 26.3) (Cont'd)			
3	Bon Kheon Army Chemical Co	Rptd new, for chemical warfare production	13°51'N 100°36'E	3
63	Ban Yah Arsenal	Rptd only explosives plant in Thailand	14°22'N 100°35'E	63

* New Target to be included in Folder revision

N.A. - No target number yet assigned and not on this chart required

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Tab C. Automobiles and Motors

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March 1943

M O T O R V E H I C L E S

KEY TARGETS					Miles radius from Wanan (inclusive)						
	TARGET										
	No.	Name	Importance	Obj. Area	500	750	1000	1250	1500	1750	over
1	522	Nissan Auto Co Yokohama	Mil Vehicles;40% Total Motor Vehicle Prod	Tokyo (90.17)						x	
2	1139	Toyoda Auto-mobile Wks Koromo	40% Total Motor Vehicle Prod; Rptd Converted to Airc	Nagoya (90.20)						x	
3	72	Ford Motor Co Yokohama	Light trucks,tanks, ordnance;4% Total Motor Vehicle Prod	Tokyo (90.17)						x	
4	1140	Toyoda Auto-mobile Wks Kariya	Large; Automotive Parts and Engines for Koromo Plant Rptd Light Tanks	Nagoya (90.20)						x	
5	573	Miyata Engin-eering Wks Tokyo	Motorcycles,Bicycles, Landing Barge Motors, Airc Parts	Tokyo (90.17)						x	
6	883	Ikegai Motor Plant, Tokyo	Engines	Tokyo (90.17)						x	
7	1340	Harley Davidson Motorcycle Tokyo	Large; Motorcycles, Sidecars	Tokyo (90.17)						x	
8	1341	Rikuo Engine Co, Tokyo	Motorcycles, Bicycles	Tokyo (90.17)						x	
9	1343	Ishikawajima Motor	Mil Vehicles, Diesel Engines,Gun Carriages	Tokyo (90.17)						x	

(Priority targets are underlined)

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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AUTOMOBILES, MOTORS

CHINA BASED OPERATIONS

Within a 1000-mile radius from Wanan operations base, as shown in the preceding table, there are no motor vehicle targets.

A 1250-mile radius includes a single plant at Zasshoguma of the Miyata Motor Company. Reported large, this is probably more important as a tool and ordnance plant than as a motor vehicle plant.

A 1500-mile radius will include, all in the Osaka area, four more targets, all of minor importance insofar as motor vehicles are concerned.

A 1750-mile radius will include both the Nagoya and Tokyo-Yokohama areas and 9 key targets covering practically 100% of Japan's motor vehicle production. There are also 10 minor targets, largely automotive parts manufacturers who supply the plants selected as key targets.

Outside the 1750-mile radius there is one minor target (assembly plant) in Java, some 2500 miles from China bases.

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AUTOMOBILES, MOTORS

The indicated annual production of the Japanese industry is approximately 31,000 trucks and 8,000 automobiles, tanks, armored cars, etc.

Capacity estimates approximate 40,000 units (trucks and automobiles, tanks, armored cars, etc.). Capacity would be limited by Japan's facilities for increasing tool production in such categories as jigs and dies, gear and spline-cutting and hob-making tools, and antifriction bearings. Both the supply of engines available to motor vehicles, and of transmission and axle gearing units are believed to be controlling factors in limiting production.

Approximately 62% of motor vehicle production is concentrated in the Tokyo-Yokohama area and about 30% in the Nagoya area, principally in Koromo.

The two principal manufacturers of motor vehicles (80% of total production) are Nissan in Yamamugi (Yokohama) and Toyoda Automobile Works which has its principal plant in Koromo (reported to be the largest auto plant in Japan and possibly now converted to aircraft production), another plant in Kariya (normally a large producer of automotive parts and engines, now reported as producing light tanks), and a small plant in Nagoya producing automotive parts.

Passenger car production declined from the start of the China incident (1937) and the armored car and tank types have replaced this item. Trucks continue to be made for military use, practically all production going to China and other occupied territory. Tanks are reported produced in mass quantities at the steel plants at Muroran and Yawata and at the various army arsenals. The Tokyo Gasu Denki Automobile Company, the Ishikawajima (Tokyo Jidosha), as well as the arsenals at Osaka, Nagoya, and Kokura and the Kawasaki Railroad Car plant in Kobe have had experience in tank manufacture. The Ford Motor Yokohama plant is reported to have been moved to Antung, Manchuria, Mitsubishi taking over the machinery to produce marine engines, and the old plant converted to armament production. Three of the six key targets in the Tokyo area produce motorcycles, sidecars, bicycles, and landing barge motors, which products are highly important in Japan's war effort.

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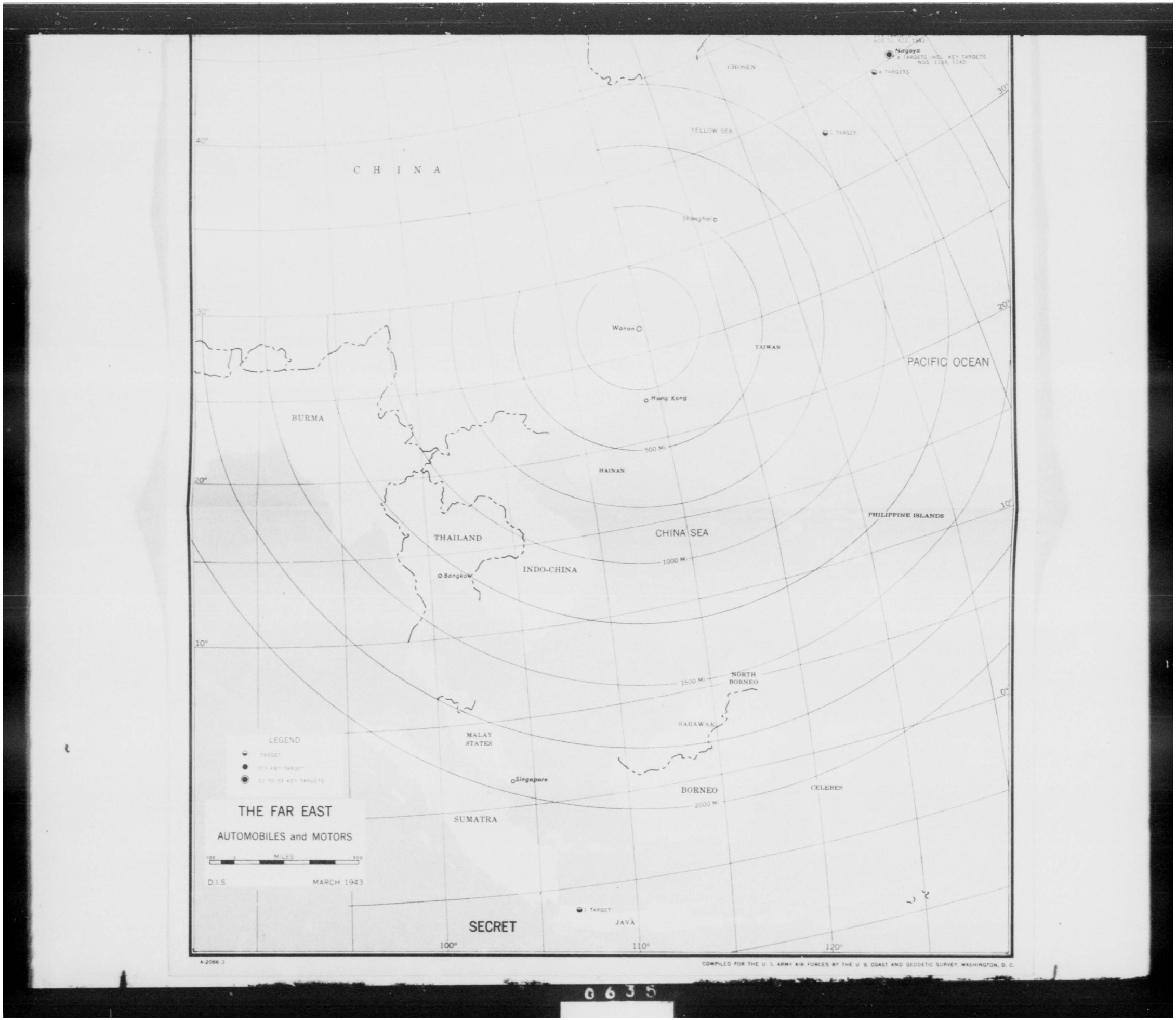

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JAPAN - AUTOMOBILES, MOTORS

All targetsin folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	TOKYO (90.17)			
72	Ford Motor Co (Yokohama)	Light trucks, tanks, probably ordnance	35°29'N 139°39'E	N A
135	Co-op Auto Works (Kawasaki)	Secondary auto plant	35°30'N 139°42'E	"
522	Nissan Auto Co (Yokohama)	Highly important, produces military vehicles	35°29'N 139°40'E	"
573	Miyata Engineering Works (Tokyo)	Motorcycles, aircraft parts, landing barge motors	35°33'N 139°43'E	"
883	Ikegai Motor Plant (Tokyo)	Internal combustion engines	35°39'N 139°45'E	"
1340	Harley-Davidson Motorcycle (Tokyo)	Large; builds motorcycles, sidecars	35°40'N 139°45'E	"
1341	Rikuo Engine Co (Tokyo)	Motorcycles	Location uncertain	"
1342	Japan Machine Industry (Tokyo)	Airplane & auto parts; rptd some aircraft assembly	35°42'N 139°49'E	"
1343	Ishikawajima Motor (Yokohama)	Military vehicles, Diesel engines, gun carriages	35°29'N 139°42'E	"
1344	Japan Auto Co (Tokyo)	Diesel engines, autos, airplane parts	35°42'N 139°41'E	"
	NAGOYA (90.20)			
430	Toyoda Machinery Mfg Co	Secondary production automotive parts	35°11'N 136°53'E	250a
1139	Toyoda Automobile Works (Koromo)	Rptd largest auto plant in Japan, possibly aircraft	35°03'N 137°10'E	1139
1140	Toyoda Automobile Works (Kariya)	Large automotive parts & engine production	34°59'N 137°00'E	1137
1141	Shinkawa Plant, Toyoda Automobile Co	Secondary production automotive parts	35°12'N 136°52'E	250a
	OSAKA (90.25)			
643	Osaka Kotsu Auto Mfg	More Data Required	34°42'N 135°28'E	661
1189	Nissan Jidosha	Cars, trucks, buses	34°38'N 135°29'E	325
1190	Teikoku Rivet Co	Auto parts	34°39'N 135°27'E	325
1192	Osaka Al. Seisakasho	Auto parts, machines & aircraft	34°40'N 135°30'E	661

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JAPAN - AUTOMOBILES, MOTORS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURUME (90.35)			
1241	Miyata Motor Works	Large; motors, tools, ordnance	33°32'N 130°29'E	662
	NETHERLANDS EAST INDIES (94)			
	JAVA (94.3)			
163	General Motors Assembly Plant	More Data Required	06°06'S 106°53'E	177

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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Tab D. Chemicals

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CHEMICALS

	KEY TARGETS				Miles radius from Wanan (inclusive)						
	TARGET No.	TARGET Name	Importance	Obj. Area	500	750	1000	1250	1500	1750	over
* 1	29	Showa Steel (Ansan)	35% Empire coke by-products	Mukden (93.3)				X			
* 2	28	Imperial Steel (Yawata)	18% Empire coke by-products	Shi'seki (90.34)				X			
* 3	30	Honkeiko Steel (Pen-hsi-hu)	11% Empire coke by-products	Mukden (93.3)				X			
4	1243	Miike Dyestuffs (Omuta)	Explosives and all coke by-products	Kurume (90.35)				X			
5	1	Chosen Fertilizer (Konan)	Largest nitrogen & sulphuric acid plant	Konan (84.2)				X			
6	1113	Japan Fertilizer (Kurosaki)	Explosives, 15% Empire nitrogen	Shi'seki (90.34)				X			
7	1537	Tokuyama Soda (Tokuyama)	30% Empire soda ash 28% " caustic	Tokuyama (90.32)				X			
8	134	Asahi Glass [redacted] (TAKIYAMA)	29% Empire soda ash 17% " caustic	Tokyo (90.17)				X			
9	1244	Tokyo Chemical (Omuta)	10% Empire nitrogen fixation	Kurume (90.35)				X			
10	137	Showa Fertilizer (Kawasaki)	10% Empire nitrogen fixation	Tokyo (90.17)						X	
11	923	Sumitomo K.K. (Niihama)	9% Empire nitrogen fixation	Niihama (90.29)					X		
12	818	Ube Fertilizer (Ube)	8% Empire nitrogen fixation	Tokuyama (90.32)				X			
13	598	Nippon Dyestuffs (Osaka)	Large explosives and poison gas plant	Osaka (90.25)					X		
14	1317	Nippon Dyestuff (Tsurusaki)	Large explosives and poison gas plant	Kyushu (90.33)				X			
15	675	Toyo Soda (Machido)	14% Empire soda ash 11% " caustic	Tokyo (90.17)						X	
16	1246	Denki Kagaku (Omuta)	Large % Empire acetone	Kurume (90.35)					X		
17	1536	Showa Fertilizer (Kanose)	18% Empire acetone	Niigata (90.9)						X	
18	1386	Japan Nitrogen (Minamata)	Largest nitric acid - acetone	Yatsushiro (90.37)				X			

(Priority targets are underlined)

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

*Also listed another category

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CHEMICALS

CHINA BASED OPERATIONS

Within a 500-mile radius from Wanan operations base, there are some twenty chemical plants on Taiwan, none of which are key targets, but which are substantial producers of fertilizer, alcohol, petroleum derivatives and substitutes, carbon black and other products. The carbon black plant at Kinsui (Target 87) may produce 50% of Japanese black. Nearby are a large oil refinery and a fertilizer factory (Target 88).

Within a 1000-mile radius from Wanan are two large fertilizer plants, one at Dairen in Manchukuo (Targets 19 and 20) and one at Tientsin (Target 8). Neither is a key target.

A 1250-mile radius includes the extensive chemical industry based on the north Kyushu coal fields and the very large coke ovens in north China. 46% of the by-product coking capacity of the Japanese Empire is concentrated at the steel mills near Anshan and Fushun (Targets 29 and 30) and 15% is at Yawata in north Kyushu (Targets 28 and 557). 40% of nitrogen fixation capacity is found at three plants in this belt (Targets 1, 113 and 1244). All of these are key targets. More than half of Japanese production of other chemicals is in this belt, important concentrations being near Omuta, Yawata and Nobeoka.

In the range between 1250 and 1500 miles from Wanan are the chemical concentrations near Osaka, Nagoya, Kyoto, and Okayama, including the dye works at Osaka (Target 598) producing 30% of Japanese dye intermediates in times of peace, and easily convertible to production of war supplies.

In the 1500 to 1750 mile belt are the large and numerous chemical plants in the vicinities of Tokyo, Toyama, Niigata and Sendai.

The significance of these key targets in relation to the Japanese war effort as a whole is indicated in the summary following.

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CHEMICAL INDUSTRY

While the "heavy chemicals" are essential to the Japanese war effort, the manufacture of war materials requires only a part of the Japanese plant capacity for some of them. The greater part of the production of nitrogen, sulphuric acid, calcium carbide and other chemicals goes into production of fertilizers and manufactured products not directly useful in war. It is estimated that about one-half of nitrogen and sulphuric acid production, and a somewhat less proportion of the soda ash, caustic soda and industrial alcohol production are used directly in the manufacture of arms and munitions. Since military requirements will almost certainly be met, crippling of the chemical industry will not necessarily restrict the production of military supplies.

The coal coking industry is an exception. The coke is necessary in the manufacture of steel, and the by-products — benzene, toluene, naphthalene, phenol, and cresol — are used almost entirely in the manufacture of war materials. It is estimated that by-product capacity is not greater than the minimum demands for the materials produced, and therefore, that reduction of coking capacity will be reflected immediately in the production of war supplies. The Japanese coking industry is highly concentrated and is believed to be vulnerable to air attack.

Even though drastic reduction in Japanese capacity to produce most of the heavy chemicals would probably not be felt immediately in the production of war materials, its long range effect would dislocate the Japanese war effort in many ways. Japan is dependent upon chemical fertilizers to maintain its present degree of self-sufficiency in food, and most of the larger plants either produce, or contribute to the production of chemical fertilizers. Serious reduction of the supply of these fertilizers would mean hungry civilians or increased shipments of food into the main islands. Shortage of the heavy chemicals would be felt in virtually all industry and could not fail to have a long range effect on war production.

COAL CARBONIZATION

By-product coke ovens are the principal sources of Japan's metallurgical coke, benzene, toluene, naphthalene, phenol and cresol, all highly important raw materials for the manufacture of war supplies.

It is estimated that the Japanese capacity to produce coal by-products does not exceed the essential wartime requirements of the Empire. Interference with by-product ovens will be directly reflected in the production of war materials. Two neighboring plants in Manchukuo produce about 46% of Japanese coal by-products, and three in North Kyushu produce 24%. All are shown in the list of key targets. Coke ovens are among the most vulnerable targets to air attack found in the chemical industry. A direct hit on the battery will put many ovens out of commission for months and even a near miss can cause serious damage.

DYES AND INTERMEDIATES

It is estimated that 50% of the Japanese dye industry has been converted to the manufacture of explosives and poison gases. The important plants are listed among the selected targets.

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CHEMICAL NITROGEN

Nitrogen is the base for the nitric acid used in all explosives, and also for the principal fertilizers used in the Japanese Empire. Other uses require a relatively small quantity.

Japanese requirements of nitrogen for all uses are 600,000 - 650,000 metric tons per year, only about one half of which is used directly in the manufacture of war materials. Capacity in 1938 was above requirements, but present production is believed to be slightly below total requirements, possibly due to a stringency of electric power and conversion of some capacity to other war materials. Shortages of coke or sulphuric acid might further restrict production.

66% of the chemical nitrogen in the Japanese Empire is produced in 6 plants listed among key targets. The plants are large. Critical units are hard to locate from the air and can be protected.

NITRIC ACID

Substantially the entire nitric acid output goes directly into the war effort. The nitrating capacity of Japan is estimated to be equal to requirements. The raw materials required are ammonia and air. There is in Japan an excess of ammonia over munitions requirements. No large amounts of power are required. Many ammonia plants have nitrating units. The Konan, Niihama, Kawasaki and Ube nitrogen plants are large producers of nitric acid. Nippon Nitrogen Fertilizer plant at Minamata is the largest peacetime producer. These plants account for perhaps 50% of Japan's requirements. Their destruction would reduce supply of a basic war material, but new plants could be built in a relatively short time.

SULPHURIC ACID

The fertilizer industry consumes about two-thirds (2/3) of the sulphuric acid normally used in Japan. The remainder is used in the manufacture of explosives, cellulose products, dye stuffs and intermediates, in petroleum refining and in the production of other products, many of which are essential war materials.

Sulphuric acid produced by the contact process is ordinarily used in the manufacture of explosives, although other acid may be used. There are more than fifty contact process plants in Japan, no one of which is known to produce a substantial proportion of total sulphuric acid needed for use in explosives. However, the Konan plant of Chosen Chisso Hiryo K.K. listed as the principal producer of ammonia is also the largest single producer of sulphuric acid in the Japanese Empire.

Large quantities of electric power are not required. With the possible exception of pyrites, raw materials are not a problem.

ALKALI INDUSTRY

Only a small percentage of either of the two principal alkalies, soda ash and caustic soda, is used directly in the war effort, although both are important in the production of glass, textiles, etc.

All raw materials are plentiful with the exception of ammonia

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and salt. Although production of salt within the Empire is sufficient to supply all requirements of the chemical industry only, supply has been considerably reduced by loss of former sources.

About 73% of the known soda ash capacity and about 50% of the known caustic soda capacity is in the three plants listed among key targets.

Electrolitic plants produce chlorine as a by-product. A large reduction in chlorine capacity would not bring production below war needs.

INDUSTRIAL ALCOHOL

Although alcohol is an essential chemical, the number of plants capable of producing it are so numerous and raw materials are so varied that it is not considered a vulnerable industry for the purposes of this study.

CALCIUM CARBIDE

In war, calcium carbide is important as the source of acetylene gas used for cutting and welding metal. More than half of the Japanese production, however, goes into the manufacture of fertilizer. Since a small proportion of plants will furnish requirements of acetylene, and the calcium fertilizer production is relatively small, no carbide plants are among key targets.

ACETONE

Acetone is an essential solvent in many chemical processes and reduction of the supply would hamper many war industries. Two plants, producing acetone, are among key targets.

CELLULOSE

While cellulose is important in the manufacture of explosives, the production formerly going into the large Japanese rayon industry is available for war use. Since destruction of many plants would be necessary to reduce the supply below military requirements, none are among the key targets.

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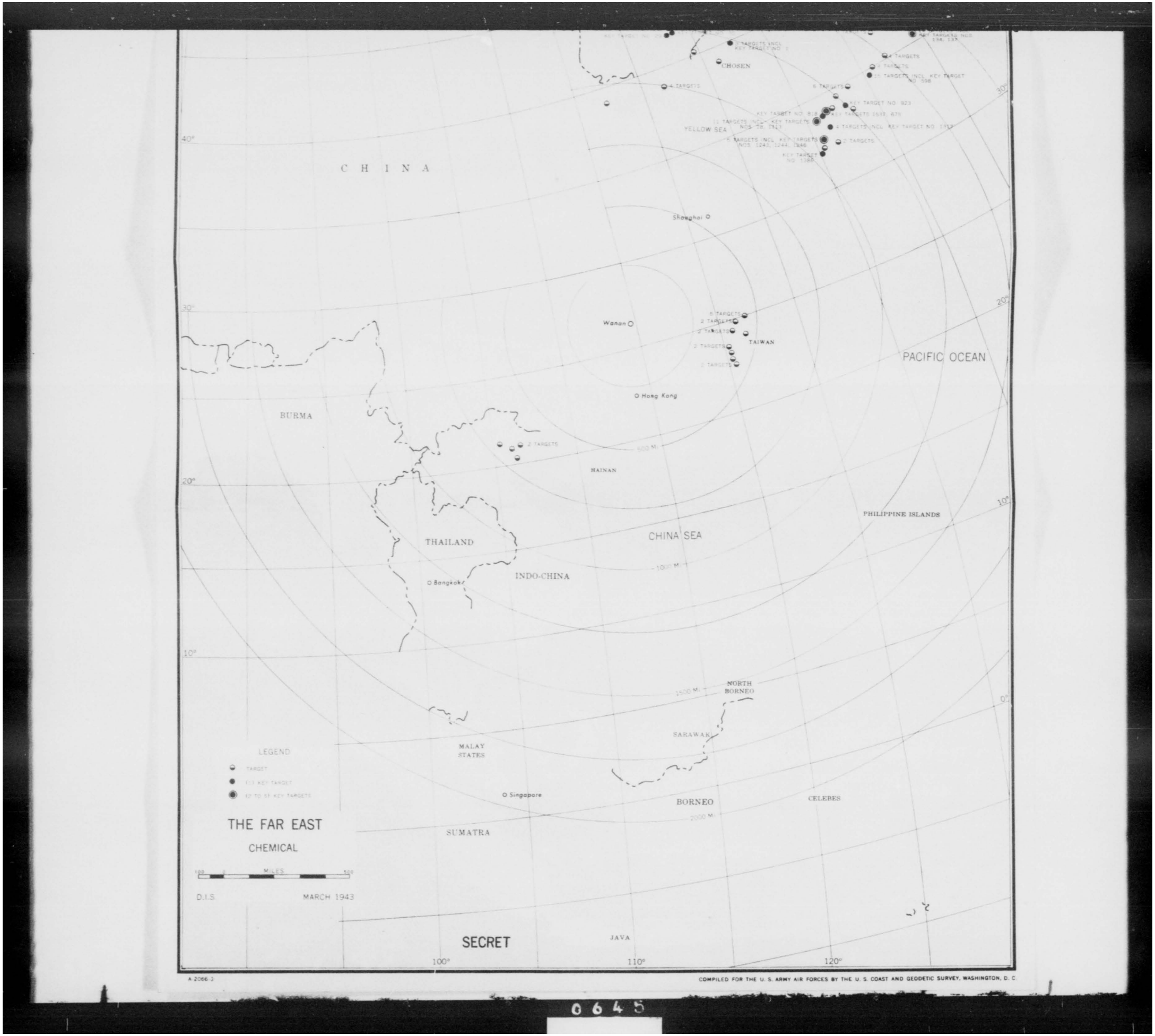

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JAPAN - CHEMICALS

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART
	JAPAN PROPER (90)			
	NIIGATA (90.9)			
1001	Niigata Ryusan Co	Large; sulphuric acid, fertilizers, etc.	37°56'N 139°05'E	998
1002	Niigata Carbide Co	No details	37°57'N 139°05'E	998
1006	Sulphuric Acid Plant	No details	37°54'N 139°01'E	1006
1009	Niigata Chemical Industry	Rptd war chemicals	37°57'N 139°05'E	1005
1536	*Showa Fertilizer Co.	Large production fertilizer & acetone	37°42'N 139°28'E	N A
	FUKUSHIMA (90.10)			
1083	Yamagata Paper Mill	No details	38°15'N 140°21'E	1082
1088	Phosphorus Plant, Nihon Mining	Rptd largest phosphorus plant in Japan	37°23'N 140°24'E	1088
	TOYAMA (90.11)			
865	Nitrogen Works (Nippon Carbide Co)	Large; nitrogen, other chemicals	36°49'N 137°24'E	865
868	Fushiki Fertiliser Plant	Fertilizer, chemicals	36°47'N 137°04'E	867
936	Nissan Chemical Co #1	Ammonia, fertilizer, etc.	36°40'N 137°11'E	936
937	Nissan Chemical Co #2	Same	36°47'N 137°03'E	867
938	Nissan Chemical Co #3	Same	37°02'N 137°00'E	870
939	Hokkai Soda Co (Niijima)	Chemicals	36°47'N 137°04'E	867
	NAGANO (90.12)			
1101	Electro-Chemical Co, Aomi plant	Large; calcium carbide, nitrogen, etc	37°00'N 137°47'E	1101
	MITO (90.14)			
1521	Showa Chemical and Fertilizer Plant	Local importance	35°08'N 140°16'E	-

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17)			
80	Niigata Sulphuric Acid Co	Large, new, built by U. S. technicians	35°29'N 139°40'E	N A
134	Asahi Glass Co (Yokohama)	Glass products of all kinds	35°29'N 139°41'E	"
137	Showa Fertilizer (Kawasaki)	Vital importance; one of largest in Empire	35°30'N 139°44'E	"
204	Japan Artificial Fertilizer #1	Rptd expanded; caustic soda, chlorine by-products	35°45'N 139°45'E	"
479	Japan Artificial Fertilizer	Important; nitrogen fixation, other chemicals	35°30'N 139°42'E	"
481	Tokyo Gas, Tsurumi branch	Most important branch Tokyo Gas Co	35°30'N 139°42'E	"
499	Nippon Carbon Co (Yokohama)	Largest unit principal Jap producer carbon electrodes	35°29'N 139°39'E	"
907	Tokyo Gas, Sunamachi branch	Smaller branch plant	35°41'N 139°48'E	"
1396	Tsurumi Soda Co (Yokohama)	New, probably enlarged; by-product chlorine	35°29'N 139°41'E	"
1397	Japan Refining Works (Tokyo)	General chemicals	35°41'N 139°51'E	"
1398	Tokyo Gas, Omori branch	Large coking capacity	35°34'N 139°45'E	"
1399	Hodogaya Soda (Yokohama)	Rptd one of important chemical targets in Empire	35°27'N 139°36'E	"
1400	Hodogaya Soda (Tokyo)	Branch of #1399	35°45'N 139°44'E	"
1401	Japan Artificial Fertilizer #2	Branch of #204	35°41'N 139°51'E	"
	NAGOYA (90.20)			
253	Japan Artificial Fertilizer Co	Nitric acid, possibly direct munitions	35°05'N 136°52'E	194
255	Yahagi Electro-Chemical Plant	Nitric acid, rptd light-metal alloys	35°05'N 136°54'E	194
466	Tokai Soda Co	Secondary, caustic soda, etc	35°05'N 136°54'E	194
467	Showa Soda Co	Caustic soda, liquid chlorine, etc	35°05'N 136°52'E	194
	KYOTO (90.23)			
1163	Asahi Bemberg Co	Large production rayon	34°59'N 135°54'E	1163
1164	Toyo Rayon Co, Otsu plant	Same	34°59'N 135°54'E	1163
1165	Toyo Rayon Co, Seta plant	Same	34°59'N 135°55'E	1163
1166	Japan Rayon Co	Same	34°53'N 135°49'E	-

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	OSAKA (90.25)			
15	Kaneyama Chemical Works	More data required	34°42'N 135°12'E	5
383	Dia Nippon Celluloid Factory	Rptd large producer explosives	34°36'N 135°29'E	325
547	Nihon Glycerine Factory	More data required	34°43'N 135°27'E	695
587	Kobe Acetic Acid Co	More data required	34°43'N 135°27'E	695
591	Lto Acid Factory	Same	34°42'N 135°27'E	695
615	Sulphuric Acid Plant	Same	34°38'N 135°28'E	325
625	Aoki Chemical Works	Same	34°41'N 135°28'E	263
642	Osaka Glycerine Co	Same	34°41'N 135°32'E	382
647	Sumitomo Chemical Industry	Important; ammonia and phosphate	34°41'N 135°30'E	661
785	Sakafuchi Soda & Magnesium Factory	More data required	34°39'N 135°10'E	10
787	Asahi Carbonic Acid Gas Works	Same	34°40'N 135°10'E	10
1199	Taiwan Sugar Refinery	Important; sugar and alcohol	34°39'N 135°10'E	10
1200	Meiji Sugar Refinery	Sugar & alcohol	34°39'N 135°10'E	10
1201	Mitsui Chemical Co	More data required	34°42'N 135°26'E	536
1202	Amagasaki Chemical Industrial Works	Same	34°42'N 135°26'E	536
598	Nippon Dyestuffs (Osaka)	Large intermediates mfg. - converted to explosives	34°40'N 125°27'E	N A
	OKAYAMA (90.27)			
1280	Nissan Chemical Co	Large capacity chemicalplant	34°36'N 134°02'E	1280
1281	Dai Nippon Celluloid (Aboshi)	Primary; celluloid, explosives, plastics, glass	34°47'N 134°36'E	1290
1282	Kimura Chemical Co (Sakoshi)	Large unit of one of largest drug companies	34°45'N 134°26'E	1296
1298	Nippon Sulphur (Innushimo Refinery)	Important solvent production	34°34'N 134°07'E	1298
1305	Himeji Poison Gas Factory	Rptd one of largest in Japan	34°50'N 134°42'E	1291
	KOCHI (90.28)			
1525	Nankai Chemical Plant (Kochi)	Small; sulphuric acid & caustic soda	33°32'N 133°33'E	1524

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	NIIHAMA (90.29)			
923	Sumitomo Chemical Co	Large; nitrates, ammonia, explosives	33°58'N 133°16'E	923
	TOKUYAMA (90.32)			
675	Toyo Soda Co (Corrected name)	Rptd largest caustic soda producer	34°03'N 131°48'E	673
818	Ube Nitrogen Fertilizer Co	Large plant	33°55'N 131°16'E	818
819	Dai Nihon Artificial Fertiliser Co(Onoda)	Large plant	34°00'N 131°11'E	819
1537	*Tokuyama Soda Co	Very large soda ash production	34°03'N 131°48'E	N A
	KYUSHU EAST (90.33)			
1313	Ohgi Fertiliser Co	Minor producer fertilisers	33°16'N 131°30'E	-
1314	Asahi Bemberg, Cuprammonium plant	Center of very important chemical works	32°34'N 131°40'E	1311
1315	Asahi Bemberg, Viscose plant	Large rayon plant	32°34'N 131°40'E	1311
1316	Hiji Plant, Hodogaya Industrial Co	Secondary producer industrial chemicals	33°22'N 131°32'E	1316
1317	Nippon Dye Works	Secondary production of poison gas materials	33°14'N 131°42'E	1317
1318	Katakura Cereal Fertiliser Co	Secondary production fertilizers	33°14'N 131°36'E	1329
	SHIMONOSEKI (90.34)			
100	Nihon Fertilizer, Hiko I Plant	Minor	33°55'N 130°55'E	43a
177	Osaka Soda Works (Kokura)	Secondary	33°53'N 130°52'E	168
180	Kyushu Chemical Wks, Kokura Plant	No details	33°53'N 130°52'E	168
567	Asahi Glass Co (Tobata)	Very large glass and soda plant	33°53'N 130°49'E	28
569	Kyushu Chemical Wks, Yawata Plant	No details	33°53'N 130°49'E	28
1113	Nihon Fertilizer, Kurosaki Plant	Important; fertiliser & war chemicals	33°52'N 130°46'E	1113
1115	Kyushu Soda Co (Kokura)	Secondary	33°53'N 130°52'E	168
1122	Japan Industrial Co	Secondary producer welding equipment, chemicals	33°53'N 130°53'E	168

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURUME (90.35)			
1243	Miike Dyestuffs (Omuta)	Very important chemical works	33°02'N 130°27'E	1243
1244	Oriental High Tension, Plant A	Chemicals for explosives & fertilizers	33°02'N 130°27'E	1243
1245	Oriental High Tension, Plant B	Chemicals for explosives & fertilizers	33°02'N 130°26'E	1243
1246	Electro-Chemical Industry	Large output chemicals, fertilizers	33°02'N 130°26'E	1243
	YATSUSHIRO (90.37) KYUSHU SO (90.38)			
1386	Japan Nitrogen Fertilizer (Minamata)	Important; nitrogen fixation, acids, ammonia	32°12'N 130°24'E	-
1387	Nissan Chemical (Kagami Plant)	Gunpowder, plastics, rptd medium size	32°14'N 130°28'E	-
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
42	Taiwan Hiryo K K	Sulphuric acid, nitrogen	25°08'N 121°43'E	-
43	Sulphuric Acid Plant	Secondary	25°07'N 121°49'E	43
44	Cyanide Plant	Secondary	25°07'N 121°51'E	44
45	Taihoku Camphor Monopoly Plant	Secondary	25°03'N 121°31'E	47
46	Taihoku Plant, Taiwan Sugar Refinery	Alcohol, sugar	25°02'N 121°30'E	28
	TAIWAN WEST (91.4)			
87	Carbon Black Plant (Kinsui)	Important; rptd 25% Jap requirements	24°37'N 120°53'E	86
88	Taiwan Chemical Co (Kinsui)	Reported important	24°37'N 120°53'E	86
89	Tainan Salt Wks	Important	22°56'N 120°08'E	112
102	Kagi Alcohol Plant	Large alcohol & butanol production	23°29'N 120°26'E	102
103	Taichu Alcohol Plant	Large alcohol & butanol production	24°08'N 120°42'E	103
104	Kobi Sugar & Alcohol, Plants #1, #2	Large plants	23°42'N 120°26'E	104
107	Mato Sugar & Alcohol Plant	Secondary	23°11'N 120°16'E	-

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAIWAN EAST (91.5)			
72	Taroko Electro-Chemical Co	Fertilizers	23°59'N 121°36'E	66
	TAKAO (91.6)			
2	Chemical Fertilizer Plant (Takao)	Fertilizers, probably war chemicals	22°38'N 120°17'E	2
6	Industrial Alcohol Plant (Takao)	Rptd one of largest such plants in Taiwan	22°37'N 120°17'E	8a
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
33	No Chosen Paper Mfg & Chemical Ind	Medium sized rayon pulp mill	40°58'N 129°20'E	33
34	Japan Magnesite Chemical Ind Co	Manganese, stainless steel, cobalt	40°41'N 129°13'E	-
	KONAN (84.2)			
1	Chosen Nitrogen Fertilizer Co	Rptd largest chemical plant, one of most important industrial targets in Empire; nitrates, explosives, aluminum, magnesium	39°50'N 127°38'E	1
2	Chosen Nitrogen Gunpowder Factory	Large, branch of #1	39°49'N 127°35'E	1
3	Motomiya Fertilizer Factory	Large, branch of #1	39°50'N 127°35'E	1
	HEIJO (84.3)			
59	Chosen Chemical Industry Co	Large, new, nitrogen fixation	39°25'N 125°57'E	59

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TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
59	Manchu Mine Explosives Co	Black powder, nitro-cellulose, etc	40°10'N 124°20'E	72
60	Manchuria Electro-Chemical Co, Kirin	Important; acetic acid, carbide, etc	43°50'N 126°35'E	58
	MUKDEN (93.3)			
62	S.M.R. Sulphuric Acid Plant	More data required	41°51'N 123°54'E	32
	DAIREN (93.5)			
18	South Manchuria Gas Wks	More data required	38°56'N 121°38'E	1
19	Manchuria Chemical Industry Co	Rptd most important chemical plant in Manchukuo	38°58'N 121°37'E	1
20	Manchuria Soda Co	Important	38°58'N 121°37'E	1
	CHINA (83)			
	TIENTSIN (83.12)			
8	Yung Li Alkali Plant (Tangku)	Soda ash, ammonia; important for area	39°01'N 117°40'E	4
	FRENCH INDO-CHINA (85)			
	FRENCH INDO-CHINA NO (85.1)			
17	Haiphong Chemical Plant	Believed small	20°52'N 106°40'E	N A

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TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	FRENCH INDO-CHINA NO (85.1)(Continued)			
18	Haiphong Phosphate Plant	Produces for export and local fertilizer needs	20°52'N 106°40'E	N A
19	Hanoi Alcohol Distillery	Converts rice into motor fuel used in Indo-China	21°01'N 105°52'E	"
20	Haiduong Alcohol Distillery	Same	20°57'N 106°20'E	"
21	Namdinh Alcohol Distillery	Same	20°25'N 106°10'E	"
22	Thanh Hoa Alcohol Distillery	Under construction 1941; believed large	19°55'N 105°47'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
5	Thai Industries (Bangkok)	Rptd manufacturing industrial chemicals	13°41'N 100°30'E	26
	NETHERLANDS EAST INDIES (94)			
	JAVA (94.3)			
159	Bandung Quinine Factory	Important; 3,600,000 ounces per month	06°54'S 107°36'E	159
160	Tjibodas Sulphur Factory	Rptd important, no details	07°07'S 107°26'E	160
161	Kalianget Salt Factory	Secondary	07°03'S 113°56'E	156
162	Krampon Salt Factory	Secondary	07°10'S 113°15'E	162

* New Target to be included in Vulcan revision
N A No number yet assigned when this list prepared

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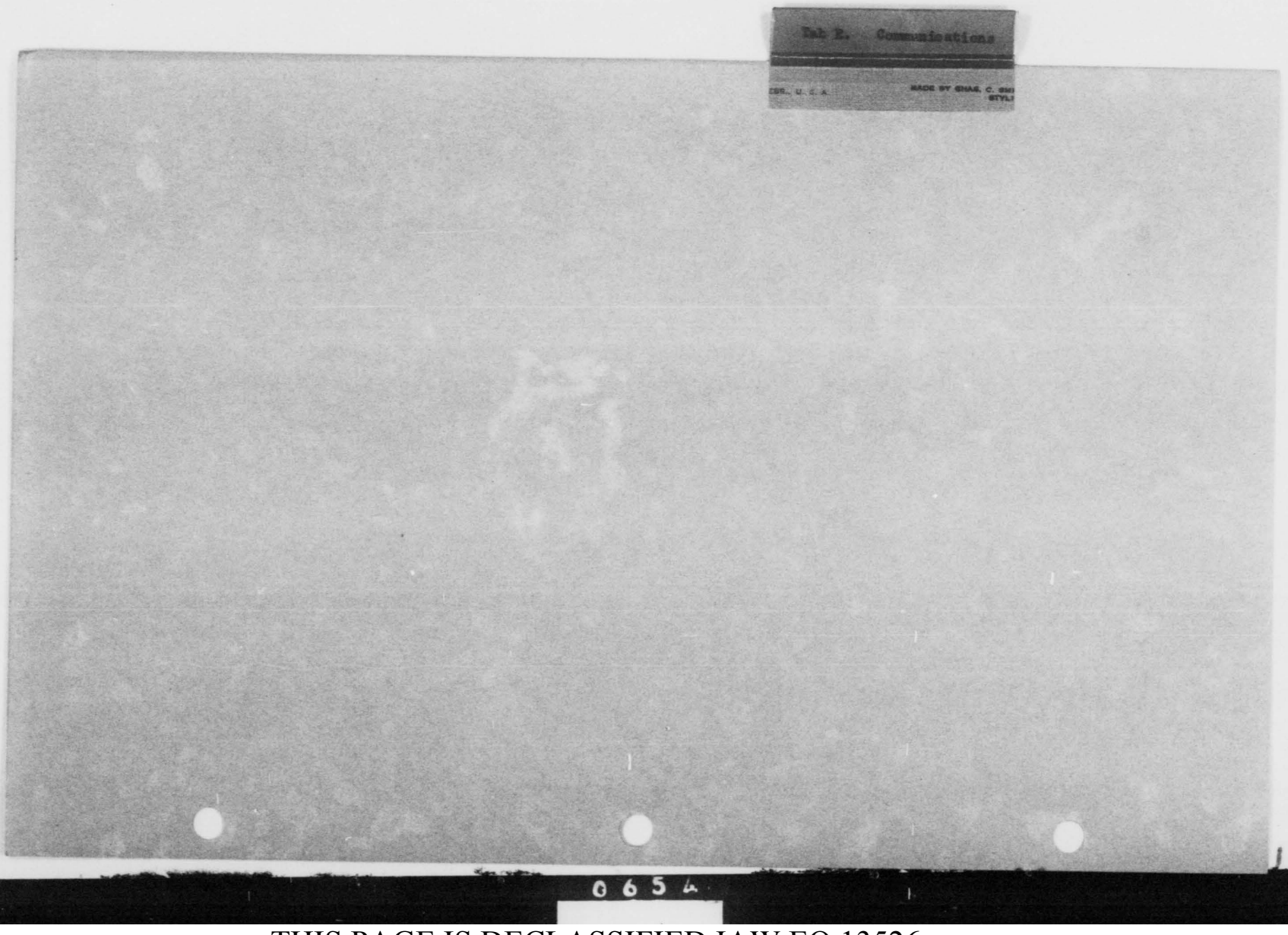

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March 1943

COMMUNICATIONS

KEY TARGETS					Miles radius from Wan An (inclusive)						
	TARGET										
	No.	Name	Importance	Obj. Area	500	600	700	800	900	1000	1100
1	497	Plant #1 of Nippon Elec Co	One of 5 most imp comm fctys. in Japan	Tokyo (90.17)						X	
2	326	Plant #2 of Nippon Elec Co	"	Tokyo (90.17)						X	
3	496	Plant #1 of Tokyo-Shibaura Electric	"	Tokyo (90.17)						X	
4	488	Plant #2 of Tokyo-Shibaura Electric	"	Tokyo (90.17)						X	
5	888	Plant #1 of Oki Electric Co	"	Tokyo (90.17)						X	
6	826	Fujikura Elec. Cable Works	One of largest cable producers	Tokyo (90.17)						X	
7	75	Furukawa Elec.	One of largest cable producers	Tokyo (90.17)						X	
8	1418	Marunouchi Telephone Exchange	Vital telephone, telegraph JC.	Tokyo (90.17)						X	

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943

COMMUNICATIONS

CHINA BASED OPERATIONS

No key communications targets are within a 1500-mile radius from Nanan operations base.

A 1750-mile radius includes 5 key communications factories of Nippon Electric, Tokyo-Shibaura Electric and Oki Electric companies manufacturing 95 percent of all radio equipment and 75-85 percent of all telephone and telegraph equipment exclusive of cables; the Furukawa Electric Company, one of Japan's two or three largest communications cable producers; Fujikura Electric, another important cable works; the vital Marunouchi Telephone Exchange of Tokyo housing domestic and international communications lines.

Destruction of these key targets would be certain to disrupt seriously Japan's communications network. The effect would be increasing and cumulative as need for replacement and repair of radio stations, telegraph and telephone lines became necessary due to war strain.

Four key targets in the Non-Ferrous Metals section accounting for 55 percent of known Japanese copper production are of importance to communications. These plants, Ashio Copper (Mill and Refinery) with 10 percent; Shisakijima Copper Smelter, with 15 percent; Niihama Copper Concentration Mill and Sumitomo Copper Concentration Mill, also with 15 percent, are all within a 1750-mile radius.

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COMMUNICATIONS

Japanese communications (telephone, telegraph, radio, etc.) have been badly strained by war. Without them coordination and direction of the military effort would be impossible. For this reason all were classified as vital to national defense and "Secret". Since 1940 the Ministry of Communications has restricted new telephone installations to companies and factories engaged in work of value to the Army or Navy. There was a 20 percent increase in the number of telegraph messages sent during the three years before 1940 which made Japan second only to the United States in number of messages handled, although the nation's telegraph facilities are far less adequate or extensive than those of England, France or Germany. This increase lowered efficiency of operations considerably.

Great stress has been placed on the development of radio communications to supplement other types and to link the telegraph networks of Japan proper, China, Chosen (Korea) and other occupied territories. Radio broadcasting stations have been located throughout Japan so that every region is served by at least one. All major stations are connected by permanent relay lines to make possible synchronized broadcasting of a single program simultaneously, or alternate broadcasting (shifting a program from station to station to confuse enemy monitors).

Dispersal and multiplicity of Japan's communications installations (like those of other nations) makes them poor bombardment targets. Destruction of key central offices, transmitters and other equipment of one type of communications still leaves other channels open, particularly radio. All towns of Japan having any strategic value or industrial significance possess one or more wireless stations; telegraph and telephone connections with other centers.

However, sources of equipment, supply and replacement are restricted and vulnerable. This is because Japan depended on foreign sources to a large extent for communications equipment until the past decade. Loading coils, telephone cable and other equipment used in building the main Tokyo-Kobe telephone line (finished 1928) were imported from the United States. Much of the facilities of Japanese radio broadcasting stations came from Germany and the United States.

Approximately 95 percent of Japan's finished radio equipment and 75-85 percent of all finished telephone equipment came from the five factories of three companies; Nippon Electric, Tokyo Electric and Oki Electric, in or near Tokyo, where the greatest concentration of telephone and telegraph lines in Japan is found in the Marunouchi Exchange. Japan's maximum production capacity of copper, 145,000 metric tons annually, is 45,000 tons below the estimated minimum needs, and 55 percent of the total output is concentrated in four plants, a further vulnerability. (See Non-Ferrous Metals). Demands of the Army and Navy for technicians and communications specialists is reported to have taken large numbers from industry for work in the field. Efforts have been made to train Japanese soldiers blinded in the China war as communications operators. Because of this, the chances appear to be against Japan's having been able to carry out a decentralization of the communications supply industry to safer and more widely separated areas since Pearl Harbor.

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
944	Toyohara Radio Station	Fixed Station	46°58'N 142°44'E	967
945	Radio Sta Nishi Notoro Point	Direction Finder Station	45°54'N 142°05'E	945
946	Esutoru Radio Station	Ship Station Service	49°04'N 142°03'E	973
947	Radio Station at Esutoru	Fixed Station	49°04'N 142°03'E	973
948	Radio Broadcasting Sta (Toyohara)	Local importance	-	967
949	Otomari Radio Station	Fixed station	46°37'N 142°47'E	966
950	Radio Station at Otomari	Ship Station Service	46°37'N 142°47'E	966
	FUKUSHIMA (90.10)			
1086	Haranomachi Transmitting Station	No details	37°41'N 140°59'E	1086
1087	Tomioka Short Wave Transmitting Sta	No details	37°20'N 141°01'E	1087
	TOKYO (90.17)			
75	Furukawa Electric Co Plant #1	Important production telephone-telegraph wire,accessories	35°27'N 139°37'E	N A
109	Oki Electric Plant #2	Former main plant	35°30'N 139°42'E	"
132	Kawasaki Naval Wireless Station	No details	35°34'N 139°38'E	"
136	Fuji Electric Works (Kawasaki)	High Tension power equipment	35°30'N 139°42'E	"
326	Nippon Electric Co, Factory #2	With #497 largest communications equipment mfr	35°39'N 139°45'E	"
363	Radio Station JOAK (Tokyo)	Japan's main broadcasting station	35°40'N 139°45'E	"
484	Shows Wire & Cable (Kawasaki)	More data required	35°32'N 139°43'E	"

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JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART No
488	Tokyo Shibaura Elec Co, Fcty #2	Major radio-telephone equipment plant	35°32'N 139°42'E	N A
489	Nippon Elec W & C (Yokohama)	Important wire & cable plant	35°32'N 139°42'E	"
494	Tokyo Elec Wire & Mfg Co	Important manufacturer copper & brass wire	35°31'N 139°42'E	"
496	Tokyo Shibaura Elec Co, Fcty #1	Major radio-telephone equipment plant	35°32'N 139°42'E	"
497	Nippon Elec Co, Fcty #1	With #326 largest communications equipment mfr	35°34'N 139°40'E	"
523	Japan Radio & Phonograph(Yokohama)	Converted to war communications	35°29'N 139°39'E	"
551	Meidensha Elec Equipmt Co,Plant #1	Special importance; rptd making aircraft detection equipment	35°37'N 139°44'E	"
826	Fujikura Electric Cable Wks	Large & important production communications equipment	35°40'N 139°48'E	"
888	Oki Electric Co, Plant #1	Large electrical & communications equipment firm	35°38'N 139°45'E	"
889	Nippon Elec Co, Plant #3	Specializes in Navy work	35°38'N 139°45'E	"
1418	Marunouchi Telephone Exch (Tokyo)	Principal Tokyo exchange, jc all domestic & cable telegraph	35°41'N 139°46'E	"
1419	Navy Dept Wireless Towers (Tokyo)	Receives messages from ships at sea	35°40'N 139°45'E	"
1420	Funabashi Naval Transmitting Sta	Transmitter to ships at sea	35°41'N 140°00'E	"
1421	Meidensha Elec.Equipmt,Plant #2	Transformers, electrical machinery	35°33'N 139°46'E	"
1422	Komuro Radio T'phone Sta (Tokyo)	Important receiving station	35°58'N 139°38'E	"
1423	Fukuoka Wireless Sta (Tokyo)	Important station	35°53'N 139°31'E	"
1424	Central Meterolg.Observatory(Tokyo)	Important; military weather information	35°39'N 139°45'E	"
1425	Iwatsuki Wireless Sta (Tokyo)	Important to shipping	35°57'N 139°41'E	"
1428	Yokohama Telephone Exchange #1	Largest in Yokohama	35°27'N 139°39'E	"
1429	Odawara Telephone Repeater Sta	Vulnerable point on Tokyo-Kobe telephone cable	35°15'N 139°20'E	"
1430	Nippon Elec Wire & Cable (Tokyo)	Important copper wire manufacturer	35°43'N 139°49'E	"
	NAGOYA (90,20)			
1151	Yosami Transmitting Station	Short-wave to Europe	34°58'N 137°01'E	1137
1152	Yokkaichi Receiving Station	Short-wave receiving from Europe	34°59'N 136°38'E	1152

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JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SASEBO (90.36)			
857	Radio JOAG (Nagasaki)	Minor importance	32°44'N 129°53'E	542
858	Nagasaki Post & Telegraph Of.(Nagasaki)	Minor importance	32°44'N 129°53'E	542
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.2)			
19	Keelung Wireless Station	Substantial station	25°08'N 121°45'E	15a
49	Tansui Wireless Station	Major receiving station for area	25°11'N 121°25'E	49
50	Itahashi Wireless Station	Rptd most important station in area	25°01'N 121°27'E	50
	TAIWAN WEST (91.4)			
116	Shinchiku Radio Station	No details	24°47'N 120°52'E	-
117	Kagi Radio Station	No details	23°28'N 120°12'E	-
118	Tainan Radio Station	No details	23°00'N 120°12'E	-
	TAIWAN EAST (91.5)			
79	Garambi Wireless Station	Key Station	21°56'N 120°49'E	79
80	Karenko Wireless Station	Secondary	23°59'N 121°36'E	66
	TAKAO (91.6)			
60	Hozan Wireless Telegraph Sta	Rptd one of most powerful in Empire	22°52'N 120°29'E	58

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JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
27	Seishin Wireless Station	Large	41°47'N 129°49'E	13
	HEIJO (84.2)			
83	Heijo Radio Station	Important in area	38°59'N 125°45'E	71
84	Chinnampo Radio Station	Important in area	38°43'N 125°24'E	76
	KEIJO (84.6)			
47	Getsubi Radio Station	At Jinsen Harbor	37°28'N 126°37'E	44
	FUSAN (84.7)			
96	Chinkai Radio Station	Links Chinkai, Sasebo & Kure naval bases	35°09'N 128°38'E	101
	THAILAND (98)			
	THAILAND (98.1, 98.2, 98.3)			
33	General Post Office (Bangkok)	Main wire communications center Thailand	13°44'N 100°31'E	26
34	Saladeng Radio Station	Rptd most powerful station Thailand	13°43'N 100°33'E	26
35	Phya Thai Radio Station	Important	13°46'N 100°32'E	37
36	Lak Sri Short Wave Radio Station	Used by Don Muang Airfield	13°53'N 100°35'E	6

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JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NETHERLANDS EAST INDIES (94)			
	SUMATRA SOUTH (94.2)			
71	Muntok Telephone Station	-	2°04'S 105°10'E	57
74	Palembang Radio Station	-	3°01'S 104°45'E	53a
75	Palembang Telephone Exchange	-	2°59'S 104°46'E	75
	JAVA (94.3)			
165	Malabar Radio Station	Powerful overseas transmitter	7°07'S 107°37'E	165
166	Batavia Telephone Exchange	-	6°10'S 106°50'E	166
167	Tandjong Priok Radio Station	More data required	6°06'S 106°53'E	177
168	Surabaya Telephone Exchange	-	7°14'S 112°45'E	174
169	Bandung Telephone Exchange	-	6°55'S 107°37'E	159
170	Bandung Radio Station	More data required	6°55'S 107°38'E	159
	CELEBES-TIMOR (94.5)			
202	Macassar Radio Station	-	5°08'S 119°24'E	202
203	Macassar Telephone Exchange	-	5°08'S 119°24'E	202

* New Target to be included in Folder revision

NA No number yet assigned when this list prepared

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Tab F. Electric Power

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March 1943 ELECTRIC POWER

KEY TARGETS					Miles radius from Warsan (inclusive)						
	TARGET										
	No.	Name	Importance	Obj. Area	500	750	1000	1250	1500	1750	over
1	110	Tokyo Elec Pr Gen Station, Tsurumi Plant	178,000* Kw	Tokyo (90.17)						X	
2	230	Senju Steam Pr Station	77,000 Kw	Tokyo (90.17)						X	
3	493	Tokyo Steam Pr Plant	70,000* Kw	Tokyo (90.17)						X	
4	111	Kawasaki Elec Pr Pl for Govt Railways	30,000* Kw	Tokyo (90.17)						X	
5	213	Kinugawa Steam Pr Station	35,000 Kw	Tokyo (90.17)						X	
6	1345	Tokyo Municipality Steam Pr Plant	30,000 Kw	Tokyo (90.17)						X	
7	228	Govt Steam Pr Station	25,000 Kw	Tokyo (90.17)						X	
8	63	Kanagawa Steam Power Plant	21,500 Kw	Tokyo (90.17)						X	
9	540	Kansai Kyoto Steam Pr Plant	118,000 Kw	Osaka (90.25)					X		
10	536	Amagasaki Steam Power Plant	300,000 Kw	Osaka (90.25)					X		
11	195	Nagoya Steam Pr Plant	109,000 Kw	Nagoya (90.30)					X		
12	325	Kiryu-gawa Steam Power Plant	100,000 Kw	Osaka (90.25)					X		
13	323	Kasumigaseki #2 Steam Plant	65,000 Kw	Osaka (90.25)					X		
14	1283	Senyo Pr Plant, Shikama	55,000 Kw	Kitakyushu (90.47)					X		
15	322	Kasumigaseki #1 Steam Plant	50,000 Kw	Osaka (90.25)					X		
16	1158	Kyoto Steam Pl	50,000 Kw	Kyoto (90.23)					X		

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

*Probably much larger; principal plants in 1,000,000 KW capacity on Harbor Front.

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March 1943 ELECTRIC POWER

KEY TARGETS					Miles radius from Wanan (inclusive)						
	TARGET										
	No.	Name	Importance	Obj. Area	500	750	1000	1250	1500	1750	over
17	324	Fusunkl Steam Power Plant	40,000 Kw	Dairen (94.8)					X		
18	4	Hinatowwe Steam Pr Plant	38,160 Kw	Dairen (94.8)					X		
19	55	Hydro Elec Pr Plant, Kirin	360,000 Kw	Manchukuo East (93.2)					X		
20	35	Taikanton Steam Pr Pl #2	150,000 Kw	Mukden (90.3)				X			
21	37	Steam Pr Plant, Showa Steel Works	80,000 Kw	Mukden (90.3)				X			
22	36	Taikanton Steam Pr Pl #1	50,000 Kw	Mukden (90.3)				X			
23	38	Pensihu Steam Power Plant	50,000 Kw	Mukden (93.3)				X			
24	56	Hydro Elec Pr Pl, Suihodo	100,000 Kw**	Manchukuo East (93.2)				X			
25	8	Fusan Hydro Elec Plant #1	120,000 Kw	Dairen (94.8)			X				
26	35	Hatto Harbor Steam Plant	38,000 Kw	Taiholu (91.8)	X						
27	159	Large Steam Pl, Takao	25,000 Kw	Taipo (91.8)	X						
28	82	Jitsuyetsutan Pr Plant, #1	100,000 Kw	Taiwan West (91.4)	X						
29	83	Jitsuyetsutan Pr Plant, #2	50,000 Kw	Taiwan West (91.4)	X						

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

**Capacity of Plant--400,000 Kw(1/3 for Manchukuo - 2/3 for Japan) AT-1382

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ELECTRIC POWER

CHINA BASED OPERATIONS

A 500-mile radius from Wanan operations base, as shown on the preceding table, includes 4 key targets in Taiwan. These four key targets account for approximately 60% of Taiwan's total electric generating capacity. Their destruction would practically stop further industrial production in Taiwan.

A 1000-mile radius includes 5 key targets: 4 in Taiwan and 1 in Manchukuo which supplies 80% of the electric power to Dairen.

A 1250-mile radius includes 10 key targets: 4 in Taiwan and 6 in Manchukuo. Most of the principal targets in Northern Kyushu and Southwestern Honshu also fall within this radius. The destruction of the 6 key targets in Manchukuo would reduce war production in Manchukuo by approximately 70%.

A 1500-mile radius includes 21 key targets: 4 in Taiwan, 7 in Manchukuo and 10 in the Osaka Supply Area, Central Honshu. The principal targets in Chosen, Northern Kyushu and Southwestern Honshu and some of the principal targets in the Osaka Supply Area, also fall within this radius. The destruction of the 10 key targets in the Osaka Supply Area would seriously affect war production, especially during the dry season.

A 1750-mile radius includes 29 key targets: 4 in Taiwan, 7 in Manchukuo, 10 in the Osaka Supply Area, Central Honshu, and 8 in the Tokyo Supply Area, Central Honshu. All of the principal targets in the Tokyo Supply Area, Osaka Supply Area, Northern Kyushu and Southwestern Honshu, and Chosen, also fall within this radius. The destruction of the 8 key targets in the Tokyo Supply Area would seriously affect war production, especially during the dry season.

The significance of these key targets in relation to the Japanese war effort as a whole is indicated in the summary following.

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E L E C T R I C P O W E R

The Japanese war effort is dependent upon the availability of electric power. No other industrial factor is so basic. The manufacture of end products such as planes, tanks, guns, ships, etc. all depend on electric power. The basic industries -- iron and steel, aluminum and other non-ferrous metals, fixed nitrogen and considerable transportation -- are likewise dependent on electric power. Without this essential commodity the Japanese war economy would collapse.

The total installed generating capacity in Japan proper, Manchukuo, Chosen (Korea), and Taiwan (Formosa) is approximately 17 million kilowatts. This capacity is comprised of 9,300,000 Kw hydro and 7,700,000 Kw steam. Of the total capacity, Japan proper has 13,200,000 Kw, Manchukuo has 1,400,000 Kw, Chosen has 2,000,000 Kw, and Taiwan has 400,000 Kw. Approximately 65 billion kilowatt hours will be produced. On the basis of estimated requirements of the basic industries, this amount of electric energy will be sufficient to meet the needs of war production and rationed civilian uses.

Japanese electric power, as outlined in the above paragraph, is divided into four distinct groups on the basis of geographical location. (1) Taiwan, (2) Manchukuo, (3) Chosen, (4) Japan proper. Each of these four groups must be analyzed as a separate and distinct entity in order to indicate the scope of air attack required, and the effects of such bombings on the total war effort.

(Note: The generating capacity percentage figures used in the following paragraphs are based on installed capacity.)

1. TAIWAN.--Four power plants account for approximately 60% of the total electric generating capacity of Taiwan. These plants are: Jitsugetsutan Power Plant #1 (Target 82), Jitsugetsutan Power Plant #2 (Target 83), Hatto Harbor Steam Plant (Target 35), and the large steam plant at Takao (Target 159). The two Jitsugetsutan plants constitute the principal source of electric energy in Taiwan, supplying power to the northern, southern and western areas. The two steam plants are auxiliary stations. The destruction of the two Jitsugetsutan plants would reduce considerably Taiwan's economic contribution to the Japanese war effort and the destruction of all four plants would practically stop Taiwan industrial production.

2. MANCHUKUO.--Seven power plants account for approximately 63% of the total electric generating capacity of Manchukuo. These plants are Hydro Electric Power Plant, Kirin (Target 55); Hydro Electric Power Plant, Suihodo (Target 56)--1/3 of capacity goes to Manchukuo and 2/3 to Chosen; Taikanton Steam Power Plant #1 (Target 36); Taikanton Steam Power Plant #2 (Target 35); Steam Power Plant Showa Steel Works (Target 37); Penhsihu Steam Power Plant (Target 38); Steam Power Plant, Kanseishi (Target 8). These plants are located in the key industrial areas of southern Manchukuo and the destruction of any one of them would result in a loss of war production. The cumulative effect of destroying all seven of these plants would reduce Manchukuo's industrial contribution to the Japanese war effort by at least 80%.

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3. CHOSEN.—Nine of ten hydro power plants account for 60% of the total hydro generating capacity and 45% of all the electric generating capacity of Chosen. These plants are Chosin Hydro-Electric Plant #1 (Target 4), Chosin Hydro-Electric Plant #2 (Target 5), Chosin Hydro-Electric Plant #3 (Target 6), Chosin Hydro-Electric Plant #4 (Target 7), Fusen Hydro-Electric Plant #1 (Target 8), Fusen Hydro-Electric Plant #2 (Target 9), Hydro-Electric Power Plant, Suihodo (Target 56) — 2/3 of capacity goes to Chosen and 1/3 to Manchukuo. The other two or three plants are located on the Kyosen River about 35 miles airline ENE from Fusen Reservoir dam and aggregate 220,000 Kw. These plants have not been assigned target numbers or described in the Objective Folders. With the exception of the plant at Suihodo on the Yalu River, these plants are located in the mountainous region north of Konan. The power plants outlined above form the basic source of electric energy in Chosen. The destruction of these plants would reduce war production in Chosen by 65% to 75%.

4. JAPAN PROPER.--Japan proper includes the islands of Hokkaido, Honshu, Shikoku, Kyushu, and Karafuto (the southern part of Saghalien Island). Approximately 75% of the war production in Japan proper is concentrated in Central Honshu, the industrial triangle which includes the Tokyo, Osaka and Nagoya industrial areas. Approximately 20% of the war production in Japan proper is concentrated in northern Kyushu and southwestern Honshu. The remaining 5% is accounted for by Karafuto, Hokkaido, Northern Honshu and Shikoku. Therefore, this survey of the electric power industry of Japan proper is confined to the two principal areas: (A) Central Honshu, (B) Northern Kyusnu and Southwestern Honshu.

A. Central Honshu.--9,401,000 Kw or 71% of the generating capacity of Japan proper is located in Central Honshu. Hydro plants account for 5,301,000 Kw and Steam plants account for 4,100,000 Kw. Central Honshu is divided into two power supply areas: Tokyo Supply area and Osaka-Nagoya Supply area. The Tokyo area operates on a frequency of 50 cycles. The Osaka-Nagoya area operates on a frequency of 60 cycles. This difference in frequency is a barrier to the complete integration of the power facilities of Central Honshu. Under these conditions the power supply of one area could be completely disrupted without affecting the power available to the other area.

(1) Tokyo Supply Area. There is 5,304,000 Kw generating capacity in the Tokyo area, 3,104,000 hydro and 2,200,000 steam. Twenty-six plants account for 42.2% of the hydro generating capacity in the area and 24.7% of the total generating capacity in the area. Nine steam plants account for 69.4% of the steam power generating capacity in the area and 28.8% of the total generating capacity. Therefore, 35 plants account for 53.5% of the total generating capacity in the Tokyo Supply area. See Table "Principal Targets, Electric Power Industry" for the listing of these plants. If only the 9 steam plants were destroyed, production would be reduced by 40% during the dry months of January-February and August and by 20% during the other months of the year. If only the 26 hydro plants were destroyed, production would be reduced by 30% during the dry season and by 60% during the remainder of the year. The destruction of all 35 plants would reduce Tokyo Supply area power for war production from 75% to 80%.

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(2) Osaka-Nagoya Supply Area. There is 4,097,000 kw generating capacity in the Osaka-Nagoya area, 2,197,000 hydro and 1,900,000 steam. Twenty-five plants account for 47.9% of the hydro generating capacity in the area and 25.7% of the total generating capacity in the area. Fifteen plants account for 74.0% of the steam power generating capacity in the area and 34.3% of the total generating capacity. Therefore, 40 plants account for 60.0% of the total generating capacity in the Osaka Supply area. See Table "Principal Targets, Electric Power Industry" for the listing of these plants. If only the 15 steam plants were destroyed, production would be reduced by 60% during the dry months of January-February and August and by 25% during the other months of the year. If only the 25 hydro plants were destroyed, production would be reduced by 20% during the dry season and by 60% during the remainder of the year. The destruction of all 40 plants would reduce Osaka Supply area power for war production from 80% to 85%.

By destroying 24 steam plants the production of Central Honshu would be reduced by 50% during the dry months, January-February and August, and by 23% during the other months of the year. The destruction of 51 hydro plants would reduce war production by 25% during the dry season and by 60% during the remainder of the year. If all 75 selected plants were destroyed, power available for war production in Central Honshu would be reduced from 75% to 83%.

B. Northern Kyushu and Southwestern Honshu.--2,601,000 or 20% of the generating capacity of Japan proper is located in this area. Steam plants account for 1,801,000 Kw and hydro plants account for 800,000 Kw. 52.2% of the steam generating capacity is accounted for by 17 steam plants and 34.6% of the hydro capacity is accounted for by 9 hydro plants. These 26 plants account for 46.7% of the total generating capacity in the area. See Table "Principal Targets, Electric Power Industry" for the listing of these plants. The destruction of the 17 steam plants would reduce production in the area by 45%. The destruction of the 9 hydro plants would reduce production in the area from 15% to 20%. Power for war production would be reduced from 60% to 65% if all 26 selected plants were destroyed.

There are over 2,000 steam and hydro plants in Japan proper of 1,000 Kw capacity or more. Out of this number 101 power plants have been selected as Principal Targets in Japan proper -- 60 hydro and 41 steam. The destruction of these 101 plants would reduce power available for war production in Japan proper by about 75%.

SUMMARY--121 power plants have been selected as principal targets in the Japanese electric power industry: 4 in Taiwan; 7 in Manchukuo; 9 in Chosen; 101 in Japan Proper. The destruction of all of these plants would drastically reduce war production and the collapse of the Japanese war effort would be imminent. Sustained and large scale operation would be required to accomplish this result. Out of the 121 principal plants, 29 have been selected as key targets or targets which should be given first priority. The destruction of these 29 plants would seriously affect Taiwan, Manchukuo and Central Honshu of Japan Proper.

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PRINCIPAL TARGETS
ELECTRIC POWER INDUSTRY

Target No.	Target Name	Capacity KW Steam	Capacity KW Hydro
	JAPAN PROPER		
	CENTRAL HONSHU		
	Tokyo Supply Area		
110	Tokyo Elec Pr Generating Sta, Tsurumi Pl	178,000*	
230	Senju Steam Power Station	77,000	
493	Tokyo Steam Power Plant	70,000*	
111	Kawasaki Elec Pr Pl for Govt Railways	60,000*	
213	Kinugawa Steam Power Station	35,000	
1345	Tokyo Municipality Steam Pr Plant	30,000	
228	Government Steam Power Station	25,000	
53	Kanagawa Steam Power Plant	21,600	
1059	Saku Plant, Kanto Hydro Plant		75,400
1515	Yatsuzawa Power Plant		42,500
881	Inawashiro #1 Hydro Plant		40,000
1502	Yomikaki Power Plant		40,800
1226	Takihara Power Plant		34,000
900	Inawashiro #2 Hydro Plant		30,000
902	Inawashiro #4 Hydro Plant		27,900
901	Inawashiro #3 Hydro Plant		19,000
	Other principal plants, for which target numbers have not been assigned, include:		
	1 Steam Plant	30,000	
	18 Hydro Plants (capacities range from 18,000 Kw to 170,000 Kw per plant).		1,001,880
	*1,000,000 Kw additional capacity on Harbor Front.	1,000,000	
		1,526,600	1,[illegible],880
	Total 2,836,880		
	CENTRAL HONSHU		
	Osaka Supply Area		
540	Kansai Kyodo Steam Power Plant	218,000	
536	Amagasaki Steam Power Plant	300,000	
195	Nagoya Steam Power Plant	175,000	
325	Kizugawa Steam Power Plant	100,000	
323	Kasugade #2 Steam Plant	65,000	
1283	Sanyo Power Plant, Shikama	85,000	
322	Kasugade #1 Steam Plant	80,000	
1158	Kyoto Steam Plant	50,000	
324	Fukusaki Steam Power Plant	50,000	
4	Hinotogawa Steam Power Plant	33,150	
877	Kurobegawa #2 Hydro Power Plant		72,000
873	Konoki Hydro Power Plant		70,000
876	Yanagawara Hydro Power Plant		14,000
874	Kanidera Hydro Power Plant		11,000
875	Soyamo Hydro Power Plant		47,000
1505	Oi Power Plant		42,000
1155	Uji Hydro Electric Plant		25,000
1156	Shizugawa Hydro Electric Plant		21,700
	Other principal plants, for which target numbers have not been assigned, include:		
	5 Steam Plants (capacities range from 28,000 Kw to 150,000 Kw per plant).	281,500	
	17 Hydro Plants (capacities range from 23,200 Kw to 77,500 Kw per plant)		354,420
		1,[illegible],650	1,[illegible],120
	Total 2,489,360		
	U. K. TOTAL 5,096,740	3,[illegible],150	1,[illegible],720

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PRINCIPAL TARGETS
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Target No.	Target Name	Capacity, Kw Steam	Capacity, Kw Hydro
	NORTHERN KYUSHU AND SHIMONOSEKI AREA		
1249	Omuta Plant, Kyushu Power Company	100,000	
827	Ube Power Company	75,000	
1127	Kokura Steam Plant	72,000	
664	Wajima Steam Station	60,000	
796	Saka Power Plant	51,000	
1284	Onukoku Power Plant	26,600	
99	Shimonoseki Maeda Power Plant	23,750	
1320	Sobaseikawa Power Plant		31,000
1250	Onagohata Power Station		17,000
1321	Morisaki Power Plant		17,000
	Other principal plants, for which target numbers have not been assigned, include:		
	10 Steam Plants (capacities range from 20,000 Kw to 150,000 Kw per plant).	520,722	
	6 Hydro Plants (capacities range from 19,347 Kw to 54,811 Kw per plant).		208,694
		939,072	274,694
	Total 1,216,066		
TOTAL JAPAN PROPER	6,512,806	3,372,532	3,640,274
	MANCHUKUO		
35	Taikanton Steam Power Plant #2	150,000	
8	Steam Power Plant (Kanseishi)	85,000	
37	Steam Power Plant, Showa Steel Works	80,000	
36	Taikanton Steam Power Plant #1	50,000	
38	Pensihu Steam Power Plant	50,000	
55	Hydro Electric Power Plant, Kirin		360,000
56	Hydro Electric Power Plant, Suihodo		100,000**
	**Capacity of Plant 300,000 Kw (1/3 for Manchukuo - 2/3 for Chosen).	415,000	460,000
TOTAL MANCHUKUO	875,000		
	CHOSEN		
56	Hydro Electric Power Plant, Suihoda		200,000**
4	Chosin Hydro Electric Plant #1		145,000
8	Fusan Hydro Electric Plant #1		129,000
5	Chosin Hydro Electric Plant #2		112,000
9	Fusan Hydro Electric Plant #2		81,000
6	Chosin Hydro Electric Plant #3		40,000
7	Chosin Hydro Electric Plant #4		83,000
	Two or three Hydro Pl's on Kyosen R. & tributaries		220,000
	**Capacity of Plant 300,000 Kw (1/3 for Manchukuo - 2/3 for Chosen).		310,000
TOTAL CHOSEN	810,000		
	TAIWAN		
35	Hatto Harbor Steam Plant	45,000	
159	Large Steam Plant, Taipo	45,000	
82	Jitsu etsuton Power Plant #1		30,000
83	Jitsu etsuton Power Plant #2		30,000
		70,000	60,000
TOTAL TAIWAN	233,000		
GRAND TOTAL	8,530,806	4,357,532	4,170,274

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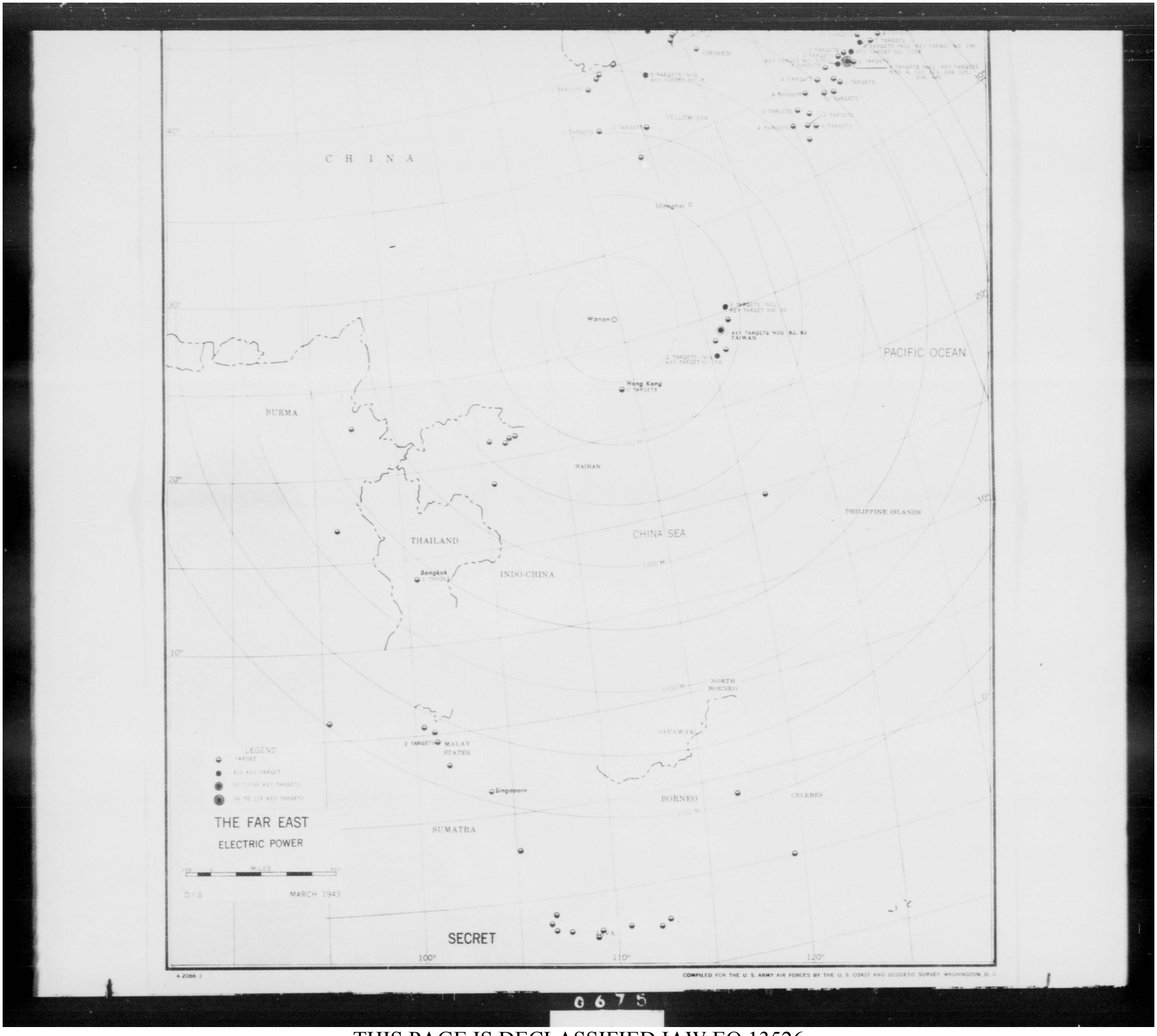

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JAPAN - ELECTRIC POWER

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
959	Hydro-Electric Power Plant	More Data Required	47°03'N 142°44'E	967
961	Hydro-Electric Power Plant	More Data Required	46°56'N 142°39'E	961
	MURORAN (90.3)			
397	Electric Light Co.	Minor	42°20'N 140°58'E	378
398	Power Station	Minor	42°20'N 141°00'E	378
985	Dai Nippon Denryoku Plant	Believed secondary	43°07'N 141°33'E	-
986	Sapporo Hydro-Electric Plant	Believed important	43°04'N 141°22'E	-
987	Otaru Electric Power Plant	More Data Required	43°12'N 141°00'E	-
	HAKODATE (90.4)			
981	Kameda Power Plant & Gas Wks	Minor	41°47'N 140°44'E	977
982	Onuma Power Plant	Minor	41°59'N 140°40'E	-
	AKITA (90.6)			
1070 a&b	Hydro Electric Power Stations	Supply nearby copper operations	40°18'N 140°50'E	1070a
	MORIOKA (90.7)			
1073	Morioka Electric Power Plant	Small	39°40'N 141°12'E	1074

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	FUKUSHIMA (90.10)			
881	Inawashiro Hydro Plant #1	Important, serves Tokyo - 42,000 Kw	37°33'N 140°00'E	881
900	Inawashiro Hydro Plant #2	Important, serves Tokyo - 30,000 Kw	37°33'N 139°59'E	881
901	Inawashiro Hydro Plant #3	Important, serves Tokyo - 18,000 Kw	38°33'N 139°57'E	881
902	Inawashiro Hydro Plant #4	Important, serves Tokyo - 27,000 Kw	37°34'N 139°55'E	902
	TOYAMA (90.11)			
873	Komaki Hydro Power Plant	72,000 Kw	36°34'N 137°00'E	873
874	Kanidera Hydro Power Plant	50,000 Kw	36°27'N 137°15'E	874
875	Soyama Hydro Power Plant	46,000 Kw	36°28'N 136°59'E	875
876	Yanagawara Hydro Power Plant	54,000 Kw	36°48'N 137°35'E	876
877	Kurobe #2 Hydro Power Plant	75,000 Kw	36°45'N 137°39'E	877
	TAKASAKI (90.13)			
1059	Saku Plant, Kanto Hydro Power	Key to Kanto System - 73,000 Kw	36°29'N 139°02'E	1059
1060	Hosoo Hydro Development, Daiya River	3 small stations	36°42'N 139°31'E	-
	TAKAYAMA (90.15)			
1495	Kosaka Power Plant	Hydro, 17,000 Kw, secondary source for Nagoya	35°55'N 137°12'E	1495

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KOFU (90.16)			
1498	Otaki Power Plant #1	28,000 Kw; targets thru #1505 hydro system supplying Osaka	35°49'N 137°41'E	1498
1499	Momoyama Power Plant & Sub-Station	23,100 Kw	35°44'N 137°43'E	1500
1500	Suchara Power Plant	9,200 Kw	35°42'N 137°41'E	1500
1501	Okuwa Power Plant	11,000 Kw	35°40'N 137°38'E	1500
1502	Yomikaki Power Plant	40,700 Kw	35°35'N 137°36'E	1502
1503	Shizumo Power Plant	14,700 Kw	35°35'N 137°32'E	1502
1504	Ochiai Power Plant	13,700 Kw	35°30'N 137°30'E	1504
1505	Oi Power Plant	42,900 Kw	35°29'N 137°24'E	1505
1506	Minamukai Power Plant	21,300 Kw	35°25'N 137°49'E	1506
1507	Tashirogawa Power Plant #1	16,700 Kw;targets thru #1511 important hydro development	35°28'N 138°19'E	1510
1508	Tashirogawa Power Plant #2	20,800 Kw	35°28'N 138°20'E	1510
1509	Hayakawa Power Plant #1	20,000 Kw	35°25'N 138°23'E	1510
1510	Hayakawa Power Plant #2	10,000 Kw	35°25'N 138°22'E	1510
1511	Hayakawa Power Plant #3	6,600 Kw	35°28'N 138°21'E	1510
1512	Shisidome Power Plant	16,800 Kw, unit in Tokyo power supply	35°31'N 138°51'E	1512
1513	Yamura Power Plant	24,000 Kw, unit in Toyko power supply	35°34'N 138°55'E	1513
1514	Komahashi Power Plant	23,400 Kw, unit in Tokyo power supply	35°37'N 138°57'E	1514
1515	Yatsuzawa Power Plant	43,200 Kw, unit in Tokyo power supply	35°37'N 139°06'E	1515
	TOKYO (90.17)			
62	Hodogaya Substation (Yokohama)	Important	35°27'N 139°37'E	NA
63	Kanagawa Steam Plant (Yokohama)	One of 5 largest in area - 21,500 Kw	35°28'N 139°38'E	NA
102	Asahi Substation (Yokohama)	Important; transmits hydroelectric power to factories	35°32'N 139°39'E	NA

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
104	Nippon Electric Trans.Sta (Kawasaki)	Secondary Substation	35°32'N 139°40'E	N A
105	Kawasaki Substation #1 (Kawasaki)	Important switching & transforming station	35°32'N 139°41'E	"
106	RR transformer station (Kawasaki)	Government railway station	35°32'N 139°42'E	"
110	Tokyo Electric, Tsurumi Plant	One of area's 5 Largest - 178,000 Kw (1936)	35°29'N 139°43'E	"
111	Kawasaki Electric Plant, Gov't. Rwys.	Large, chief power source for Gov't. railways of area	35°30'N 139°43'E	"
211	Inawashiro Transforming Sta (Tokyo)	Handles power from Key L Inawashiro hydro system	35°44'N 139°46'E	"
213	Kurawa Steam Station (Tokyo)	Reserve plant for Tokyo tramways - 35,000 Kw	35°45'N 139°47'E	"
228	Government Steam Station (Tokyo)	Important, supplies railways - 25,000 Kw	35°46'N 139°44'E	"
230	Senju Steam Power Sta (Tokyo)	One of area's 5 Largest - 77,000 Kw	35°45'N 139°48'E	"
470	Tokyo Electric Station (Kawasaki)	Medium size	35°31'N 139°44'E	"
493	Tokyo Steam Power (Kawasaki)	One of area's 5 largest - 70,000 Kw	35°30'N 139°43'E	"
1345	Tokyo Municipality Steam Plant	Supplementary for tramways - 30,000 Kw	35°39'N 139°45'E	"
1346	Yokohama Electric Light (Yokohama)	Serves Yokohama residential section	35°26'N 139°39'E	"
	NAGOYA (90.20)			
195	Nagoya Steam Power Plant	Main power source for Nagoya - 109,000 Kw	35°05'N 136°54'E	194
1142	Atsuta Steam Power Plant	Standby, 10,000 Kw	35°06'N 136°54'E	197
1143	Iwakura Substation (Kashikawa)	Important distributing station	35°13'N 136°57'E	196
1144	Seto Hydro Electric Station	Secondary	35°13'N 137°06'E	1144
	HAMAMATSU (90.21)			
1226	Takihara Power Plant	Hydro 34,000 Kw	35°09'N 137°49'E	1226

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JAPAN - ELECTRIC - POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KYOTO (90.23)			
1155	Uji Hydro Electric Plant	Supplies Osaka & Kyoto area - 35,000 Kw	34°53'N 135°49'E	1155
1156	Shizugawa Hydro Electric Plant	Supplies Osaka-Kyoto area - 34,000 Kw	34°52'N 135°50'E	1155
1157	Ohmine Hydro Electric Plant	Supplies Osaka-Kyoto area - 16,000 Kw	34°52'N 135°51'E	1155
1158	Kyoto Steam Plant	Important in dry season - 50,000 Kw	35°01'N 135°52'E	1163
	OSAKA (90.25)			
4	Minatogawa Steam Power Plant	Secondary - 38,000 Kw	34°39'N 135°09'E	10
322	Kasugade #1 Steam Plant	Important - 50,000 Kw	34°40'N 135°28'E	263
323	Kasugade #2 Steam Plant	Important - 65,000 Kw	34°40'N 135°28'E	263
324	Fukuzaki Steam Power Plant	Important - 40,000 Kw	34°39'N 135°28'E	325
325	Kizugawa Steam Power Plant	Important -100,000 Kw	34°37'N 135°29'E	263
536	Amagasaki Steam Power Plant	Very important - 300,000 Kw	34°42'N 135°24'E	18
540	Kansai Kyodo Steam Power Plant	Rptd largest steam plant in Japan - 318,000 Kw	34°42'N 135°24'E	18
	OKAYAMA (90.27)			
1283	Sanyo Power Plant, Shikama #3	Steam, main source of power for Himeji	34°47'N 134°40'E	1290
1284	Chukoku Power Plant	26,500 Kw	34°36'N 133°59'E	1280
1285	Horie Power Plant	Largest on Shikoku Island	34°16'N 133°45'E	1303
1286	Sanyo Power Plant, Shikama #2	20,000 Kw	34°48'N 134°42'E	1290
1287	Uno Power Plant	Steam, serves Okayama City	34°29'N 133°57'E	1295
1288	Aboshi Power Plant	Steam, serves Aboshi, probably Target 1281	34°47'N 133°36'E	1290
	KOCHI (90.28)			
1526	Ichiu Power Plant, Ichiumura	Small, supplies Tokushima city	33°53'N 133°49'E	1526

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KOCHI (90.28) (Continued)			
1527	Toho Power Plant, Iya	Small, supplies Tokushima city	33°51'N 133°55'E	1527
1528	Kochi Steam Power Plant, Kochi	Small, supplies Kochi city	33°33'N 133°31'E	1524
	NIIHAMA (90.29)			
926a	Hadeba Power Plant	Power for Sumitomo Besshi Mine, Target 926	33°58'N 133°19'E	926
931	Niihama Steam Power Plant	40,000 Kw	33°58'N 133°17'E	923
	KURE (90.30)			
742	Electric Railways Power Station	Steam, in Hiroshima City	34°23'N 132°27'E	738
743	Electric Power Generator	In Hiroshima City, no details	34°23'N 132°27'E	737
744	Electric Generator	Same	34°23'N 132°27'E	738
796	Saka Power Plant	51,000 Kw	34°21'N 132°32'E	733
	TOKUYAMA (90.32)			
823	Toyo Electric Power (Asa Sta)	Large, hydro electric	34°03'N 131°10'E	819
824	Electric Power Station	Capacity unknown	34°22'N 131°30'E	-
827	Ube Power Co	75,000 Kw	33°57'N 131°14'E	818
	KYUSHU EAST (90.33)			
1320	Gokasekawa Power Plant	Important - 31,000 Kw; supplies Target 1314	32°39'N 131°22'E	1320
1321	Morisaki Power Plant	Important - 16,000 Kw	32°37'N 131°26'E	1320
1322	Sansuhara Power Plant	Secondary - 13,000 Kw; supplies Oita area	32°29'N 131°23'E	1322
1323	Takachiho Power Plant	Secondary - 13,000 Kw	32°42'N 131°17'E	1323
1324	Shin Chinda Power Plant	Minor - 7,000 Kw	32°59'N 131°31'E	1324
1325	Jikumaru Power Plant	Minor - 7,000 Kw	32°59'N 131°27'E	1325
1326	Unoshima Steam Power Plant	Secondary - 10,000 Kw; supplies Nakatsu City	33°37'N 131°08'E	1326

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIMONOSEKI (90.34)			
99	Shimonoseki-Maeda Power Plant	23,750 Kw	33°58'N 130°58'E	44a
188	Kyushu Electric Tramway Power Plant	Important	33°53'N 130°52'E	168
1127	Kokura Steam Plant	Important; 72,200 Kw	33°53'N 130°52'E	168
1128	Kokura Power Plant #1	Rptd new, secondary	33°53'N 130°52'E	168
	KURUME (90.35)			
664	Najima Steam Station	Important - 60,000 Kw	33°39'N 130°25'E	664
1249	Omuta Plant, Kyushu Power Co	Important - 100,000 Kw	33°00'N 130°26'E	1246
1250	Onagohata Power Sta (4 mi SE of Hida)	Important - 27,000 Kw	33°17'N 130°59'E	1250
1251	Kurokawa Hydro Electric Station #1	Minor - 15,000 Kw	32°52'N 130°58'E	1252
1252	Kurokawa Hydro Electric Station #2	Minor - 15,000 Kw	32°52'N 130°58'E	1252
1253	Kurokawa Hydro Electric Station #3	Minor - 10,000 Kw	32°52'N 130°59'E	1252
	SASEBO (90.36)			
847	Nagasaki Steam Power Plant	Minor - 10,000 Kw	32°45'N 129°52'E	542
848	Sasebo Power Plant	Supplies or controls power for Naval Base	33°10'N 129°42'E	755
878	Nagasaki Substation #1 - #2	Minor	32°44'N 129°51'E	542
	YATSUSHIRO (90.37) - KYUSHU SOUTH (90.38)			
1388	Umeto Power Plant	Steam, supplies Minamata chemical plant	32°12'N 130°23'E	-
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
35	Hatto Harbor Steam Plant	Main source for Keelung - 38,000 Kw	25°09'N 121°47'E	35
36	Transformer Station	Secondary	25°01'N 121°32'E	47

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JAPAN - ELECTRIC POWER

TARGET NO	TARGET	COMMENT	APPROXIMATE	TARGET CHART NO
	TAIHOKU (91.3) (Continued)			
37	Shosoko Hydro-Electric Substation	Auxiliary station	24°56'N 121°32'E	38
38	Kizan Hydro-Electric Substation	Minor	24°54'N 121°34'E	38
39	Shin-Kizan Hydro-Electric Plant	Secondary	24°53'N 121°34'E	38
	TAIWAN WEST (91.4)			
82	Jitsugetsutan Power Plant #1	Very important - 100,000 Kw	23°51'N 120°52'E	82
83	Jitsugetsutan Power Plant #2	Important; with Target 82 rptd 60% Taiwan power	23°48'N 120°52'E	83
84	Kagi Substation	Secondary	23°29'N 120°26'E	102
	TAIWAN EAST (91.5)			
70	Maruyama Power Plant	Important; supplies Karenko light-metals plants	24°39'N 121°40'E	70
71	Taito Sub-station	Secondary	22°45'N 121°09'E	67
	TAKAO (91.6)			
1	Steam Power Plant	Secondary	22°38'N 120°16'E	1
159	Large Steam Plant, Takao	35,000 Kw	22°38'N 120°16'E	N A
	CHOSEN (84)			
	KONAN (84.2)			
4	Chosin Hydro-Electric Plant #1	140,000 Kw, with targets thru #11 one of largest power developments	40°11'N 127°16'E	4
5	Chosin Hydro-Electric Plant #2	112,000 Kw	40°07'N 127°16'E	5
6	Chosin Hydro-Electric Plant #3	40,000 Kw	40°04'N 127°22'E	5

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JAPAN - BELOW 50 LAT

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KONAN (84.2) Continued			
7	Chosin Hydro-Electric Plant #4	28,000 Kw	40°03'N 127°25'E	7
8	Fusen Hydro-Electric Plant #1	129,000 Kw	40°21'N 127°34'E	9
9	Fusen Hydro-Electric Plant #2	43,400 Kw	40°18'N 127°30'E	9
10	Fusen Hydro-Electric Plant #3	18,000 Kw	40°14'N 127°26'E	11
11	Fusen Hydro-Electric Plant #4	12,000 Kw	40°12'N 127°23'E	11
12	Steam Power Plant	Capacity unknown	39°50'N 127°06'E	1
	HEIJO (84.2)			
85	Heijo Steam Power Plant	Small, 7,000 Kw	39°00'N 125°46'E	71
	MANCHUKUO (Manchuria) (93)			
	MANCHUKUO EAST (93.2)			
55	Hydro-Electric Power Plant, Kirin	Largest Hydro Plant in Manchukuo - 360,000 Kw	44°05'N 126°25'E	55
56	Hydro-Electric Power Plant, Suihodo	Very important, serves both Korea and Manchukuo	40°25'N 125°00'E	56
73	Electric Generating Station, Antung	More Data Required	40°10'N 124°20'E	72
78	Kokai Hydro-Electric Power Plant	More Data Required	40°55'N 126°30'E	78
79	Gishu Hydro-Electric Power Plant	Projected	40°15'N 124°30'E	79
80	Igen Hydro-Electric Power Plant	Projected	40°50'N 126°00'E	80
81	Mampochin Hydro-Electric Power Plant	Projected	41°10'N 126°15'E	81
82	Jijo Hydro-Electric Power Plant	Projected	41°30'N 126°30'E	82
83	Chuko Hydro-Electric Power Plant	Projected	41°40'N 126°55'E	83
84	Kosho Hydro-Electric Power Plant	Projected	41°30'N 127°05'E	84

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MUKDEN (93.3)			
35	Taikanton Steam Power Plant #2	Largest & most important in Manchukuo - 150,000 Kw	41°51'N 123°54'E	32
36	Taikanton Steam Power Plant #1	2nd largest plant in Fushun - 50,000 Kw	41°51'N 123°54'E	32
37	Steam Power Plant, Showa Steel Wks	Supplies Steel Wks - 80,000 Kw	41°05'N 122°58'E	29
38	Pensihu Steam Power Plant	Supplies mines & blast furnaces of Steel Wks - 50,000 Kw	41°18'N 123°45'E	30
39	Fuhsin Steam Power Plant	Supplies industry in Fuhsin	42°05'N 121°35'E	42
64	Electric Power Station	Supplies industry in Mukden	41°47'N 123°23'E	50
	DAIREN (93.5)			
8	Steam Power Plant (Kanseishi)	Largest supplier in Darien - 85,000 Kw	38°58'N 121°37'E	1
9	Electric Power Station	Minor	38°56'N 121°38'E	1
27	Amanagawa Electric Power Plant	Supplies 20% power in Darien	38°55'N 121°35'E	10
	CHINA (83)			
	CANTON (83.4)			
48	Hong Kong Electric, North Point	Only known power plant on Hong Kong Island	22°18'N 114°11'E	55
49	China Light & Power (Kowloon)	Only known power plant in Kowloon	22°19'N 114°11'E	55
	TSINGTAO (83.11)			
68	New Power Plant (Tsingtao)	Largest in area	36°07'N 120°20'E	78
69	Old Power Plant (Tsingtao)	Second largest in area	36°04'N 120°18'E	78
70	Power Plant (Laoyao)	Only plant in port	34°44'N 119°27'E	79

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TSINGTAO (83.11) (Continued)			
71	New Power Plant (Tsinan)	Supplies local industries, RR Shops	36°40'N 117°01'E	71
72	Old Power Plant (Tsinan)	Small	36°40'N 117°01'E	71
	TIENTSIN (83.12)			
15	Belgian Tramway & Light (Tientsin)	Largest Tientsin City, not important industrially	39°08'N 117°11'E	11
16	British Electric Co (Tientsin)	Not important industrially	39°07'N 117°11'E	11
26	Port Power House (Chinwangtao)	Important port power	39°56'N 119°37'E	26
34	Linsi Power House	Primary target in area, power for Kailan mine	39°42'N 118°26'E	34
35	Tangshan Power House (Tangshan)	Auxiliary power for Kailan mine operation	39°38'N 118°14'E	35
	FRENCH INDO-CHINA (85)			
	FRENCH INDO-CHINA NORTH (85.1)			
23	Hanoi Power Plant	Chief source of power Tonkin Delta - 22,500 Kw	21°02'N 105°51'E	N A
24	Haiphong Power Plant	Standby plant for Hanoi Power Plant - 5,500 Kw	20°52'N 106°41'E	"
25	Hongay Power Plant	Very important, supplies anthracite coal mines	20°57'N 107°05'E	"
26	Huong Bi Power Plant	Very important; supplies anthracite coal mines	21°00'N 106°45'E	"
27	Vinh Power Plant	Supplies town and important RR shops	18°40'N 105°40'E	"

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
26	Thai Electric Power Plant	Steam, rptd largest in Thailand - 40,000 Kw	13°44'N 100°30'E	26
27	Samsen Steam Power Plant	Supplies Bangkok & Royal Ordnance Fcty - 30,000 Kw	13°47'N 100°31'E	26
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
65	Perak Hydro Power Plant	27,000 Kw; supplies tin mining industry	4°57'N 100°58'E	65
66	Penang Power Plant	Steam - 15,000 Kw; supplies Georgetown, Butterworth, Prai	5°23'N 100°23'E	27
67	Bungsar Power Plant	Steam - 31,500 Kw; supplies Kuala Lumpur & RR Shops	3°07'N 101°40'E	60
68	Malin Nawar Power Plant	Steam - 30,000 Kw; supplies tin mining industry	4°21'N 101°07'E	68
69	Batu Gajah Power Plant	Steam - 21,000 Kw; supplies tin mining industry	4°28'N 101°03'E	69
	SINGAPORE (92.2)			
64	St. James Power Plant, Singapore	Steam - 17,000 Kw; supplies city	1°16'N 103°50'E	52
	BURMA (82)			
	BURMA NORTH (82.1)			
41	Namsahm Power Plant	Hydro, serves Burma Corp smelters, refinery	22°45'N 97°30'E	41

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BURMA SOUTH (82.2)			
10	Rangoon El.T & S Plant	Only central plant, supplies 90% Rangoon's power	16°46'N 96°8'E	14
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
29	Sabang Electric Power Station	Supplies harbor and town	5°53'N 95°19'E	1
	SUMATRA SOUTH (94.2)			
70	Muntok Power Plant	Small Diesel, at tin smelter	2°04'S 105°10'E	70
	JAVA (94.3)			
186	Oebroeg Hydro Power Station	17,300 Kw; supplies Batavia, Buitenzorg	6°55'S 106°46'E	186
187	Kratjak Hydro Power Station	11,000 Kw; supplies Buitenzorg	6°37'S 106°34'E	187
188	Batavia Power Station	Steam - 7,900 Kw	6°13'S 106°51'E	166
189	Lamadjan Hydro Power Station	19,200 Kw; supplies Bandung	7°10'S 107°33'E	189
190	Semampir Power Station	Steam - 13,000 Kw; supplies Surabaya	7°12'S 112°46'E	174
191	Cheribon Power Station	Diesel - 1,700 Kw; supplies, town, harbor	6°42'S 108°33'E	147
192	Tjilatjap Power Station	Small Diesel - 800 Kw	7°44'S 109°00'E	149
193	Ketenger Hydro Power Station	10,500 Kw	7°24'S 109°13'E	193
194	Djelok Hydro Power Station	14,400 Kw; supplies Semarang	7°12'S 110°30'E	194
195	Mandalan Hydro Power Station	22,000 Kw; supplies Surabaya, Kediri, Malang	7°50'S 112°17'E	195

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BORNEO SOUTH (94.4)			
219	Balikpapan Power Plant	Supplies town and harbor	1°16'S 116°49'E	219
	CELEBES TIMOR (94.5)			
204	Macassar Power Station	Supplies Macassar and harbor	5°08'S 119°24'E	202
	PHILIPPINE ISLANDS (96)			
	(PHILIPPINES; NORTH 96.1, SOUTH 96.2)			
35	Manila Electric Co, Steam Plant	Principal source of supply of Manila	14°35'N 120°59'E	NA
47	Manila Electric Co, Hydro Plant	Supplies Manila	14°04'N 121°29'E	NA
48	Philippine Govt., Hydro Plant	Largest hydro plant in Philippines	14°18'N 121°28'E	NA

* New Target to be included in Folder revision

N A - No number yet assigned when this list prepared

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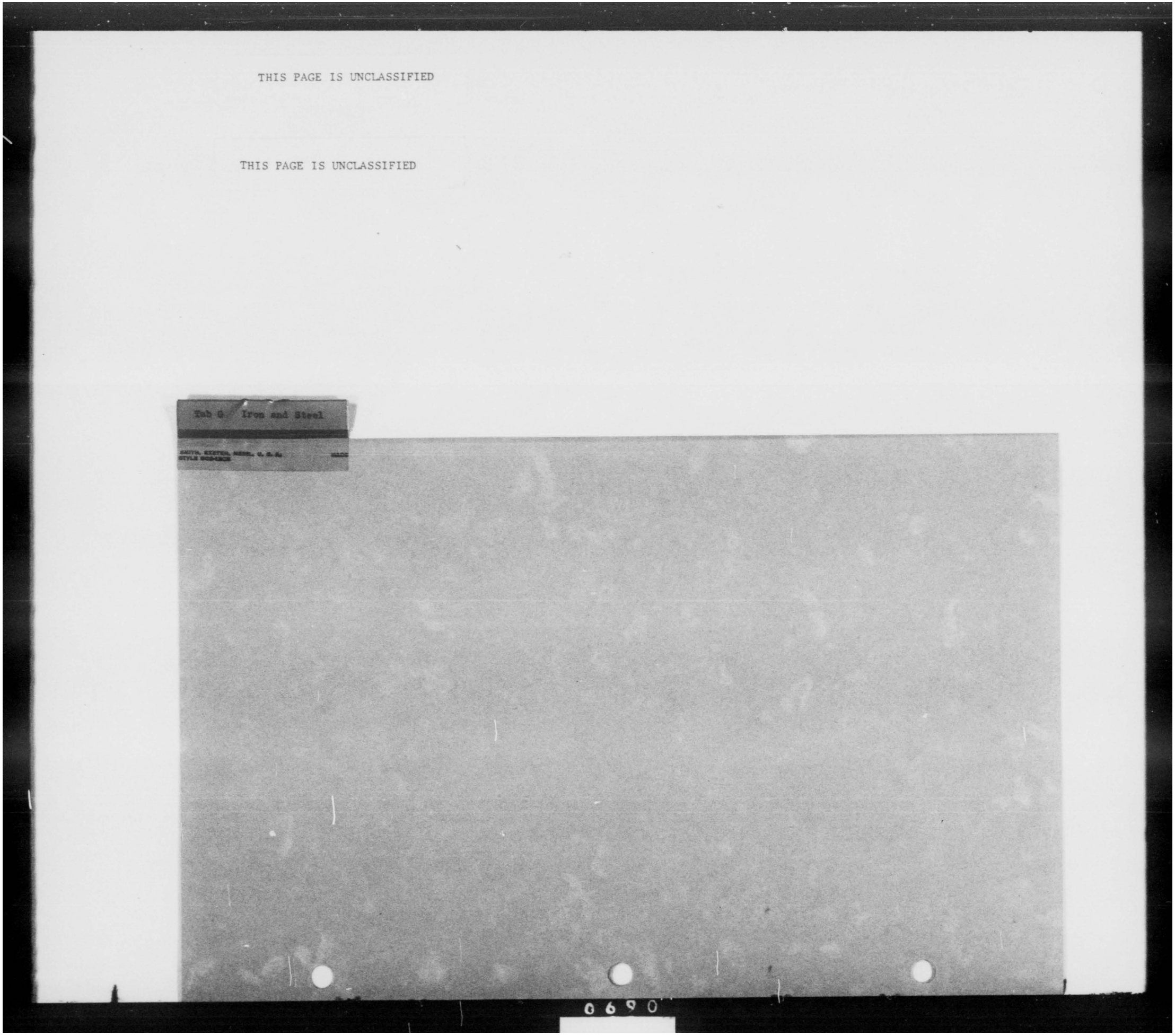

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March 1943 IRON & STEEL

	KEY TARGETS				Miles radius from Wanan (inclusive)						
	TARGET		Importance	Obj. Area	500	750	1000	1250	1500	1750	over
	No.	Name									
1	28, 29	)Imp. I. & S.,)Yawata-Tobata	Largest steel mills in Far East	Shim'seki (90.34)				X			
2	29	Showa Steel Wks	Ranks second in pig iron and steel	Mukden (93.3)				X			
3	1290	Nippon Steel Co., Hirohata	Modern plant; largest plate mill	Okayama (90.27)					X		
4	378, 379	)Nippon Steel)Co., Wanishi	Tanks, ordnance; huge iron output	Muroran (90.3)							X
5	5, 6	Kobe Steel Wks	Big integrated mill; also machinery	Osaka (90.25)					X		
6	713	Wakayama Steel Wks	Integrated mill; large rolling cap.	Osaka (90.25)					X		
7	7	Kawasaki Dkyd Steel Wks	Ship's plate	Osaka (90.25)					X		
8	189	Imp. Iron & Steel, Kamaishi	Large integrated mill	Kamaishi (90.8)							X
9	66	Japan Iron Co., Kenjiho	Biggest in Korea	Heijo (84.3)				X			
10	51	Asano Iron Wks	Important in ship's plate	Tokyo (90.17)						X	
11	165	Kokura Steel Wks	Supplies Kokura Arsenal	Shim'seki (90.34)				X			
12	264	Sumitomo Steel Wks	Rptd largest forging & casting shop	Osaka (90.25)						X	
13	52	Japan Steel Tube	Pipe products; large steel capacity	Tokyo (90.17)						X	
14	28, 29	)Japan Iron)Mfg Co Seishin	Iron, steel, rolled products	Seishin (84.1)						X	
15	546	Mitsubishi Steel & Arms Wks	Plate for big affiliated shipyard	Sasebo (90.36)					X		
16	30	Pensihu Iron Wks	Pig iron	Mukden (93.3)					X		
17	247	Daido Electric Steel Co.	Elec. furnaces; spec. high-grade steels	Nagoya (90.20)						X	

(Priority targets are underlined)

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943 SECRET

IRON AND STEEL

CHINA BASED OPERATIONS

No major iron and steel mills lie within 1000 miles of Wanan operations base.

The two leading targets in the industry are less than 1250 miles distant. The huge Yawata-Tobata mills in northern Kyushu and the Showa Steel Works in Manchoukuo together produce about 38% of the pig iron, 42% of the crude steel, and 35% of the rolled steel products available to the Japanese. These are two of the prime objectives in the entire Far East. Four other and smaller factories in this range also constitute key targets.

A radius of 1500 miles would include, in addition to those listed above, seven other key targets. Among these are the modern Hirohata plant, which has the largest mill for rolling steel plate in the Far East; two integrated steel plants in the Kobe-Osaka region; and the largest forge shop in Japan. The thirteen key targets found within this 1500-mile radius from base are reported to account for about 71% of the pig iron capacity, 67% of the crude steel capacity, and 66% of the rolling mill capacity in the Japanese Far East.

Of the four remaining key targets, two lie 1500-1750 miles from Wanan, and the other two, both important plants, are more than 1750 miles away.

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March 1943

IRON AND STEEL

There is a wide variation in estimates of Japanese requirements for iron and steel. The quantity of steel used depends upon the scale of military operations on land, the extent of Allied Nations sinkings of Naval and merchant ships and their cargoes, upon the extent of damage inflicted upon industrial targets by aerial action and numerous other circumstances. Nevertheless, it is possible to make some sort of estimate of Japanese steel requirements by considering reports coming out of Japan concerning the situation in industries which are important consumers of steel. Activity in the shipbuilding industry, the machine tool industry, and in many other branches of the machinery and industrial equipment industries has been considerably less than capacity, and it appears that at least part of the explanation for this state of affairs lies in the shortage of steel materials of which the Japanese sources complain. As a rough approximation, it might be estimated that operation of the various munitions, armament, shipbuilding and other consuming industries on the level of which they are capable and which would seem to be required by a full-scale military effort would call for a steel output of 9-10,000,000 tons in 1943.

The Japanese steel industry appears to have a conceivable capacity equal to this required figure. Nevertheless, the problem of utilising plant facilities to full capacity is not likely to be fully mastered, due to difficulties in assuring a continuous and adequate supply of iron ore and coking coal, of replacing and training skilled workers, etc. It seems probable, on balance, that output of the industry in Japan and Japanese-controlled territory in 1943 is not likely to exceed 7,500,000 tons of crude steel and 1,500,000 tons of cast and wrought iron products. This output appears insufficient to assure adequate steel for both the military production program and the maintenance of industrial equipment, and allocations of steel will probably force some curtailment in both programs.

The accompanying table, which shows the plants selected as key targets, demonstrates that a significant portion of the iron and steel output is concentrated in comparatively few plants. The six mills listed first in the table are estimated to account for roughly 68% of the pig-iron capacity, 61% of the crude steel-making capacity and 50% of the rolling mill capacity available to the Japanese.

Rolling mill capacity is more specialized and differentiated than the equipment for producing crude steel. It is, therefore, a matter of special importance to ascertain the amount of capacity suited to rolling particular types of products and to examine the possibilities of converting

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equipment to the rolling of more essential types. One of the most crucial types of finished steel products for military purposes is steel plate of thicknesses suitable for ships and tanks. Estimates have been made of the amount of plate-rolling equipment available in Japan. Indicated total plate capacity is at least 1,200,000 tons per year and may be as much as 1,400,000 (These estimates are based upon the supposition that suitable sheet-mills will be converted to the manufacture of plate.) This capacity would amply cover plate requirements but allocations are likely to cut the figure.

Major iron and steel works are integrated plants having blast furnaces, open hearth steel furnaces, and some rolling mill equipment, ordinarily at water's edge in order that iron ore and coking coal (most of which must be imported from overseas) may be easily delivered. Japanese blast furnaces are of normal type. Open hearth steel furnaces are used almost exclusively in the Far East, although there is some electric furnace capacity for special steels.

The major plants, especially the Yawata-Tobata plants, are believed heavily defended against air attacks. There is the further fact that a large steel mill occupies a considerable area. Nevertheless, iron and steel output in Japanese-controlled territory is highly concentrated in a few key mills, as indicated in the attached table, and destruction of this capacity would be of critical importance.

As brought out above, the expected output of steel products during 1943 is likely, even in the best of conditions, to fall considerably short of requirements. It is believed that consumption of steel for non-essential uses has already been curtailed to the limit. It is known, furthermore, that there is virtually no stockpile of iron and steel in Japan. It is indicated that bombing operations which result in curtailing the output of either pig iron or crude steel by as much as 35% would necessitate a drastic retrenchment in Japanese military operations.

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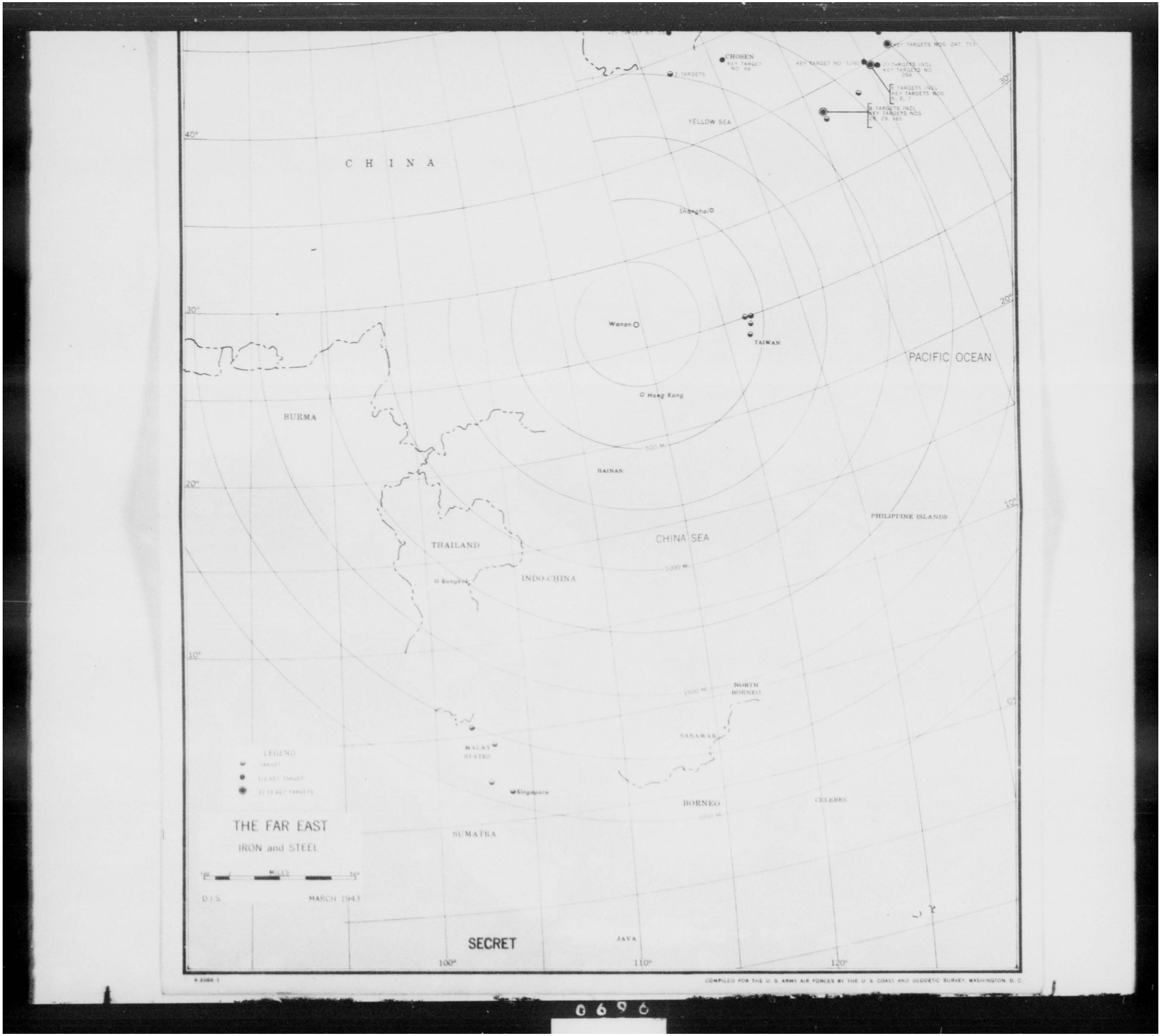

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JAPAN - IRON AND STEEL

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	MURORAN (90.3)			
378	Nippon Steel Co	Important steel & ordnance production	42°19'N 141°00'E	378
379	Wanishi Steel Wks	Very important	42°20'N 141°01'E	378
	MORIOKA (90.7)			
1072	Kuji Sponge-Iron plant	Believed secondary	40°11'N 141°46'E	1072
	KAMAISHI (90.8)			
189	Imperial Iron & Steel Wks	Important government plant	39°16'N 141°53'E	189
	NIIGATA (90.9)			
1011	Kuayama Steel Wks	Small; high-grade steel tubes, bars and rails	37°57'N 139°05'E	1005
	TOYAMA (90.11)			
869	Kawasaki Iron Wks, Fushiki plant	Secondary	36°47'N 137°05'E	867
940	Nippon Steel Tubing Co	Steel tubes, electrolytic metal work, etc	36°47'N 137°05'E	867
941	Fuji Special Steel Co	Precision tools, bearings, airplane parts, etc	36°41'N 137°14'E	941
942	Japan High Frequency Steel Co	Electric furnaces	36°47'N 137°05'E	867
943	Japan Electric Forging Co	Alloys	36°44'N 137°03'E	943

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAYAMA (90.15)			
1481	Daido Industrial Co	Important; chains, marine machine parts	36°18'N 136°17'E	1481
1482	Kaga Rim Mfg Wks (Komatsu)	Rims for all types vehicles	36°24'N 136°28'E	1483
1483	Komatsu Engineering Wks	Major; electric alloy steel, machinery, etc	36°24'N 136°28'E	1483
	TOKYO (90.17)			
51	Asano Iron Wks (Kawasaki)	Iron, steel; supplies Tsurumi Steel & Shipbuilding	35°29'N 139°42'E	N A
52	Japan Steel Tube Co (Kawasaki)	Rated most important steel plant in area	35°30'N 139°43'E	"
56	Imperial Iron & Steel, Fuji Wks (Kawasaki)	One of large plants	35°32'N 139°44'E	"
57	Oriental Steel Products Co (Kawasaki)	Specializes in structural steel	35°30'N 139°43'E	"
58	Tokyo Special Steel & Chrome Wks	Special steels, aircraft and auto parts	35°32'N 139°42'E	"
328	Watanabe Steel Wks (Tokyo)	Group of small plants	35°34'N 139°45'E	"
334	Nisso Steel Mfg Co (Tokyo)	Absorbed 1938 by Nippon Soda KK	35°41'N 139°50'E	"
336	Japan Special Steel Co (Tokyo)	One of leading alloy-steel producers	35°35'N 139°45'E	"
904	Sakurada Engineering Wks (Tokyo)	Girders, pipes, boilers, chemical & RR equipment	35°41'N 139°51'E	"
1347	Japan Service Co (Kawasaki)	Stainless steel, rolling & forging	35°32'N 139°44'E	"
1348	Toho Steel Foundry Co (Tokyo)	Produces alloy steels; electric furnaces, mills, foundries	35°46'N 139°41'E	"
1349	Japan Special Steel Wks (Tokyo)	Electric furnaces for special steels; location not certain	35°40'N 139°50'E	"
1350	Tokyo Kosai Co (Tokyo)	Medium size; electric furnaces	35°41'N 139°50'E	"
1351	Tokyo Nakayama Iron Wks (Kawasaki)	Zinc & iron products	35°30'N 139°42'E	"
1352	Steel Plants in NE Joto Ward (Tokyo)	Four small steel plants	35°41'N 139°51'E	"
	NAGOYA (90.20)			
247 a,b,c	Daido Electric Steel Co	Munitions, tools, aircraft parts; 3 units	35°05'N 136°54'E	194

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
5	Kobe Steel Wks Unit #1	Important, rptd 10% Japan output	34°42'N 135°13'E	5
6	Kobe Steel Wks Unit #2	Operates in conjunction with #5	34°42'N 135°13'E	5
7	Kawasaki Dockyard Co Steel Wks	Important, steel for Dockyard shipbuilding	34°42'N 135°13'E	5
8	Uyenoshita Steel Wks Unit #2	More data required	34°41'N 135°12'E	5
9	Uyenoshita Steel Wks Unit #1	More data required	34°42'N 135°13'E	5
264	Sumitomo Steel Wks #1	Important; castings, forgings, special steel	34°40'N 135°27'E	263
266	Sumitomo Steel Wks #2	More data required	34°40'N 135°28'E	263
267	Asai Iron Works	More data required	34°40'N 135°28'E	263
268	Osaka Steel Works	Important, open hearth furnaces	34°42'N 135°27'E	263
269	Aikoku Steel Works	More data required	34°42'N 135°27'E	695
270	Lto Steel Works	More data required	34°42'N 135°27'E	695
271	Nakagawa Iron Works	More data required	34°43'N 135°27'E	695
664	Umebachi Iron Works	More data required	34°36'N 135°29'E	325
685	Kurimoto Iron Works	More data required	34°39'N 135°29'E	325
686	Osaka Metal Wks Co	More data required	34°39'N 135°30'E	325
688	Kuboda Iron Works	More data required	34°39'N 135°30'E	661
691	Osaka Kozai Co	More data required	34°40'N 135°29'E	661
694	Gamamori Steel Works	More data required	34°43'N 135°29'E	695
695	Kaka Foundry Works	More data required	34°43'N 135°29'E	695
696	Sambei Metal Works	More data required	34°43'N 135°31'E	382
698	Iron Works	More data required	34°42'N 135°33'E	382
700	Nihon Steel Pipe	More data required	34°38'N 135°28'E	325
701	Kuboda Iron Works	More data required	34°38'N 135°28'E	325
702	Wakayama Iron Works	More data required	34°38'N 135°28'E	325
703	Mibara Iron Works	More data required	34°38'N 135°29'E	325
713	Nakayama Steel Works	Important, blast furnace products	34°36'N 135°28'E	325
1196	Kanedmo Steel Manufacturing	More data required	34°43'N 135°25'E	536
1197	Kubota Iron Works	More data required	34°43'N 135°25'E	536

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OKAYAMA (90.27)			
1290	Nippon Steel Co (Hirohata)	Rptd to rank 4th in Japanese steel production	34°47'N 134°38'E	1290
	KOCHI (90.28)			
1530	Kochi Steel Plant	Minor	33°33'N 133°33'E	1524
	SHIMONOSEKI (90.34)			
24	Minsukasa Coke Plant (Tobata)	Supplies #28, #29	33°54'N 130°50'E	29
28	Imperial Iron & Steel Wks, Yawata plant	Rated largest steel works Empire	33°52'N 130°49'E	28
29	Imperial Iron & Steel Wks, Tobata plant	Important steel & tinplate plant	33°54'N 130°50'E	29
30	Tobata Foundry Co	Important, munitions	33°54'N 130°49'E	29
165	Kokura Steel Works	Important steel wks	33°53'N 130°53'E	168
166	Tokyo Steel Co (Kokura)	Secondary, cable & wire	33°53'N 130°54'E	168
554	Imperial Foundry (Wakamatsu)	Secondary	33°55'N 130°49'E	29
555	Tokai Steel Wks (Wakamatsu)	Secondary bars and plate production	34°54'N 130°49'E	29
556	Mitsubishi Steel Mfg Co	No details	32°52'N 130°45'E	1113
557	Nihon Steel Works	No details	33°52'N 130°44'E	1113
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
40	Taiwan Electro-Chemical Co	Carbide, ferro-alloys, magnesium	25°08'N 121°43'E	-
41	Maruyama Special Alloys Plant	No details	25°05'N 121°31'E	30

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAIWAN EAST (91.5)			
62	Nickel Smelter (Karenko)	Important	24°00'N 121°37'E	61
63	Manganese Smelter (Rato)	Secondary	24°40'N 121°46'E	68
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
28	Japan Iron Mfg Co	Iron & steel, exact location unknown	41°47'N 129°50'E	-
29	Mitsubishi Iron Co	Small, iron & steel, exact location unknown	41°47'N 129°50'E	-
31	Japan High Frequency Heavy Industry Co	Small, steel, exact location in Joshin unknown	40°41'N 129°13'E	-
32	Mosan Iron Mine	Major mine, rptd largest Far East deposit	42°12'N 129°12'E	32
	HEIJO (84.3)			
66	Japan Iron Co(Kenjiho)	Most important iron & steel plant in Chosen	38°44'N 125°38'E	66
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
57	Steel Works, Tunghua	Rptd still under construction, small production	41°40'N 125°55'E	57
	MUKDEN (93.3)			
29	Showa Steel Works	Most important steel plant in Manchukuo	41°05'N 122°58'E	29
30	Pensihu Iron Works	2nd most important steel plant Manchukuo	41°18'N 123°45'E	30

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	DAIREN (93.5)			
7	Special Steel Plant	Important	38°58'N 121°37'E	-
26	Cast Iron Pipe Co	More data required	38°55'N 121°35'E	10
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
44	Bukit Besi Iron Mine	Very important; 1,000,000 tons ore yearly, open cut	4°45'N 103°10'E	44
46	Temangan Iron Mine	250,000 tons ore yearly, open cut	5°43'N 102°07'E	46
	SINGAPORE (92.2)			
43	Hume Pipe Co (Singapore)	Makes steel boilers, pipes, drums	1°20'N 103°48'E	43
45	Sri Medan Iron Mine	Important; 500,000 tons ore yearly, open cut	1°59'N 102°58'E	45

* New Target to be included in Folder revision
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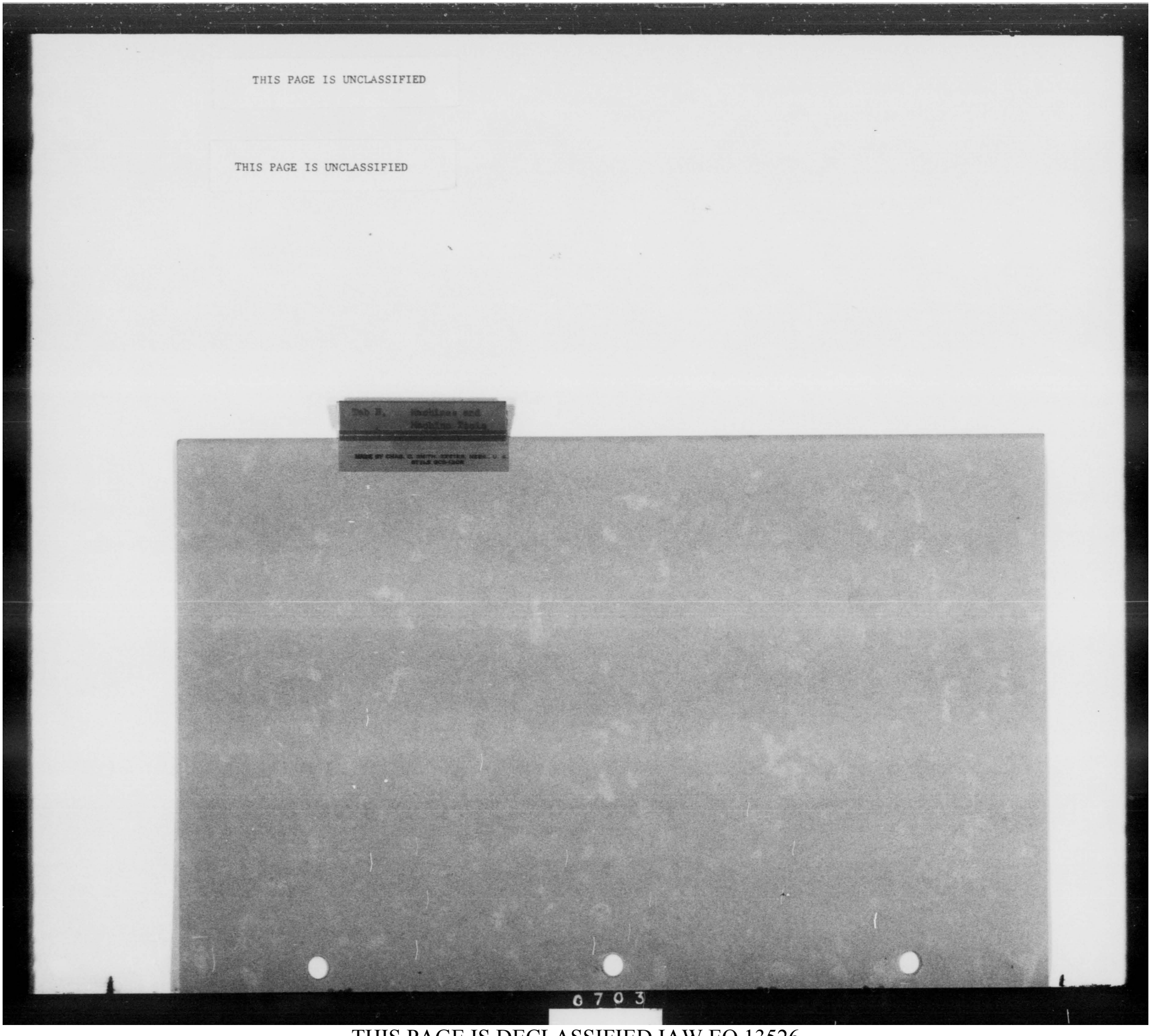

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March 1943

MACHINE TOOLS

KEY TARGETS					Miles radius from Wanan (inclusive)						
	TARGET										
	No.	Name	Importance	Obj. Area	500	750	1000	1250	1500	1750	over
1	899	Dai Nippon Ordnance Co. (Arms)	Swiss type machine tools. Gun-making machinery	Tokyo (90.17)						X	
2	254	Mitsubishi Electric Mfg. Co.	Precision and heavy machine tools. Westinghouse Patents	Nagoya (90.20)						X	
3	998	Niigata Iron Wks Plant #1	One of Big 5	Niigata (90.9)						X	
4	882	Ikegai Machine Foundry Shiba-Ku	One of Big 5	Tokyo (90.17)						X	
5	916	Hitachi Engineering Wks. Kameido Plant	Machine tools to replace American exports, turbines	Tokyo (90.17)						X	
6	331	Tokyo Gas & Electric Co. Omorike	One of Big 5	Tokyo (90.17)						X	
7	1191	Osaka Kikai KK	Milling machines, planers	Osaka (90.25)					X		
8	1146	Okuma Tekkosho Hagino Plant	One of Big 5	Nagoya (90.20)						X	
9	133	Shibaura Engineering Wks. Ltd.	Grinders, lathes, General Electric patents	Tokyo (90.17)						X	
10	1522	Shinohara Kikai Seisa Kusho	Milling machines	Tokyo (90.17)						X	
11	1357	Tokyo Special Machinery Co. Kamata-Ku (Japan Physico-Chem. Co.)	Kawasaki precision instruments, Zeiss patents	Tokyo (90.17)						X	
12	687	Osaka Wakayama Tekkusho	Machine tools, gauges	Osaka (90.25)					X		
13	835	Karatsu Iron Wks.	One of Big 5	Sasebo (90.36)				X			
14	919	Tokyo Keiki Seisakusho K K	Largest aircraft instruments wks. in East	Tokyo (90.17)						X	
15	1361	Kokusai Mchy Co. Shibuyaku	Turret lathes signal apparatus, centerless grinders	Tokyo (90.17)						X	

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943 MACHINE TOOLS

CHINA BASED OPERATIONS

Within a 1000-mile radius from Nanan operations base, as shown in the preceding table, there are no Machine Tool targets.

A 1250-mile radius includes 1 key plant at Karatsu and 18 minor targets. About 5% of machine tool production is included in this radius.

A 1500-mile radius includes the Osaka area and a cumulative total of 3 key targets and 29 others. Possibly 20% of machine tool production is included in this radius.

A 1750-mile radius includes in addition to the above the Tokyo-Yokohama area, the Nagoya area and the Niigata area, a cumulative total of 15 key targets and 49 others, and practically 100% of Japanese machine tool production.

Outside the 1750-mile radius lie 10 other targets in Malaya, Sumatra and Java, all of minor importance.

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March 1943

MACHINES AND MACHINE TOOLS

The Japanese machine tool industry is of prime importance but is so dispersed and the products of individual plants so diversified that effect of attack on individual units would be relatively limited.

Machine tools are employed in making practically every product of the manufacturing arts and are essential to mass production of every mechanical device used in the war effort.

Machine tool production is largely concentrated in sixteen firms licensed and subsidized by the Japanese government. The main plants of these firms include 9 plants in the Tokyo-Yokohama area, one plant in the Niigata area, two each in the Nagoya and Osaka areas, and one in the Karatsu area. About 60% of these plants are concentrated in the Tokyo-Yokohama area.

Japan's 1942 tool production is estimated to have been about $30,000,000 as against $1,400,000,000 in this country. Japan has, however, since 1937 imported large quantities of machine tools while we have exported such tools, so that the Japanese machine tool inventory in the period 1933-1942 increased about $285,000,000 while, during the same period the United States machine tool inventory increased about $1,800,000,000 or more than 6 times that of Japan. Japan is forced to utilize completely every available machine tool, moving small lathes and tools otherwise obsolete to homes or street shops (Machi Koba) to provide parts production or roughing operations, with finishing and assembly affected by sub-contractors and the licensed firms. This early Japanese version of mass production should not be underestimated.

With practically all machine tool producing countries now involved in war, Japan has no source of machine tools other than her own production. Japan's machine tool war production depends on the accumulated inventory together with current production of such equipment. As result of this inventory, Japan has been able to maintain a high rate of war production. However, any cutting into machine tool capacity will directly reduce ability to turn out war materials and there are no substitutes for machine tools.

Machine tool production equipment (machine tools) is fragile as to accuracy but many tools are heavy and rugged enough to withstand moderate concussion without breakage.

Since machine tools are essential to Japan's war effort and the machine tool inventory limits manufacturing, any reduction of machine tools, either in the machine tool production plants or in the general manufacturing plants, would directly reduce Japan's output of all types of war equipment.

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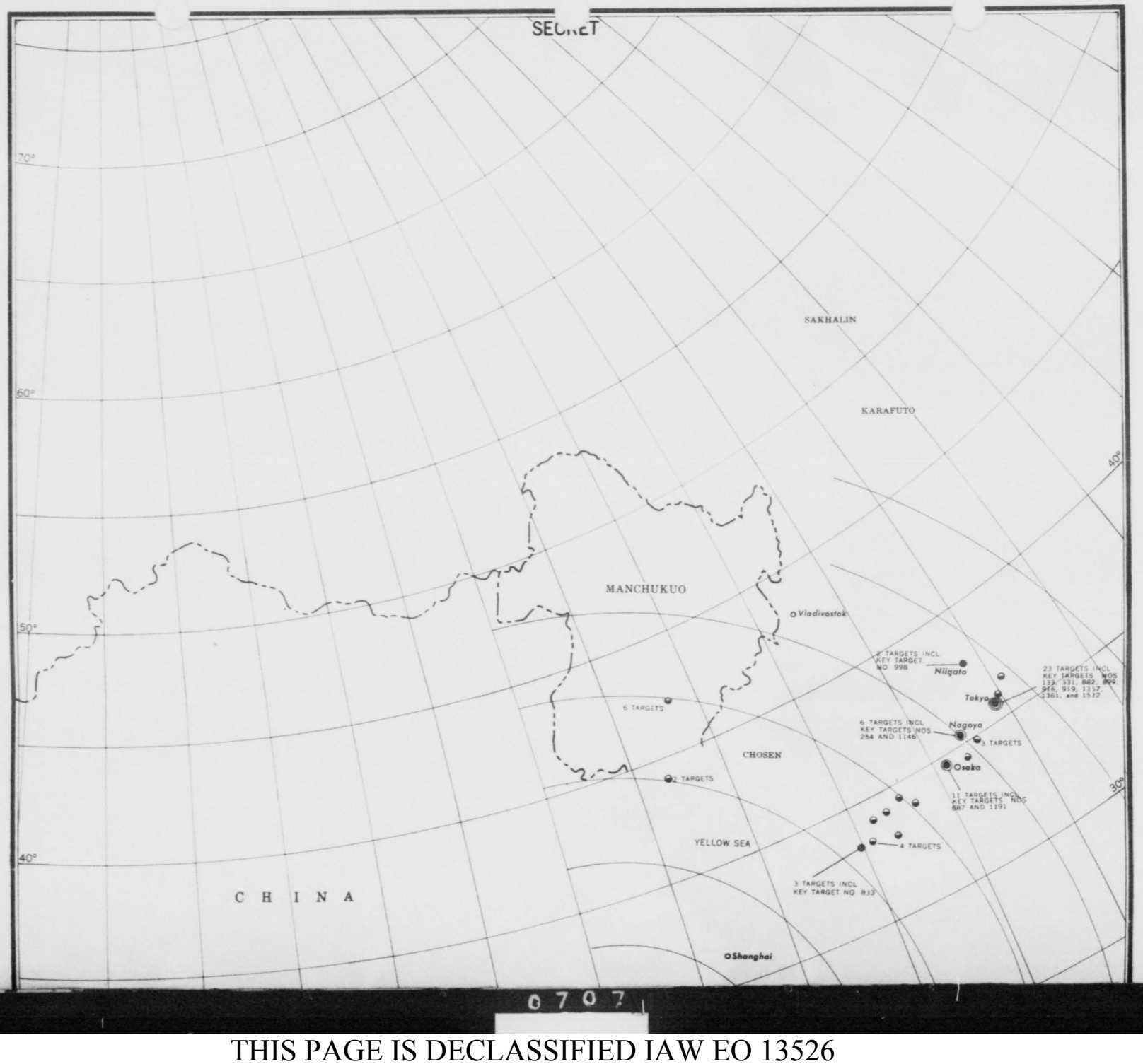

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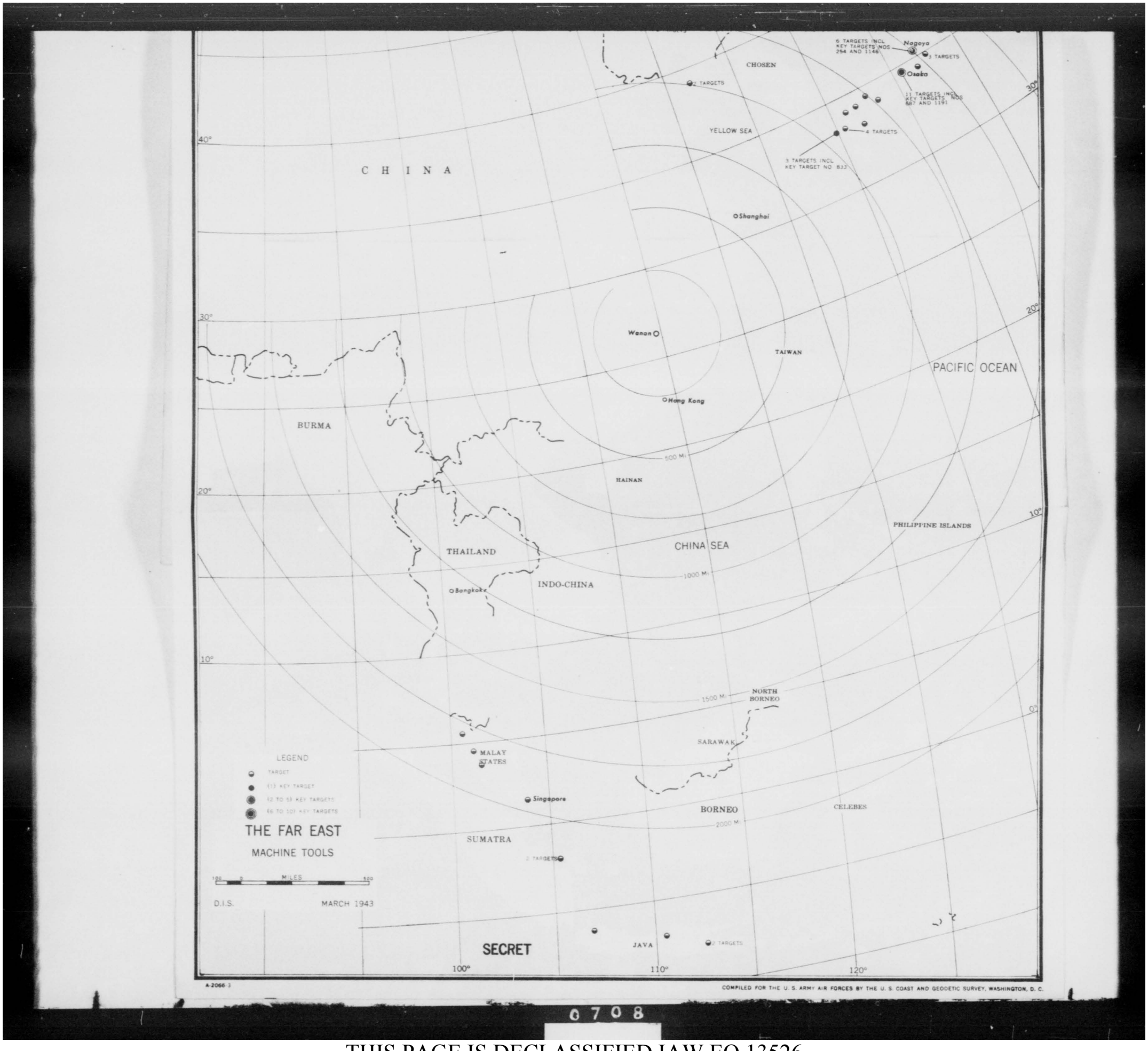

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	NIIGATA (90.9)			
998	Niigata Iron Wks, plant #1	Rated one of first 5 Japan machine tool producers	37°56'N 139°04'E	998
999	Niigata Iron Wks, plant #2	Large, newer than plant #1	37°56'N 139°04'E	998
	MITO (90.14)			
1476	Hitachi Engineering Wks, Kaigan plant	Very important; heavy, electrical machinery, munitions	36°35'N 140°39'E	1476
1522	Shinohara Machinery Wks	Important production machine tools	35°41'N 140°04'E	1519
	TOKYO (90.17)			
133	Shibaura Engineering Wks (Yokohama)	Vital importance; electrical equipment, navy turbines, munitions	35°29'N 139°42'E	N A
354	Shibaura Machine Tool Co (Tokyo)	Lathes, grinders & abrasives, "jeeps"	35°39'N 139°46'E	N A
350	Tsugishima Machinery Co (Tokyo)	One of many tool plants near Ishikawajima dockyard	35°39'N 139°47'E	N A
882	Ikegai Machine Foundry (Tokyo)	Industrial machines, machine tools	35°39'N 139°45'E	N A
913	Hattori Co (Tokyo)	Precision instruments, fuses, etc	35°42'N 139°49'E	N A
916	Hitachi Engineering, Kameido Pl (Tokyo)	Important prod heavy industry goods, conversion to war goods	35°42'N 139°50'E	N A
918	Niigata Iron Works (Tokyo)	Machine tools, submarine motors, Diesel trucks	35°34'N 135°43'E	N A
1353	Niigata Iron Works (Urawa)	Highly important, recent expansion	35°52'N 139°39'E	N A
1354	Oriental Babcock Co (Yokohama)	Important; boilers, other heavy industry goods	35°25'N 139°38'E	N A
1355	Japan Steel Bearing Co (Tokyo)	Very important; with #1356 rated leading Japan bearing production	35°37'N 139°44'E	N A
1356	Japan Steel Bearing Co (Fujisawa)	Very important; with #1355 rated leading Japan bearing production	35°20'N 139°29'E	N A

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JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	TOKYO (90.17) (Continued)			
1357	Tokyo Special Machine Mfg Co-Japan Physico-Chemical Co (Tokyo)	Army and Navy precision tools	35°34'N 139°41'E	N A
1358	Riken Heavy Industry Co (Tokyo)	Produces "Riken" car; probable war conversion	Location uncertain	-
1359	Nippon Piston Ring Co (Kawaguchi)	Important; produces piston rings, rings for airplanes	35°47'N 139°45'E	N A
1360	Ishii Iron Works (Tokyo)	Chemical equipment plant, also produces machine tools	Location uncertain	-
1361	Kokusan Machinery Co (Tokyo)	One of most important producers machine tools	35°39'N 139°43'E	N A
1362	Kitashin Electric Engineering Co(Tokyo)	Electrical and precision instruments	35°34'N 139°42'E	N A
1363	Shoun Engineering Co (Ofuna)	Rptd new ball & roller bearing capacity	35°21'N 139°32'E	N A
1364	Physico-Chemical Industries (Tokyo)	Abrasives, precision machinery	35°43'N 139°45'E	N A
	NAGOYA (90.20)			
254	Mitsubishi Electric Mfg Co	Important; power plant equipment	35°11'N 136°57'E	196
461	Ozone Plant, Okuma Iron Works	Tools & munitions	35°11'N 136°56'E	196
1146	Hagino Plant, Okuma Iron Works	Important tools & munitions production	35°11'N 136°56'E	196
1147	Nunoike Plant, Okuma Iron Works	Tools & munitions	35°11'N 136°56'E	196
1148	Takaoka Engineering Works	Minor; aircraft & automotive parts	35°11'N 136°56'E	250a
1149	Yamada Engineering Works	Minor; tools, hydraulic pumps	35°11'N 136°56'E	196
	HAMAMATSU (90.21)			
1227	Suzuki Automatic Loom Works	Large, rptd converted to war production	34°42'N 137°45'E	1219
1228	Enshu Loom Works	Important loom factory	34°41'N 137°41'E	1219
1229	Nishikawa Tool Co	Minor; polishing tools	34°42'N 137°45'E	1219
	KUMANO (90.24)			
1215	Kobe Steel Co (Toba)	Heavy electrical equipment, cranes, etc	34°28'N 136°51'E	1215

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JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
631	Kansei Electric Machinery Co	More data required	34°42'N 135°29'E	695
648	Dainippon Crane Mfg Co	More data required	34°41'N 135°29'E	661
661	Amatsuji Steel Ball Bearing Co	Rptd only Japan production bearing balls	34°40'N 135°30'E	661
687	Osaka Wakayama Iron Works	Machine tools, gauges, aeroplane engines & parts	34°39'N 135°30'E	325
774	Imperial Precision Machinery Works	More data required	34°39'N 135°08'E	10
779	Precision Machinery Works	More data required	34°39'N 135°09'E	10
782	Kobe Machinery Works	More data required	34°40'N 135°10'E	10
784	Kobe Engines Factory	More data required	34°40'N 135°10'E	10
786	Electric Machinery Works	More data required	34°40'N 135°11'E	10
1191	Hatsudori Seiso	Deisel engines, locomotive parts & machinery	34°42'N 135°29'E	695
1198	Toyo Bearing Seizo KK	Very important production ball bearings	34°47'N 135°22'E	1198
	NIIHAMA (90.29)			
932	Sumitomo Machinery Works	Mining, smelter, misc machinery	33°58'N 133°16'E	923
	KURE (90.30)			
730	Hiro Naval Turbine & Engine Factory	Turbines, engines	34°13'N 132°36'E	656
	TOKUYAMA (90.32)			
825	Hitachi Mfg (Kasado fcty)	One of largest locomotive & tank works	33°59'N 131°53'E	672
	KYUSHU EAST (90.33)			
1327	Usuki Iron Works	Minor producer marine engines	33°07'N 131°48'E	1327

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JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIMONOSEKI (90.34)			
1126	Yasukawa Electric Machine Wks	Large plant, electric equipment	33°52'N 130° 44' E	1113
	KURUME (90.35)			
1256	Miike Machinery Wks (Omuta)	Very large producer mining machinery	33°02'N 130° 27' E	1243
1257	Kobukuro Machinery Wks (Iizuka)	Large; Navy & marine equipment	33°39'N 130° 41' E	1257
1258	Nogata City Industries	Grouped colliery machinery factories	33°45'N 130° 44' E	1258
1259	Togami Electric Wks (Saga)	Large; electrical equipment, Navy supplier	33°16'N 130° 18' E	1259
	SASEBO (90.36)			
829	Mitsubishi Elec Mfg Co	Important, power plant equipment	32°45'N 129°52'E	542
830	Instrument Workshop, Sasebo	New, rptd important	33°10'N 129°42'E	-
833	Karatsu Steel Works	One of most important machine tool plants	33°28'N 129°58'E	833
	MANCHUKUO (MANCHURIA) (93)			
	MUKDEN (93.3)			
50	Sumitomo Metal Works	More data required	41°47'N 123°23'E	50
51	Machine Shop	More data required	41°47'N 123°23'E	50
52	Electric Wire Co	More data required	41°47'N 123°23'E	50
61	Machine Shop	More data required	41°52'N 123°58'E	32
63	Railway Repair Shop	More data required	41°51'N 123°54'E	32
68	Locomotive & Railway Car Mfg Co	Rptd large	41°47'N 123°23'E	50
	DAIREN (93.5)			
16	South Manchurian Railway Shops	Largest RR shops in Manchukuo	38°56'N 121°35'E	10

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JAPAN-MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	DAIREN (93.5) (Cont'd)			
17	Dairen Machine Works	Important	38°54'N 121°34'E	16
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
53	Machine Shop Area, Ipoh	Machine shops serving Kinta Valley tin industry	4°35'N 101°04'E	53
54	Federated Engineering Co	Machine shop, foundry, dredge building	3°08'N 101°42'E	60
55	United Engineers Ltd, Georgetown	Machine shop, foundry	5°24'N 100°20'E	27
	SINGAPORE (92.2)			
52	United Engineers, Ltd, Singapore	Largest metal working, machine shops, foundries in Malaya	1°18'N 103°51'E	52
	NETHERLANDS EAST INDIES (94)			
	SUMATRA SOUTH (94.2)			
72	Muntok Machine Shop	For Muntok tin smelter	2°04'S 105°10'E	57
73	Muntok Auto Repair Shop	Small machine shop	2°04'S 105°10'E	57
	JAVA (94.3)			
182	Lindetevis-Stokvis Co	Large machine shop	6°58'S 110°25'E	148
183	Braat Machine Shops	Large shops	7°17'S 112°45'E	174
184	Ned Indische Industrie	Large shops, Surabaya	7°14'S 112°44'E	174

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JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAVA (94.3) (Continued)			
185	Lindetevis-Stokvis, Batavia	Large machine shops	6°09'S 106°49'E	166

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAVA (94.3) (Continued)			
185	Lindetevis-Stokvis, Batavia	Large machine shops	6°09'S 106°49'E	166

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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Tab I. Non-Ferrous Metals

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March 1943 NON - FERROUS METALS

	KEY TARGETS				Miles radius from Wanan (inclusive)						
	TARGET		Importance	Obj. Area	500	750	1000	1250	1500	1750	over
	No.	Name									
1	42	Bawdin Mine & Mill	80% Lead capacity & 40% Zinc capacity	Burma N. (82.1)				X			
2	1176	Japan Light Metals	40% Alumina capacity	Shizuoka (90.18)						X	
3	1177	Japan Light Metals	16% Aluminum cap.	Shizuoka (90.18)						X	
4	811	Ashio Copper Refinery	22% Copper capacity	Takasaki (90.13)						X	
5	1108	Japan Aluminum Co.	20% Alumina capacity	Shim'seki (90.34)				X			
6	1260	Mitsui Zinc Smelter	30% Zinc capacity	Kurume (90.35)				X			
7	810	Ashio Copper Plants	10% Copper capacity	Takasaki (90.13)						X	
8	815	Shisakijima Copper Ref'y	19% Copper capacity	Niihama (90.29)					X		
9	1535	Kokusan Light Metals	15% Aluminum capacity	Toyama (90.11)						X	
10	1100	Japan Electro-Chemical Co.	9% Aluminum capacity	Nagano (90.12)						X	
11	814	Shisakijima Copper Sml'tr	15% Copper capacity	Niihama (90.29)					X		
12	925	Niihama Conc. Mill	15% Copper capacity	Niihama (90.29)					X		
13	926	Sumitomo Copper Conc. Mill	15% Copper capacity	Niihama (90.29)					X		
14	1261	Mitsui Zinc Refinery	30% Zinc capacity	Kurume (90.35)				X			

(Priority targets are underlined)

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943

NON - FERROUS METALS.

CHINA BASED OPERATIONS.

Within a 500-mile radius from a Wanan Operations Base, as shown in the preceding table, there are two non-ferrous metal plants neither of which is a key target.

A 750-mile radius includes 5 plants none of which is a key target.

A 1000-mile radius includes one target in the Philippine Islands.

Within a 1250-mile radius there are 15 plants of which 4 are key targets. Principal among these is the Bawdwin Mine in Burma (having a capacity of about 80% of Japan's lead requirements as well as 40% of the total zinc capacity) and the Japan Alumina plant producing 20% of the total aluminum capacity.

Within a 1500-mile radius there are 17 plants of which 4 are designated key targets, two of these are copper treatment mills together with a copper smelter and refinery, all in close proximity in the Niihama area, representing 45% of the total capacity.

A 1750-mile radius includes 13 targets 6 of which are key targets comprising two of the largest alumina plants accounting for about 60% of the total aluminum capacity as well as the largest copper mine, mill, smelter and refinery.

Within a 2000-mile radius there are 7 plants none of which is designated as a key target.

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NON - FERROUS METALS

Japan's position in non-ferrous metals is generally comfortable but vulnerable in several respects. An estimated 1,000,000 tons of ores and metals per year must be moved into Japan Proper; there are vulnerable points in this movement, (see Shipping). In some cases production or processing is concentrated in relatively small areas and there are also individual processing units, the destruction of which would cut off critical proportions of certain metals.

APPROXIMATE POSITION
(tons of equivalent metal)

Metal	Requirements	Total Production	Japan Proper	
			Imported Production	Stockpile
Copper	190,000	145,000	45,000	200,000
Aluminum	150,000	150,000	120,000	100,000-150,000
Lead	100,000	113,000	100,000	80,000
Zinc	80,000	100,000	80,000	25,000-40,000
Magnesium	15,000	15,000	7,500	15,000
Tin	10,000	150,000	10,000	100,000
Antimony	3,000	300	3,000	3,000-4,000
Mercury	500	- - -	500	1,000-1,500

Eighty percent of Japan's aluminum supply is dependent on bauxite ore shipped from the Singapore area amounting to some 450,000 tons per year. Denial of these shipments would make Japan dependent on the 20% of aluminum which is derived from alunite and shale ores mined and processed into metal in Korea and Manchuria. Conversion of not only future shipments, but also of ore stockpiles into metal depends upon the operation of treatment plants in Japan Proper. Two plants produce the alumina from which about 60% of Japan's aluminum is derived.

The bulk of Japan's copper supply is mined and processed in Japan Proper. It is doubtful if the mines are capable of increased production but the large stockpile, together with the fact that, to some extent aluminum can be substituted for copper, makes Japan's position relatively secure. However, destruction of copper refineries, smelters, and concentrating mills would probably be reflected in the munitions industry as well as presenting a problem to maintenance of Japan's electrical facilities.

Japan's position relative to lead is most precarious in that 80% of the supply comes from one source, the Bawdwin Mine in Burma; destruction of the two shafts, concentrating mill and smelter would make it extremely difficult, if not impossible, for Japan to meet its requirements. No other metal is a satisfactory substitute for lead in small arms ammunition, batteries, cable sheathing etc. This mine also produces about 40% of Japan's zinc supply.

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Magnesium plants in Japan Proper are believed capable of furnishing an ample supply of this metal. Electrolitic plants using sea water could probably be expanded sufficiently to care for any shortages which might occur.

Zinc production in Japan is negligible. Forty percent of the requirements originate in the Bawdwin Mine in Burma. As this product is in zinc concentrates, which must be reduced to metal in smelters and refineries, the large zinc smelter and refinery at Kurume are important.

Stockpiles of tin are believed to be sufficient for several years. Large stocks of the metal were obtained after the occupation of Malaya and as Japan's requirements are small, no shortage should be felt in this metal.

Antimony requirements are met by smuggling and otherwise from Occupied and Unoccupied China. The supply is ample and the requirements are small.

Mercury stockpiles are believed to be sufficient for two to three years. The supply comes from Italy and Spain and stocks could be replenished by blockade running.

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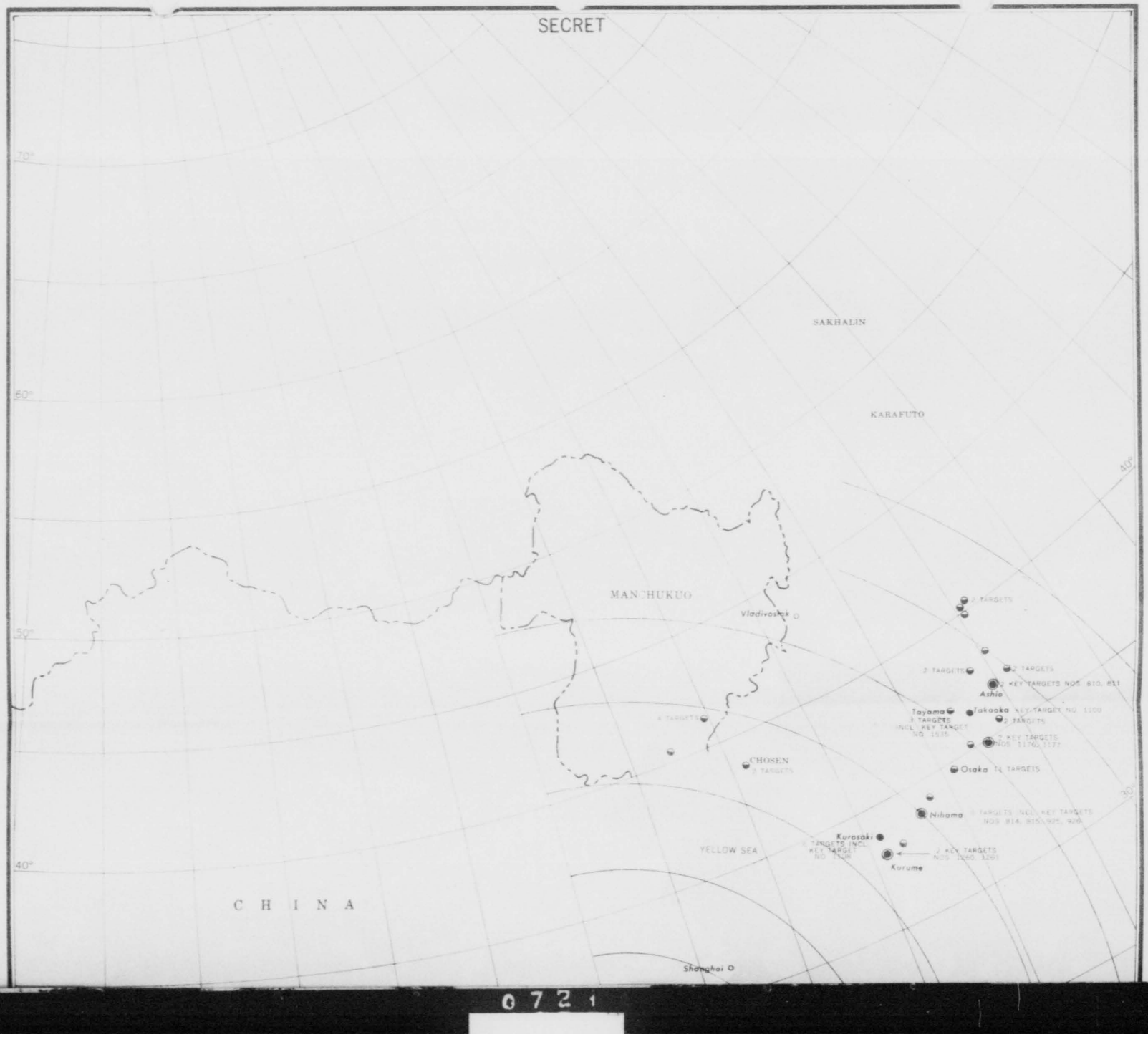

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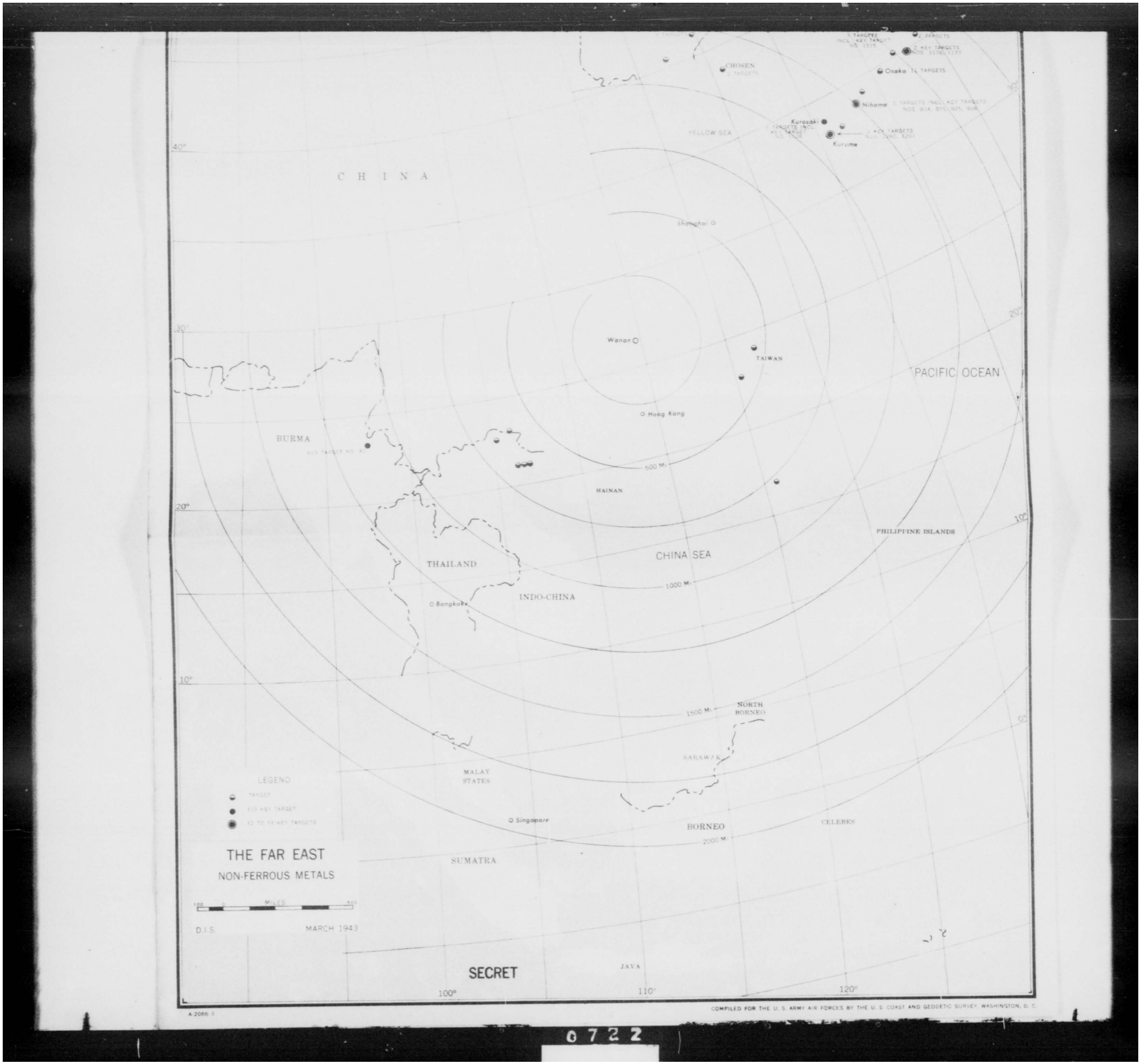

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All targets in folders to 3/1/43, grouped by Areas

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	AKITA (90.6)			
808	Osarizawa Copper Smelter	Secondary	40°13'N 140°42'E	808
809	Kosaka Copper Smelter & Refinery	Rptd 10% Japan copper	40°15'N 140°44'E	809
1064	Arakawa Copper Smelter	Small	39°38'N 140°24'E	1064
1065	Ani Copper Smelter	Small	39°50'N 140°25'E	1065
	NIIGATA (90.9)			
1003	Japan Light Metals, Plant #1	Among 5 largest aluminum plants in Japan	37°54'N 139°02'E	998
1004	Japan Light Metals, Plant #2	Rolling mill, reduction works	37°55'N 139°04'E	998
	FUKUSHIMA (90.10)			
1081	Tetsuko Alloy Wks, Yamagata Fcty	No details	38°15'N 140°20'E	1082
	TOYAMA (90.11)			
861	Nichiman Aluminum Co	Important, aluminum & alumina	36°45'N 137°14'E	862
866	Nippon Soda Co (Takaoka)	Important, aluminum, alumina & other chemicals	36°46'N 137°01'E	943
1535	Kokusan Light Metals (Sasazu)	Rptd 15% total of aluminum; also alumina	36°26'N 137°58'E	N A
	NAGANO (90.12)			
1100	Showa Electrical Industry, Aluminum Plant	Major aluminum production	36°29'N 137°52'E	1100

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKASAKI (90.13)			
810	Ashio Copper Works	Rated largest in Empire	36°40'N 139°26'E	810
a,b,&c 811	Furukawa Copper Refinery	Rptd Japan's leading producer non-ferrous metals	36°44'N 139°33'E	811
	MITO (90.14)			
812	Hitachi Copper Refinery	With #1492, 4th largest Japan production	36°36'N 140°39'E	1476
1492	Hitachi Copper Smelter	With #812, 4th largest copper production	36°37'N 140°38'E	1476
	TOKYO (90.17)			
212	Asahi Electro Chemical Co (Tokyo)	One of most important magnesium plants in Japan	35°44'N 139°47'E	N A
521	Japan (Showa) Electro Chemical Co (Yokohama)	One of most important alumina plants in Japan	35°29'N 139°40'E	N A
	SHIZUOKA (90.18)			
1176	Japan Light Metals Co (Shimizu)	Rptd largest alumina plant in Japan	35°00'N 138°31'E	1176
1177	Japan Light Metals Co (Kambara)	Rptd largest aluminum plant in Japan	35°07'N 138°37'E	1177
	NAGOYA (90.20)			
1145	Ogaki Aluminum Plant	Rptd important, but no details	35°21'N 136°37'E	1135b

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
262	Sumitomo Electric Wire & Cable Wks	Important	34°40'N 135°27'E	263
263	Sumitomo Copper & Steel Tubing Co	Very important; copper, aluminum products, etc	34°40'N 135°27'E	263
265	Tai Nippon Tungsten Co	More data required	34°40'N 135°28'E	263
689	Osaka Aluminum Co	More data required	34°40'N 135°29'E	661
690	Asano Copper Wks	Important, bars & rods	34°40'N 135°29'E	661
692	Sumitomo Copper Wks & Warehouses	More data required	34°41'N 135°29'E	661
693	Taido Aluminum Co	More data required	34°43'N 135°28'E	695
697	Mitsubishi Copper Refinery	Rptd one of four largest in Japan	34°42'N 135°31'E	382
1193	Toyosaki Copper Works	Important, sheets and plates	34°43'N 135°31'E	382
1194	Amagasaki Copper Works	More data required	34°42'N 135°25'E	536
1195	Sumitomo Copper Works	More data required	34°43'N 135°25'E	536
	OKAYAMA (90.27)			
1297	Mitsubishi Copper Smelter & Zinc Refinery	Major installation	34°28'N 133°58'E	1295
	NIIHAMA (90.29)			
814	Sumitomo Copper Smelter	Large	34°06'N 133°11'E	814
815	Sumitomo Copper Refinery	One of most important copper refineries	33°58'N 133°16'E	923
924	Sumitomo Aluminum Reduction Plant	Rptd 4% Japanese aluminum	33°58'N 133°17'E	923
925	Niihama Ore Dressing Plant	Important, linked with #926	33°58'N 133°16'E	923
926	Sumitomo Besshi Copper Mine & Hadeba Ore Dressing Plant	One of largest; target is ore dressing plant	33°53'N 133°19'E	926
	TOKUYAMA (90.32)			
922	Rikan Metal Co	One of few known magnesium plants in Japan	33°57'N 131°14'E	818

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KYUSHU EAST (90.33)			
1328	Saganoseki Copper Wks	Important smelter & refinery	33°15'N 131°53'E	1328
	SHIMONOSEKI (90.34)			
45	Hiko Island Smelting Wks	Believed important zinc smelter	33°56'N 130°53'E	43a
46	Kobe Steel Co (Komoriye)	Rptd tungsten, molybdenum refinery	33°55'N 130°57'E	43a
1108	Japan Aluminum Co (Kurosaki)	Very important alumina plant, rptd nearly 20% Empire capacity	33°52'N 130°46'E	1113
1116	Japan Tube Co (Shimonoseki)	Rptd important aluminum rolling mill	33°58'N 130°58'E	44a
	KURUME (90.35)			
1260	Mitsui Zinc Distilling Plant	Rptd largest zinc distilling plant in Japan	33°02'N 130°27'E	1243
1261	Mitsui Electrolytic Zinc Refinery	Important zinc refinery	33°02'N 130°26'E	1243
	JAPANESE ISLANDS (91)			
	TAIWAN EAST (91.5)			
61	Japan Aluminum Co	Important; aluminum & magnesium	24°00'N 121°37'E	61
	TAKAO (91.6)			
3	Nippon Aluminum Co (Takao)	Important alumina & aluminum production; rptd several other important plants adjacent	22°37'N 120°17'E	3

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (KOREA) (84)			
	HEIJO (84.3)			
67	Chosen Riken Metals Co (Chinnampo)	Large, new, aluminum & magnesium	38°43'N 125°23'E	76
68	Japan Mining Co Smelter (Chinnampo)	Small lead smelter	38°44'N 125°26'E	76
	MANCHUKUO (MANCHURIA) (93)			
	MUKDEN (93.3)			
31	Japan-Manchukuo Light Metals Mfg	Very important; aluminum	41°51'N 123°54'E	-
32	Manchuria Light Metals Mfg	Most important such plant in Manchukuo	41°51'N 123°54'E	32
33	Aluminum Plant of Manchuria RR	Important	41°51'N 123°54'E	-
34	Manchuria Magnesium Industry Co	Important	40°35'N 122°30'E	34
	FRENCH INDO-CHINA (85)			
	INDO CHINA NORTH (85.1)			
34	Cho Dien Zinc Mine	Largest zinc mine Indo China	22°20'N 105°35'E	N A
35	Quang Yen Zinc Smelter	Only zinc smelter in country	20°57'N 106°48'E	N A
36	Hongay Coal Treating Plant	Secondary	20°58'N 107°04'E	N A
37	Campha Coal Treating Plant	Secondary	21°01'N 107°21'E	N A
38	Cao Bang Tin Smelter	Largest tin smelter in country	22°39'N 106°15'E	N A

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES NORTH (92.1)			
47	Penang Tin Smelter	60,000 tons yearly	5°25'N 100°20'E	27
49	Butterworth Tin Smelter	40,000 tons yearly	5°24'N 100°22'E	27
	SINGAPORE (92.2)			
48	Pulo Brani Tin Smelter	45,000 tons yearly	1°15'N 103°50'E	52
	BURMA (82)			
	BURMA NORTH (82.1)			
42	Burma Corp Wks, Namtu	Treats ore of largest lead-zinc mine in Far East	23°05'N 97° 27'E	42
	BURMA SOUTH (82.2)			
17	Concentrating Mill, Mawchi Mines	Treats ore from world's largest tungsten mine	18°49'N 97°11'E	17
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
30	Bintan Island Bauxite Plant	Supplies 60% of Jap bauxite ore	0°50'N 104°36'E	30

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SUMATRA SOUTH (94.2)			
68	Muntok Tin Smelter	Approx 7,500 tons per year	2°09'S 105°10'E	57
69	Pangkal Pinang Tin Smelter	Approx 15,000 tons per year	2°08'S 106°09'E	58
	PHILIPPINES (96)			
	PHILIPPINES NORTH (96.1)			
	PHILIPPINES SOUTH (96.2)			
8	Lepanto Smelter	Smelters 90% Philippine copper ore	16°51'N 120°47'E	-

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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Tab J. Petroleum

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PETROLEUM

March 1943

KEY TARGETS							Miles radius from Wanan (inclusive)						
	TARGET		IMPORTANCE										
	No.	Name	% Crude Cap.	% Synth. Cap.	% Comb. Cap.	Obj. Area	0-50	50-100	100-150	150-300	300-450	450-600	Over
1	* 61	Fladjoe Ref'y.	29.0	-	25.4	Sumatra So. (94.2)							X
2	8	Lutong Ref'y.	11.6	-	10.2	Borneo No. (81.1)						X	
3	*116	Mitsubishi Oil Kawasaki Ref.	6.1	-	5.3	Tokyo (90.17)						X	
4	* 87	Ogura Oil Yokohama Ref.	5.8	-	5.1	Tokyo (90.17)						X	
5	672	Nihon Oil Co. Kudamatsu	4.4	-	3.8	Tokuyama (90.32)				X			
6	58	Kirin Artificial Oil Co.	-	25.2	3.1	Manch. East (93.2)					X		
7	43	Manchuria Coal Liquefaction Co. Ssupingkai	-	21.0	2.6	Mukden (93.3)					X		
8	29	Showa Steel Wks. (Synth. Plant)	-	15.0	1.9	Mukden (93.3)				X			
9	225	Shell Oil Co. Balikpapan	4.8	-	4.2	Borneo So. (81.1)							X
10	*128	Petroleum Center Tsurumi	3.5	-	3.0	Tokyo (90.17)						X	
11	*673	Tokuyama Naval Fueling Station	2.9	-	2.5	Tokuyama (90.32)				X			
12	1	Manchukuo Petro. Co. Dairen	2.9	-	2.5	Dairen (93.5)			X				
13	* 88	Chosen Oil Co. Refinery	2.9	-	2.5	Genzan (84.4)				X			
14	1203	Nippon Oil Ref. Amagasaki	2.9	-	2.5	Osaka (90.25)					X		
15	41	S.M.R. Coal Liquefaction Plt. (Fushun)	-	8.4	1.0	Mukden (93.3)				X			
16	110	Mitsui Mining Co. - Chinchow	-	7.5	0.9	Mukden (93.3)				X			
	76.8		77.1	76.5									

* Produces Aviation Gasoline.

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

PRIORITY TARGETS ARE UNDERLINED

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March 1943 SECRET

P E T R O L E U M

CHINA BASED OPERATIONS

Within 1000 miles of Wanan there is one key target, the refinery at Darien.

Within a 1250-mile radius are 7 key targets, of which two — the Nihon refinery at Kudamatsu, and the synthetic oil plant at Showa Steel at Anshan (Manchukuo) — are priority targets.

A 1500-mile radius takes in a total of 10 key targets. The additional two priority targets are the Kirin and Fushun Manchuria Coal Liquification plants, respectively representing 25% and 21% of total synthetic capacity.

Within 1750 miles are 14 key targets and a total of 7 priority targets. The latter include (in addition to those mentioned above) the important Lutong Refinery in British Borneo with 12% of total crude capacity, and the Tokyo area plants of Mitsubishi Oil at Kawasaki (9% of crude refining capacity) and Ogura Oil at Yokohama (6%).

Beyond 1750 miles from Wanan is the Pladjoe Refinery at Palembang, South Sumatra, the largest in the Far East and representing 29% of all crude refining capacity under Japanese control.

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P E T R O L E U M

JAPANESE PETROLEUM POSITION
1943

(000 bbls)

Product	Requirements	SUPPLY					Storage Jan. 1, 1943.
		Total Supply	Produced in Japan from			Produced in Indies	
			Domestic Crude	Indies Crude	Synthetic		
Aviation Gasoline	3,735	15,683	300	1,173	600	1,887	11,723
Motor Gasoline	6,413	25,277	1,508	3,067	7,495	7,181	6,036
Kerosene	1,020	1,455	426	-	-	-	1,029
Lube Oil	2,300	4,431	731	250	250	250	2,950
Diesel & Fuel Oil	39,853	64,627	3,457	3,793	5,307	26,320	25,750
TOTAL	53,321	111,473	6,422	8,273	13,652	35,638	47,488

It is noteworthy that while domestic output (synthetic and crude) of petroleum products is equivalent to almost 40% of total requirements, it supplies only 24% of aviation gasoline requirements and only 22% of fuel oil requirements. The importance of the 12,036,000 barrels of natural fuel oil obtained from the Indies, plus the 14,284,000 barrels of refined fuel oil processed largely at Pladjoe (at Palembang, South Sumatra) and Lutong (Borneo), and the 1,887,000 barrels of aviation gas from Pladjoe, is evident.

Annual crude oil refining capacity in the Japanese Empire is approximately 35,000,000 bbls., only 15,000,000 of which will be used during 1943. The Indies refineries, however, particularly Pladjoe and Lutong, will be run to capacity. Their destruction would force Japan to ship over 22,000,000 bbls. of crude home for refining and then to ship the refined products down to the South Pacific combat zones, a process which would impose a severe strain on the tanker fleet.

The Pladjoe and Lutong refineries lead the list of 8 priority targets in the preceding table, and unquestionably are the most important to Japan at the present time. Destruction of this capacity would greatly increase the importance of refinery and synthetic capacity in the north; the synthetic plants would become still more important if sea-borne transport of crude from the south were seriously restricted.

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The accompanying two tables list all crude oil refineries now under Japanese control and all the principal synthetic oil plants on which there is information.

There are four concentrations of crude oil refining capacity:

(1) Pladjoe, with 29.0% of the total;

(2) Lutong, with 11.6% of the total;

(3) Tokyo Area (9 refineries), with 20.5% of the total;

(4) Kudumatsu-Tokuyama (2 refineries), with 9.7% of the total.

In the case of synthetic oil, 27.3% of the capacity is represented by the two plants at Kirin, (Manchukuo), while the Manchu plant at Szepingkai (north of Mukden) produces 21.0% of the total, and the Showa plant at Anshan 15.0%.

A final table, on the principal known oil storage points in Japanese territory, is included in the report. Although a considerable amount of oil is stored at each of these tank farms, they are, of course, not self-replenishing, and are thus assigned secondary values as targets.

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PETROLEUM REFINERIES IN JAPAN & OCCUPIED TERRITORY

NAME	LOCATION	CAPACITY Bbls. Per Day	CAPACITY % of Total
Pladjoe Refinery*	Palembang, Sumatra	50,000	29.00
Lutong Refinery	Lutong (Miri) British Borneo	20,000	11.6
Mitsubishi Oil Co.*	Kawasaki	10,500	6.1
Ogura Oil Co.*	Yokohama	10,000	5.8
Shell Oil Co.	Balikpapan, Dutch Borneo	8,200	4.8
Nippon Oil Co.	Kudamatsu	7,500	4.4
Nippon Oil Co.*	Tsurumi	6,000	3.5
Nippon Oil Co.	Amagasaki	5,000	2.9
Imperial Navy*	Tokuyama	5,000	2.9
Manchurian Oil Co.*	Dairen	5,000	2.9
Chosen Oil Co.*	Genzan	5,000	2.9
Nippon Oil Co.	Akita	4,000	2.3
Nippon Oil Co.	Kashiwazaki	4,000	2.3
Ogura Oil Co.	Tokyo	3,500	2.0
Nippon Oil Co.	Akita	3,000	1.7
Imperial Navy	Kudamatsu	3,000	1.7
Maruzen Oil Co.*	Shimotsu	3,000	1.7
South Manchurian RR Co.	Fushun	3,000	1.7
Aikoku Oil Co.	Kawasaki	2,000	1.2
Hayama Oil Co.*	Kawasaki	2,000	1.2
South Manchurian RR Co.	Dairen	1,200	0.7
Nihon Seiro Oil Co.	Tokuyama	1,200	0.7
Maruzen Oil Co.	Osaka	1,000	0.6
Thai Navy	Bangkok	1,000	0.6
Toyo Oil Co.	Osaka	700	0.4
Niitsu Oil Co.	Nakadori	700	0.4
Asahi Oil Co.	Tokyo	500	0.3
Toho Oil Co.*	Yokohama	500	0.3
Niitsu (Marushin) Oil Co.	Niigata	500	0.3
Niitsu Oil Co.*	Niigata	500	0.3
Nihon Oil Co.	Funakawa	500	0.3
Asahi	Hikoshima	500	0.3
Nippon Oil Co.	Garugawa	400	0.2
Nippon Oil Co.	Byoritsu, Taiwan	250	0.2
Niitsu (Marushin) Oil Co.	Akita	200	0.1
Hayama Oil Co.	Niigata	200	0.1
Toyo Shoko Oil Co.	Yokohama	200	0.1
Total		169,750	
All Other Refineries		2,690	1.5
Grand Total		172,440	100.0

*Produces Aviation Gasoline.

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PRINCIPAL KNOWN SYNTHETIC OIL PLANTS IN THE JAPANESE EMPIRE

NAME	LOCATION	CAPACITY Bbls. Per Day	CAPACITY % of Total
Kirin Artificial Oil Co.	Kirin	6160	25.2
Manshu Coal Liquefaction Co.	Szepingkai	5140	21.0
Showa Steel Co.	Anshan	3670	15.0
South Manchurian RR Co.	Fushun	2055	8.4
Mitsui Mining Co.	Chinchow (Manchuria)	1840	7.5
Mitsui Mining Co.	Miike	1030	4.2
Hokkaido Jinjo Oil Co. #2	Rumoe	940	3.8
Hokkaido Jinjo Oil Co. #1	Takikawa	925	3.8
Chosen Denryoku	Mokpo	900	3.7
Chosen Chisso	Agochi	880	3.6
Manchurian Synthetic Fuel Co.	Kirin	520	2.1
Nissan Liquid Fuel Co.	Wakamatsu	410	1.7
TOTAL		24,470	100.0

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MAJOR KNOWN OIL STORAGE IN JAPAN & OCCUPIED TERRITORY

NAME	LOCATION	CAPACITY (Bbls.)
Tokuyama Naval Fueling Station	Tokuyama	3,000,000
Alexandra Tank Farm	Singapore	2,900,000
Kranji Tank Farm	Singapore	2,900,000
Maizuru Naval Station Tanks	Maizuru	1,505,000
Bukum Island Tank Farm	Singapore	1,500,000
Sasebo Oil Storages	Sasebo	600,000 - 1,000,000
Hanano Waki Oil Tanks	Tokuyama	588,000
Rising Sun Petroleum Co.	Osaka	500,000
Hitonose Oil Storage	Kure	400,000
Kozaki Point Oil Storages	Nagasaki	385,000

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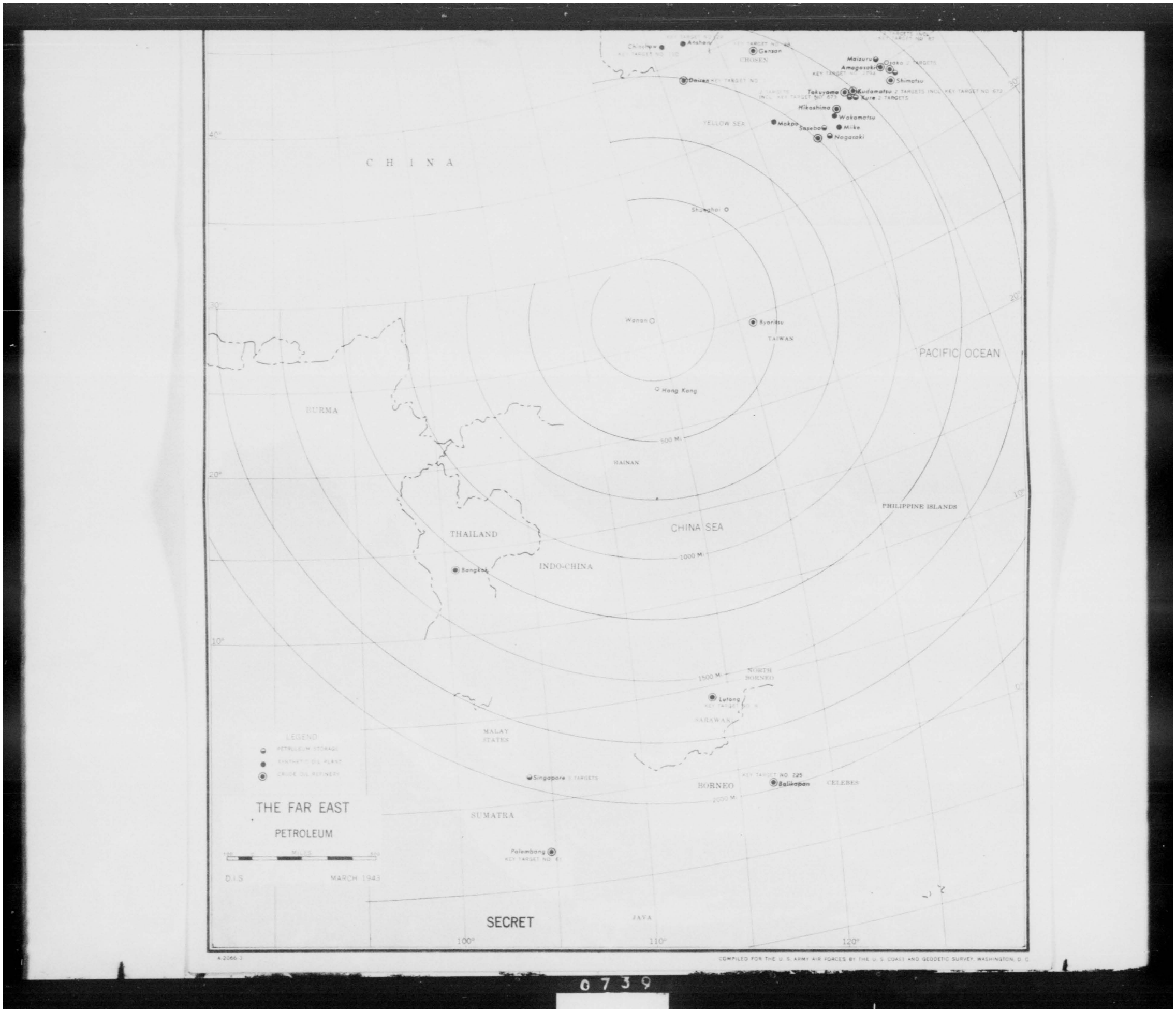

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All targets in folders to 3/1/43, grouped by Areas

JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
962	Synthetic Oil Plant at Naihoro	Minor plant	46°40'N 141°50'E	954
963	Ambetsu Oil Field	More data required	49°59'N 142°11'E	963
964	Standard Vacuum Oil Storage	More data required	46°38'N 142°46'E	966
	HOKKAIDO NORTH (90.2)			
1049	Synthetic Fuel Plant, (Kushiro)	Minor importance	43°00'N 144°22'E	-
1050	Synthetic Fuel Plant, (Takigawa)	Minor importance	43°33'N 141°52'E	-
	MURORAN (90.3)			
988	Mitsubishi Coal Liquefaction Plant	Secondary synthetic petroleum plant	42°20'N 141°01'E	378
1027	Kerugawa Refinery	Small refinery	43°04'N 141°22'E	-
	HAKODATE (90.4)			
980	Fuel Oil Storage	Minor bunkering storage	41°47'N 140°44'E	977
	AOMORI (90.5)			
995	Nonai Oil Storage	Secondary but rptd largest in N Japan	40°52'N 140°50'E	995

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	AKITA (90.6)			
1066	Nippon Oil Co Refinery	Secondary	39°46'N 140°04'E	1066
1067	Funakawa Oil Refineries	Small	39°53'N 139°52'E	-
	KAMAISHI (90.8)			
376	Northern Pier Oil Storage	Small	39°16'N 141°54'E	189
377	Radio Towers Oil Storage	Small	39°16'N 141°54'E	189
	NIIGATA (90.9)			
1000	Nippon Oil Co Refinery	One of largest refineries in Japan	37°55'N 139°04'E	998
1010	Sekiyu Oil Refinery	No details	37°57'N 139°50'E	998
1012	Oil Storage #1	Large storage tanks	37°51'N 139°05'E	998
1013	Oil Storage #2	Large storage tanks	37°56'N 139°04'E	1005
	FUKUSHIMA (90.10)			
1084	Standard Vacuum Oil Co	Secondary storage	37°45'N 140°28'E	1077
1085	Rising Sun Petroleum Co	No details	37°45'N 140°28'E	1077
1090	Standard Vacuum Oil Co	No details	38°14'N 140°54'E	1104
1091	Standard Vacuum Oil Co	Small storage	38°15'N 140°20'E	1082
1092	Rising Sun Petroleum Co	No details	38°15'N 140°20'E	1082
	TAKASAKI (90.13)			
1061	Standard Vacuum Oil, Takasaki	Small storage	36°19'N 139°01'E	1051

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JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90,17)			
87	Ogura Oil Co (Yokohama)	Large refinery & tanks	35°29'N 139°40'E	NA
88	Japan-American Oil (Yokohama)	Fuel oil, gasoline, kerosene; small	35°29'N 139°39'E	"
89	Eastern Petroleum Refinery (Yokohama)	Oil & asphalt	35°29'N 139°41'E	"
90	Oriental Oil Co (Yokohama)	Oil & gasoline	35°29'N 139°40'E	"
92	Lighthouse Bureau & Kanagawa Tanks	Petroleum stores & military supplies	35°26'N 139°40'E	"
94	Matsukata Oil Storage (Yokohama)	Petroleum & gasoline storage	35°29'N 139°40'E	"
116	Mitsubishi Oil Refinery (Kawasaki)	Japan's largest; produces aviation gasoline, lubricants	35°30'N 139°44'E	"
117	Mitsubishi Oil & Chiyoda Tanks	Production & storage	35°29'N 139°41'E	"
127	Hayama Refinery (Kawasaki)	One of area's largest refineries	35°30'N 139°44'E	"
128	Petroleum Center (Kawasaki)	4 refineries & storage; aviation gasoline etc	35°29'N 139°42'E	"
129	Nippon Super Fuel Co (Yokohama)	Small output gasoline by coal liquefaction	35°30'N 139°41'E	"
130	Asaishi Petroleum Co (Kawasaki)	Oil & gasoline	35°30'N 139°43'E	"
147	Aikoku Refinery (Kawasaki)	Fairly large	35°30'N 139°43'E	"
359	Uiber Oil Co (Tokyo)	More data required	35°41'N 139°50'E	"
360	Edogawa Petroleum Refinery (Tokyo)	More data required	35°40'N 139°53'E	"
910	Rising Sun Petroleum Terminal (Tokyo)	Secondary storage tank farm	35°42'N 139°49'E	"
911	Ogura Oil Co (Tokyo)	Large	35°41'N 139°49'E	"
1366	Nippon Oil Co (Tokyo)	Warehouses & storage	35°44'N 139°49'E	"
	SHIZUOKA (90,18)			
1186	Oil Refinery (Shimizu)	No details	35°01'N 138°30'E	1176
	NAGOYA (90,20)			
243	Rising Sun Oil Storage	Minor fueling depot for harbor shipping	35°04'N 136°52'E	194

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JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NAGOYA (90.20) (continued)			
244	Hatta Oil Storage	Small	35°09'N 136°51'E	250a
456	Toho Gas Works Synthetic Oil Plant	Synthetic oil, large gas works	35°08'N 136°55'E	197
1150	Naval Oil Storage	Fueling depot navy supply ships	34°51'N 136°56'E	1138
	OSAKA (90.25)			
17	Rising Sun Petroleum Co	Important storage terminal	34°39'N 135°09'E	10
164	Standard Vacuum Oil Co	Minor storage	34°42'N 135°17'E	164
257	Maruzen Toyo Petroleum Refinery	Secondary, 1,000 barrels per day	34°38'N 135°28'E	325
258	Mitsubishi Oil Co	Important storage	34°38'N 135°28'E	325
259	Osaka Oil Refinery	More data required	34°38'N 135°28'E	325
260	Rising Sun Petroleum Tanks	More data required	34°38'N 135°29'E	325
261	Standard Vacuum Oil Co	Minor storage	34°40'N 135°27'E	263
1203	Nippon Oil Refinery	Important, 4,000 barrels per day	34°42'N 135°24'E	526
	KOCHI (90.28)			
1529	Kochi Oil Storage	Small	33°33'N 133°33'E	1524
	NIIHAMA (90.29)			
934	Itozaki Oil Storage	Small	34°23'N 133°07'E	933
	KURE (90.30)			
659	Hitonose Oil Storage	Large	34°12'N 132°28'E	659

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKUYAMA (90.32)			
669	Hanano Waki Oil Tanks	Large storage capacity	33°58'N 131°47'E	669
670	Japan Paraffin Mfg Co	Large synthetic oil refinery	33°58'N 131°47'E	669
672	Nihon Oil Co	Large refinery & storage	33°59'N 131°52'E	668
673	Tokuyama Naval Fueling Station	Largest of Japanese Navy	34°02'N 131°49'E	673
	SHIMONOSEKI (90.34)			
40	Asahi Sekiyu Oil Refinery	Secondary production	33°55'N 130°56'E	43a
41	Rising Sun Petroleum Co	Secondary storage	33°55'N 130°55'E	43a
1107	Tanokubi Oil Storage	Secondary storage	33°55'N 130°55'E	43a
1123	Nissan Liquid Fuel Co	Secondary synthetic petroleum plant	33°54'N 130°48'E	29
	KURUME (90.35)			
665	Saitozaki Petroleum Storage	Secondary	33°39'N 130°21'E	665
1262	Mitsui Coal Liquefaction Plant	Rptd 2nd largest synthetic oil plant in Empire	33°02'N 130°27'E	1243
	SASEBO (90.36)			
545	Kozaki Point Oil Storages	Important	32°43'N 129°51'E	545
755	Sasebo Oil Storages	Very large naval storage	33°08'N 129°42'E	755
831	O Shima Oil Storage	Rptd Secondary	33°05'N 129°37'E	-
832	Megami Point Oil Storage (Nagasaki)	Small	32°43'N 129°51'E	544

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JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	YATSUSHIRO (90.37) KYUSHU SOUTH (90.38)			
1382	Sakura Island Oil Storage	Substantial oil storage	31°36'N 130°37'E	-
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
14	Underground Oil Storage	Believed secondary	25°09'N 121°44'E	15c
33	Kyushi Zan Oil Storage	Largest storage Taihoku area	25°09'N 121°44'E	15a
34	Rising Sun Petroleum Storage	Secondary	25°10'N 121°27'E	49
	TAIWAN WEST (91.4)			
85	Byoritsu Refinery	Believed secondary	24°34'N 120°49'E	-
86	Kinsui Casing Head Plant	Rptd important	24°37'N 120°53'E	86
119	Shukkoko Oil Wells & Refinery	Secondary	24°25'N 120°51'E	119
	TAIWAN EAST (91.5)			
81	Suo Oil Storage	Rptd largest storage E coast Taiwan	24°36'N 121°53'E	81
	TAKAO (91.6)			
4	Mitsubishi Oil Storage	Storage, bunkering wharf	20°37'N 120°17'E	3
5	Oil Storage (Takao)	Minor	22°37'N 120°16'E	8a

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JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (84)			
	GENZAN (84.4)			
88	Chosen Oil Co Refinery	Very large, important refinery	39°09'N 127°28'E	88
90	Rising Sun Oil Co Storage	Rptd large Oil Storage	39°11'N 127°24'E	88
	KEIJO (84.6)			
46	Getsubi Petroleum Storage	Jinsen harbor storage	37°28'N 126°37'E	44
	FUSAN (84.7)			
104	Chinkai Oil Storage	8 large tanks, fueling facilities	35°09'N 128°38'E	101
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
58	Kirin Artificial Oil Co	One of largest oil producing plants in Manchukuo	43°50'N 126°35'E	58
	MUKDEN (93.3)			
40	S.M.R. Shale Oil Refinery	Most important oil producing unit in Manchukuo	41°51'N 123°54'E	32

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MUKDEN (93.3) (continued)			
41	S.M.R. Coal Liquefaction Plant	One of major plants in Manchukuo	41°51'N 123°54'E	32
42	Manchuria Synthetic Fuel Co	Important	42°05'N 121°35'E	42
43	Manchuria Coal Liquefaction Co	Important	43°10'N 124°25'E	43
71	Standard Oil Co	More data required	41°47'N 123°23'E	50
	DAIREN (93.5)			
1	Manchukuo Petroleum Co	Largest refinery in Manchukuo	38°58'N 121°39'E	1
2	Standard Vacuum Oil Co	Largest oil storage in Dairen	38°55'N 121°41'E	2
3	Texas Co Oil Storage	Important	38°55'N 121°41'E	2
4	Asiatic Petroleum Co	More data required	38°55'N 121°41'E	2
5	Manchuria Oil Co Storage	More data required	38°55'N 121°41'E	2
6	Naval Oil Storage	More data required	38°48'N 121°16'E	11
	CHINA (83)			
	CANTON (83.4)			
58	Standard Oil Storage	Rptd medium sized	22°20'N 114°08'E	55
	TSINGTAO (83.11)			
76	Oil Storage Area (Tsingtao)	Capacity more than 50,000 tons	36°05'N 120°20'E	78
77	Oil Storage (Tsinan)	Small	36°40'N 117°01'E	71

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TIENTSIN (83,12)			
4	Asiatic Petroleum Co (Taku)	Storage, no details	38°59'N 117°40'E	4
5	Japanese Oil Storage (Taku)	Storage, no details	38°59'N 117°40'E	4
9	Standard Vacuum, Ta Hwa, Idemitsu Co	Storage, no details	39°02'N 117°38'E	4
10	Asiatic Petroleum Co (Tientsin)	Storage, no details	39°08'N 117°12'E	11
13	Standard Vacuum Oil (Tientsin)	Storage, no details	39°07'N 117°13'E	11
21	Texas Co (Tientsin)	Storage, no details	39°08'N 117°11'E	11
	FRENCH INDO-CHINA (85)			
	INDO-CHINA NORTH (85,1)			
39	Standard Vacuum Oil Storage (Haiphong)	One of 2 main I. China installations; may be empty	20°52'N 106°39'E	NA
40	Texas Oil Storage (Haiphong)	May be empty	20°52'N 106°39'E	"
41	N American Syndicate (Haiphong)	Storage, may be empty	20°52'N 106°39'E	"
42	Shell Storage (Haiphong)	Important oil installation; may be empty	20°52'N 106°39'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98,1, 98,2, 98,3)			
31	Government Oil Refinery & Tank Farm	Rptd only Thailand refinery & largest storage	13°42'N 100°33'E	31
32	Asiatic Petroleum Storage	Tank storage, wharf	13°41'N 100°30'E	26
64	K Si Chang Island Oil Storage	Deep-water anchorage	13°09'N 100°49'E	64

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES NORTH (92.1)			
74	Butterworth Oil Storage	Secondary	5°24'N 100°22'E	27
	SINGAPORE (92.2)			
70	Alexandra Tank Farm	Large; rptd 2,900,000 bbls	1°17'N 103°48'E	52
71	Kranji Tank Farm	Large; rptd 2,900,000 bbls	1°28'N 103°45'E	17
72	Bakum Island Tank Farm	Rptd 1,500,000 bbls	1°14'N 103°46'E	72
73	Shell Oil Storage	Minor storage, Singapore harbor	1°16'N 103°50'E	52
	BURMA (82)			
	BURMA SOUTH (82.2)			
18	Syriam Refinery (Rangoon)	Rptd largest Burma refinery, being repaired	16°46'N 96°14'E	18
19	Dunneedaw Plant Burmah Oil Co	Packaging plant for #18, rptd now idle	16°46'N 96°11'E	14
20	Seikgyi Refinery (Rangoon)	Small, rptd now idle	16°43'N 96°14'E	18
21	Thilawa Refinery (Rangoon)	Small, rptd now idle	16°40'N 96°15'E	21

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
31	Standard Oil Storage Tanks	Harbor oil storage	3°47'N 98°40'E	23
32	Shell Oil Storage Tanks	Harbor oil storage	3°47'N 98°40'E	23
33	Pankalan Brandon Oil Center	Produces oil, aviation gasoline, storage	4°02'N 98°17'E	15
34	Sabang Harbor Oil Storage	Naval base fuel storage	5°23'N 95°19'E	1
35	Sambo Is Oil Tank Farm	Large tank farm, fueling station	1°09'N 103°54'E	35
	SUMATRA SOUTH (94.2)			
61	Pladjoe Refinery	Largest in Far East, 18,000,000 bbls crude per yr plus 650,000 bbls 100-octane aviation gas	03°00'S 104°50'E	61
61a	Pladjoe Refinery	Three distilling towers	03°00'S 104°50'E	61
61b	Pladjoe Refinery	Distilling, cracking, reforming unit, key unit	03°00'S 104°50'E	61
61c	Pladjoe Refinery	Aviation gasoline plant	03°00'S 104°50'E	61
61d	Pladjoe Refinery	Power plant	03°00'S 104°50'E	61
62	Emma Haven Petrol Tanks	At harbor, capacity unknown	01°00'S 100°22'E	54
	BORNEO SOUTH (94.4)			
224	Tarakan Storage Tanks	Large fuel oil storage	03°18'N 117°36'E	221
	PHILIPPINES (96)			
	PHILIPPINES (96.1, 96.2)			
40	Manila Oil Storage	Center Manila oil storage; partly destroyed	14°36'N 120°58'E	NA

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JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	PHILIPPINES (96.1, 96.2)(continued)			
56	RR yds & Asiatic Pet Co Storage (Iloilo)	Large oil storage, RR yards	10°42'N 122°35'E	NA
57	Texas Co Storage (Iloilo)	Large oil storage	10°42'N 122°34'E	"
58	Standard Oil Co Storage (Iloilo)	Large oil storage	10°42'N 122°34'E	"
	BRITISH PACIFIC ISLANDS (81)			
	BORNEO NORTH (81.1)			
8	Lutong Oil Installations	Extremely important; supply 9,000,000 bbls natural fuel oil plus 11,000,000 bbls crude oil annually; storage	04°30'N 114°00'E	8

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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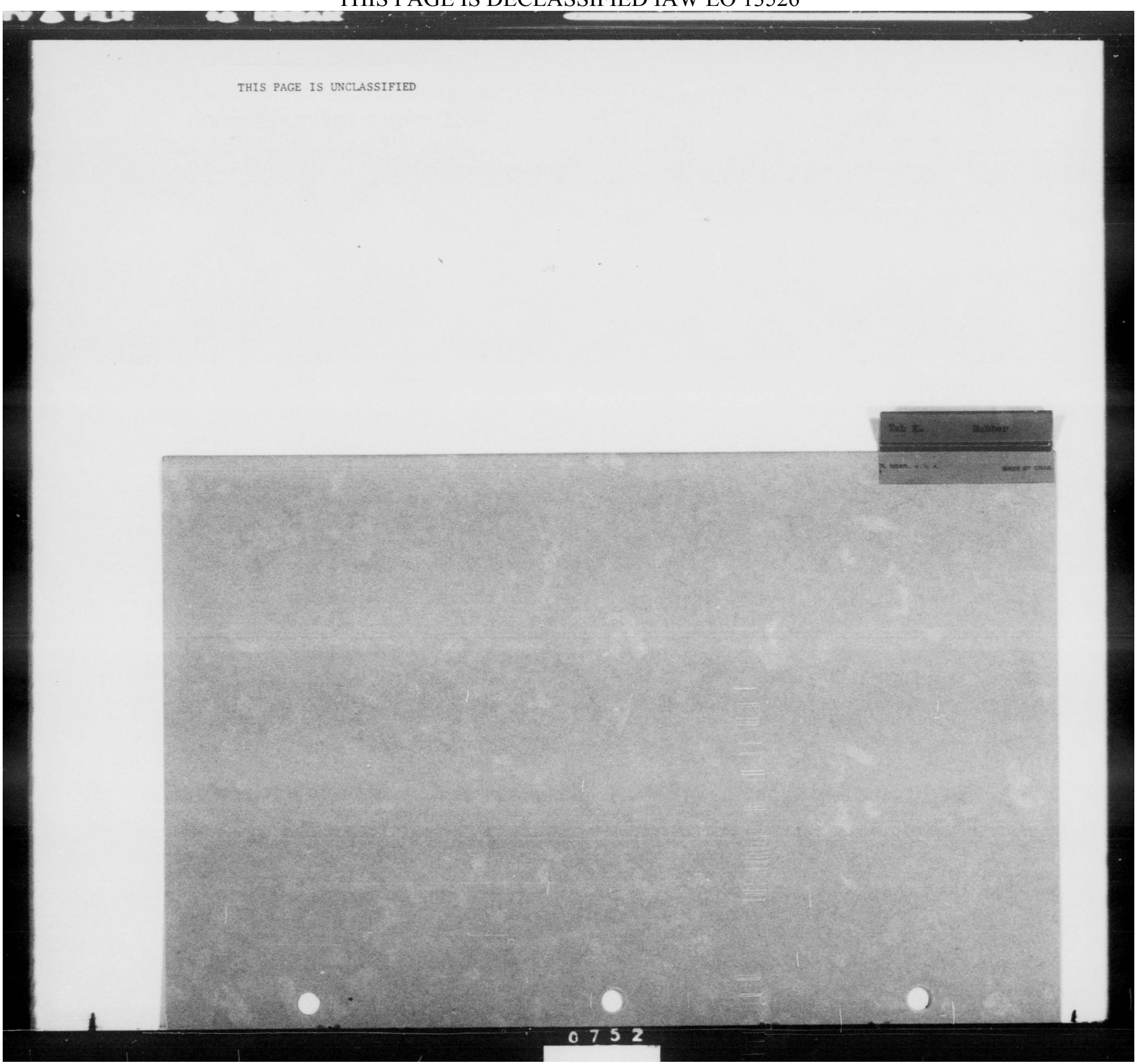

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March 1943

RUBBER PRODUCTS

KEY TARGETS					Miles radius from Wanan (inclusive)						
	TARGET										
	No.	Name	Importance	Obj. Area	500	750	1000	1250	1500	1750	over
1	14	Dunlop Rubber Co.	Largest tire plant in Far East; about 30% of Jap total tire output	Osaka (90.25)					X		
2	141	Yokohama Rubber Co.	About 20% of tire output; also other rubber products	Tokyo (90.17)						X	
3	1263	Bridgestone Tire Co., Kurume	Third largest tire plant; about 16%	Kurume (90.35)				X			
4	164	Goodyear Rubber Co.	Largest plant outside Japan Proper	Java (94.3)							X
5	1431	Bridgestone Tire Co., Totsuka	Rptd about 8% of tires	Tokyo (90.17)						X	
6	101	Bridgestone Tire Co., Tsingtao	Exact location unknown	Tsingtao (83.11)				X			
7	109	Yokohama Rubber Co., Mukden	Only tire plant in Manchukuo	Mukden (93.3)					X		
8	102	Kiyowa Rubber Co., Tsingtao	Exact location unknown	Tsingtao (83.11)				X			

(Priority targets are underlined)

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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RUBBER PRODUCTS

CHINA-BASED OPERATIONS

A radius of 1000 miles from operations base at Wanan includes two key rubber tire factories in Tsingtao which together produce 7-8% of the tires available to the Japanese.

Within a 1250-mile arc lie two other key tire-making plants, the main factory of the Bridgestone Tire Co. at Kurume and the Manchurian branch of the Yokohama Rubber Co. The Bridgestone works alone builds an estimated 16% of the total tire output, and the sum of the tire capacity in the 1250-mile zone is about 28%.

Extension of the radius to 1500 miles would bring in the huge Dunlop Rubber Co. plant at Kobe. This key target is the largest in the industry and accounts for about 30% of the entire tire output.

A radius of 1750 miles would include 7 major tire factories---all but one of the key targets in the industry---and would total about 92% of the tire-building capacity. The Goodyear plant in western Java lies more than 1750 miles from the Wanan base.

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March 1943

RUBBER PRODUCTS

The very existence of the modern mechanized, mobile army pre-supposes the liberal use of rubber tires. They are necessary equipment for all types of land-based and carrier-based airplanes, for army scout cars, gun caissons, mobile kitchens, ambulances, etc. The essentiality of tires for important industrial purposes is equally familiar. Not only are tires required for the trucks and buses used in the transportation of goods and workers, but they are needed to equip many kinds of construction, earth-moving, and road-building machinery.

Over two-fifths of the output of the Japanese rubber industry consists of vehicular tires. Since the tire branch of the industry is also the one with most strategic importance and since it is difficult to convert other rubber factories to the production of tires, the present report is confined to the tire branch of the rubber industry.

No highly reliable information is available concerning the total number of tires which are highly essential or "required" for the necessary military and industrial uses, but the number is probably in the neighborhood of 2,000,000-2,500,000 per year. This estimate is below the production in recent years and allows for the elimination of tires for pleasure cars and for export.

The total tire-making capacity in Japan and her occupied territory appears to be at least 2,500,000 tires of all types per year. This is adequate to supply the requirements for essential purposes, as estimated above. The distribution of the total tire-building facilities between the major plants in the industry is indicated in the attached table. It is evident that productive capacity is extremely concentrated, perhaps more so than in any other major Japanese industry. The three leading tire factories account for about 67% of the total, and the first five plants aggregate about 84%.

As stated above, the tire industry in the Far East is so highly concentrated in a few large plants that destructive bombing operations against two or three large factories would cut tire output by about two-thirds. Although Japan has a superabundance of crude rubber, of course, the manufacture of tires requires specialized machinery. Persons familiar with the industry estimate that it would require six months to convert a rubber shoe factory or other rubber-goods plant to the manufacture of tires.

Interruption of the output of new tires would be less serious, of course, if Japan should happen to possess large stockpiles of finished tires in the required sizes and types. On the basis of what information is at hand, it seems highly unlikely that the Japanese have any considerable inventory of such tires, although there may be some stocks of passenger-car tires.

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So far as the individual plants are concerned, they present no peculiar problems of vulnerability or invulnerability. The priority targets in the industry are all steel and concrete buildings two to four stories in height.

Because of the essentiality of rubber tires in conducting the war and because of the lack of adequate substitutes, any successful destruction of major plants in the industry would force a curtailment in the output of new vehicles requiring tires or force existing equipment off the road, or both. This effect would appear within a very short time, since stockpiles are low and the difficulties of compensating for damaged plants through conversion of other facilities are great.

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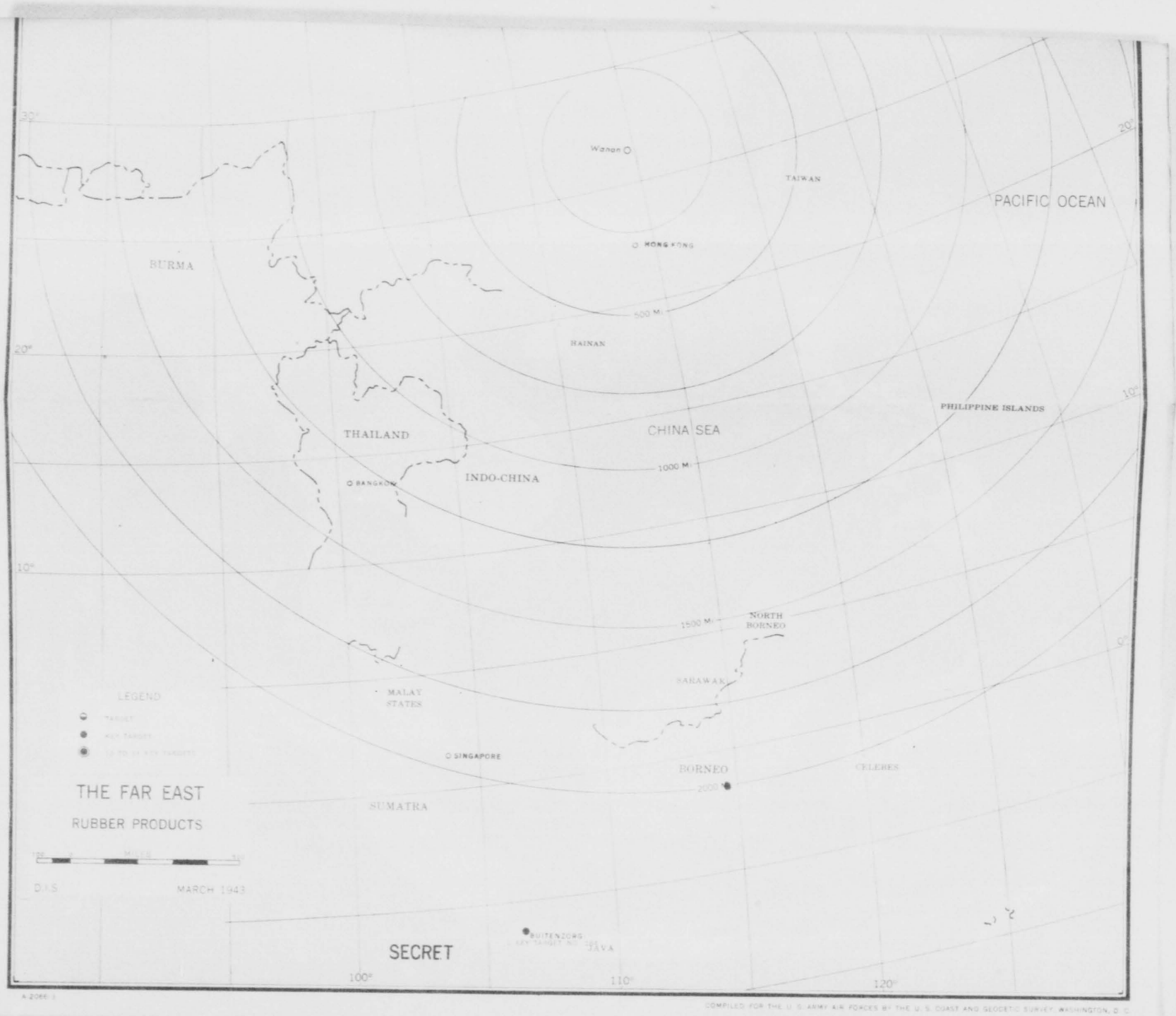

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - RUBBER

TARGET O.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	TOKYO (90.17)			
141	Yokohama Rubber Co (Yokohama)	Rptd 2nd most important rubber target Far East	35°30'N 139°42'E	N A
1431	Bridgestone Tire Co (Totsuka)	-	35°24'N 139°32'E	"
	OSAKA (90.25)			
14	Dunlop Rubber Wks #1	Rptd over 30% tire mfg capacity of Empire	34°42'N 135°13'E	5
788	Asahi Rubber Wks	More data required	34°41'N 135°11'E	5
1204	Manshin Rubber Co	All kinds rubber products	34°39'N 135°10'E	10
1205	Yokohama Rubber Co	All kinds rubber products	34°39'N 135°09'E	10
	KURUME (90.35)			
1263	Bridgestone Tire Co	Rptd 3rd largest tire output in Empire	33°19'N 130°30'E	1263
1264	Nippon Rubber, Kurume City Plant	Large output rubber products	33°19'N 130°30'E	1263
1265	Nippon Rubber, Fukuoka Plant	Secondary production tin & rubber products	33°35'N 130°25'E	1238
1266	Tsuchiyu Tabi Co	Large output rubber footwear	33°18'N 130°30'E	1263
	MANCHUKUO (MANCHURIA) (93)			
	MUKDEN (93.2)			
109	*Yokohama Rubber Co, Mukden	Small tire plant; about 3-4% of total	41°47'N 123°23'E	N A

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JAPAN - RUBBER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHINA (83)			
	TSINGTAO (83.11)			
101	*Bridgestone Tire Co,(Tsingtao)	3-4% of tire mfg capacity available to Japs	36°05'N 120°20'E	N A
102	*Kiyowa Rubber Co,(Tsingtao)	3-4% of tire mfg capacity available to Japs	36°05'N 120°20'E	"
	NETHERLANDS EAST INDIES (94)			
	JAVA (94.2)			
164	Goodyear Tire Factory	Only tire factory in N E I	6°35'S 106°47'E	164

* New Target to be included in Folder revision

N A No number yet assigned when this list prepared

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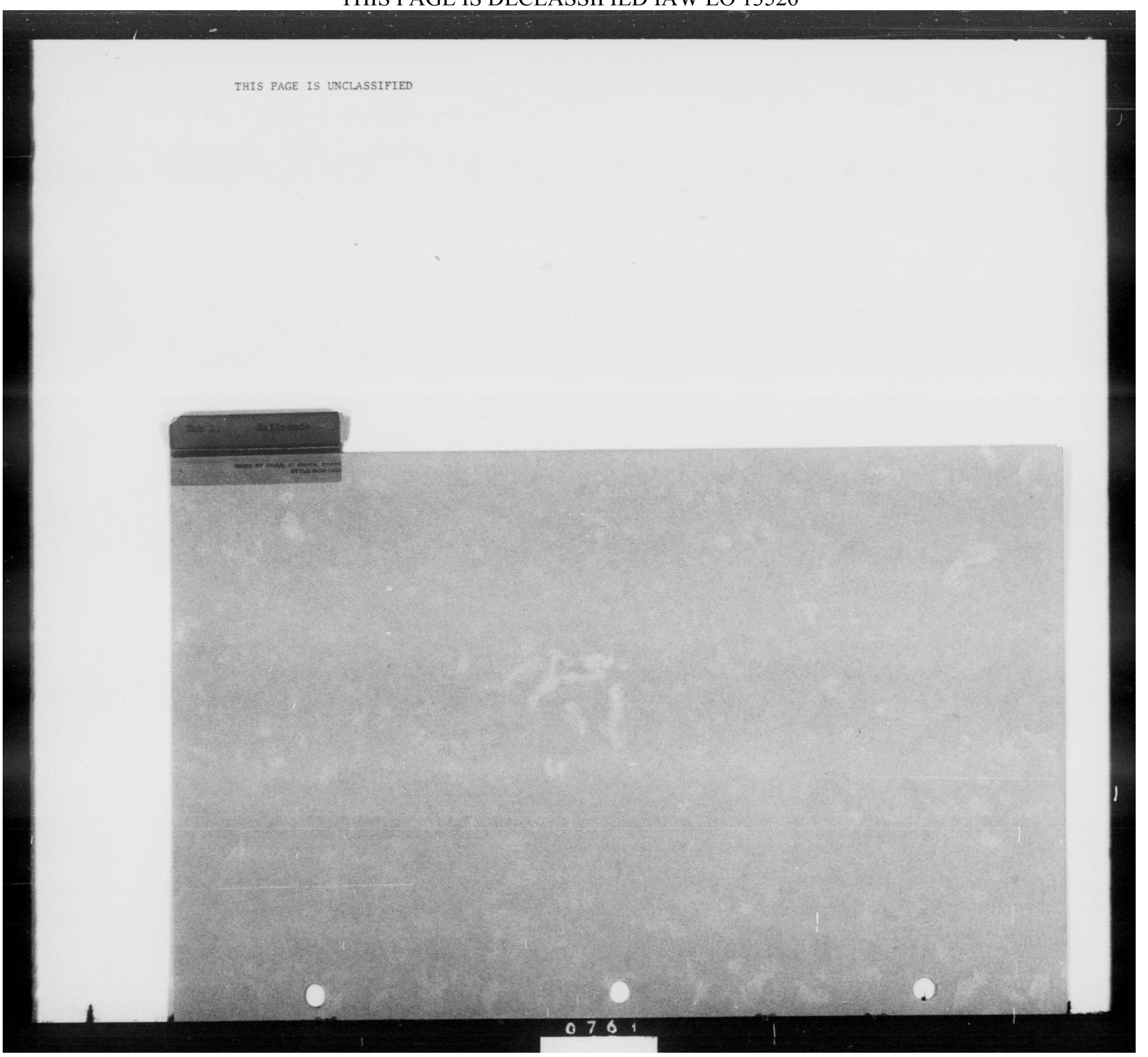

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March 1943 **TRANSPORTATION**

KEY TARGETS					Miles radius from Wanan (inclusive)						
	TARGET				500	750	1000	1250	1500	1750	over
	No.	Name	Importance	Obj. Area							
1	16	South Manchurian Ry Work Shops, Dairen	Repairs, maintenance construction	Dairen (93.5)			x				
2	36	Tongshan RR Shops Tongshan	"	Tientsin (83.12)			x				
3	88	RR Shops & Roundhouse, Tsingtao	"	Tsingtao (83.11)			x				
4	40	RR Shops, Shanhaikwan	"	Tientsin (83.12)				x			
5	43	Ryuzan RR Shops and Yards, Keijo	"	Keijo (84.6)				x			
6	105	Fusan RR Work-shops, Fusan	"	Fusan (84.7)				x			
7	184	Kokura RR Shops Kokura	"	Shimono-seki (90.34)				x			
8	538	I.G.R. Shops, Takatori	"	Osaka (90.25)					x		
9	894	Imperial Govt RR Shops, Omiya	"	Tokyo (90.17)						x	
10	1230	Govt RR Work-shops, Hamamatsu	"	Hamamatsu (90.21)						x	
11	871	Kanazawa RR Stn & Shops, Kana-zawa	Repairs & maintenance	Toyama (90.11)						x	
12	990	Sapporo Shops Imperial Govt Rys, Sapporo	"	Muroran (90.3)							x
13	997	RR Yds, Aomori	Train Ferry	Aomori (90.5)							x
14	977	Imperial Govt Ry Wharves, Hako-date	Train Ferry	Hakodate (90.4)							x
15	86	Ry Shops & Yds, Harbin	Repair, maintenance and building	Manchukuo No.(93.1)						x	
16	89	RR Yds, Tsinan	Repairs and mainten-ance	Tsingtao (83.11)			x				

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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TRANSPORTATION

CHINA BASED OPERATIONS

From the standpoint of China based operations it is believed that greater damage can be done to the Japanese war effort by attacks on the mainland railroad system than by attacks in Japan Proper.

Aside from the military value of the mainland railroads, they are necessary for the transport of essential industrial supplies to ports for shipment to Japan. Without such transport to shipside, Japanese home production could not support the war.

That section of the mainland system lying within the 1250-mile radius from Wahan operations base, and including North China, Southern Manchukuo and Chosen, is estimated to deliver to shipside 43% of the total essential overseas industrial supplies originating in ports outside of the Japanese Islands. In this figure are included ore, coal and pig iron, representing approximately 40% of steel production in Japan Proper. This percentage will rise in proportion to the curtailment of iron ore receipts from Malaya, Philippines and the Yangtze Valley.

Maintenance and repair facilities of North China are especially important to the total system. Curtailment in this region will not only disorganize movement of essential supplies, but will burden the shops of Manchukuo which are situated in the most congested sections of the Manchurian system.

Within the 1250-mile radius the mainland system is roughly characterized by two lines running south out of Mukden; one to Shanghai, the other to Fusan. These north-south lines either pass through ports themselves (as Chinwangtao), or reach shipside by branch lines (as Tsingtao). The system permits an alternate choice of ports to meet changing conditions of sea transport.

With the growing stringency of the shipping position, the Japanese are shortening their sea hauls and greater industrial dependence is being placed on the ever increasing production of raw and semi-processed materials of the region in question. The shorter sea hauls from the industrial concentration of southern Japan reach the mainland within this radius.

Limitations on the free use of ships and the increasing production of the mainland will tend to create stockpiles in the ports awaiting shipment by ships arriving in convoy rather than singly. The prevention of such stockpiling has an adverse effect on the efficient use of available ships since lengthening the turn-around time in ports immobilizes ship tonnage.

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It is indicated that the mainland system is now being operated nearly to capacity, and that the strain on repair and maintenance is increasing. The railroad shops selected as key targets maintain the most heavily burdened sections of the railroads and are relatively distant from replacement centers in Japan. The shops in Woosung and Pukow (not key targets), while important, service a section of the railroad system lying relatively close to our base of operations. At the present time this section of the railroad has a greater military than industrial value.

The building capacity of the mainland is estimated not to exceed 100 locomotives and 3000 freight cars per annum. Since mainland railroads are standard, and Japanese railroads are narrow gauge, locomotives must be especially built in Japan for export. It is not believed that more than 200 locomotives are being built in Japan this year for mainland railroads. Since the difference in gauge precludes transfer of locomotives and freight cars, the replacement rate is only a fraction of the demolition potential of sustained air attack, on roundhouses, locomotive and rolling stock concentrations.

The cumulative effect of sustained attacks on these targets will be the disruption of one of the most vital links in the transportation system supporting Japanese industry.

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TRANSPORTATION - RAIL

The network of railroads in Japan Proper presents a system of alternate transportation routes requiring relatively widespread and sustained attacks on fixed facilities to accomplish paralyzation.

Of the 141 targets included in folders, 8 have been selected as key targets. Six of these are Imperial Government Ry shops and two are the terminii of the Aomori-Hakodate train ferry. The remaining 133 targets, which are not considered key targets for the purpose of this study, are smaller shops, marshalling yards, bridges and junctions. Each of the I. G. R. Shops selected as key targets is the largest maintenance unit for its respective section of the main line.

These I. G. R. Shops have been selected as key targets because it is believed that maintenance is the most vulnerable factor in the effective operation of Japanese railroads. In addition to the normal congestion apparent in Japan previous to the war, the railroads are being further taxed by withdrawal of ships from coastwise service for overseas trades. However, it is estimated that the railroad system will not absorb more than a 10 percent increase for the purpose of releasing coastwise shipping and will not materially change the shipping position from a long time point of view. For instance, 4,000,000 tons of this transferred movement will be coal, which will not release more than 150,000 gross tons of second rate vessels for overseas trade - one month's sinking at the current rate.

Because of the partial or complete conversion of locomotive and car construction units of private plants to military goods, it is believed that construction in Government shops has been increased. These construction units of private plants have been treated as targets in other industrial classifications. The indications are that construction will not exceed 600 steam and 50 electric locomotives, for 1943. Of these steam locomotives, 200 will be standard gauge for export to the mainland. Freight car construction is believed to be approximately 11,000 for this year. This rate of replacement is low compared to the demolition rate in the event of sustained attacks on concentrations.

Among the targets described in the folders but not considered key targets for the purpose of this report are those points of locomotive and rolling stock concentrations (roundhouses and marshalling yards). The freight and passenger car congestion in marshalling and freight yards offer first class targets, especially for incendiary attack.

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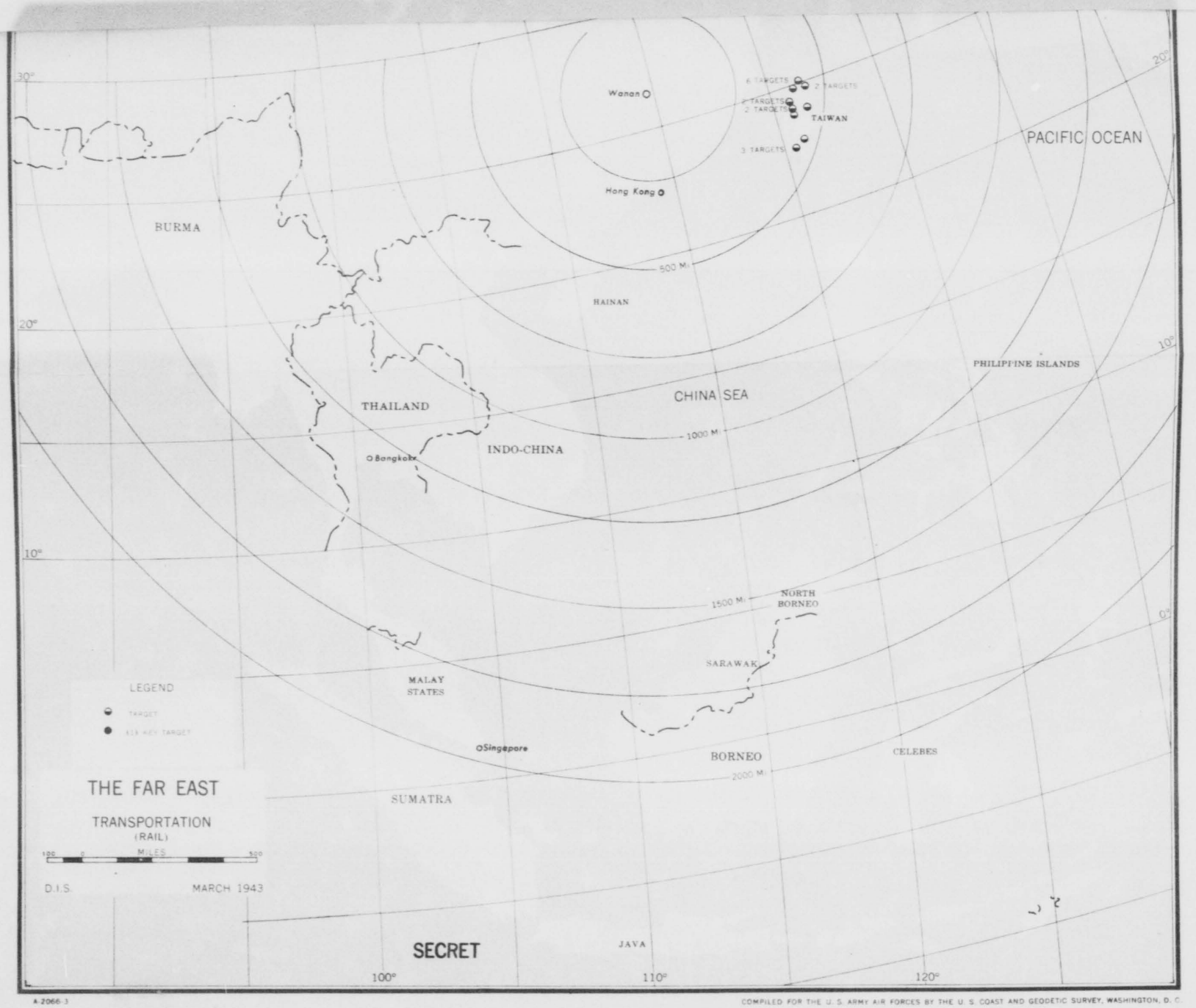

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	MURORAN (90.3)			
380	Muroran RR Terminus	Import nt coal traffic	42°19'N 140°59'E	378
990	Sapporo Shops Imperial Govt Railways	Important	43°04'N 141°23'E	-
991	Iwanizawa RR Yards & Jc	On main Muroran line	43°12'N 141°46'E	991a
	HAKODATE (90.4)			
977	Imperial Govt Railway Wharves	Terminus for Aomori traffic	41°46'N 140°44'E	977
978a&b	Onuma Causeway & Tunnel	Minor	41°59'N 140°40'E	978
979	Goryokaku RR Shops	Minor	41°48'N 140°44'E	979
	AOMORI (90.5)			
997	RR Yards (Aomori)	Important unit for car-ferry traffic	40°49'N 140°45'E	993
	AKITA (90.6)			
1068	Tsuchizaki RR Shops	Principal repair shops for area	39°45'N 140°05'E	1066

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MORIOKA (90.7)			
1074	Morioka RR Yards & Jc	Secondary	39°42'N 141°13'E	1074
1075	Hanamaki RR Junction	Jc to important Kamaishi steel center	39°23'N 141°08'E	1075
1076	Koma RR Junction	Secondary	39°52'N 141°11'E	1076
	KAMAISHI (90.8)			
1030	Owatari Bridge	Secondary	39°16'N 141°53'E	189
1031	Kamaishi Ry Bridge	Secondary	39°16'N 141°53'E	189
	NIIGATA (90.9)			
1015	Bandai Bridge	Main artery between E-W sections of city	37°55'N 139°03'E	998
1016	Bridge "X"	Main artery between E-W sections of city	37°55'N 139°03'E	1005
1017	RR Bridge "A"	Important, links E & W sections of city	37°55'N 139°02'E	998
1018	RR Bridge "B"	Important, links E & W sections of city	37°56'N 139°05'E	998
1019	RR Bridge "C"	Important, links E & W sections of city	37°55'N 139°05'E	998
1020	Niigata Harbor RR Station	Loading & unloading facilities	37°56'N 139°05'E	1005
1023	RR Shunting Yards & Junction	Extensive yards & junction	37°55'N 139°04'E	998
1024	Freight Yards & Station	Yards, handling facilities, passenger station	37°55'N 139°04'E	998
1029	RR Bridge "D"	Outlet from city of main N-S Shinyetsu line	37°50'N 139°07'E	1029

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	FUKUSHIMA (90.10)			
1077	Fukushima RR Station	Secondary	37°45'N 140°28'E	1077
1082	Yamagata RR Station	Secondary	38°15'N 140°20'E	1082
1089	Sendai RR Station	Principal station Sendai Region	38°16'N 140°53'E	1104
1104	Wakamatsu RR Station	Largest yards Sendai Region	38°12'N 140°54'E	1104
1105	Iwanuma RR Junction	Jc 2 important lines north from Tokyo	38°06'N 140°51'E	1105
1106	Koriyama RR Junction	Controls cross-Japan traffic north of Tokyo	37°24'N 140°24'E	1088
	TOYAMA (90.11)			
871	Kanazawa RR Station & Shops	Only shops on W coastline Niigata-Shimonoseki	36°35'N 136°39'E	871
	NAGANO (90.12)			
1093	Chikuma River Bridge	Strategic	36°33'N 138°08'E	1094
1094	Shinonoi RR Junction	Strategic main line junction	36°34'N 138°08'E	1094
1095	Shiojiri RR Junction	Connects 2 main N-S lines	36°06'N 137°57'E	1095
1096	Komoro RR Junction	Controls traffic between Tokyo, Nagoya & north	36°18'N 138°27'E	1096
1097	Toyono RR Junction	Controls traffic on main Shinetsu line	36°43'N 138°17'E	1097
1098	Nagano Government RR Shops	Repairs, maintenance of rolling stock	36°38'N 138°11'E	1098
1099	Sai River Bridge	Controls traffic into Nagano from S	36°37'N 138°09'E	1094

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TARGET NO.	TARGET	OBJECT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKASAKI (90.13)			
1051	Takasaki RR Jc Roundhouse & Yard	Key to cross-Japan traffic	36°19'N 139°01'E	1051
1052	Shinizu RR Tunnel	Longest tunnel in Orient	36°50'N 138°55'E	1052
1053	Kiryu RR Junction	Key point on line serving Ashio Mine	36°25'N 139°20'E	1053
1054	Oyama RR Junction	Tokyo-Aomori main line	36°19'N 139°50'E	1054
1055	Shin-Maebashi Jc Yd & Brs	Important in connection #1054	36°23'N 139°03'E	1055
1056	Utsunomiya RR Jc & Br	Rail connection at Furukawa Refinery	36°32'N 139°53'E	1056
	MITO (90.14)			
1478	Mito RR Jc & Station	Secondary	36°22'N 140°28'E	
1479	Toride RR Bridge	Important	35°53'N 140°04'E	
	KOFU (90.16)			
1497	RR Junction	Connects area with southern main line	35°39'N 138°36'E	1497
	TOKYO (90.17)			
66	Takashima Freight Yd (Yokohama)	Area's most important ship-shore transfer point	35°28'N 139°38'E	N A
67	Junctions, Overpass at Yokohama Station	Chief passenger concentration in Yokohama	35°28'N 139°38'E	"
68	Higasahi Yokohama Yd (Yokohama)	Second most important yd in Yokohama	35°27'N 139°38'E	"
112	Tsurumi Shunting Yd (Kawasaki)	Most important yard in Kawasaki	35°32'N 139°40'E	"
224	Tabata-Nippori RR Yards (Tokyo)	Among most important yards in Tokyo vicinity	35°44'N 139°46'E	"

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
364	Shinagawa RR Yards (Tokyo)	Rptd most important yard in area	35°38'N 139°45'E	N A
365	Shiodome Freight Yards (Tokyo)	Among most important yards in Tokyo vicinity	35°40'N 139°46'E	"
367	Tokyo Central Station (Tokyo)	Most important passenger station in area	35°40'N 139°46'E	"
369	Ueno RR Station (Tokyo)	One of 3 major Tokyo passenger depots	35°42'N 139°47'E	"
370	Oi RR Works (Tokyo)	Second most important shops IGR region	35°37'N 139°44'E	"
894	Imperial Govt RR Shops (Omiya)	Largest shop in IGR region	35°55'N 139°38'E	"
1367	Tama River Bridges (Kawasaki)	Possibly area's most vulnerable RR bottleneck	35°32'N 139°43'E	"
1368	Akabane RR Bridges & Jc (Tokyo)	Control main line outlets N out of Tokyo	35°46'N 139°44'E	"
1369	Tsurumi River Bridges (Kawasaki)	Only outlet S from Tokyo & Kawasaki except #1367	35°31'N 139°41'E	"
1370	Sumida R Br & Yd, Joban Line (Tokyo)	With #1371 controls chief outlet NE out of Tokyo	35°44'N 139°48'E	"
1371	Arakawa River RR Bridges (Tokyo)	With #1370 controls outlet NE out of Tokyo	35°45'N 139°49'E	"
1372	Sumida R Br & Ryogoku Br & RR Yd	Sobu RR E out of Tokyo; alternate for Joban line	35°41'N 139°48'E	"
1373	Sobu RR Br of Arakawa R, & Shinkoiwa Yd	With #1372 Sobu RR E out of Tokyo	35°43'N 139°52'E	"
1374	Shinjuku Sta & RR Jc (Tokyo)	One of three important Tokyo stations	35°41'N 139°43'E	"
1375	Hachioji Junctions & Br	Key outlying traffic points of Tokyo area	35°39'N 139°21'E	"
1376	Ofuna Jc (Yokosuka)	Controls main RR traffic with Yokosuka base	35°21'N 139°32'E	"
1377	Sagami (Banyu) R Br (Hiratsuka)	One of area's important bridges	35°20'N 139°22'E	"
	SHIZUOKA (90.18)			
1173	RR Bridge over Oi River	Tokaido main line & telephone cable	34°49'N 138°09'E	1173

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TARGET NO.		OCCUPANT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIZUOKA (20.18) (Continued)			
1174	RR Bridge over Abe River	Tokaido main line	34°57'N 138°22'E	1175
1175	RR Shops & Roundhouse (Shizuoka City)	No details	34°58'N 138°23'E	1175
1180	RR Junction (Fuji)	Controls traffic over alternate route	35°09'N 138°40'E	1177
1181	RR Shops & Roundhouse (Numazu)	Important repair shops & yards	35°06'N 138°52'E	1181
1182	RR Junction (Matsuda)	Controls traffic over Tokaido & Chuo lines	35°20'N 139°00'E	1182
	NAGOYA (20.20)			
250a	Nagoya Freight Yard	Important; largest yards Nagoya area	35°09'N 136°53'E	250a
250b	Nagoya Repair Shops	Important; largest shops Nagoya area	35°09'N 136°52'E	250a
250c	Nagoya Station	Secondary	35°10'N 136°53'E	250a
425	Nada Canal	Intensive artery between port & freight yards		
425a	Nada Canal Tramway Bridge	See #425	35°05'N 136°53'E	194
425b	Nada Canal Control House	See #425	35°05'N 136°53'E	194
425c	Nada Canal Elevated Crane	See #425	35°05'N 136°53'E	194
425d	Nada Canal Barge Basin	See #425	35°05'N 136°53'E	194
1132a&b	NW Shonai River Bridges	On main line	35°12'N 136°52'E	250a
1133	Inazawa Shunting Yard	Principal shunting yard of area	35°16'N 136°50'E	1133
1134a&b	Kuwana RR Bridges	Important	35°05'N 136°42'E	1134a
1135a&b	Gifu-Oroki RR Bridges	Important	35°24'N 136°40'E	1135b
1136a&b	NE Shonai River Bridges	On alternate route to Tokyo	35°12'N 136°57'E	196
1137	Kariya RR Bridge	Important	35°00'N 136°59'E	1137

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HAMAMATSU (90.21)			
1230	Government RR Workshops (Hamamatsu)	Important, rptd 3rd largest in Japan	34°42'N 137°43'E	1219
1231	Station, Yards, Roundhouse (Hamamatsu)	Secondary	34°42'N 137°44'E	1219
1232	Tenryu River Bridge	Long, steel, on Tokaido main line	34°43'N 137°48'E	1219
1233	Bentenjima Bridge	Major, carries Tokyo-Nagoya traffic	34°40'N 137°35'E	1233
1234	Toyo River Bridge	Carries Tokaido main line, telephone cable	34°46'N 137°22'E	1222
	HAIZURU (90.22)			
1035	RR Junction	Connects Tsuruga with main line	35°39'N 136°05'E	1033
1036	Tsuruga Junction	Vital, connects Tsuruga with rest of Japan	35°37'N 136°04'E	1036
1045	Haizuru Junction	Connects Tsuruga with Kobe, Osaka, Shimonoseki	35°20'N 135°20'E	1045
	KYOTO (90.23)			
1159	Kyoto MM Sta Jc & Yds	Controls 4-way traffic out of Kyoto	34°59'N 135°46'E	1170
1160	Maibara RR Junction	Important Jc Tokaido & Hokuriku Lines	35°19'N 136°18'E	1160
1161	RR Bridge	Important bridge on Tokaido main line	34°59'N 135°55'E	1163
1162	Ayabe RR Junction	Important junction	35°18'N 135°16'E	1162
	OSAKA (90.24)			
1217	Kameyama Jc	Important junction of RR line between Nagoya & Osaka	34°51'N 136°27'E	1217
1218	Matsuzaka Jc & Roundhouse	Minor	34°34'N 136°32'E	1218

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
154	Kobe RR Station	Central passenger station	34°41'N 135°11'E	10
156	Onohama RR Station	Important freight station	34°41'N 135°12'E	5
157	Sannomiya RR Station	Passenger station	34°41'N 135°12'E	5
158	Wadamisaki RR Station	Important freight station	34°39'N 135°11'E	10
159	Takatori RR Station	More data required	34°39'N 135°08'E	10
538	I.G.R. Shops, Takatori	Very important repair & maintenance	34°39'N 135°08'E	10
1206	Osaka RR Station	Most important station in Osaka	34°42'N 135°30'E	695
1207	Shinyodo RR Br #1	Key bridge Tokaido Line entering Osaka	34°43'N 135°30'E	695
1208	Shinyodo RR Br #2	On Osaka-Kobe main line	34°42'N 135°29'E	695
1209	Suita RR Yard & Shops	Important railroad yards and shops	34°46'N 135°32'E	1209
	OKAYAMA (90.27)			
1299	Okayama Yards	Extensive RR yds, large whses, roundhouse	34°40'N 133°55'E	1294
1300	Takamatsu Terminal	Extensive RR yards	34°21'N 134°03'E	1300
1301	Yoshino River RR Bridge	Coastal route from Tokushima to Takamatsu	34°06'N 134°32'E	1302
1302	Tokushima Yards & Repair Shops	Shipping point agricultural products, Shikoku Island	34°04'N 134°33'E	1302
1303	Tadotsu Yards & Repair Shops	Yards of 3 RR lines	34°16'N 133°45'E	1303
1304	Yoshino River Highway Bridge	Largest vehicular bridge in Orient	34°05'N 134°33'E	1302
	KOCHI (90.28)			
1532	RR Tunnel (Totano)	Secondary; northern outlet for Kochi	33°40'N 133°41'E	1532

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HIROSHIMA (90.29)			
933	Mihara Railroad Junction	For coastal line serving Kure Naval Base	34° 23'N 133° 05'E	933
	KURE (90.30)			
733	Kaitaichi RR Junction	Important coastal line	34°22'N 132°33'E	733
740	East Hiroshima Station	Jc main line and Ujina military branch	34°23'N 132°27'E	740
798	Kure NR Station	Large, cranes, storage, serves Naval Base	34°14'N 132°33'E	657
	KYUSHU EAST (90.33)			
1329	Oita RR Yard	Secondary RR terminal	33°13'N 131°37'E	1329
	SHIMONOSEKI (90.34)			
184	Kokura RR Shops	Most important shops Kyushu Island	33°53'N 130°52'E	168
561	Wakamatsu RR Shops	Rptd important repairs	33°54'N 130°49'E	29
772	Kwannon RR Tunnel & Viaduct	Important	33°57'N 130°55'E	43a
1110	Moji RR Sta & Yds	Important	33°56'N 130°58'E	44a
1111	Shimonoseki RR Shops & Yds	Important; includes terminus Korea ferry	33°57'N 130°56'E	43a
1118	Kokura NR Jc	Secondary	33°53'N 130°52'E	168
1119	Hatabu RR Jc	Secondary	33°59'N 130°56'E	99
	KURUME (90.35)			
838	Isahaya RR Junctions	Junction Nagasaki main line & Sasebo branch	32°51'N 130°03'E	838

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TARGET NO.	TARGET	COMMENT	AIR OBJECTIVE COORDINATES	TARGET CHART NO.
	KUMAMOTO (90.35) (Continued)			
1267	Miike Coal Yard (Mikawa)	Important	33°00'N 130°25'E	1243
1268	Mitsui RR Workshops	Secondary	33°00'N 130°25'E	1243
1269a&b	Chikugo River Bridges	On main line between Kurume area & north	33°18'N 130°30'E	1263
1270	Hakata RR Station	Principal station Kurume area	33°36'N 130°25'E	664
	SASEBO (90.36)			
759	Sasebo RR Station	Minor	33°10'N 129°43'E	757
839	Haiki RR Terminal	Secondary	33°08'N 129°48'E	839
840	RR Tunnels (Okusa)	Minor	SW Tunnel: 32°51'N 129°58'E SE Tunnel: 32°50'N 129°54'E	840
	YATSUSHIRO (90.37) KYUSHU SOUTH (90.38)			
1384	Oyodo River Railway Bridge at Miyasaki	On only east coast RR in S Kyushu	31°54'N 131°27'E	N A
1385	Kuma River Railway Bridge at Yatsushiro	On only west coast RR in S Kyushu	32°30'N 130°38'E	"
1517	Kagoshima RR Repair Shops	Only known RR repair shop in S Kyushu	31°34'N 130°32'E	"
1518	Kagoshima Station & Freight Yards	Large, in most important RR city in S Kyushu	31°36'N 130°34'E	"

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPANESE PACIFIC ISLANDS (91)			
	TAIHOKU (91.3)		25°07'N 121°44'E	27
27	Bridges & Tunnels near Hatto	Carry all heavy Keelung traffic	25°02'N 121°29'E	28
28	Shinten River RR Bridge	Only RR between Taihoku & S Taiwan	25°04'N 121°30'E	29
29	Taihoku Highway Bridge	Secondary	25°05'N 121°31'E	30
30	Meiji Highway & RR Bridges	Secondary	25°03'N 121°31'E	31
31	Taihoku RR Terminal	Important	25°03'N 121°35'E	32
32	Matsuyama RR Shops	Important		
	TAIWAN WEST (91.4)		23°47'N 120°38'E	90
90	Misui Junction & Bridge	Secondary	24°07'N 120°34'E	91
91	Taito River Bridges	Important	24°06'N 120°33'E	92
92	Shoka RR Terminal	Important	24°17'N 120°45'E	93
93	Toyohara Tunnel & Bridge	Secondary	24°25'N 120°38'E	94
94	Taian River Bridge	Secondary	24°41'N 120°48'E	95
95	Chikunan Terminal & Bridges	Important		
	TAIWAN EAST (91.5)		23°59'N 121°36'E	66
66	Karenko RR Station & Yards	Northern terminal Taito-Karenko line	22°45'N 121°09'E	67
67	Taito RR Station	Southern terminal Taito-Karenko line	24°43'N 121°46'E	68
68	Dakusui River RR Bridge	Suo's only RR connection with Keelung	24°46'N 121°45'E	69
69	Giran River RR Bridge	Only Karenko-Suo RR connection with Keelung		

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAO (91.6)			
9	RR Yard & Repair Shops (Takao)	Southern terminal Taiwan's only trunk line	22°38'N 120°16'E	9
10	RR Car Sheds (Takao)	Minor	22°37'N 120°17'E	
55	Shimo Tansui RR Bridge (Heito)	Important	20°40'N 120°23'E	55
	CHOSEN (84)			
	SEISHIN (84.1)			
16	Seishin RR Station & Yards	Terminal for goods to NE Chosen	41°47'N 129°48'E	13
17	Seishin Railway Workshops	One of few in NE Chosen	41°47'N 129°48'E	13
18	Rashin RR Yards	Terminal for goods, military supplies	42°14'N 130°18'E	14
19	Tumen River Bridge #1	Targets 19,20,21 control traffic in NE Chosen & Manchukuo	42°59'N 129°48'E	19
20	Tumen River Bridge #2	Targets 19,20,21 control traffic in NE Chosen & Manchukuo	42°42'N 129°45'E	20
21	Nanyo Junction	Targets 19,20,21 control traffic in NE Chosen & Manchukuo	42°48'N 129°50'E	20
22	Ranan RR Yards & Munitions Warehouses	Serve army base	41°42'N 129°41'E	22
	HEIJO (84.3)			
73	Heijo RR Station	Includes yards, workshops, army depot	39°00'N 125°44'E	71
74	Heijo Shunting Yards	Large, still under construction	39°04'N 125°44'E	74
75	Teishu Railroad Workshops	One of important shops in Chosen	39°41'N 125°13'E	-
91	Daido Railroad Bridge	Steel, only crossing Daido River	38°59'N 125°45'E	71
92	Daido Highway Bridge	Steel, only crossing Daido river	39°01'N 125°45'E	71

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN EAST (84.5)			
56	Kakusando RR Terminal	Terminal Korean RR system	36°03'N 129°22'E	55
	KEIJO (84.6)			
42	Han River RR Bridge	All N-S RR traffic in Korea crosses this bridge	37°31'N 126°57'E	42
43	Ryuzan RR Shops & Yards	Largest in Korea	37°32'N 126°57'E	42
44	Jinsen RR Station & Yards	Connect with Jinsen Harbor	37°29'N 126°37'E	44
	FUSAN (84.7)			
105	Fusan RR Workshops	One of principal Chosen locomotive repair shops	35°07'N 129°03'E	97
106	Rakuto River RR Bridge	On main RR Fusan-Manchukuo, 2 parallel spans	36°00'N 128°23'E	106
	MANCHUKUO (93)			
	MANCHUKUO NORTH (93.1)			
86	RR Shops & Yards (Harbin)	Important, northernmost maintenance shops	45°47'N 126°40'E	N A
	MANCHUKUO EAST (93.2)			
72	Antung RR Station	Principal station Antung	40°10'N 124°20'E	72
77	RR Bridge over Yalu River	Very important in Korea-Manchukuo traffic	40°10'N 124°20'E	72

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MUKDEN (93.3)			
53	RR Station	Main RR Station in Mukden	41°47'N 123°23'E	50
	DAIREN (93.5)			
26	RR Station	Principal station of Dairen	38°56'N 121°38'E	1
	CHINA (83)			
	SHANGHAI (83.1)			
98	Tientsin-Pukow RR Wkshops	Important	32°05'N 118°43'E	N A
99	Pukow-Nanking Train Ferry	Connects Tientsin-Pukow RR with Nanking-Shanghai RR	32°05'N 118°43'E	"
100	Pukow-Nanking RR Wkshops	Important	31°23'N 121°30'E	"
	CANTON (83.4)			
59	Kowloon RR Terminal	Canton-Kowloon RR terminus, ferry piers	22°17'N 114°10'E	55
60	Canton-Kowloon RR Shops	Only RR shops in area	22°19'N 114°11'E	55
	TSINGTAO (83.11)			
80	Litsun River RR Bridge	On only line Tsingtao to Mukden-Shanghai RR	36°09'N 120°22'E	80
81	Peisha River RR Bridge	On only line Tsingtao to Mukden-Shanghai RR	36°15'N 120°22'E	81
82	Taku River RR Bridge	On only line Tsingtao to Mukden-Shanghai RR	36°21'N 120°07'E	82
83	Haichow River RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34°40'N 119°10'E	83
84	Shu River RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34°26'N 118°19'E	84
85	RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34°26'N 118°27'E	85
86	Grand Canal RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34° 22'N 117°50'E	86

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES		TARGET CHART NO.
	TSINGTAO (83.11) (Continued)				
87	I River RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34°23'N	118°02'E	87
88	RR Shops & Roundhouse (Tsingtao)	Construction, maintenance; most important in area	36°06'N	120°20'E	78
89	RR Shops (Tsinan)	Repairs, maintenance; important	36°40'N	117°01'E	71
90	RR Station & Yards (Tsingtao)	Rolling stock primary target	36°04'N	120°18'E	78
91	Yellow River RR Bridge	On only line Mukden-Shanghai RR	36°43'N	117°01'E	91
	TIENTSIN (83.12)				
11	East Station (Tientsin)	Concentration point	39°08'N	117°11'E	11
12	Central Station & Yards	Concentration point	39°10'N	117°11'E	11
17	Hsin Kai River RR Bridge	Important RR crossing	39°10'N	117°11'E	11
18	Hai River RR Bridge (Tientsin)	Important RR crossing	39°09'N	117°10'E	11
19	West Station Yards (Tientsin)	Concentration point	39°09'N	117°09'E	11
25	Kailan Mining RR Yards, Shops	Major concentration point	39°56'N	119°37'E	26
28	Pekin-Mukden RR Station, Yards	Concentration point	39°56'N	119°36'E	26
36	Tangshan RR Shops	Important locomotive & car building	39°40'N	118°12'E	35
38	Luan River RR Bridge	Very important; coking coal to Anshan & Japan	39°46'N	118°47'E	38
39	Pehtang River RR Bridge	Only line to Manchukuo	39°17'N	117°45'E	39
40	RR Shops (Shanhaikwan)	Most important shop in area	40°01'N	119°45'E	40
44	RR Shops (Tientsin)	Important	39°10'N	117°11'E	11

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JAPAN - ABANDONMENT

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	FRENCH INDO-CHINA (85)			
	NORTH INDO-CHINA (85.1)			
43	Gialam RR Repair Shops	2nd largest RR shops IC; all repairs Haiphong-Yunnan RR	21°03'N 105°53'E	N A
44	Vinh RR Repair Shops	Largest RR shops IC; all repairs Hanoi-Saigon RR	18°40'N 105°41'E	"
45	Tourane RR Yards	Small	16°00'N 108°14'E	"
46	Hongai RR Yards & Workshops	Important; maintains RR connecting coal mines & port	20°57'N 107°04'E	"
47	Nam Dinh RR Yards	Fairly large	20°25'N 106°10'E	"
48	Quang Ngai RR Yd	Small	15°06'N 108°51'E	"
49	Hanoi RR Station & Yds	Only RR junction in Indo-China	21°01'N 105°51'E	"
50	Col des Nuages RR Tunnels	Key point Saigon-Hanoi line	16°13'N 108°08'E	"
51	Cap Varella RR Tunnels	Key point Saigon-Hanoi line	12°55'N 109°24'E	"
52	Pont Doumer Bridge (Hanoi)	Controlling point in entire Indo-China RR system	21°02'N 105°00'E	"
53	Phuly RR Highway Bridge	Important bridge Hanoi-Saigon RR line	20°31'N 105°56'E	"
54	Haiphong City RR & Highway Br	Important bridge, in city proper on Haiphong-Hanoi RR	20°51'N 106°40'E	"
55	Ham Rong RR & Highway Br	Important bridge on Hanoi-Saigon RR	19°55'N 105°47'E	"
56	Quang Tri RR Highway Br	Important bridge on Hanoi-Saigon RR	16°45'N 107°12'E	"
57	Clonenceau RR Highway Br (Hue)	Important bridge on Hanoi-Saigon RR	16°28'N 107°35'E	"
58	Tourane RR Bridge	Important bridge on Hanoi-Saigon RR	16°07'N 108°08'E	"
59	Quang Ngai RR Bridge	Important bridge on Hanoi-Saigon RR	15°06'N 108°51'E	"
60	Thanh Hoa RR Highway Br	Important bridge on Hanoi-Saigon RR	22°03'N 114°56'E	"
61	Moncay RR Bridge	On frontier between China and Indo-China	21°32'N 107°57'E	"

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	THAILAND (98)			
	THAILAND (98.1,98.2,98.3)			
37	Makasan Railroad Workshop	Rptd most extensive shops in Thailand	13°45'N 100°33'E	26
38	RR Workshops, Bangsue Station & Yards	Rptd second largest in Thailand	13°49'N 100°33'E	37
39	Bangkok Noi Station & Yards	Important yards, river landing	13°46'N 100°29'E	26
40	Hua Lampong Station & Yards	Main Bangkok passenger sta, roundhouses etc	13°44'N 100°31'E	26
41	Kengkoi Switching Yards & Roundhouse	Important Korat Line & engine change point	14°35'N 101°01'E	41
42	Korat RR Yards, Sta & Jc	Important, jc RR to Ma Keng with RR to Ubon	14°58'N 102°05'E	42
43	Tung Song Junction	Controls important traffic, including to Singapore	08°09'N 99°40'E	43
44	Haad Yai Junction	Rptd most important junction on peninsula	07°01'N 100°28'E	44
45	Rama VI RR Bridge	Controls N & E lines, line to Malaya, Singapore	13°49'N 100°31'E	38
46	Ratburi RR Bridge	Combined highway & RR mainline S	13°32'N 99°50'E	46
47	Pechaburi RR Bridge	Main line	13°07'N 99°57'E	47
48	Prachuab Kirikhan RR Bridge	Main line	11°51'N 99°49'E	11
49	Lampang RR Bridge	Controls traffic to Lampun & Chiengmai	18°17'N 99°29'E	49
50	Ta Roe RR Bridge	Secondary	14°34'N 100°44'E	50
51	Jaisri RR Bridge	Controls EW lines	13°49'N 100°16'E	51
52	Ban Pachi RR Junction	Jc Chieng Mai-Bangkok & Korat Bangkok lines	14°27'N 100°44'E	52
61	Memorial Bridge (Bangkok)	Only vehicular bridge in district across Chao Phraya	13°44'N 100°30'E	26
	BRITISH MALAYA (92)			
	MALAY STATES NORTH (92.1)			
56	Central RR Shops	All repair work Malayan RRs	03°11'N 101°41'E	60

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	CHART GRID NO.
	MALAY STATES NORTH (92.1) (Cont'd.)			
58	Guillemard RR Bridge	Very important; connects Malaya & Thailand	05°46'N 102°08'E	58
59	Victoria RR Bridge	Very important; with #58 Malaya-Thailand connection	04°50'N 100°58'E	59
60	Kuala Lumpur RR Yds, North	Station & small yards	03°09'N 101°42'E	60
61	Kuala Lumpur RR Yds, South	Large yards, engine sheds, warehousing	03°08'N 101°41'E	60
63	Prai RR Yards	Important; yds for all Malaya-Penang Island traffic	05°23'N 100°23'E	27
75	Iskandar Highway Bridge	Highway alternate for #59	04°49'N 100°57'E	59
	SINGAPORE (92.2)			
62	Gemas RR Junction	Jc E & W RR lines	02°35'N 102°37'E	62
	BURMA (82)			
	BURMA NORTH (82.1)			
43	Gokteik Viaduct	2200 ft viaduct on Mandalay-Lashio RR	22°22'N 96°55'E	43
44	Ava Bridge	Near Mandalay; only road & RR br across Irrawaddy	21°52'N 96°00'E	44
45	Shweli Bridge	Controls RR traffic to Bhamo	23°50'N 97°47'E	45
46	RR Shops Myitnge	Main RR shops in Mandalay area	21°52'N 96°05'E	46
47	Myitnge RR Bridge	RR br on main Rangoon-Mandalay line	21°51'N 96°04'E	46
48	RR Yards, Maymyo	Yards & locomotive repair near Mandalay	22°02'N 96°32'E	48
49	Ta-Hapalai Bridge	On Mandalay-Lashio RR	22°40'N 97°20'E	49
50	Warehouses, Old Lashio	Storage dumps & warehouses	23°00'N 97°50'E	31

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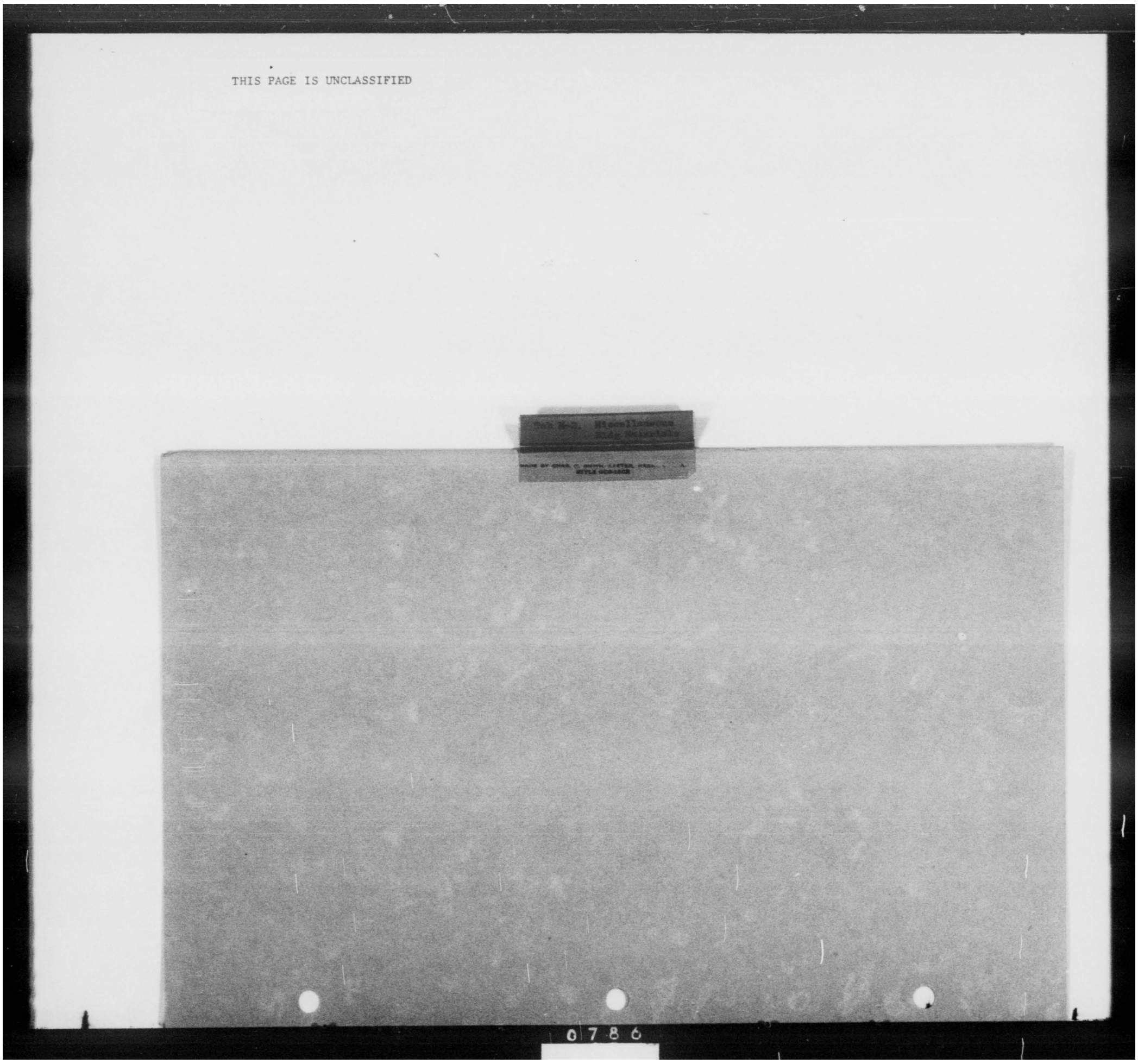

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Tab M-1, Miscellaneous
General

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TARGET NO.	TARGET	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO
	JAVA (94.3)			
171	Semarang RR Center	RR junction, yards	06°57'S 110°25'E	148
172	State RR Shops, Manggarai	Large; repair & rebuild all equipment	06°13'S 106°51'E	166
173	State RR Shops, Madiun	Repair, rebuild steam locomotives	07°40'S 111°30'E	173
174	State RR Shops, Boebeng	Repair freight cars	07°16'S 112°45'E	174
175	RR Sta & Shops, Bandung	Large	06°57'S 107°36'E	159
176	RR Sta & Yards, Batavia	Important	06°08'S 106°49'E	166
177	Tandjong Priok RR Station	Harbor terminal	06°06'S 106°53'E	177
178	Surabaya RR Station	City's main station	07°15'S 112°45'E	174
179	Surabaya RR Yards	Large yards at harbor	07°12'S 112°44'E	174
180	Cheribon RR Yards	Yards, jc two important lines	06°42'S 108°33'E	147
181	Djilatjap RR Sta & Yards	Southern terminus Javan RR system	07°44'S 109°00'E	149
196	Modjokrono RR Sta & Bridge	Important outlet Surabaya	07°18'S 112°45'E	174
	PHILIPPINES (96)			
	PHILIPPINE ISLANDS (96.1, 96.2)			
15	Caloocan RR Shops	Only large RR shops in Philippines	14°40'N 120°58'E	N A
30	Tondo Station RR Yards	Largest RR yards in Philippines	14°37'N 120°58'E	"
41	Santa Messa Bridge	Carries all Manila traffic to south	14 36'N 121 01'E	"
	BRITISH PACIFIC ISLANDS (81)			
	BORNEO NORTH (81.1)			
7	Jesselton RR Repair Shops	Only known RR repair shops in Borneo	05°59'N 116°05'E	4

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES		CHART OR MAP NO.
	BURMA SOUTH (82.2)				
22	Insein Shops	Important RR repair shops	16°53'N	96°07'E	3
23	Mahlwagon Shops (Rangoon)	Roundhouse, minor repairs & storage	16°47'N	96°11'E	14
24	Botataung Freight Yds (Rangoon)	Serve Rangoon dock area	16°46'N	96°10'E	14
25	Martaban Roundhouse & Yds	Serve Moulmein area	16°32'N	97°38'E	4
26	Pegu Bridge	RR bridge on Rangoon-Mandalay main line	17°22'N	96°30'E	26
27	Pazundaung Creek Bridge	Carries Rangoon-Taleik main line	16°52'N	96°13'E	27
28	Twante Canal Toll Sta	Key point on inland waterways system	16°45'N	96°05'E	28
	NETHERLANDS EAST INDIES (94)				
	SUMATRA NORTH (94.1)				
23	Belawan Station & Yards	RR terminal at large harbor	03°47'N	98°41'E	23
24a	Belawan RR Bridges	Connect RR system with Belawan Harbor	03°46'N	98°41'E	23
24b	Belawan RR Bridges	Connect RR system with Belawan Harbor	03°45'N	98°41'E	23
24c	Belawan RR Bridges	Connect RR system with Belawan Harbor	03°46'N	98°41'E	23
	SUMATRA SOUTH (94.2)				
63	Kertapati RR Sta & Yds, Palembang	Terminal of South Sumatran RR	03°03'S	104°45'E	53a
64	Emma Haven RR Station	At harbor, sidings to wharves	01°00'S	100°22'E	54
65	Penjang RR Sta, Oosthaven	Southern terminal South Sumatran RR	05°26'S	105°19'E	55
66	Padang RR Sta & Yds	Important transit point	00°57'S	100°22'E	54

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MISCELLANEOUS

The targets in this section are in the AAF target folders under the headings Building Materials, Textiles, Water Supply and Miscellaneous. No key targets are listed under this heading but a number of the plants in this section have been included as key targets in the review of specific industries.

The large textile mills have not been considered key targets largely because the Japanese ability to produce cloth of all kinds has been drastically cut by shortage of raw materials, leaving great excess plant capacity which would have to be destroyed before a shortage could be produced by bombing. Large cellulose plants, most of which are in Hokkaido, likewise have been excluded from the key list because Japan's ability to produce cellulose probably far exceeds its war requirements.

Many of the targets in this section may have local significance although, they are not important to Japanese overall economy. As examples, many of the cement plants are the only local sources of cement, and their destruction might hamper fortification of the areas in which they are located or require the use of shipping space to import cement. The alcohol plants may be the principal source of local motor fuel. Other targets in the miscellaneous category may be important if bases are moved.

Since no key targets are listed no table of distances from the operational base at Wanan is given.

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
965	Shikuku Pulp Factory	Large & important plant	49°14'N 143°07'E	965
966	Otomari Pulp Factory	Pulp & paper cellulose	46°38'N 142°47'E	966
967	Toyohara Pulp Factory	Pulp & paper cellulose	46°58'N 142°44'E	967
968	Maoka Pulp Factory	Pulp & paper cellulose	47°02'N 142°02'E	968
969	Noda Pulp Factory	Important plant	47°27'N 141°59'E	969
970	Ochiai Pulp Factory	Important plant	47°21'N 142°47'E	970
971	Shiritori Pulp Factory	Probably most important in Karafuto	48°38'N 142°47'E	971
972	Tomarioru Pulp Factory	Important plant	47°46'N 142°04'E	972
973	Esutoru Pulp Factory	One of largest plants in Karafuto	49°08'N 142°05'E	973
	MURORAN (90.3)			
402	Toyo Whale Co	Small whale oil plant	42°20'N 140°57'E	378
403	Harbor Construction Office	Minor	42°21'N 140°57'E	378
404	Iron Works	Minor	42°20'N 140°58'E	378
405	Carpenter Shop	Minor	42°20'N 140°58'E	378
406	Kurihayashi Commercial Mines	Minor	42°20'N 140°58'E	378
407	Civil Engineering Branch	Minor	42°19'N 140°58'E	378
989	Fuji Paper Co	Minor	43°07'N 141°33'E	-
	HAKODATE (90.4)			
983	Hokkai Cement Plant	Important as region's source of supply	41°49'N 140°38'E	983
984	Sulphur Plant	Secondary	41°49'N 140°40'E	983

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NIIGATA (90.9)			
1005	Hokuetsu Paper Mill	Pulp & all types paper	37°55'N 139°05'E	1005
1008	Unidentified Pulp Mill	No details	37°56'N 139°04'E	998
	MITO (90.14)			
1520	Riken Vacuum Tubes Plant	Believed minor	35°26'N 140°18'E	-
	TAKAYAMA (90.15)			
1484	Kamioka Mine & Smelter	Important, lead & zinc	36°24'N 137°12'E	1484
	TOKYO (90.17)			
475	Asano Cement Co (Kawasaki)	Secondary	35°31'N 139°43'E	N A
485	Fuji Spinning Mills (Kawasaki)	Indeterminate importance	35°32'N 139°43'E	"
487	Meiji Sugar Factory (Kawasaki)	Beet sugar plant; rptd large alcohol expansion	35°32'N 139°42'E	"
880	Konishi Photo Works (Tokyo)	Leading photo equip mfr'r	35°41'N 139°42'E	"
912	Nisshin Spinning Mill (Tokyo)	Cotton thread and fabrics	35°42'N 139°49'E	"
914 & 915	Oriental Weaving Co Plants (Tokyo)	Yarn, serge & muslin; probable war conversion	35°41'N 139°50'E	"
1365	Japan Bakelite Co (Tokyo)	Leading & one of few important plants in Orient	35°43'N 139°49'E	"
	NAGOYA (90.20)			
1153	Japan Porcelain Co	Major industrial porçelain & fire-brick plant	35°10'N 136°53'E	250a
1171	Nippon Insulator Co	Minor industrial ceramics, sparkplugs, etc	35°08'N 136°55'E	197

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HAMAMATSU (90.21)			
1235	Kune Copper Mines	Secondary, pyrites mines with dressing mill	35°05'N 137°50'E	1235
	OSAKA (90.25)			
1211	Osaka Central Market	Largest in Osaka	34°41'N 135°29'E	661
	KOCHI (90.28)			
1533	Kochi Woodworking Cooperative	-	33°33'N 133°33'E	1524
	NIIHAMA (90.29)			
935	Sumitomo Rayon Plant	Rptd converted to munitions	33°58'N 133°16'E	923
	KURE (90.30)			
729	Naval Academy	Imperial naval academy	34°15'N 132°28'E	658
741	Gas Works	Gas for Hiroshima City	34°23'N 132°27'E	738
745	Weather Observation Station	For Hiroshima area	34°23'N 132°27'E	738
746	Telephone Station	Central Hiroshima exchange	34°23'N 132°27'E	738
748	Division Headquarters	Army barracks, minor depots	34°23'N 132°27'E	740
	TOKUYAMA (90.32)			
674	Tokuyama Naval Coal Yard & Briquette Fcty	Largest of Japanese Navy	34°02'N 131°49'E	673
817	Okinoyama Collieries	Under-sea coal mines	(33°57'N 131°14'E) (33°58'N 131°11'E)	821

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIMONOSEKI (90.34)			
174	Kokura Paper Factory	Minor	33°52'N 130°53'E	168
	KURUME (90.35)			
1274	Dainoura Mine	One of largest mines in Japan (Coal)	33°43'N 130°40'E	1257
1275	Tagawa Mines	Large operation (Coal)	33°38'N 130°49'E	1275
1276	Futase Mines	Large operation (Coal)	33°39'N 130°40'E	1257
1277	Kineshima Mine	Smaller mine (Coal)	33°14'N 130°05'E	1277
1278	Manda Mine	Large operation (Coal)	33°00'N 130°27'E	1243
1279	Yotsuyama Mine	Important operation (Coal)	33°00'N 130°25'E	1243
	SASEBO (90.36)			
842	Takashima Colliery	Secondary	32°39'N 129°46'E	842
843	Ha Shima Colliery	Secondary	32°37'N 129°44'E	842
844	Sasebo Coal Yard	Secondary; near shipyards & fuel depots	33°09'N 129°42'E	755
846	Koyagi Shima Coke Ovens	Secondary, supply Nagasaki steel mills	32°41'N 129°49'E	545
	YATSUSHIRO (90.37)			
	KYUSHU SOUTH (90.38)			
1516	Kagoshima City Gas Mfg. Plant	Furnishes gas for Kagoshima (pop 150,000)	31°35'N 131°34'E	N A

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
47	Jonai District of Taihoku	Grouped public buildings	25°03'N 121°31'E	47
	TAIWAN WEST (91.4)			
105	Hokko Sugar Refinery	No details	23°34'N 120°17'E	105
106	Shinei Sugar Refinery	Minor	23°18'N 120°19'E	106
108	Sharoken Sugar Refinery	No details	23°55'N 120°14'E	-
109	Shoka Sugar Refinery	No details	24°05'N 120°32'E	-
110	Tainan Magnesium Plant	Believed important for war chemicals, magnesium	23°00'N 120°09'E	89
111	Kagi Lumber Mill	Secondary	23°29'N 120°26'E	102
	TAKAO (91.6)			
11	Water reservoir & Filtering Plant	Supplies Takao City	22°38'N 120°16'E	9
12	Prefectural Office	Takao City Administration	22°37'N 120°17'E	3
	MANCHUKUO (93)			
	MANCHUKUO EAST (93.2)			
76	Coal Yard, Antung	-	40°10'N 124°20'E	72

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	MUKDEN (93,3)			
44	Fushun Colliery	Most important in Manchukuo, coal & oil shale	41°50'N 123°54'E	32
47	Mond Gas Plant	More data required	41°51'N 123°54'E	32
65	Electric Company	More data required	41°47'N 123°23'E	50
66	Electric Company	More data required	41°47'N 123°23'E	50
70	Coal Yard	-	41°47'N 123°23'E	50
	DAIREN (93,5)			
23	Army Barracks	-	38°56'N 121°39'E	1
25	Army Barracks	-	38°56'N 121°39'E	1
54	Onoda Cement Works	Probably largest cement wks in Manchukuo	38°58'N 121°31'E	12
	CHINA (83)			
	TSINGTAO (83,11)			
63	Tzechwan Mines	Production small but good smokeless navy bunker coal	36°39'N 117°57'E	63
64	Fangtze Mines	Production small but good smokeless navy bunker coal	36°37'N 119°08'E	64
65	Tsapchwang Mines	Second largest mines North China - 2,000,000 tons yearly	34°52'N 117°26'E	65
66	Peanut Oil Tanks (Tsingtao)	Possible oil storage	36°05'N 120°20'E	78
67	Peanut Oil Tanks (Tsingtao)	Possible oil storage	36°05'N 120°20'E	78
73	Jap Gens-d'Armes Hq (Tsingtao)	Important in area	36°04'N 120°19'E	78
74	Jap Naval Hq (Tsingtao)	Important in area	36°04'N 120°19'E	78
75	Asia Affairs Board (Tsingtao)	Administrative Hq	36°04'N 120°19'E	78

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JAPAN-MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	TIENTSIN (83.12)			
27	Yao Hua Glass Wks	Secondary	39°56'N 117°36'E	56
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
59	Thai Cement Co (Bangkok)	Rptd largest in S E Asia	13°42'N 100°33'E	37
60	Government Distillery (Bangkok)	Rptd main Government alcohol plant	13°46'N 100°30'E	26
	MALAY STATES (92)			
	MALAY STATES NORTH (92.1)			
50	Malayan Collieries	Sole Malayan source; 500,000 tons per year	3°19'N 101°28'E	50
	BURMA (82)			
	BURMA SOUTH (82.2)			
29	Burma Cement Co	Modern, only known cement mill in Burma	19°20'N 95°7'E	29
	PHILIPPINES (96)			
	PHILIPPINES (96.1, 96.2)			
22	Philippine Ref Co	Largest coconut oil refinery in Philippines	14°35'N 121°59'E	-

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	PHILIPPINES (96.1, 96.2) (Continued)			
23	Spencer-Kellog Co	Large producer coconut oil and meat	14°36'N 121°58'E	-
31	Philippine Mfg Co	Coconut oil and glycerine	14°37'N 120°58'E	-
32	Elizalde Rope Factory	One of three rope factories in Philippines	14°35'N 120°59'E	-
36	Johnson Pickett Rope Co	One of three rope factories in Philippines	14°36'N 120°59'E	-
37	Manila Cordage Co	One of three rope factories in Philippines	14°56'N 120°59'E	-
38	Manila Gas Plant	Supplies all gas to Manila	14°35'N 121°59'E	-
39	Insular Refinery	Coconut oil and derivatives	14°36'N 121°00'E	-

* New Target to be included in Folder revision

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - BUILDING MATERIALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KOFU (90,16)			
1496	Chichibu Cement Co	Only cement plant in area	36°00'N 139°05'E	1496
	NAGOYA (90,20)			
454	Tokokuni Cement Co	Large plant	35°05'N 136°54'E	194
455	Onoda Cement Co	Large plant	35°07'N 136°55'E	197
	KOCHI (90,28)			
1524	Tosa Cement Plant (Kochi)	Secondary but area's largest industrial target	33°32'N 133°33'E	1524
	TOKUYAMA (90,32)			
821	Ube Cement Co	Large capacity	33°57'N 131°14'E	818
822	Onoda Cement Co	One of largest in Japan	33°58'N 131°11'E	819
	SHIMONOSEKI (90,34)			
39	Asano Cement Co	Very large, possible conversion to explosives	33°56'N 130°57'E	43a
	KURUME (90,35)			
1242	Sangyo Cement Co (Gotoji)	Minor	33°37'N 130°46'E	1275

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JAPAN - BUILDING MATERIALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPANESE ISLANDS (91)			
	TAKAO (91.6)			
13	Asano Cement Plant	More data required	22°39'N 120°16'E	9
	CHOSEN (KOREA) (84)			
	HEIJO (84.3)			
82	Onoda Cement Co	Most important cement plant in Chosen	39°01'N 125°48'E	-
	CHINA (83)			
	CANTON (83.4)			
61	Green Island Cement Co	Important; large & only one in area	22°19'N 114°11'E	55
	TIENTSIN (83.12)			
37	New Cement Wks (Tangshan)	Largest in area	39°40'N 118°12'E	35
	FRENCH INDO-CHINA (85)			
	INDO-CHINA NORTH (85.1)			
16	Haiphong Cement Plant (Haiphong)	Only large cement plant in country, major in Far East	20°52'N 106°40'E	N A

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JAPAN - BUILDING MATERIALS

TARGET NO	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NETHERLANDS EAST INDIES (94)			
	SUMATRA SOUTH (94.2)			
67	Indarung Cement Plant	Important as local source of supply	00°57'S 100°29'E	67
	PHILIPPINES (96)			
	P. I. (NORTH 96.1, SOUTH 96.2)			
49	Rezal Cement Co	Estimated 25% Philippine capacity	14°28'N 121°10'E	N A *
60	Cebu Cement Plant	Estimated 75% Philippine capacity	10°16'N 123°45'E	

* New Target to be included in Folder revision

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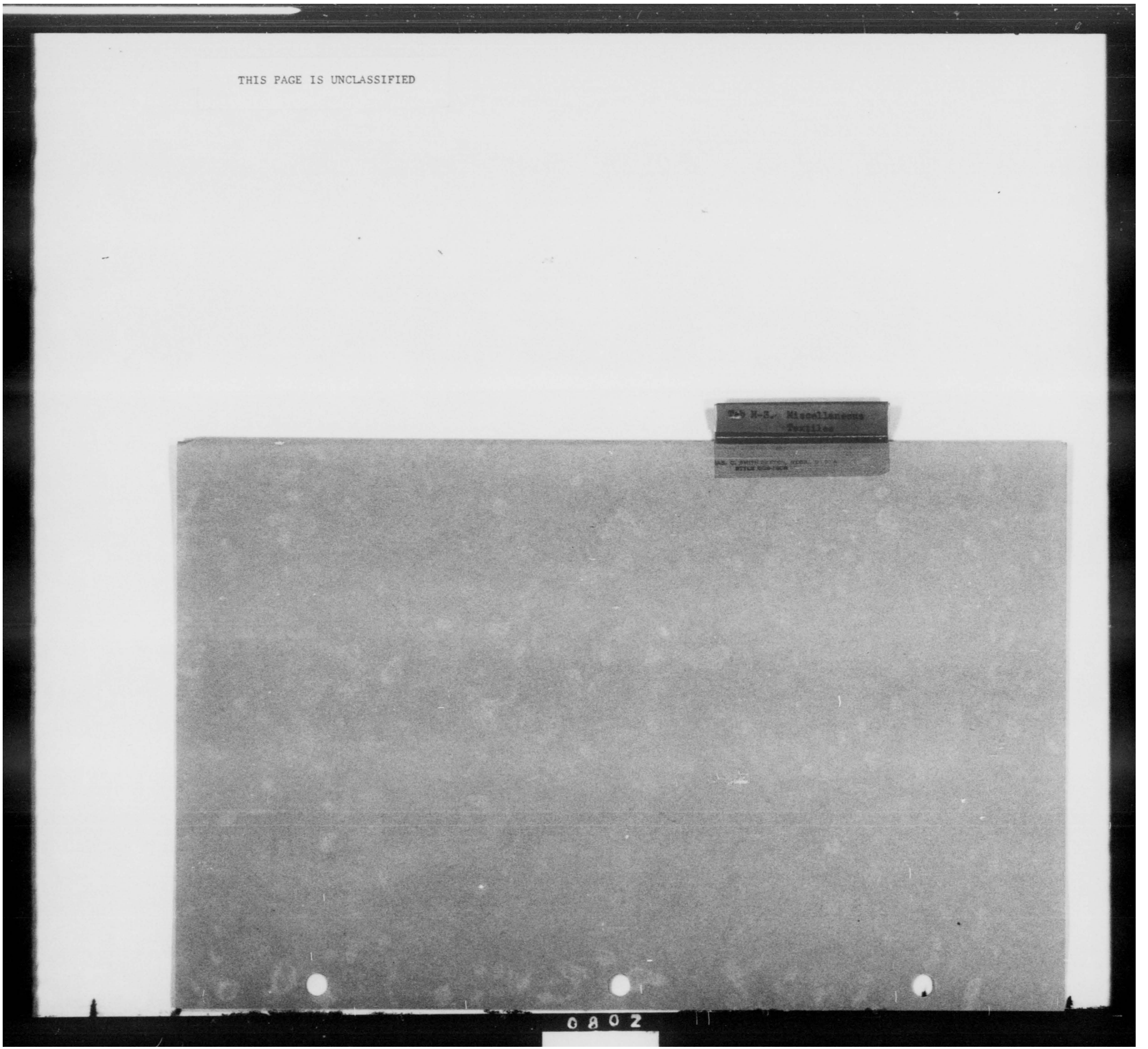

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - TEXTILES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART No.
	JAPAN PROPER (90)			
	NIIGATA (90.9)			
1007	Miye Spinning Mill	Rayon, possibly converted to munitions	37°56'N 139°05'E	998
1014	Niigata Rayon Co	Rayon, possibly converted to munitions	37°57'N 139°06'E	1005
	FUKUSHIMA (90.10)			
1078	Marutomo Silk Factory	No details	37°46'N 140°28'E	1077
1079	Spinning Mill (Fukushima)	No details	37°46'N 140°28'E	1077
	KOCHI (90.28)			
1531	Tenma Silk Mill (Kochi)	Minor	33°35'N 133°33'E	1524
	KYUSHU EAST (90.33)			
1330	Fuji Gas Spinning Co	Secondary producer textiles & cotton linters	33°14'N 131°35'E	1329
	KURUME (90.35)			
1271	Kanegafuchi Spinning Co, Fukuoka Mill	Large	33°35'N 130°25'E	614
1272	Kanegafuchi Spinning Co, Kurume Mill	Large	33°19'N 130°30'E	1263
1273	Kanegafuchi Spinning Co, Omuta Mill	Very large mill	33°02'N 130°27'E	1243

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JAPAN - TEXTILES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SASEBO (90,36)			
851	Nagasaki Spinning & Weaving Mill (Nagasaki)	Minor	32°45'N 129°52'E	542
	FRENCH INDO CHINA (85)			
	INDO CHINA NORTH (85,1)			
62	Cotton Spinning Mill (Haiphong)	Large mill	20°52'N 106°42'E	N A
63	Cotton Spinning Mill (Nam Dinh)	Large mill	20°25'N 106°10'E	"

*New Target to be included in Folder revision

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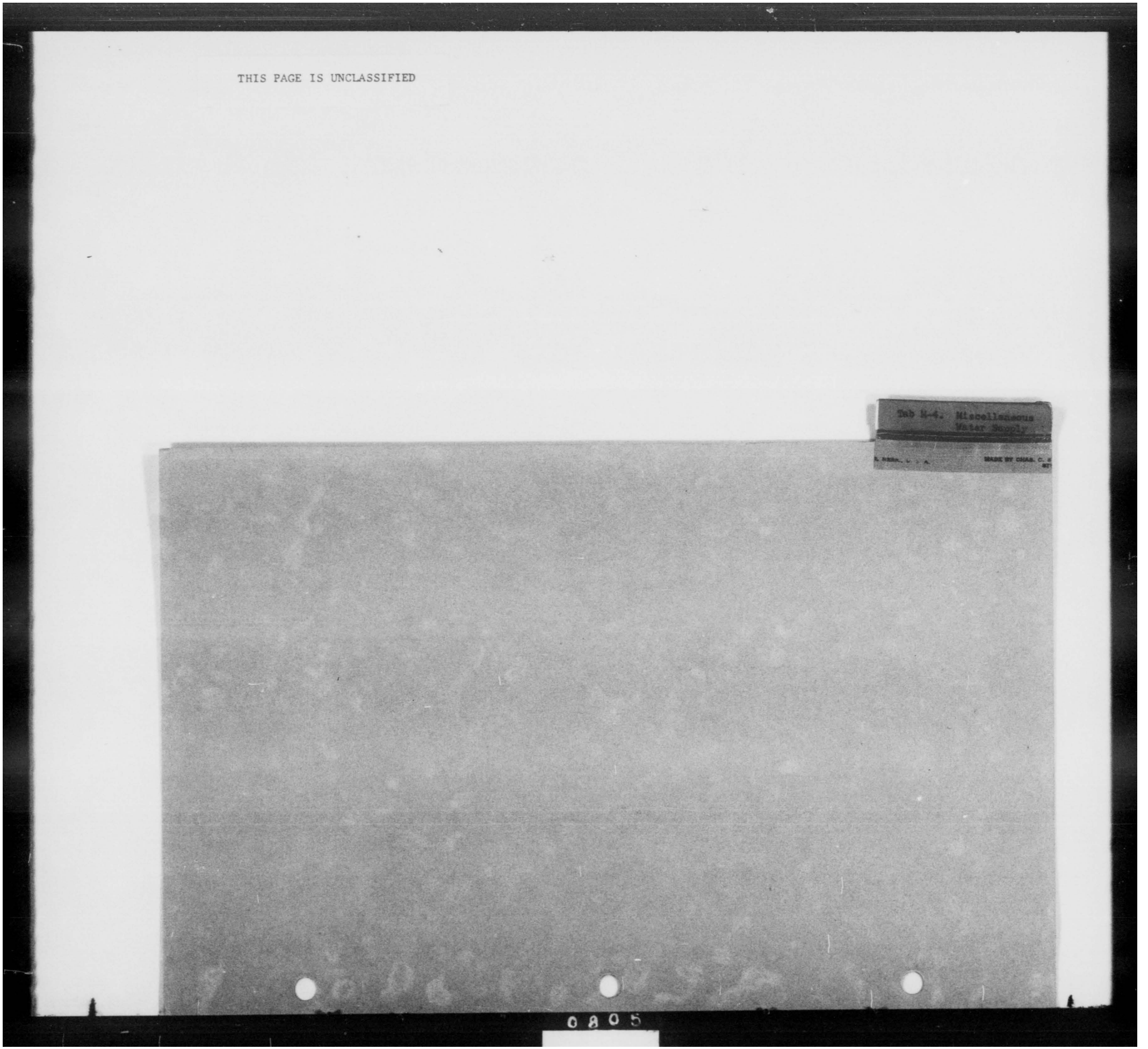

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JAPAN - WATER SUPPLY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	MURORAN (90.3)			
399	Muroran Reservoir #1	Minor	42°19'N 140°59'E	378
400	Muroran Reservoir #2	Minor	42°20'N 141°01'E	378
401	Wanishi Reservoir	Minor	42°20'N 141°01'E	378
	NIIGATA (90.9)			
1026	Water Works & Reservoir	Supplies Niigata City	37°55'N 139°02'E	998
	NAGOYA (90.20)			
426	Nagoya Filtering Plant	Filter plant Nagoya water supply	35°10'N 136°57'E	196
	OSAKA (90.25)			
152	Uegahara Water Works	Principal water works for Kobe	34°46'N 135°21'E	1198
153	Senkari Reservoir Dam	Principal source of water for Kobe	34°52'N 135°16'E	153
1210	Osaka Water Works	Principal water works for Osaka	34°43'N 135°31'E	695
	SHIMONOSEKI (90.34)			
1172	Kawachi Dam	Yawata City water supply	33°50'N 130°48'E	28
	SASEBO (90.36)			
841	Old Nagasaki Waterworks	Rptd minor	Location uncertain	-
859	New Nagasaki Waterworks	Rptd minor	Location uncertain	-

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JAPAN - WATER SUPPLY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
51	Taihoku Reservoir & Filtering Plant	Water supply for Taihoku City	25°01'N 121°32'E	47
	CHOSEN (KOREA) (84)			
	HEIJO (84.3)			
81	Heijo Water Works	Source all Heijo City water	39°02'N 125°46'E	71
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
74	Antung Water Works	Rptd principal water works for Antung	40°10'N 124°20'E	72
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
62	Main Bangkok Water Works	Reservoir, treatment & pumping station for city	13°46'N 100°32'E	26

* New Target to be included in Folder revision
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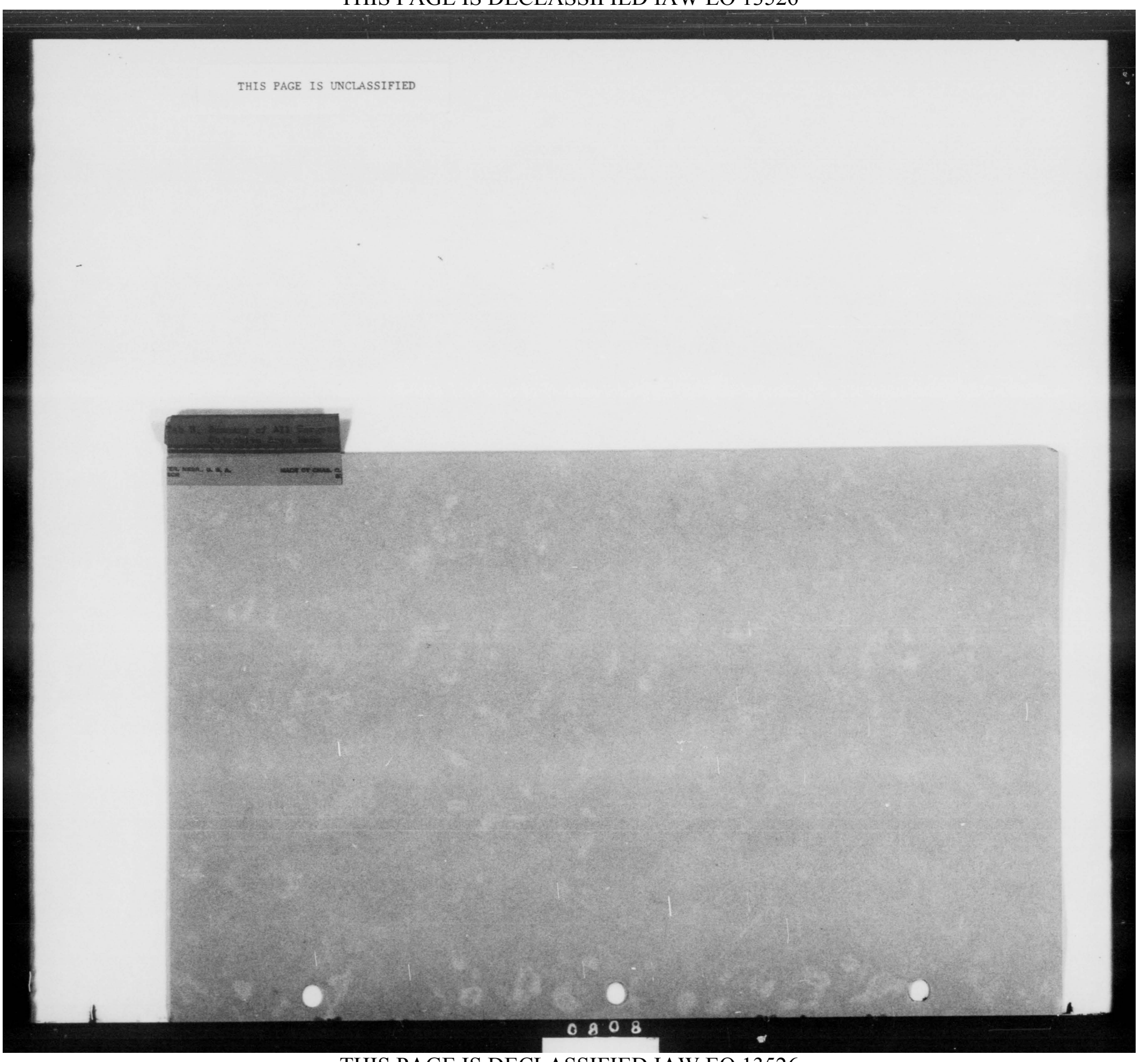

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FAR EASTERN TARGET SUMMARY

AREA NAME	AREA NUMBER	AIRCRAFT	AIR PORTS SEA PLANE BASES	ARMS MUNITIONS	AUTOMOBILES AND MOTORS	BUILDING MATERIALS	CHEMICALS	COMMUNICATIONS	DEFENSES	ELECTRIC POWER	HARBOR FACILITIES WAREHOUSES	IRON and STEEL	MACHINES, MACHINE TOOLS	NAVAL BASES — SHIPYARDS	NON FERROUS MATERIALS	PETROLEUM	RUBBER	TRANSPORTATION RAIL	TEXTILES	WATER SUPPLY	MISCELLANEOUS	TOTAL
JAPAN PROPER	90																					
Karafuto	90.1		4					7		2	4					3					9	29
Hokkaido North	90.2										1					2						3
Muroran	90.3									5	2	2				2		3		3	7	24
Hakodate	90.4									2	2			1		1		3			2	11
Aomori	90.5										2			1		1		1				5
Akita	90.6								1	1	1				4	2		1				10
Morioka	90.7									1		1						3				5
Kamaishi	90.8										1	1				2		2				6
Niigata	90.9		1				4				3	1	2		2	4		9	2	1	2	31
Fukushima	90.10						2	2	1	4					1	5		6	2			23
Toyama	90.11	1	2				6			5	3	5			2			1				25
Nagano	90.12		2				1								1			7				11
Takasaki	90.13	1	2						2	2					2	1		6				16
Mito	90.14	1	17				1		1				2	1	2			2			1	28
Takayama	90.15	1								1		3									1	6
Kofu	90.16					1				18								1				20
Tokyo	90.17	17	19	32	10		14	28	1	16	26	15	19	28	2	18	2	22			8	277
Shizuoka	90.18		1								1			1	2	1		6				12
Izu	90.19																					
Nagoya	90.20	3	2	3	4	2	4	2	1	4	1	1	6		1	4		14		1	2	63
Hamamatsu	90.21	2	1	1						1			3					5			1	14
Meizuru	90.22		2								4			7				3				16
Kyoto	90.23	1	1	1			4		1	4								4				16
Kumano	90.24		1	1									1	1				2				6
Osaka	90.25	7	1	14	4		15			7	3	28	11	5	11	8	4	10		3	1	132
Iatsue	90.26																					
Okayama	90.27						5		4	6	1	1		2	1			6				26
Kochi	90.28		1			1	1			3		1				1		1	1		1	11
Niihama	90.29						1			2			1	5	5	1		1			1	17
Kure	90.30	1	5	10						4	3		1	1		1		3			5	34
Fungo	90.31																					
Tokuyama	90.32			2		2	3			3			1	1	1	4					2	19
Kyushu East	90.33		4	3			6		1	7			1		1			1	1			25
Shimonoseki	90.34		4	3		1	6		2	4	8	10	1	3	4	4		7		1	1	61
Kurume	90.35	1	3	3	1	1	4		2	6	2		4		2	2	4	5	3		6	49
Sasebo	90.36	2	3	4				2	1	3	4		3	6		4		4	1	2	4	43
Yatsushiro	90.37		1				1			1								1				4
Kyushu South	90.38		2				1		2							1		3			1	10
Tsushima	90.39																					
TOTAL		44	81	77	19	8	81	41	20	112	72	69	56	63	44	72	10	143	10	11	55	1088

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FAR EASTERN TARGET SUMMARY

	Area Number	Aircraft	Air Ports Seaplane Bases	Arms Munitions	Automobiles and Motors	Building Materials	Chemicals	Communications	Defenses	Electric Power	Harbor Facilities Warehouses	Iron and Steel	Machines, Machine Tools	Naval Bases — Shipyards	Non-Ferrous Metals	Petroleum	Rubber	Transportation Rail	Textiles	Water Supply	Miscellaneous
CHOSEN (KOREA)	84																				
Seishin	84.1		2				2	1	2		3	4						7			
Konan	84.2						3			9											
Heijo	84.3	1	2	5		1	1	2	2	1	5	1			2			5		1	
Genzan	84.4		1								1			1		2					
Chosen East	84.5		1								9							1			
Keijo	84.6		6					1			1					1		3			
Fusan	84.7		3	1				1			1			2		1		2			
Koshu	84.8										3										
TOTAL		1	15	6		1	6	5	4	10	23	5		3	2	4		18		1	
MANCHUKUO (MANCHURIA)	93																				
Manchukuo North	93.1																				
Manchukuo East	93.2						2		1	10	1	1				1		2		1	1
Mukden	93.3	1	2	2			1		1	6		2	6		4	5		1			5
Manchukuo West	93.4																				
Dairen	93.5		1	3			3			3	3	2	2	2		6		1			3
TOTAL		1	3	5			6		2	19	4	5	8	2	4	12		4		1	9
JAPANESE ISLANDS	91																				
Kurile	91.1		2								23										
Ryukyu	91.2																				
Taihoku	91.3		3				5	3	2	5	3	2		3		3		6		1	1
Taiwan West	91.4		4				7	3	4	3	2					3		6			6
Taiwan East	91.5		5				1	2	1	2	2	2			1	1		4			
Takao	91.6		3			1	2	1		1	2			2	1	2		3			2
Pescadores	91.7		2											2							
Bonin	91.8																				
Mariana	91.9																				
Marshall	91.10																				
Caroline	91.11																				
Palao	91.12																				
TOTAL			19			1	15	9	7	11	32	4		7	2	9		19		1	9
NETHERLANDS EAST INDIES	94																				
Sumatra North	94.1		11							1	10				1	5		2			
Sumatra South	94.2		5			1		3		1	17		2		2	6		4			
Java	94.3		10		1		4	6		10	15		4				1	12			
Borneo South	94.4									1	4					1					
Celebes Timor	94.5		5					2		1	14										
New Guinea West	94.6																				
TOTAL			31		1	1	4	11		14	60		6		3	12	1	18			

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FAR EASTERN TARGET SUMMARY

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	Area Number	Aircraft	Air Ports Seaplane Bases	Arms Munitions	Automobiles and Motors	Building Materials	Chemicals	Communications	Defenses	Electric Power	Harbor Facilities Warehouses	Iron and Steel	Machines, Machine Tools	Naval Bases	Shipyards	Non-Ferrous Metals	Petroleum	Rubber	Transportation Rail	Textiles	Water Supply	Miscellaneous	Total
CHOSEN (KOREA)	84																						
Seishin	84.1		2				2	1	2		3	4							7				21
Konan	84.2						3			9													12
Heijo	84.3	1	2	5		1	1	2	2	1	5	1				2			5		1		29
Genzan	84.4		1								1			1			2						5
Chosen East	84.5		1								9								1				11
Keijo	84.6		6					1			1						1		3				12
Fusan	84.7		3	1				1			1			2			1		2				11
Koshu	84.8										3												3
TOTAL		1	15	6		1	6	5	4	10	23	5		3	2	4			18		1		104
MANCHUKUO (MANCHURIA)	93																						
Manchukuo North	93.1																						
Manchukuo East	93.2						2		1	10	1	1					1		2		1	1	20
Mukden	93.3	1	2	2			1		1	6		2	6			4	5		1			5	36
Manchukuo West	93.4																						
Dairen	93.5		1	3			3			3	3	2	2	2			6		1			3	29
TOTAL		1	3	5			6		2	19	4	5	8	2	4	12			4		1	9	85
JAPANESE ISLANDS	91																						
Kurile	91.1		2								23												25
Ryukyu	91.2																						
Taihoku	91.3		3				5	3	2	5	3	2		3			3		6		1	1	37
Taiwan West	91.4		4				7	3	4	3	2						3		6			6	38
Taiwan East	91.5		5				1	2	1	2	2	2				1	1		4				21
Takao	91.6		3			1	2	1		1	2			2		1	2		3			2	20
Pescadores	91.7		2											2									4
Bonin	91.8																						
Mariana	91.9																						
Marshall	91.10																						
Caroline	91.11																						
Palao	91.12																						
TOTAL			19			1	15	9	7	11	32	4		7	2	9			19		1	9	145
NETHERLANDS EAST INDIES	94																						
Sumatra North	94.1		11							1	10				1	5			2				30
Sumatra South	94.2		5			1		3		1	17		2		2	6			4				41
Java	94.3		10		1		4	6		10	15		4					1	12				63
Borneo South	94.4									1	4						1						6
Celebes Timor	94.5		5					2		1	14												22
New Guinea West	94.6																						
TOTAL			31		1	1	4	11		14	60		6		3	12		1	18				162

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FAR EASTERN TARGET SUMMARY

	Area Number	Aircraft	Air Ports Sea Plane Bases	Arms Munitions Automobile and Motors	Building Materials	Chemicals	Communications	Defenses	Electric Power	Harbor Facilities Warehouses	Iron and Steel	Machines, Machine Tools	Naval Bases Shipyards	Non-Ferrous Metals	Petroleum	Rubber	Transportation Rail	Textiles	Water Supply	Miscellaneous
CHINA	83																			
Shanghai	83.1																			
Wenchow	83.2																			
Fukien	83.3																			
Canton	83.4		4		1				2	3			5		1		2			
Nanning	83.5																			
Hainan	83.6		3										1							
Kweiyang	83.7																			
Hankow	83.8																			
Chungking	83.9																			
Kaifeng	83.10																			
Tsingtao	83.11								5	2			2		2		12			8
Tientsin	83.12				1	1			5	6			4		6		12			1
Kalgan	83.13																			
Hsining	83.14																			
Kunming	83.15																			
TOTAL			7		2	1			12	11			12		9		26			9
FRENCH INDO-CHINA	85																			
Indo-China North	85.1	1	6		1	6			5	6			5	4			19	2		
Indo-China South	85.2																			
TOTAL		1	6		1	6			5	6			5	4			19	2		
THAILAND (SIAM)	98																			
Thailand North	98.1		3														1			
Bangkok	98.2	1	5	3		1	4	5	2	3			5		3		13		1	2
Thailand South	98.3		2														3			
TOTAL		1	10	3		1	4	5	2	3			5		3		17		1	2
MALAY STATES	92																			
Malay States North	92.1		4						5	18	2	3		2	1		7			1
Singapore	92.2		5						1	7	2	1	10	1	4		1			
TOTAL			9						6	25	4	4	10	3	5		8			1
BURMA	82																			
Burma North	82.1		11						1					1			8			
Burma South	82.2		8				1		1	3			3	1	4		7			1
TOTAL			19				1		2	3			3	2	4		15			1
PHILIPPINES	96																			
Philippines North	96.1		4		1		5		3	7			3	1	1		3			8
Philippines South	96.2		3		1					3					3					
TOTAL			7		2		5		3	10			3	1	4		3			8

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FAR EASTERN TARGET SUMMARY

	Area Number	Aircraft	Air Ports Sea Plane Bases	Arms Munitions	Automobile and Motors	Building Materials	Chemicals	Communications	Defenses	Electric Power	Harbor Facilities Warehouses	Iron and Steel	Machines, Machine Tools	Naval Bases Shipyards	Non-Ferrous Metals	Petroleum	Rubber	Transportation Rail	Textiles	Water Supply	Miscellaneous	Total
CHINA	83																					
Shanghai	83.1																					
Wenchow	83.2																					
Fukien	83.3																					
Canton	83.4		4			1				2	3			5		1		2				18
Nanning	83.5																					
Hainan	83.6		3											1								4
Kweiyang	83.7																					
Hankow	83.8																					
Chungking	83.9																					
Kaifeng	83.10																					
Tsingtao	83.11									5	2			2		2		12			8	31
Tientsin	83.12					1	1			5	6			4		6		12			1	36
Kalgan	83.13																					
Hsining	83.14																					
Kunming	83.15																					
TOTAL			7			2	1			12	11			12		9		26			9	89
FRENCH INDO-CHINA	85																					
Indo-China North	85.1	1	6			1	6			5	6				5	4		19	2			55
Indo-China South	85.2																					
TOTAL		1	6			1	6			5	6				5	4		19	2			55
THAILAND (SIAM)	98																					
Thailand North	98.1		3															1				4
Bangkok	98.2	1	5	3			1	4	5	2	3			5		3		13		1	2	48
Thailand South	98.3		2															3				5
TOTAL		1	10	3			1	4	5	2	3			5		3		17		1	2	57
MALAY STATES	92																					
Malay States North	92.1		4							5	18	2	3		2	1		7			1	43
Singapore	92.2		5							1	7	2	1	10	1	4		1				32
TOTAL			9							6	25	4	4	10	3	5		8			1	75
BURMA	82																					
Burma North	82.1		11							1					1			8				21
Burma South	82.2		8						1	1	3			3	1	4		7			1	29
TOTAL			19						1	2	3			3	2	4		15			1	50
PHILIPPINES	96																					
Philippines North	96.1		4			1			5	3	7			3	1	1		3			8	36
Philippines South	96.2		3			1					3					3						10
TOTAL			7			2			5	3	10			3	1	4		3			8	46

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FAR EASTERN TARGET SUMMARY

	AREA NUMBER	AIRCRAFT	AIR PORTS SEAPLANE BASES	ARMS MUNITIONS	AUTOMOBILES and MOTORS	BUILDING MATERIALS	CHEMICALS	COMMUNICATIONS	DEFENSES	ELECTRIC POWER	HARBOR FACILITIES WAREHOUSES	IRON and STEEL	MACHINES MACHINE TOOLS	NAVAL BASES SHIPYARDS	NON-FERROUS METALS	PETROLEUM	RUBBER	TRANSPORTATION RAIL	TEXTILES	WATER SUPPLY	MISCELLANEOUS
BRITISH PACIFIC ISLANDS	81																				
Borneo North	81.1										6					1		1			
(Other B.P.I. not schedld)																					
TOTAL											6					1		1			
TOTAL ALL TARGETS		48	207	91	20	16	120	70	44	196	255	87	74	108	66	139	11	291	12	15	94

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FAR EASTERN TARGET SUMMARY

	AREA NUMBER	AIRCRAFT	AIR PORTS SEAPLANE BASES	ARMS MUNITIONS	AUTOMOBILES and MOTORS	BUILDING MATERIALS	CHEMICALS	COMMUNICATIONS	DEFENSES	ELECTRIC POWER	HARBOR FACILITIES WAREHOUSES	IRON and STEEL	MACHINE MACHINE TOOLS	NAVAL BASES SHIPYARDS	NON-FERROUS METALS	PETROLEUM	RUBBER	TRANSPORTATION RAIL	TEXTILES	WATER SUPPLY	MISCELLANEOUS	TOTAL
BRITISH PACIFIC ISLANDS	81																					
Borneo North	81.1										6					1		1				8
(Other B.P.I. not schedld)																						
TOTAL											6					1		1				8
TOTAL ALL TARGETS		48	207	91	20	16	120	70	44	196	255	87	74	108	66	139	11	291	12	15	94	1964

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JAPANESE OBJECTIVE FOLDER AREAS AAF A-2

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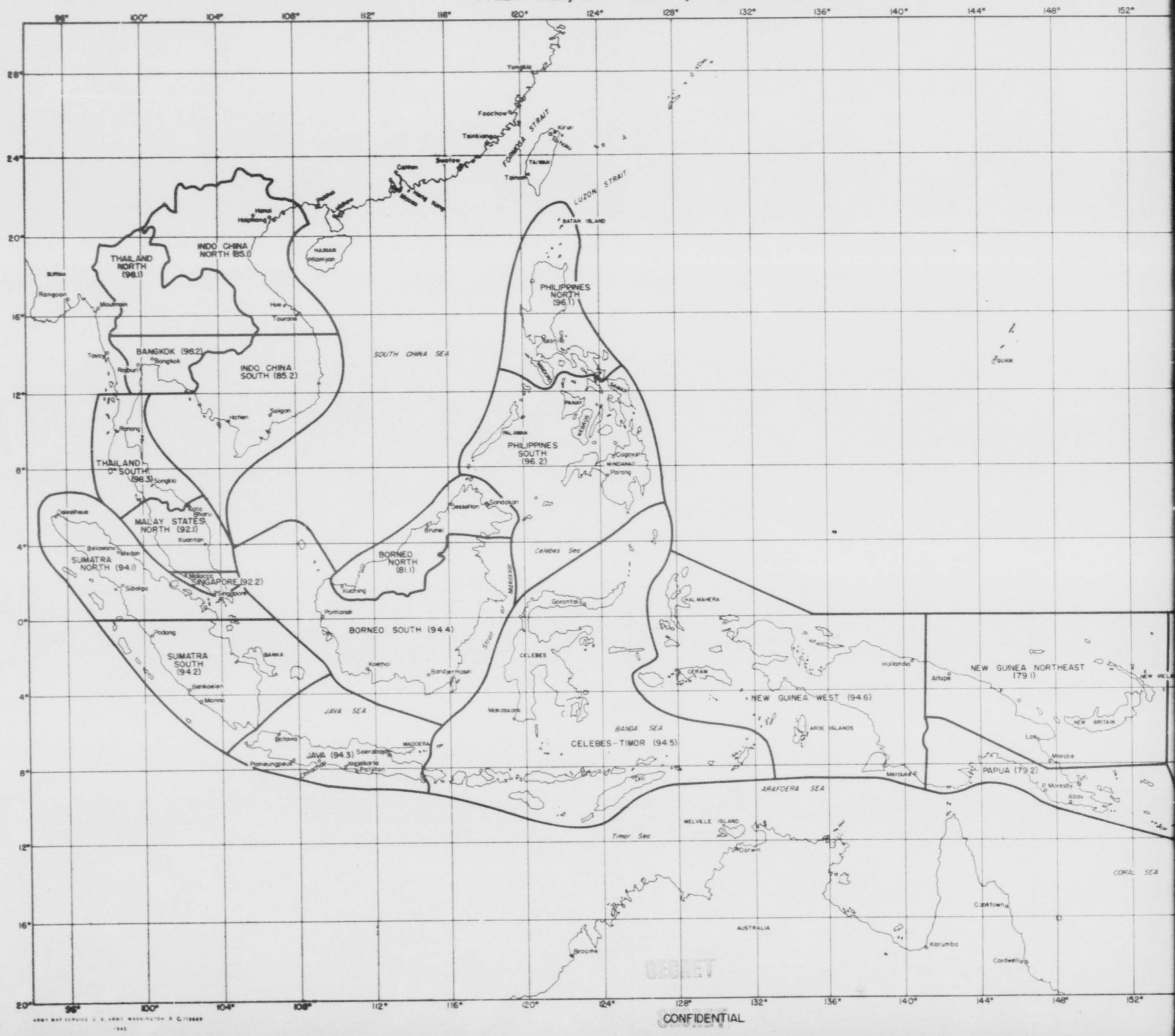
OUTLINE OF OBJECTIVE AREAS
PHILIPPINES, EAST INDIES, AND SOUTHEASTERN ASIA



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OUTLINE OF OBJECTIVE AREAS
PHILIPPINES, EAST INDIES, AND SOUTHEASTERN ASIA

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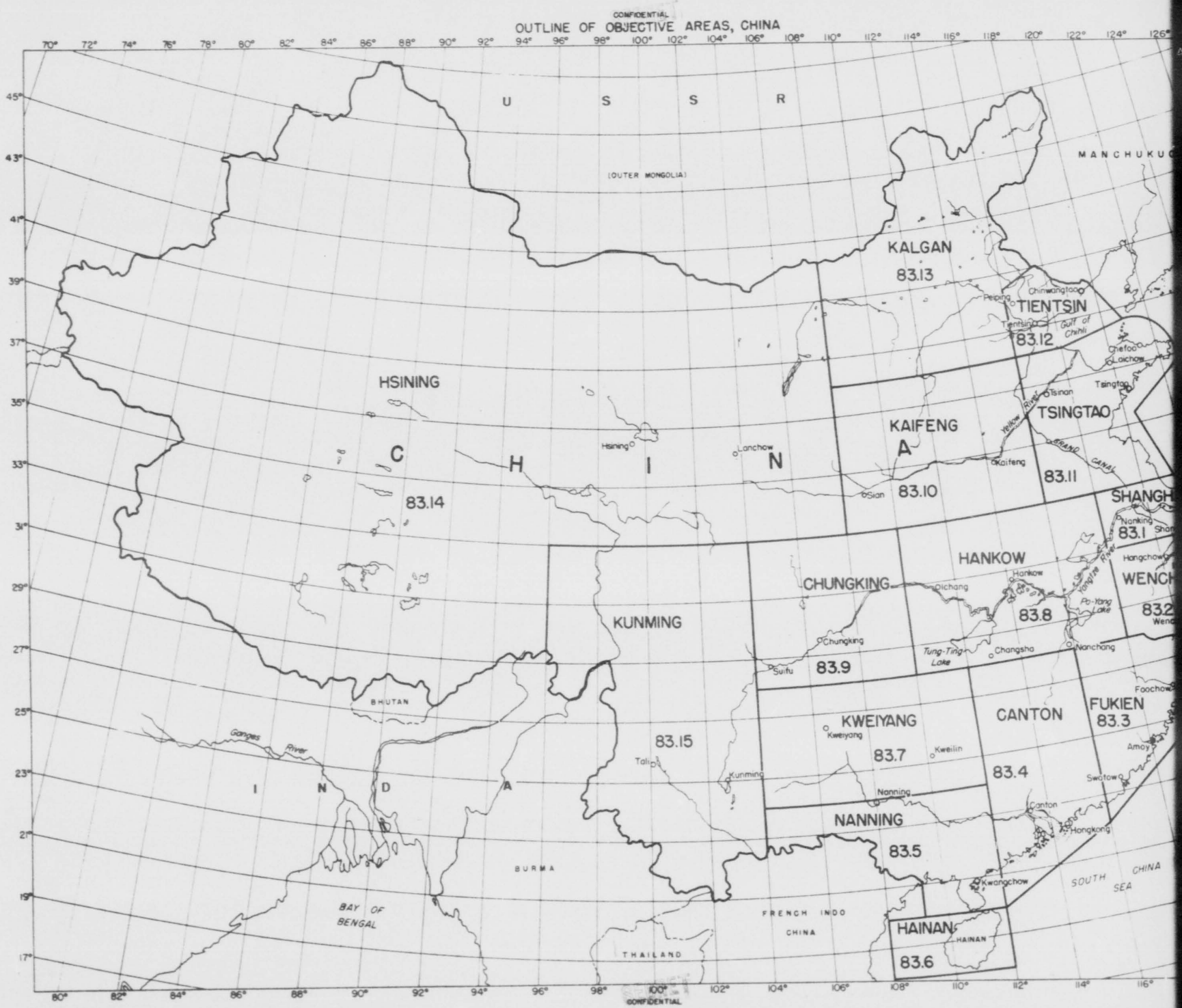
OUTLINE OF OBJECTIVE AREAS, CHINA



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OUTLINE OF OBJECTIVE AREAS, CHINA

U S S R

(OUTER MONGOLIA)

MANCHUKUO

CHOSEN

KALGAN
83.13

TIENTSIN
83.12

KAIFENG
A
83.10

TSINGTAO
83.11

SHANGHAI
83.1

HANKOW
83.8

CHUNGKING
83.9

WENCHOW
83.2

KUNMING
83.15

KWEIYANG
83.7

CANTON
83.4

FUKIEN
83.3

NANNING
83.5

HAINAN
83.6

HSINING
83.14

C H I N A

I N D A

BHUTAN

BURMA

THAILAND

FRENCH INDO CHINA

BAY OF BENGAL

SOUTH CHINA SEA

YELLOW SEA

EAST CHINA SEA

TAIWAN

LUZON

Peiping
Chinwangtao
Tientsin
Gulf of Chihli
Chefoo
Lanchow
Tsinan
Tsingtao
Yellow River
Grand Canal
Kaifeng
Sian
Hsining
Lanchow
Nanking
Shanghai
Hangchow
Ningpo
Hankow
Tungting Lake
Po-Yang Lake
Yangtze River
Wenchow
Pichang
Chungking
Suifu
Changsha
Nanchang
Foochow
Kweiyang
Kweilin
Amoy
Swatow
Canton
Hongkong
Nanning
Kwangchow
Tali
Kunming
Ganges River

72° 74° 76° 78° 80° 82° 84° 86° 88° 90° 92° 94° 96° 98° 100° 102° 104° 106° 108° 110° 112° 114° 116° 118° 120° 122° 124° 126° 128° 130°

45° 43° 41° 39° 37° 35° 33° 31° 29° 27° 25° 23° 21° 19°

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PACIFIC ISLANDS OBJECTIVE AREAS AAF A-2

Statute Miles

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U. S. S. R.

KURIL 91.1

JAPAN

TOKYO

PESCADORES 91.7

BONIN 91.8

RYUKU 91.2

MARIANAS 91.9

WAKE 100.5

PHILIPPINE ISLANDS

GUAM 100.6

CAROLINE ISLANDS 91.11

PALAU ISLAND 91.12

MARSHALL ISLANDS 91.10

HAWAIIAN ISLANDS

MIDWAY 100.4

JOHNSTON 100.3

HILO 100.2

OAHU 100.1

HOWLAND 100.7

FANNING 81.12

CHRISTMAS 100.8

GILBERT ISLANDS 81.2

PHOENIX 81.8

STARBUCK 81.10

NEW GUINEA

P. MORESBY

SANTA CRUZ 81.3

BR. SAMOA 95.5

ELLICE ISLAND 81.5

U.S. SAMOA 100.9

MARQUESAS ISLAND 86.3

DARWIN

NEW HEBRIDES 81.4

FR SAMOA 86.2

COOK 81.9

TONGA

FIJI ISLANDS 81.6

81.7

SOCIETY 86.4

TUAMOTU 86.5

NEW CALEDONIA

AUSTRALIA

BRISBANE

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PACIFIC ISLANDS OBJECTIVE AREAS AAF A-2

U. S. S. R.

JAPAN

TOKYO

KURIL 91.1

PESCADORES 91.7

BONIN 91.8

RYUKU 91.2

MARIANAS 91.9

WAKE 100.5

PHILIPPINE ISLANDS

GUAM 100.6

CAROLINE ISLANDS 91.11

PALAU ISLAND 91.12

MARSHALL ISLANDS 91.10

HOWLAND 100.7

GILBERT ISLANDS 81.2

NEW GUINEA

P. MORESBY

DARWIN

SANTA CRUZ 81.3

NEW HEBRIDES 81.4

NEW CALEDONIA

ELLICE ISLAND 81.5

FIJI ISLANDS 81.6

TONGA 81.7

FR SAMOA 86.2

PHOENIX 81.8

BR SAMOA 95.5

U.S. SAMOA 100.9

COOK 81.9

FANNING 81.12

CHRISTMAS 100.8

STARBUCK 81.10

MARQUESAS ISLAND 86.3

SOCIETY 86.4

TUAMOTU 86.5

PITCAIRN 81.11

HAWAIIAN ISLANDS

MIDWAY 100.4

JOHNSTON 100.3

HILO 100.2

OAHU 100.1

COCOS 81.13

VANCOUVER

SEATTLE

SAN FRANCISCO

Statute Miles

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AUSTRALIA

BRISBANE

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OBJECTIVE AREAS

INDIA AND BURMA

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OBJECTIVE AREAS

INDIA AND BURMA

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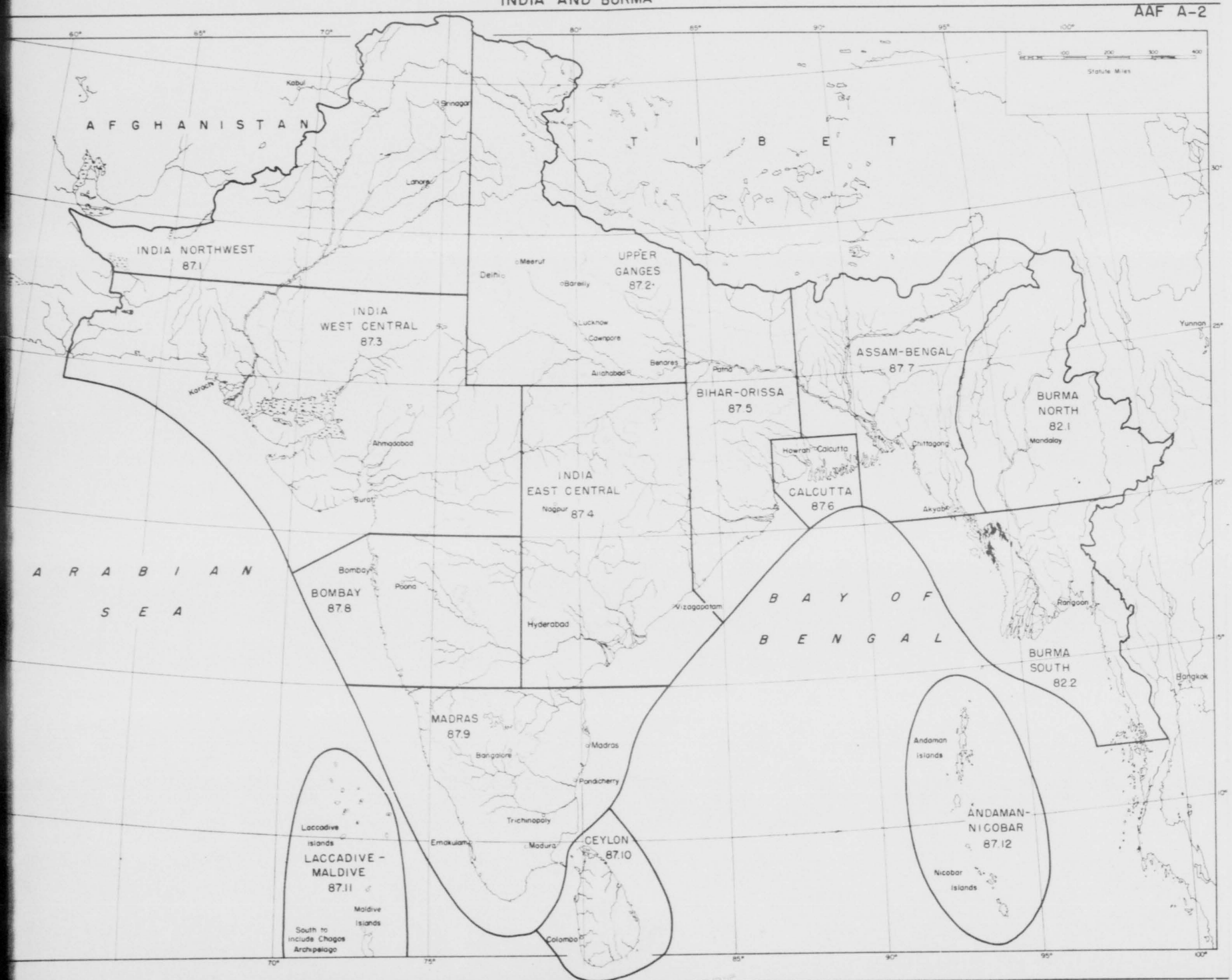

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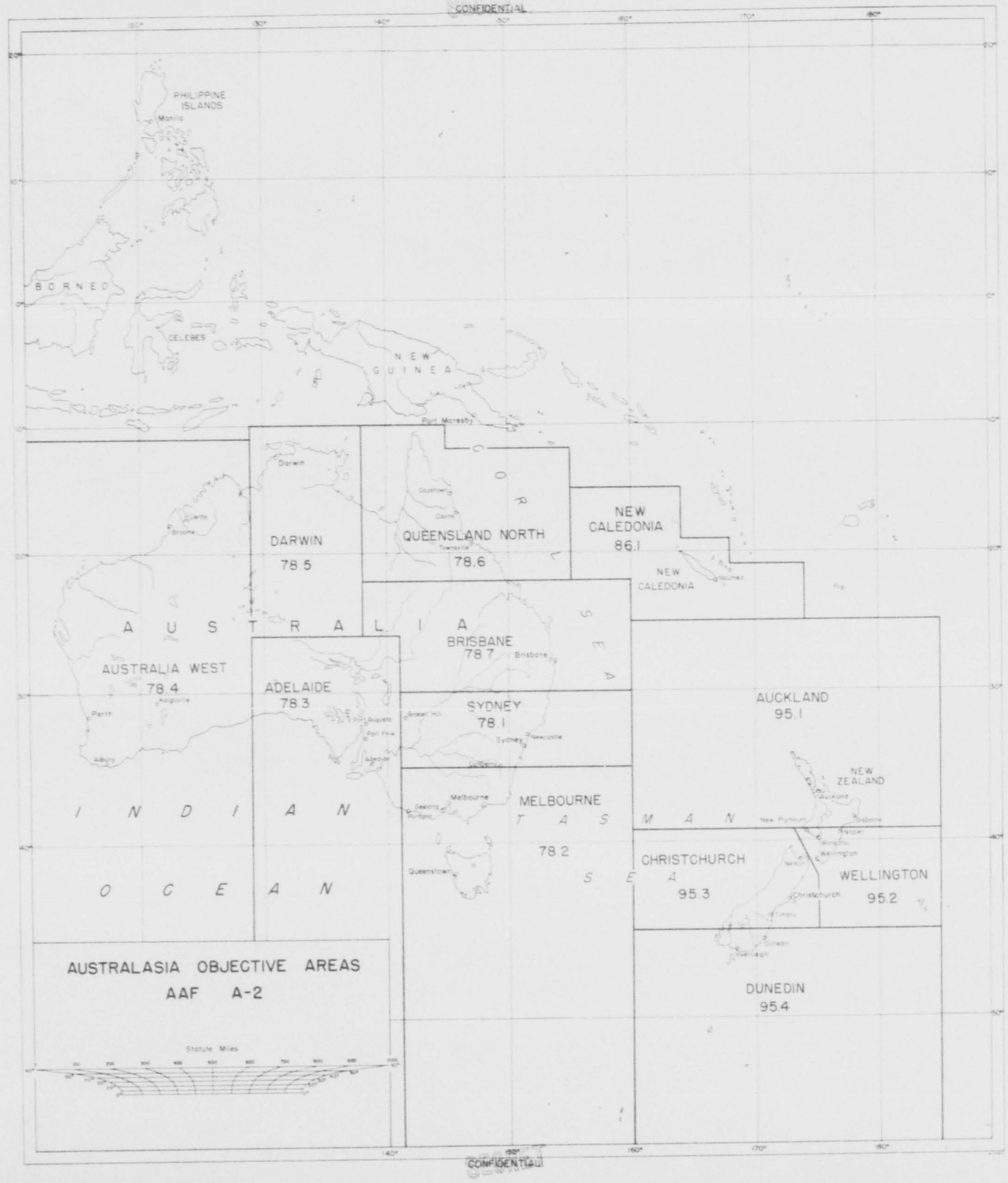

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No. 9

JAPANESE TARGET DATA

SOUTHWEST PACIFIC BASES

APRIL 1943

OFFICE OF THE
ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE
WASHINGTON, D. C

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Part I Directive

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SUBJECT: Japanese Targets for Air Attack from Southwest Pacific Bases

TO: Assistant Chief of Air Staff, Intelligence March 29, 1943

FROM: Brigadier General Howard C. Davidson

1. It is requested that the study recently prepared by the Directorate of Intelligence Service on "Japanese Target Data" be re-oriented to show the results that might be achieved by bombing operations conducted from Southwest Pacific bases, i.e., Darwin, Port Moresby, Timor, and Mindanao.

/s/ Howard C. Davidson
HOWARD C. DAVIDSON,
Brigadier General

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Part II Answering Memo and Outline of Report

S. C. SMITH, EXETER, NEBR., U. S. A.
STYLE GCB-12GR

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April 30, 1943

MEMORANDUM FOR BRIGADIER GENERAL HOWARD C. DAVIDSON

SUBJECT: Japanese Target Data, Southwest Pacific Bases

1. Pursuant to the directive from Brigadier General Howard C. Davidson, dated March 29, 1943, this study has been prepared as a re-orientation of JAPANESE TARGET DATA - MARCH 1943 from the standpoint of present or potential bases in Australia, New Guinea, Timor and the Philippines.

2. This study consists of:

a. The basic material in JAPANESE TARGET DATA - MARCH 1943, including the over-all summary and the sections on each industry from that report, except for the Shipping and Military sections.

b. A special Report section on selected air attack objectives below 25°N and from 100°E through the Solomons, with a regional map showing the relationship of these objectives to four bases.

c. A Military section including enemy orders of battle and a map showing the more important airfields in the Far East.

d. A Shipping section which is substantially the material in JAPANESE SHIPPING - AIR ATTACK DATA - APRIL 1943.

3. The separate industry sections in this report, with minor changes, are those in JAPANESE TARGET DATA - MARCH 1943. These sections indicate the relative significance of the targets discussed in Tab AA-1 Selected Targets, Southwest Pacific Bases.

4. This report has been prepared for use in the theater, and does not incorporate discussion of topography, military details, etc., in the combat areas.

5. This study is based primarily on material contained in the Air Objective Folders on the Far East published by the Assistant Chief of Air Staff, Intelligence. This material has been supplemented by the latest information obtainable at military, naval and civilian agencies engaged in the study of bombing requirements.

6. All targets referred to in this study are identified by the Target Numbers used in the Air Objective Folders. At the end of each industry section of this study is an index of all Targets in that industry. These Targets are grouped by Objective Areas. The corresponding Air Objective Folders provide photographs, plans, and detailed information required for determination of bombing requirements.

7. Study of the vulnerability to air attack of the economic and industrial resources and supports of Japan's war effort is being continued, and additional information will be presented from time to time as it becomes available.

a w brock jr.

A. W. BROCK, JR.
Colonel, G. S. C.
Deputy Assistant Chief of Air Staff,
Intelligence

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OUTLINE OF THE REPORT

Part I. Directive

Part II. Answering Memo and Outline of Report

Part III. Report

- Tab AA-1. Selected Targets, Southwest Pacific Bases
- Tab AA-2. Japanese Targets - General

Part IV. Annexes

- Tab BB-1. Military: Air-Ground
- Tab CC-1. Shipping - General
- Tab CC-2. Shipping - Naval Bases & Shipyards
- Tab A. Aircraft
- Tab B. Arms and Munitions
- Tab C. Automobiles and Motors
- Tab D. Chemicals
- Tab E. Communications
- Tab F. Electric Power
- Tab G. Iron and Steel
- Tab H. Machine and Machine Tools
- Tab I. Non-Ferrous Metals
- Tab J. Petroleum
- Tab K. Rubber
- Tab L. Transportation - Rail
- Tab M-1. Miscellaneous - General
- Tab M-2. Miscellaneous - Building Materials.
- Tab M-3. Miscellaneous - Textiles
- Tab M-4 Miscellaneous - Water Supply
- Tab N. Summary of All Targets
  Objective Area Maps

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Part III Report

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SELECTED TARGETS

SOUTHWEST PACIFIC BASES

This report relates to objectives in the area below 25°N and from 100°E through the southern Japanese-controlled arc to the Solomons. For general orientation (without specific reference to present or potential status of these particular bases), objectives are discussed in relation to 2 presently-held bases - Port Moresby and Darwin, and 2 others - Koepang in Timor, and Del Monte in Mindanao.

Important air attack objectives in this area (other than direct military, which with the exception of airfields are not included in the scope of this report) are principally confined to Petroleum, Shipping and Ship Facilities.

In the area are 9 out of the total of 199 objectives rated as KEY TARGETS in terms of the Japanese war effort as a whole. There are also 4 out of the total of 17 KEY SHIP CONCENTRATIONS. The basis for evaluation of KEY TARGETS and KEY SHIP CONCENTRATIONS is indicated in the following section (Japan - General) of the Report.

Of the 9 KEY TARGETS in this area, 2 are rated as PRIORITY TARGETS (see Japan - General). Both are crude oil refineries. The Pladjoe refinery at Palembang (Sumatra) is the largest in the Far East and represents an estimated 29% of total refining capacity under Japanese control; Pladjoe is particularly important as a source of an estimated 1,800,000 barrels annually of aviation gasoline. The former Shell refinery at Lutong (Borneo) represents an estimated 11% of capacity, which was destroyed but is believed to have been substantially rebuilt. This refinery operates on crude from nearby fields, about half of which is suitable for direct use as bunker fuel and moves through Lutong irrespective of the operating status of the refinery.

Of the other 7 KEY TARGETS in this area, 2 of the most important are the Singapore Naval Base and the Balikpapan oil refinery (Borneo). There is conflicting intelligence on the extent of restoration of the Balikpapan refinery capacity. Another KEY TARGET in the area is the partially destroyed Goodyear tire factory at Buitenzorg (Java). Four of the area's KEY TARGETS are the principal electric power plants in Taiwan.

One of the 4 KEY SHIP CONCENTRATIONS in the area is the off-shore tanker anchorage at Lutong. Kuala Dungun in Malaya and Calambayanga Island (Paracale) in the Philippines are important iron ore export points. The fourth KEY SHIP point is Keelung, principal port of Taiwan.

Within this area are numerous other installations which do not warrant rating as KEY objectives in terms of the total Japanese war economy, but which are of substantial localized importance. Together with PRIORITY and KEY TARGETS, these objectives are shown on the map at the end of this section. Distance from base and a brief description of each objective are indicated in the following separate target tabulations for each of the four bases mentioned. Location of the PRIORITY and KEY TARGETS in the area with reference to the Far East as a whole is shown on the Priority and Key Targets map at the end of the Japan - General section.

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Also in the area are a number of other targets which are of minor importance and are not considered in this report. All of these, however, are included in the tabulations of all known targets at the end of each industry section of this study.

As indicated by the nature of the major targets mentioned, the wartime economic importance to Japan of this area is principally as a source of basic commodities. While the commodity tonnage originating south of Taiwan is less than 20% of the estimated total Japanese commodity movement, it includes the bulk of Japan's supplies of crude oil and products, of bauxite for aluminum, and of nickel, and significant amounts of other basic materials. The relative importance of commodity transport out of this area, the shipping aspects of stockpiling, etc., are indicated in the special Shipping section of this report.

The importance of this area as a source of basic commodities is, generally speaking, limited to that part of the area which includes and is west of the Celebes. Air attack objectives in the Timor-New Guinea-Solomons region are primarily of a direct military character, the evaluation of which is contingent upon military developments, reconnaissance, and field intelligence.

It is reported that the Japanese may be obtaining small but strategically located oil production in the Vogelkop (Berau Peninsula) section of New Guinea. Except for this oil and negligible quantities of copra, New Guinea cannot be considered a source of raw materials.

Over half of Japan's nickel ore comes from the Kolaka district, Celebes. Although a stockpile adequate for 1943 requirements is believed to have been accumulated, the ore moved out of Kolaka is of critical importance.

Borneo is an important source of crude oil and refined products (see Petroleum section). In addition to refineries at Lutong and Balikpapan, there is a large movement out of Tarakan on the east coast of crude which is directly used as bunker fuel.

Java produces some oil and salt, quinine, etc. Sumatra is presently Japan's most important source of refined oil products, moving out of Palembang. Tandjong Pinang is the principal export point for the more than 80% of Japan's bauxite imports originating in the general Singapore area.

In addition to bauxite, Malaya also supplies important amounts of iron ore, some manganese, and tin. It is indicated that crude rubber shipments from this region are not presently of critical importance.

Rice is the volume export from Thailand. Non-coking coal and rice are the volume shipments out of Indo-China; other exports are phosphate rock, zinc, salt. Indo-China is an alternate Japanese source of rubber.

The Philippines are a strategic source of high-grade iron, chrome and copper. Taiwan supplies Japan with large tonnages of sugar, non-coking coal, rice, salt, and copper.

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The availability to Japan of these commodities involves a large and consistent ship movement in this area, in addition to military transport. The principal commodity ports are shown on the map in the Shipping section. These ports, and smaller pre-war ports of call for inter-island shipping, are also shown on the Inter-Island Shipping map at the end of this section.

Ship concentrations and facilities involved in long-haul shipping, and oil installations, are the principal non-military objectives within a 1000-mile radius from any of the four indicated bases.

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PORT MORESBY BASE

None of the selected targets in this area are within 1000 miles of Port Moresby.

The only objectives shown within 1500 miles are the Boela Oil Terminal on the northeast coast of Ceram Island, and a group of oil terminals in the Vogelkop section at the western end of New Guinea reported to be used by the Japanese in connection with working of small-yield wells in that region.

Air attack objectives in the New Guinea - Solomons region are predominantly of a military character -- including such ports as Rabaul, Wewak, Buin, Kavieng, Salamaua -- the evaluation of which is contingent upon military developments, reconnaissance and field intelligence.

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SELECTED TARGETS

PORT MORESBY BASED OPERATIONS

TARGET		Comment	Objective Area	Miles From Port Moresby				
No.	Name			0-500	500-750	750-1000	1000-1250	1250-1500
		PETROLEUM						
N A	Wasiam, Klamono & Moji Oil Terminals (NW New Guinea)	Oil fields believed worked by Japs (Reconnaissance suggested)	New Guinea W (94.6)				x	
N A	Boela Oil Terminal (Ceram Is.)	Crude oil storage	New Guinea W (94.6)					x

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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DARWIN BASE

Targets shown in a 500-750 mile radius from Darwin are the Boela and Vogelkop oil installations, and the important Ambon Naval Base. Two ports of considerable regional importance are Dobo (Aroe Island) and Dili (Timor).

A 1000-mile radius includes Macassar Harbor, principal port of the Celebes, and Kolaka Harbor, the Celebes nickel ore export point.

A 1000-1250 radius from Darwin includes the port and oil refinery at Balikpapan on the east coast of Borneo. There is conflicting intelligence as to the extent to which this substantial refinery capacity has been restored by the Japanese.

Among the other targets within a 1500-mile radius are two machinery plants and the important harbor at Surabaya, and the important oil export port of Tarakan on the east coast of Borneo.

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SELECTED TARGETS
DARWIN BASED OPERATIONS

TARGET No.	TARGET Name	Comment	Objective Area	Miles From Darwin 0-500	500-750	750-1000	1000-1250	1250-1500
		HARBOR FACILITIES AND WAREHOUSES						
216	Macassar Harbor	Largest, best equipped harbor in Celebes	Celebes-Timor (94.3)			x		
212	Koloka Harbor	Nickel ore export port	Celebes-Timor (94.5)			x		
220	Balikpapan Harbor	Large, well equipped harbor; oil	Borneo S. (94.4)				x	
143 a&b	Surebaya Commercial & Naval Harbor	Restored; best equipped harbor in Java	Java (94.3)					x
221	Tarakan Harbor	Large, crude oil port; two piers	Borneo S (94.4)					x
51	Pembujan Sur	Iron ore export port	Philippines N (96.1)					x
		PETROLEUM						
225	Shell Oil Co. Refinery (Balikpapan)	4.8% of total Jap crude oil refinery capacity; large storage	Borneo S. (94.4)				x	
N A	Boela Oil Terminal (Ceram Is.)	Crude oil storage	New Guinea W (94.6)		x			
224	Tarakan Storage Tanks	Large oil tank farm	Borneo S. (94.4)					x
NA	Wasiam, Klamono and Moji Oil Terminals (NW New Guinea)	Oil fields believed worked by Japs. (Reconnaissance suggested)	Borneo S. (94.4)		x			
		NAVAL BASES & SHIPYARDS						
NA	Ambon Naval Base (Amboin Is.)	Facilities restored, used by Japanese	New Guinea W (94.6)		x			
		R.R. TRANSPORTATION						
173	State RR Workshops (Madiun)	Repairs, rebuilds steam locomotives; large	Java (94.3)					x

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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SELECTED TARGETS
DARWIN BASED OPERATIONS
(Continued)

TARGET		Comment	Objective Area	Miles From Darwin				
No.	Name			0-500	500-750	750-1000	1000-1250	1250-1500
		MACHINES & MACHINE TOOLS						
183	Braat Machine Shops (Surabaya)	Large machinery repair & building shops	Java (94.3)					x
184	Ned. Indische Industrie (Surabaya)	Machinery shop; structural steel products	Java (94.3)					x
		BUILDING MATERIALS						
60	Cebu Cement Plant	Largest cement mill in Philippines	Philippines S (96.2)					x

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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KOEPANG (TIMOR) BASE

As compared with operations from Darwin, availability of a Koepang base would include no additional objectives of importance (except for the State Railroad Shops at Madiun, Java) within a 1000-mile radius.

The important oil refinery (estimated 12% of total Japanese capacity) and harbor at Lutong are approximately 1100 miles from Koepang. The still larger Pladjoe refinery (across the river from the demolished N.K.P.M. refinery) and port at Palembang, Sumatra, are approximately 1500 miles from Koepang.

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SELECTED TARGETS

KOEPANG BASED OPERATIONS

TARGET No.	TARGET Name	Comment	Objective Area	Miles From Koepang 0-500	500-750	750-1000	1000-1250	1250-1500
		PETROLEUM						
61	Pladjoe Refinery (Palembang)	29% of total Jap crude refinery cap; large storage	Sumatra S. (94.2)					x
8	Lutong Refinery	11.6% of total Jap crude refinery cap; large storage	Borneo N. (81.1)				x	
225	Shell Oil Co Refinery (Balikpapan)	4.8% total Jap crude refinery cap; large storage	Borneo S. (94.4)		x			
224	Tarakan Storage Tanks (Tarakan)	Large oil tank farm	Borneo S. (94.4)			x		
N A	Boela Oil Terminal (Ceram Is.)	Crude oil storage	New Guinea W (94.6)		x			
N A	Wasiam, Klamono and Moji Oil Terminals (NW New Guinea)	Oil fields believed worked by Japs (Reconnaissance suggested)	New Guinea W (94.6)			x		
		HARBOR FACILITIES AND WAREHOUSES						
216	Macassar Harbor	Largest, best equipped harbor in Celebes	Celebes-Timor(94.5)	x				
212	Kolaka Harbor	Nickel ore export port	Celebes-Timor(94.5)	x				
145 a&b	Surabaya Commercial & Naval Harbor	Restored; best equipped harbor in Java	Java (94.3)			x		
220	Balikpapan Harbor	Large, well equipped harbor	Borneo S. (94.4)		x			
221	Tarakan Harbor	Large, shelter harbor; two piers; crude oil	Borneo S. (94.4)			x		
1	Kuching Harbor	Ship repairs, coal export, sheltered anchorage	Borneo N. (81.1)				x	
51	Pambujan Sur Harbor	Iron ore export port	Phil. N. (96.1)					x
53	Palembang Harbor	Oil loading port, 2 tanker wharves	Sumatra S. (94.2)					x
N A	Lutong Harbor	Oil tanker loading port	Borneo N. (81.1)					x
		NAVAL BASES & SHIPYARDS						
N A	Ambon Naval Base (Amboin Is.)	Facilities restored; used by Japanese	New Guinea W (94.6)		x			
19	Cavite Naval Base (Philippines	Rptd restored; in use	Phil. N. (96.1)					x

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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SELECTED TARGETS

KOEPANG BASED OPERATIONS

(Continued)

TARGET No.	TARGET Name	Comment	Objective Area	Miles From Koepang 0-500	500-750	750-1000	1000-1250	1250-1500
		R.R. TRANSPORTATION						
173	State RR Workshops (Madiun)	Repairs, rebuilds steam locomotives; large	Java (94.3)			x		
172	State RR Workshops (Manggarai)	Large locomotive repair shops	Java (94.3)					x
		MACHINES & MACHINE TOOLS						
183	Braat Machine Shops (Surabaya)	Large machinery repair & building shops	Java (94.3)			x		
184	Ned. Indische Industrie (Surabaya)	Machinery shops; structural steel products	Java (94.3)			x		
		BUILDING MATERIALS						
60	Cebu Cement Plant	Largest cement mill in Philippines	Philippines S (96.2)				x	
		RUBBER						
164	Goodyear Tire Fcty (Buitenzorg)	Large rubber tire factory; partially restored						x
		ELECTRIC POWER						
35	Manila Electric Power Steam Plant	29,500 KW; main source of power for Manila area	Philippines N. (96.1)					x
		HARBOR FACILITIES AND WAREHOUSES						
2	Calambayanga Is. Pier (Paracale)	Iron ore export port	Philippines N. (96.1)					x

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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DEL MONTE (MINDANAO) BASE

In addition to installations to the south, availability of a Del Monte base and a radius of 1000 miles would include objectives in the Philippines and Taiwan, and the shipping along the South China coast.

The more important targets in Taiwan are the major ports of Keelung and Takao, the alumina-aluminum plant at Takao, the Kinkaseki copper concentrate plant, the carbon black plant at Kinsui, and 4 large power plants providing an estimated 60% of Taiwan's electricity.

As indicated in the special Shipping section, the water-borne transportation along the China Coast is a major link in the Japanese war effort. A Philippines base would substantially increase the possibilities in a co-ordinated attack on Japanese shipping to and from the South Pacific.

The map indicates the considerable extension of radius required to reach the important targets in Singapore and Hong Kong, objectives in Indo-China, and the southern end of Japan Proper.

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SELECTED TARGETS
DEL MONTE BASED OPERATIONS

TARGET		Comment	Objective Area	Miles From Del Monte				
No.	Name			0-500	500-750	750-1000	1000-1250	1250-1500
		PETROLEUM						
8	Lutong Refinery	11.6% of total Jap crude refinery cap; large storage	Borneo N. (81.1)		x			
225	Shell Oil Co Refinery (Balikpapan)	4.8% total Jap crude refinery cap; large storage	Borneo S. (94.4)			x		
224	Tarakan Storage Tanks	Large oil tank farm	Borneo S. (94.4)		x			
NA	Boela Oil Terminal (Ceram Is.)	Crude oil tank storage	New Guinea W (94.6)			x		
NA	Wasiam, Klamono & Moji Oil Terminals (NW New Guinea)	Oil fields believed worked by Japs (Reconnaissance suggested)	New Guinea W (94.6)			x		
		HARBOR FACILITIES AND WAREHOUSES						
15a & c	Western Keelung Wharves (Taiwan)	Largest, best equipped port in Taiwan	Taihoku (91.3)			x		
8a & b	Military Storehouses, Takao (Taiwan)	Naval and commercial port	Takao (91.6)			x		
2	Calambayanga Is. Pier (Paracale)	Iron ore export port	Philippines N. (96.1)	x				
3	San Fernando La Union	Copper concentrate export port	Philippines N. (96.1)		x			
51	Pambujan Sur	Iron ore export port	Philippines N. (96.1)	x				
NA	Haiphong Harbor and Dockyard	Floating docks; wharves	Indo-China W (85.1)					x
NA	Saigon Harbor	Largest hbr in Indo-China; RR trans-shipment wharves	Indo-China S (85.2)					x
37	Kuala Dungun Harbor	Iron ore export port	Malay States (92.1)					x
40	Kota Bahru Harbor	Iron & manganese ore export port	Malay States (92.1)					x

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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SELECTED TARGETS

DEL MONTE BASED OPERATIONS
(Continued)

TARGET		Comment	Objective Area	Miles From Del Monte				
No.	Name			0-500	500-750	750-1000	1000-1250	1250-1500
		HARBOR FACILITIES AND WAREHOUSES (Cont'd)						
39	Tempat Harbor	Iron & manganese ore export port	Malay States (92.1)					x
145a &b	Surabaya Commercial & Naval Harbor	Restored; best equipped harbor in Java	Java (94.3)				x	
1	Kuching Harbor	Ship repair facilities; coal export port	Borneo N. (81.1)				x	
220	Balikpapan Harbor	Large, well equipped harbor	Borneo S. (94.4)			x		
221	Tarakan Harbor	Large crude oil harbor	Borneo S. (94.4)		x			
216	Macassar Harbor	Largest, best equipped harbor in Celebes	Celebes-Timor (94.5)			x		
212	Kolaka Harbor	Nickel ore export port	Celebes-Timor (94.5)			x		
NA	Lutong Harbor	Oil tanker loading port	Borneo N. (81.1)		x			
		NAVAL BASES & SHIPYARDS						
53	Taikoo Dockyard (Hong Kong)	1 large drydock; 4 patent slips; 6 bldg. ways	Canton (83.4)				x	
54	Royal Navy Yard (Hong Kong)	1 drydock; several re-wharves; shops	Canton (83.4)				x	
55	Kowloon Dockyard (Hong Kong)	3 drydocks; 2 patent slips; 2 bldg. ways	Canton (83.4)				x	
56	Cosmopolitan Dock (Hong Kong)	1 drydock; bldg. ways; shops	Canton (83.4)				x	
15b	Gyucho Ko Dockyard (Taiwan)	1 drydock; 1 patent slip; shops; fuel	Taihoku (91.3)			x		
33	Yulinkan Harbor Naval Base (Hainan Is.)	Submarine base	Hainan (83.6)				x	

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored

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SELECTED TARGETS

DEL MONTE BASED OPERATIONS

TARGET No.	TARGET Name	Comment	Objective Area	Miles From Del Monte 0-500	500-750	750-1000	1000-1250	1250-1500
		NAVAL BASES & SHIP-YARDS (Cont'd)						
		Shops, repair facilities	Indo-China (85.2)				x	
NA	Saigon Arsenal & Navy Yard							x
18 23	Singapore Naval Base	Drydocks; shops; bldg. ways; fuel stores; restored	Singapore (92.2)					x
51	Tandjong Rhu Shipyards (Singapore)	Bldg. & repair docks Small vessels	Singapore (92.2)				x	
146	Ansan Naval Base Wharves	Fueling & repair facilities	Pescadores (91.7)					
19	Cavite Naval Base (Philippines)	Reported restored; in use	Philippines N. (96.1)			x		
NA	Ambon Naval Base (Amboin Is.)	Facilities restored, used by Japanese	New Guinea W. (94.6)				x	
		R.R.TRANSPORTATION						
32	Matsuyama RR Shops (Taiwan)	Largest RR shops in Taiwan	Taihoku (91.3)					x
NA	Vinh RR Shops	Largest shops in Indo-China	Indo-China N. (85.1)					x
172	State RR Workshops (Manggarai)	Large locomotive repair shops	Java (94.3)					x
173	State RR Workshops Madiun	Repairs, rebuilds steam locomotives; large	Java (94.3)					
		NON-FERROUS METALS						
44	Kinkaseki Copper Conc. Plant (Taiwan)	One of Japan's largest copper sources	Taihoku (91.3)					x
61	Japan Aluminum Col, Karenko (Taiwan)	About 3% of total Jap aluminum capacity	Taiwan E. (9.15)					x
3	Nippon Aluminum Co., Takao (Taiwan)	About 6% total Jap aluminum capacity	Taihoku (91.3)					

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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SELECTED TARGETS

DEL MONTE BASED OPERATIONS

TARGET		Comment	Objective Area	Miles From Del Monte				
No.	Name			0-500	500-750	750-1000	1000-1250	1250-1500
		NAVAL BASES & SHIP - YARDS (Cont'd)						
NA	Saigon Arsenal & Navy Yard	Shops, repair facilities	Indo-China (85.2)				x	
15 23	Singapore Naval Base	Drydocks; shops; bldg. ways; fuel stores; restored	Singapore (92.2)					x
51	Tandjong Rhu Shipyards (Singapore)	Bldg. & repair docks Small vessels	Singapore (92.2)					x
146	Ansan Naval Base Wharves	Fueling & repair facilities	Pescadores (91.7)			x		
19	Cavite Naval Base (Philippines)	Reported restored; in use	Philippines N. (96.1)	x				
NA	Ambon Naval Base (Amboin Is.)	Facilities restored, used by Japanese	New Guinea W. (94.6)		x			
		R.R.TRANSPORTATION						
32	Matsuyama RR Shops (Taiwan)	Largest RR shops in Taiwan	Taihoku (91.3)			x		
NA	Vinh RR Shops	Largest shops in Indo-China	Indo-China N. (85.1)					x
172	State RR Workshops (Manggarai)	Large locomotive repair shops	Java (94.3)					x
173	State RR Workshops Madiun	Repairs, rebuilds steam locomotives; large	Java (94.3)					x
		NON-FERROUS METALS						
44	Kinkaseki Copper Conc. Plant (Taiwan)	One of Japan's largest copper sources	Taihoku (91.3)			x		
61	Japan Aluminum Col, Karenko (Taiwan)	About 3% of total Jap aluminum capacity	Taiwan E. (9.15)			x		
3	Nippon Aluminum Co., Takao (Taiwan)	About 6% total Jap aluminum capacity	Taihoku (91.3)			x		

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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SELECTED TARGETS

DEL MONTE BASED OPERATIONS
(Continued)

TARGET		Comment	Objective Area	Miles From Del Monte				
No.	Name			0-500	500-750	750-1000	1000-1250	1250-1500
		NON-FERROUS METALS (Cont'd)						
8	Lepanto Conc. Mill & Smelter	Rptd. producing 10,000 tons copper per yr	Philippines N. (96.1)		x			
		MACHINES & MACHINE TOOLS						
NA	Andre Grillet Foundry, Saigon	Large foundry & machine shop; munitions	Indo-China S. (85.2)				x	
52	United Engineers Ltd. (Singapore)	Largest metal & machine shops in Malaya	(92.2)					
183	Braat Machine shops (Surabaya)	Large machinery repair & bldg. shops	Java (94.3)				x	
184	Ned. Indische Industrie (Surabaya)	Machinery shop; structural steel products	Java (94.3)				x	
		AIRCRAFT						
NA	Tong Aircraft Factory (Sontay)	Small aircraft assembly plant	Indo-China N. (85.1)					x
		ELECTRIC POWER						
82 83	Jitsugetsutan Power Plants (Taiwan)	Total cap 144,000 KW	Taiwan W (91.4)			x		
35	Hattoshi Steam Power Plant	38,000 KW	Taihoku (91.3)			x		
159	Large Takao Steam Plant	35,000 KW	Takao (91.6)			x		
35	Manila Electric Power Steam Plant	29,500 KW; main source of power for Manila area	Philippines N. (96.1)	x				
48	Hong Kong Electric Co., North Point	45,000 KW; only plant on Hong Kong Island	Canton (83.4)				x	
49	China Light & Power Col, Kowloon	39,000 KW; only plant in Kowloon	Canton (83.4)				x	

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SELECTED TARGETS

DEL MONTE BASED OPERATIONS
(Cont'd)

TARGET		Comment	Objective Area	Miles From Del Monte				
No.	Name			0-500	500-750	750-1000	1000-1250	1250-1500
		BUILDING MATERIALS						
60	Cebu Cement Plant	Largest cement mill in Philippines	Phil. S. (96.2)	x				
		CHEMICALS						
87	Carbon Black Plant Kinsui (Taiwan)	Supplies Approximately 50% of Japanese Carbon Black Requirements	Taiwan West (91.4)			x		

These and all other targets are included in the target tabulation with coordinates and brief description. KEY TARGETS are underscored.

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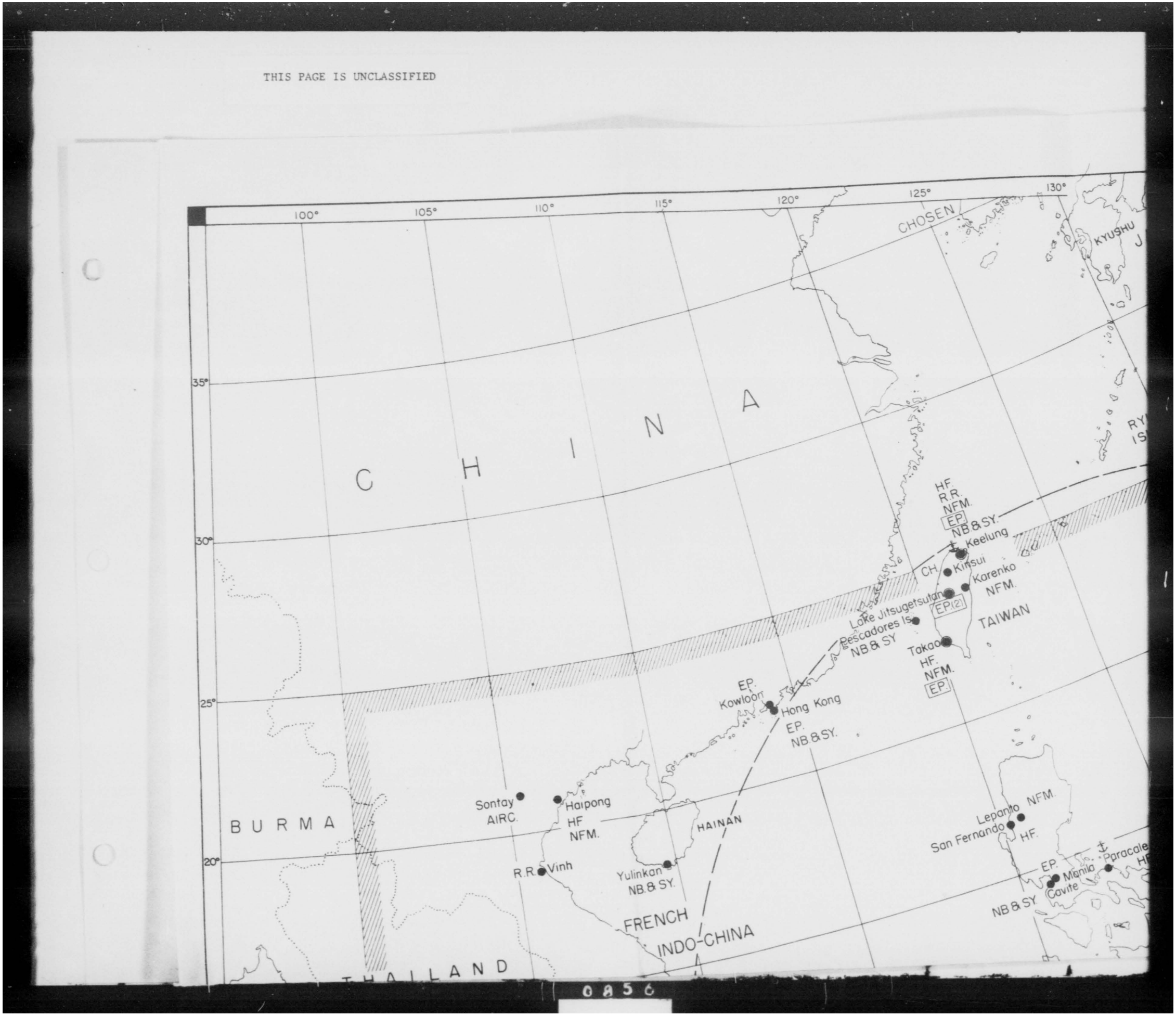

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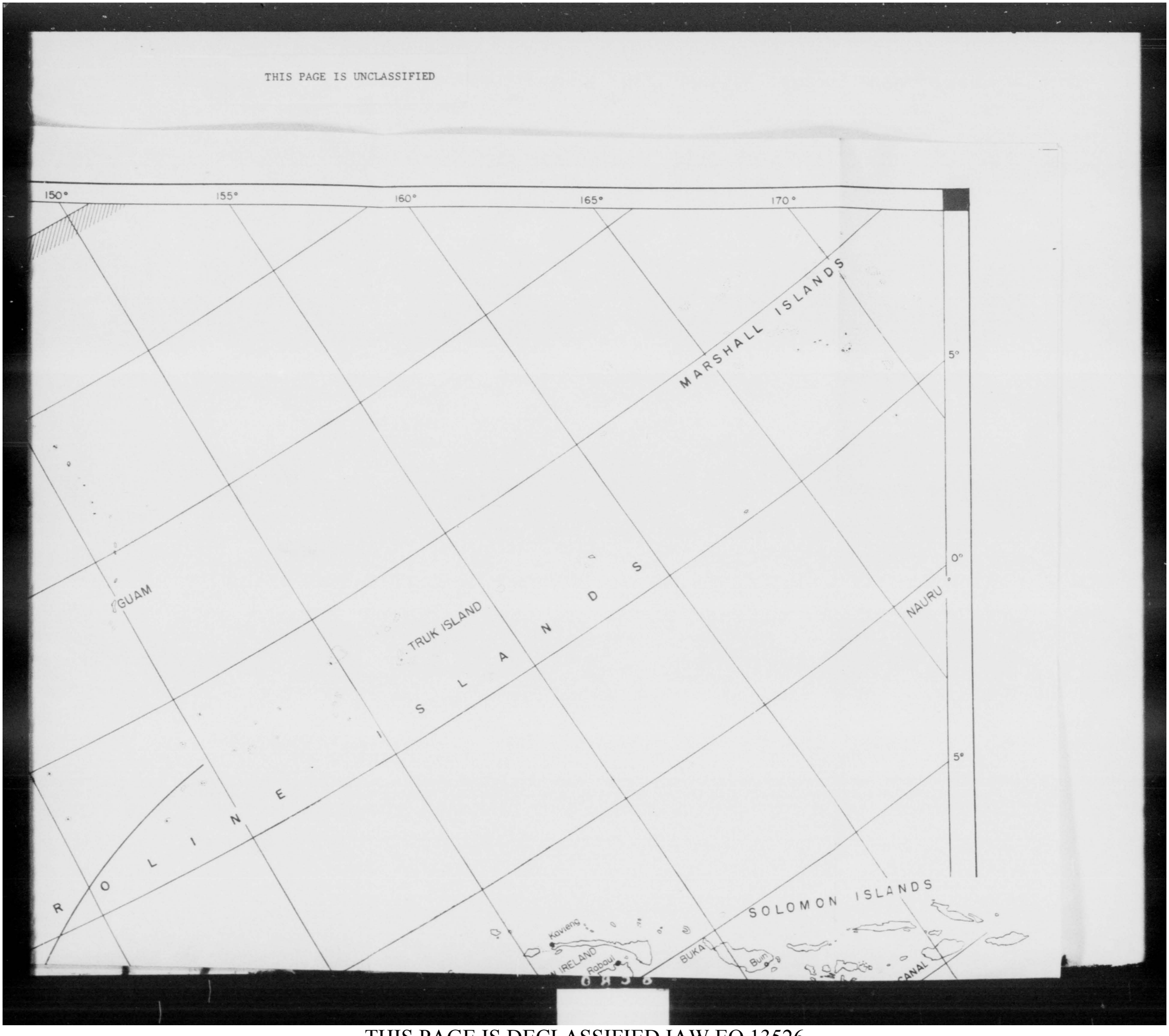

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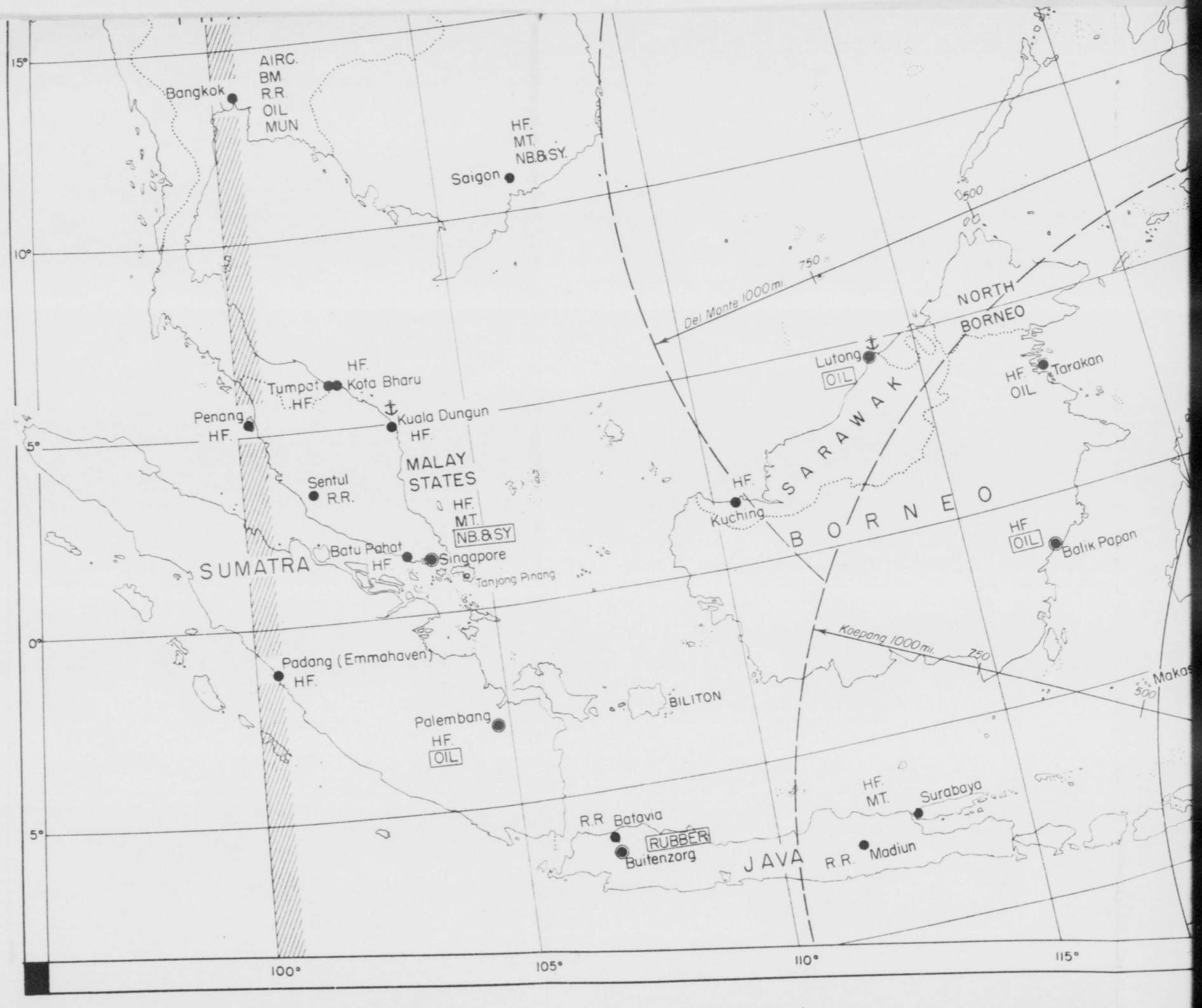

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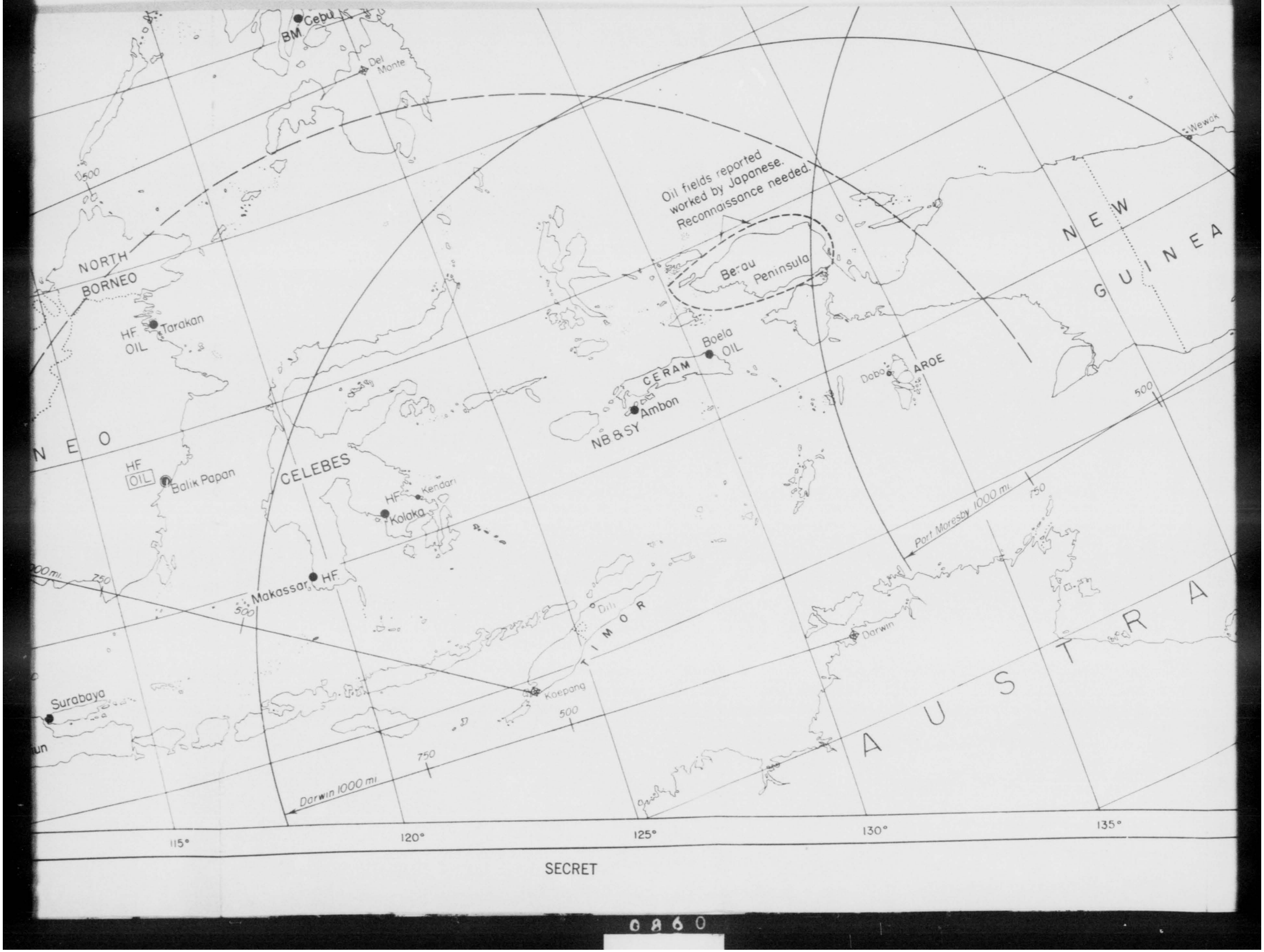

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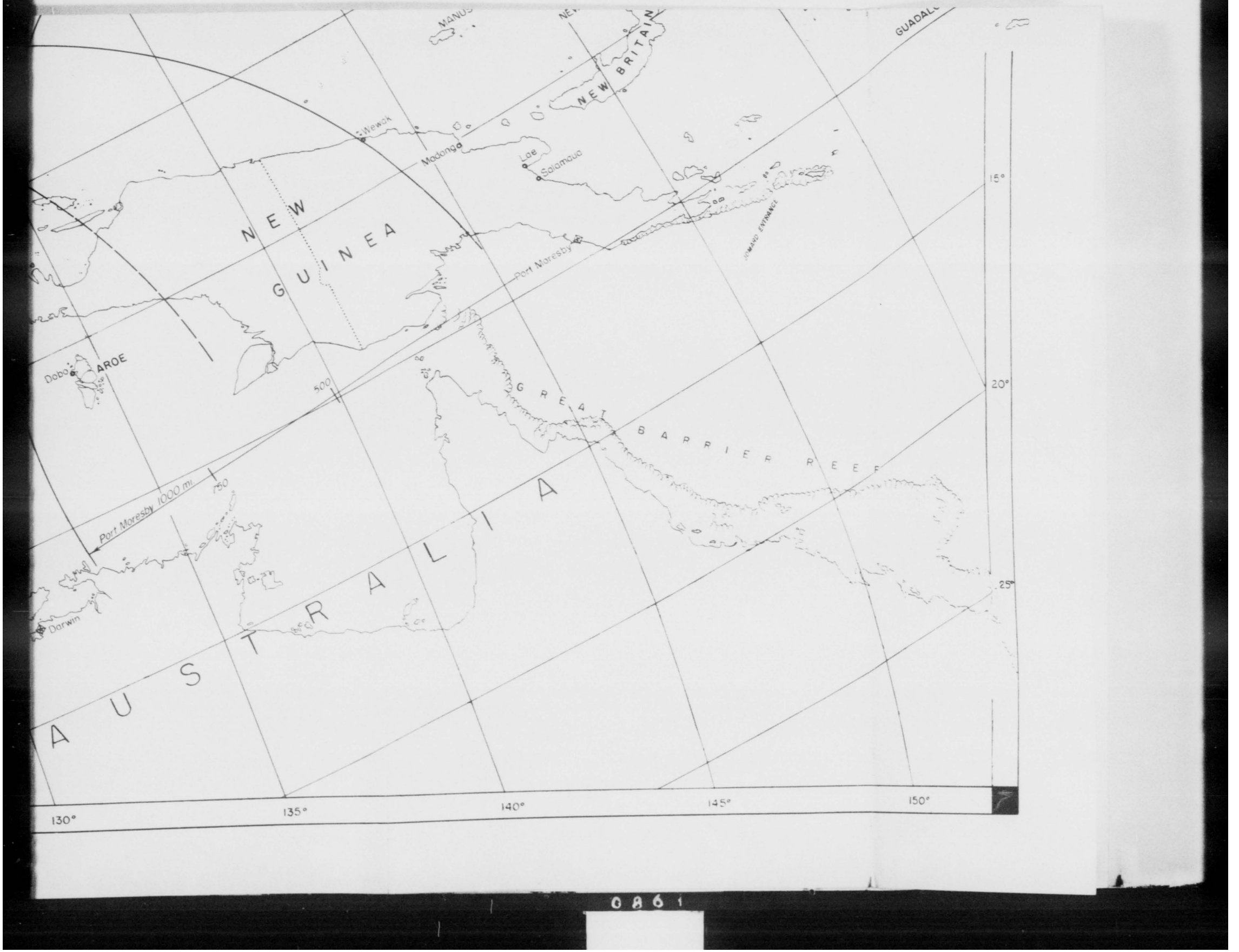

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March, 1943

FAR EAST TARGETS

SCHEDULE I

Order of Priority	Classification	Priority Targets		Key Targets		All Targets
		No.	Significance	No.	Significance	
1	Aircraft	8	50% engine capacity 50% plane "	16	70% engine capacity 70% plane "	48
2	Non-Ferrous Metals	5	60% alumina (equiv. % aluminum) 40% copper 80% lead, 40% zinc	14	60% alumina, 40% aluminum 55% copper 80% lead, 40% zinc	66
3	Naval Bases & Shipyards	9	66% shipbuilding 55% ship repairing 67% marine engines	17	84% new ships Over 60% repairs 87% marine engines	108
4	Iron & Steel	6	61% of steel capacity 68% of pig iron capacity	17	81% steel capacity 94% pig iron capacity	87
5	Petroleum	8	57% crude refinery capacity 61% synthetic capacity	16	77% crude refinery capacity 77% synthetic capacity	139
6	Chemicals	8	65% coke by-products 48% nitrogen 60% soda ash, 45% caustic	18	68% coke by-products 65% nitrogen 73% soda ash, 56% caustic 60% acetone	120
7	Automobiles, Motors	2	80% capacity, largely converted to war production	9	86% capacity, largely converted to war production	20
8	Rubber	3	67% of tire production	8	95% of tire production	11
*	Airports	-		-		207
*	Arms, Munitions	-		16		91
*	Communications	-		8		70
*	Defenses	-		-	Relative importance of these targets cannot be expressed in statistical terms	44
*	Electric Power	-		29		196
*	Harbor Facilities & Whses	-		-		255
*	Machines, Machine Tools	-		15		74
*	Railroad Transportation	-		16		291
*	Miscellaneous	-		-		137
	TOTAL	49		199		1964
9	Ship Concentrations	10	Largest concentrations in Far East	17	Largest concentrations in Far East	57

* No Priority Targets

Priority Targets are included in Key Targets above and are identified in the Key-Target lists in each industry section.

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March 1943 SECRET

JAPANESE INDUSTRIAL TARGETS

Schedule I indicates the pattern for air attack to destroy Japan's industrial power.

First in the schedule, ranged in order for attack, are the 49 Priority Targets, the destruction of which would have the greatest per-target effect upon Japanese industrial production.

These Priority Targets are selected, without reference to accessibility, from a total of 199 Key Targets evaluated in this study. The Priority Targets are the major plants or installations in the nine categories which warrant priority in air attack upon the Japanese war economy.

First in order of priority for attack is the Aircraft industry, followed by Non-Ferrous Metals primarily because of the importance of aluminum for aircraft. Naval Bases & Shipyards are ranked high; ship building and repair capacity is one of the most critical phases of the Japanese war effort. Japan's steel position has always been tight, and any substantial loss of production would be immediately felt. The war importance of Petroleum, Chemicals and Rubber Tires is evident. Two automobile plants are included because they represent 80% of the industry's capacity, almost entirely converted to war production. The bases for this order of priority are indicated in the detailed evaluation in each industry section of the study.

An important category included in priority objectives is Ship Concentrations. As discussed in a special section of this study, shipping is one of the most vital links in Japan's war economy and is the link most exposed to air attack from presently-held bases.

The 199 Key Targets are selected from a total of 1964 Far East targets. They comprise all known plants or installations which are of major significance, including the categories of Electric Power, Arms-Munitions, Machine Tools and Railroad Transportation. While these industries are of unquestioned significance, and there are certain particularly important individual objectives, they are not included in Priority Targets because conclusive damage to these industries would require large-scale and sustained attacks on widely dispersed, numerous objectives. Several other categories (Building Materials, Textiles, etc.) do not warrant major consideration as objectives in terms of the total Japanese war effort.

The following map indicates the geographical dispersion of Priority Targets and Key Targets. There are five principal areas of industrial concentration -- Tokyo, Kobe-Osaka, Nagoya, Yawata, Mukden. It is to be noted that factors other than the number of targets determine the relative importance of any one area. The Yawata, Kobe-Osaka and Tokyo areas may be considered of generally comparable significance to the Japanese war effort as a whole, although the map shows a decided preponderance of targets for the general Tokyo area. These five principal areas are all in Japan's "inner triangle", within which are most of the basic materials required for Japan's heavy industry and virtually all of the processing capacity.

Schedule II shows the dispersion of Priority Targets and Key Targets in terms of progressive distances from a presently-held China base.

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TIME FACTOR

The time required for Japan to restore capacity lost through conclusive destruction of the various types of Priority Targets and Key Targets is contingent upon a large number of variable factors, such as availability of materials, skilled labor, etc.

Aircraft plant structures are not believed to be a major problem. In view of the estimated stringent Japanese position in machine tools, however, specialized machinery (especially in engine plants) could not be replaced in volume within a minimum of a year.

Destroyed alumina capacity (upon which the production of aluminum and alloys depends) could not be replaced in volume in less than six months. Such destruction would neutralize the large stockpile of bauxite ore with which the Japanese are credited.

Under ideal conditions, it is estimated that a minimum of six months would be required to replace destroyed drydocks. The situation in marine engine capacity would be generally comparable to that in aircraft plant equipment.

Iron and steel works equipment is heavy. While blast furnaces or open hearths might be repaired or replaced in 3-6 months, a considerably longer time would be required to provide new rolling mills, etc.

A minimum of a year would be necessary to replace major crude refining or synthetic oil plants.

It is estimated that modern by-product coke oven capacity could not be replaced in less than 9-12 months, and trade comment indicates that coke oven batteries might be de-commissioned for 3-6 months even though not completely destroyed. Except for probable stringency in highly specialized equipment, other types of chemical plants on average would require less replacement time.

The replacement time factor for automobile, armament, machine tool, communications equipment and tire-making capacity would be comparable to that in aircraft. A limited amount of other rubber-products capacity is available for conversion to tires, but such conversion would require an estimated six months.

Electric power plants are multi-unit targets. Replacement of a major power generating plant (hydro or steam) would require a minimum of a year. Penstocks, switchgear, etc., could be replaced within a shorter period of time.

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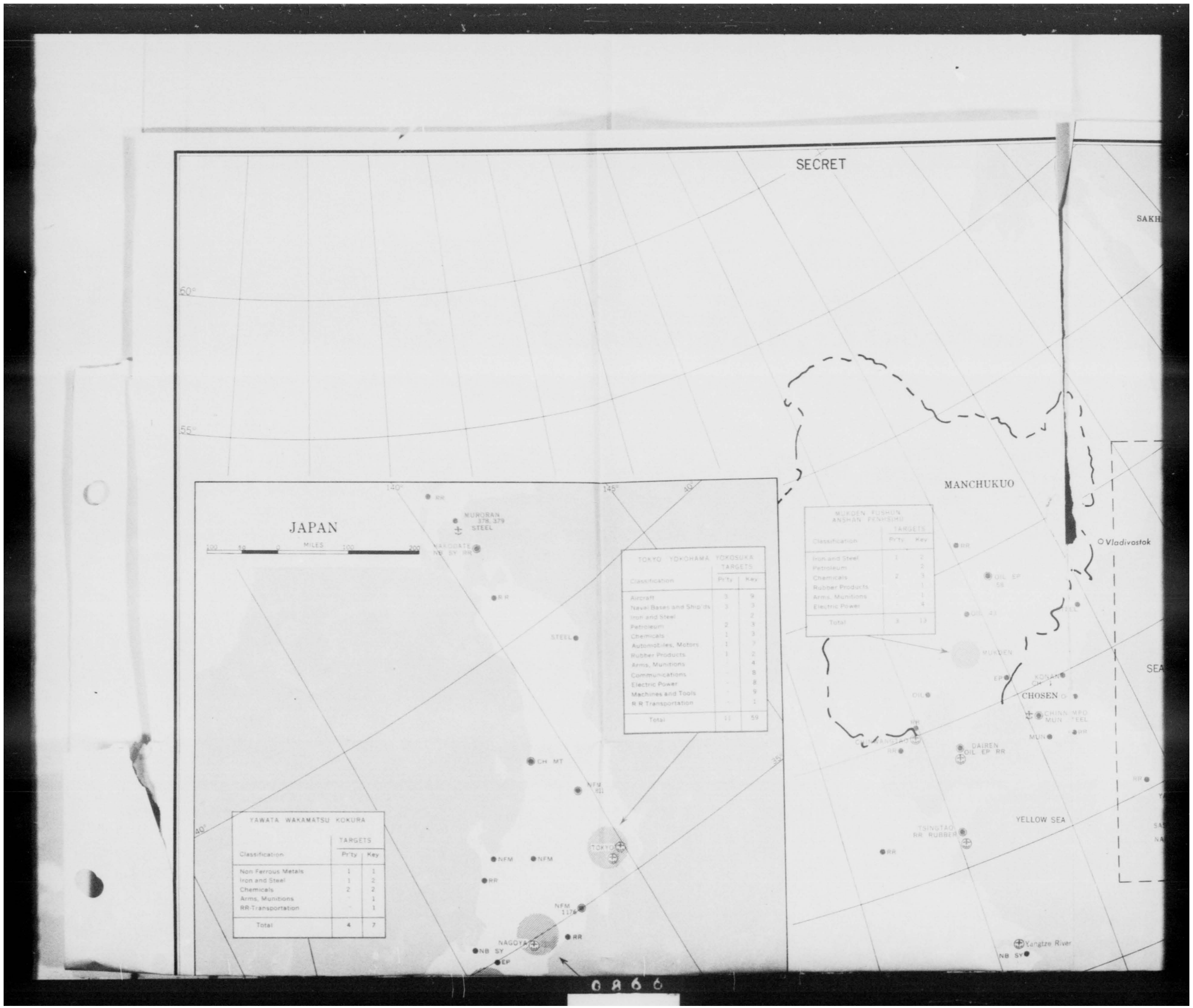

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SAKHALIN

KARAFUTO

HOKKAIDO

MANCHUKUO

Vladivostok

JAPAN

SEA OF JAPAN

HONSHU

SHIKOKU

KYUSHU

CHOSEN

YELLOW SEA

SEE INSET-JAPAN PROPER

TOKYO YOKOHAMA YOKOSUKA TARGETS		
Classification	Prty	Key
Aircraft	3	9
Naval Bases and Ship ds	3	3
Iron and Steel		2
Petroleum	2	3
Chemicals	1	3
Automobiles, Motors	1	7
Rubber Products	1	2
Arms, Munitions		4
Communications		8
Electric Power		8
Machines and Tools		9
R R Transportation		1
Total	11	59

MUKDEN FUSHUN ANSHAN PENHSIHU TARGETS		
Classification	Prty	Key
Iron and Steel	1	3
Petroleum		2
Chemicals	2	3
Rubber Products		1
Arms, Munitions		1
Electric Power		4
Total	3	14

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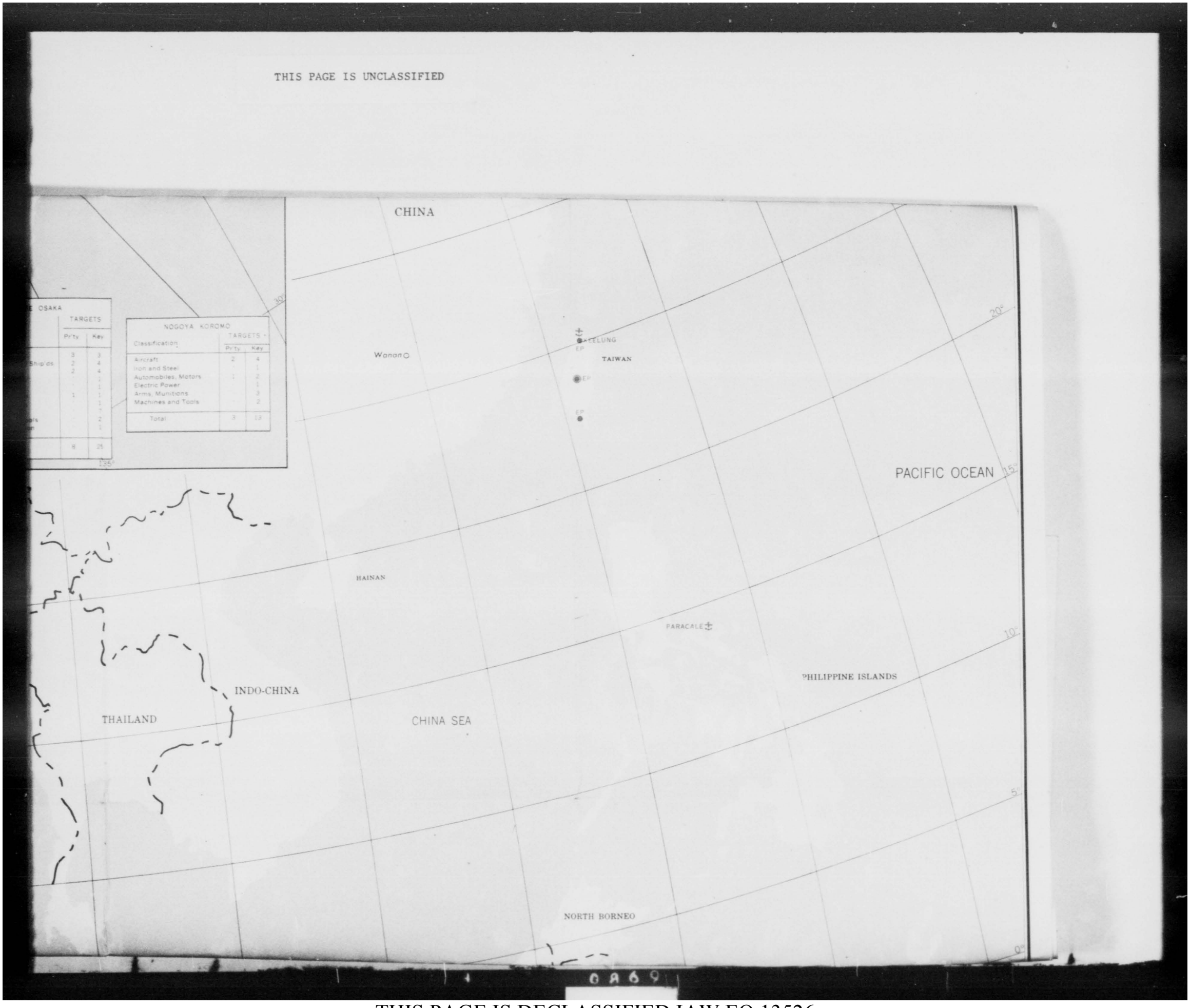

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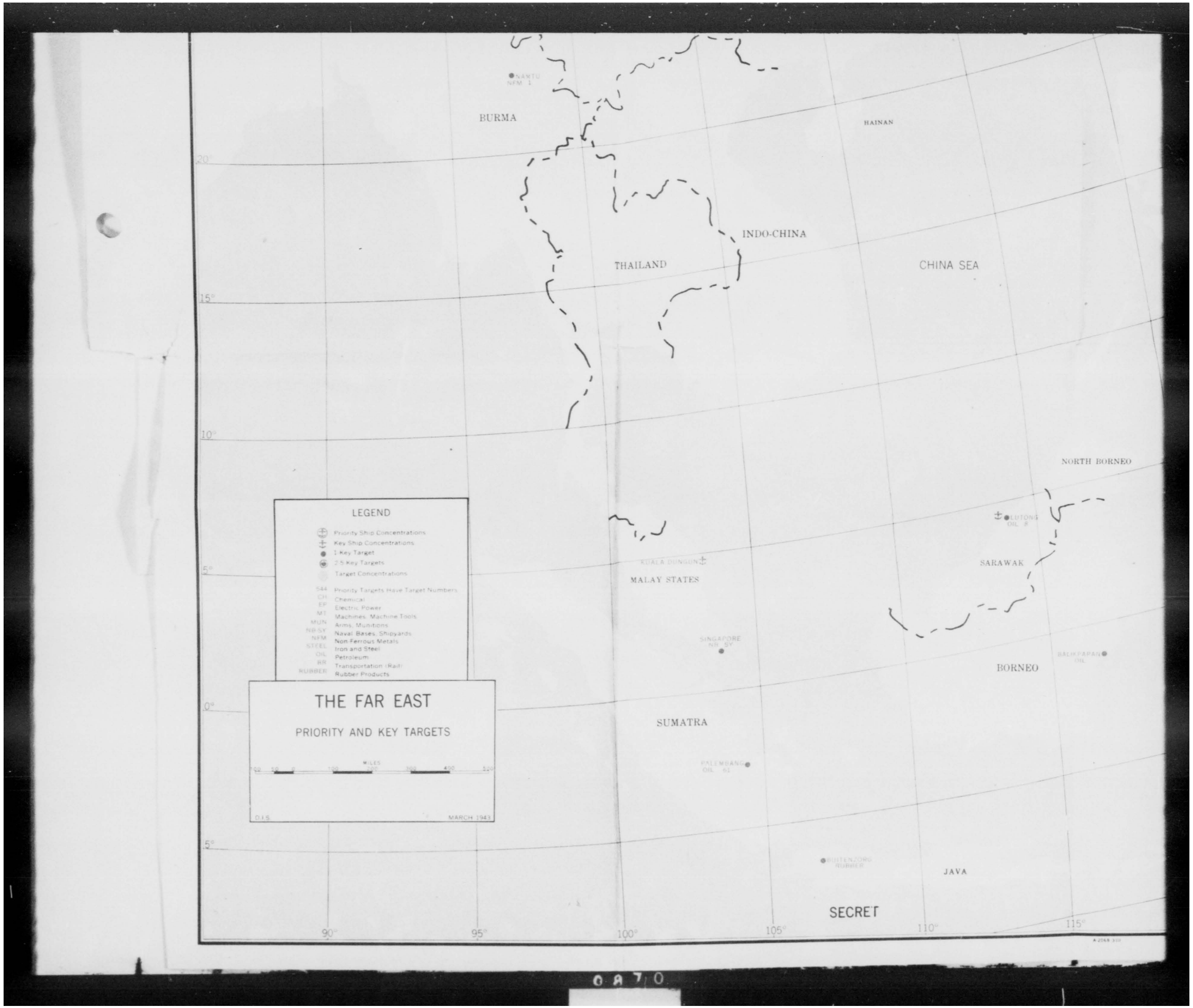

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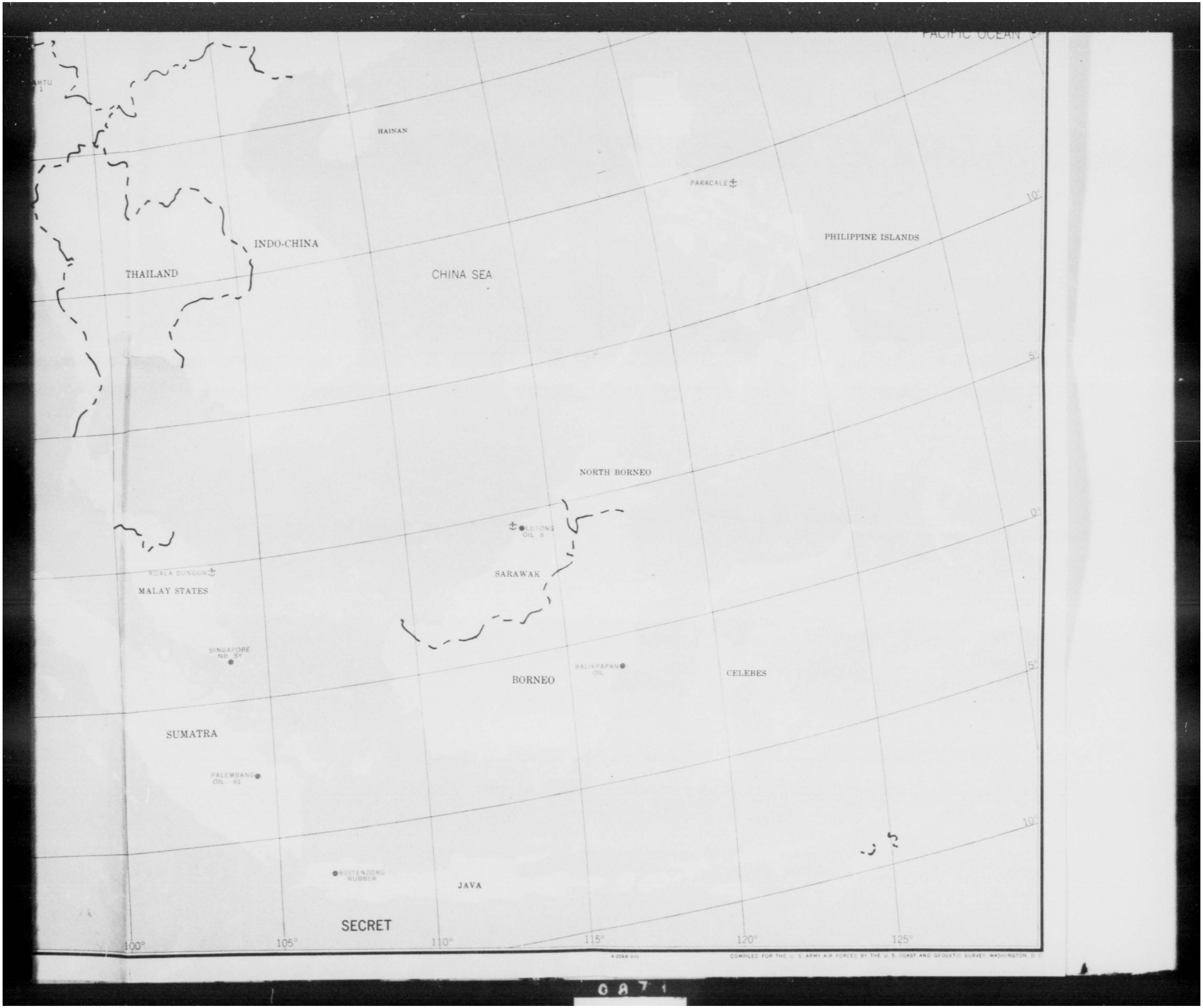

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Part IV Annexes

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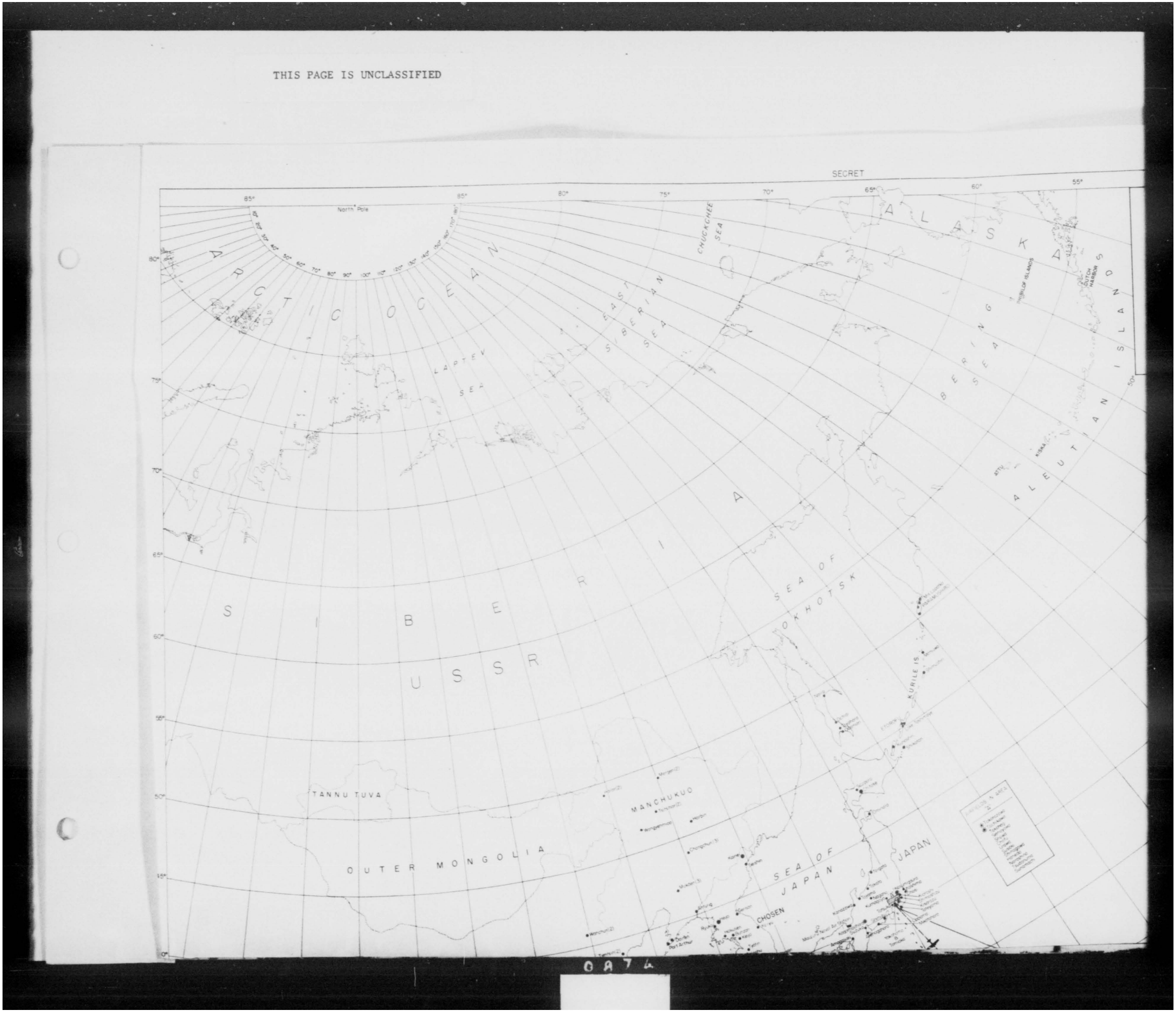

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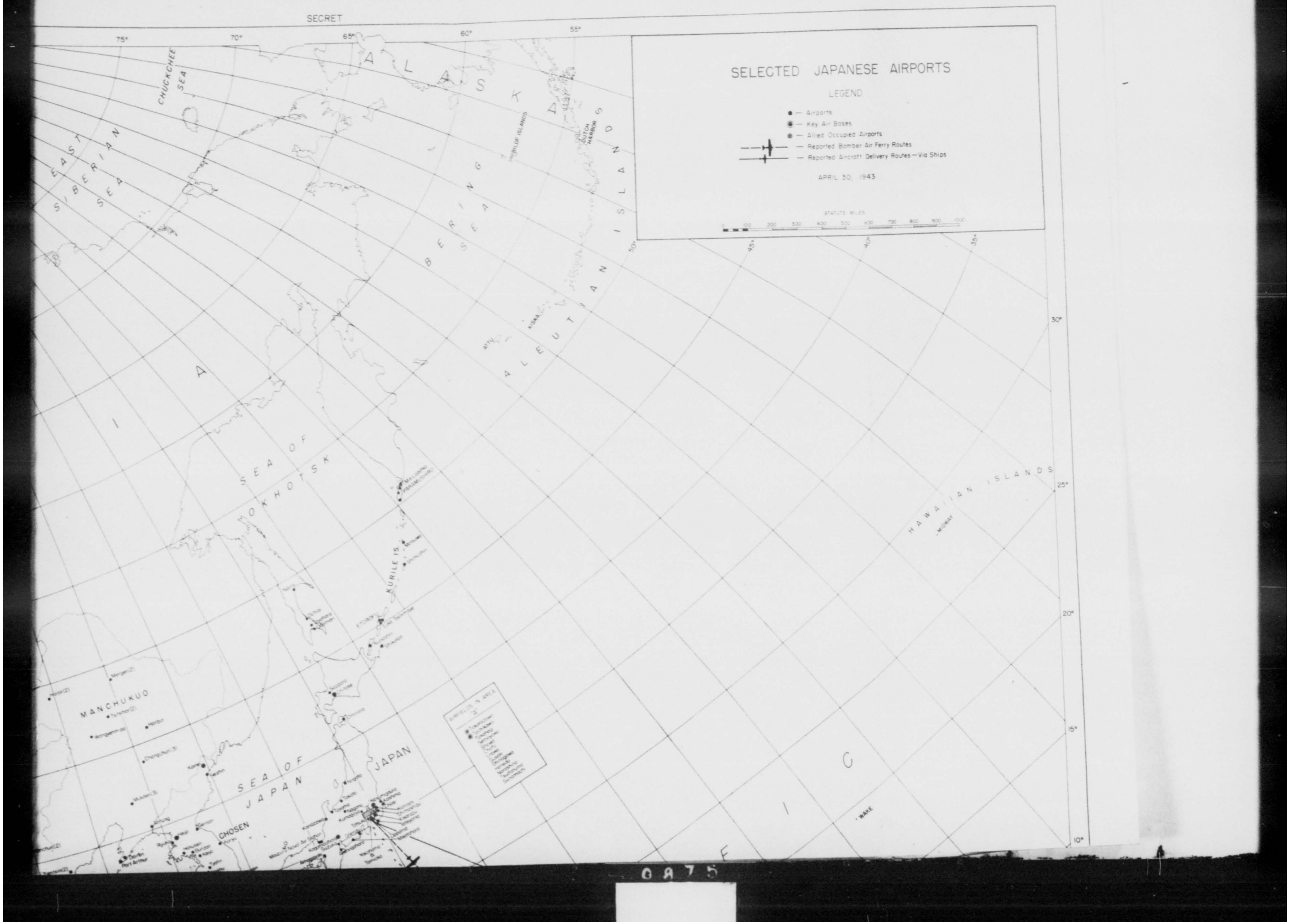

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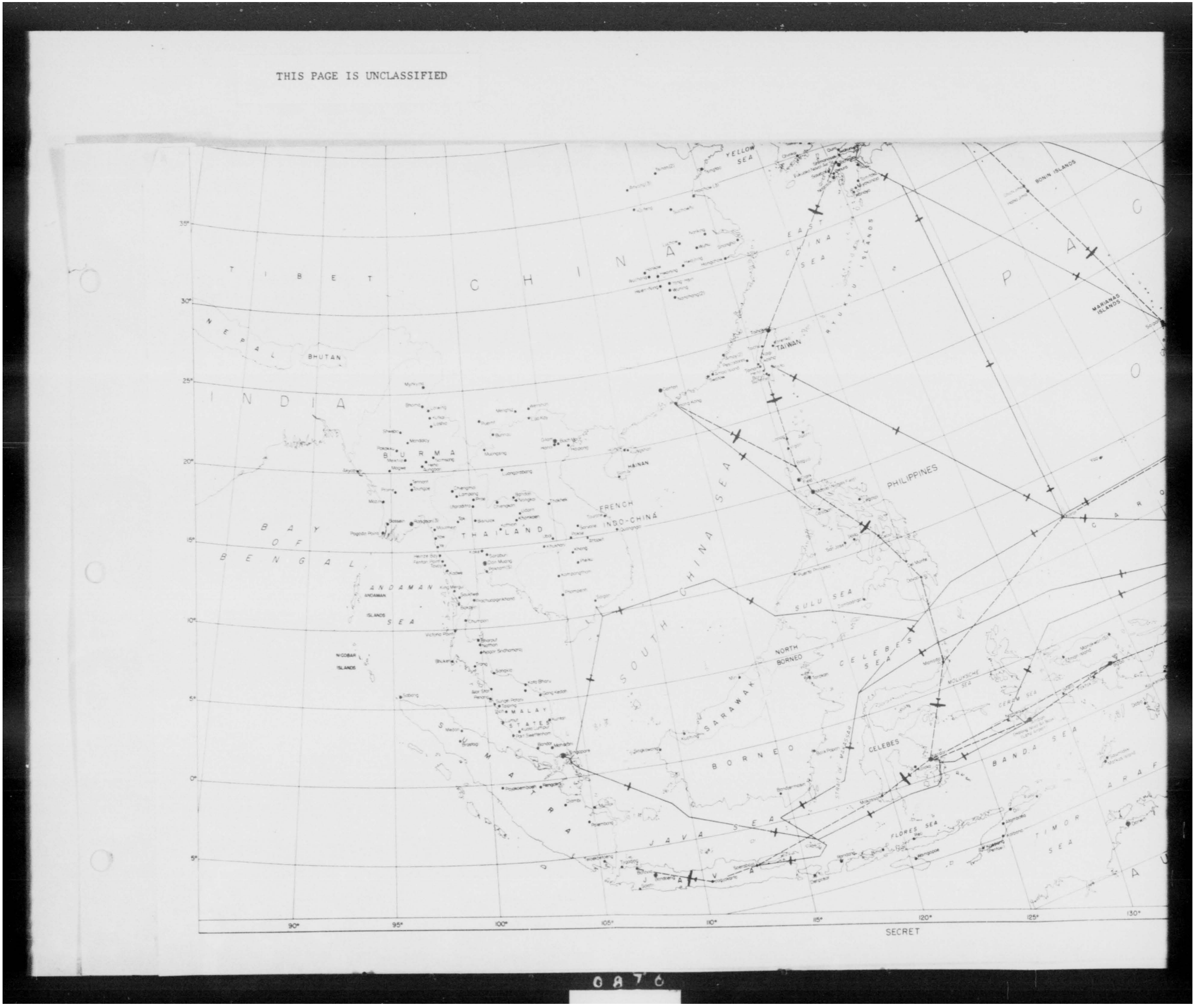

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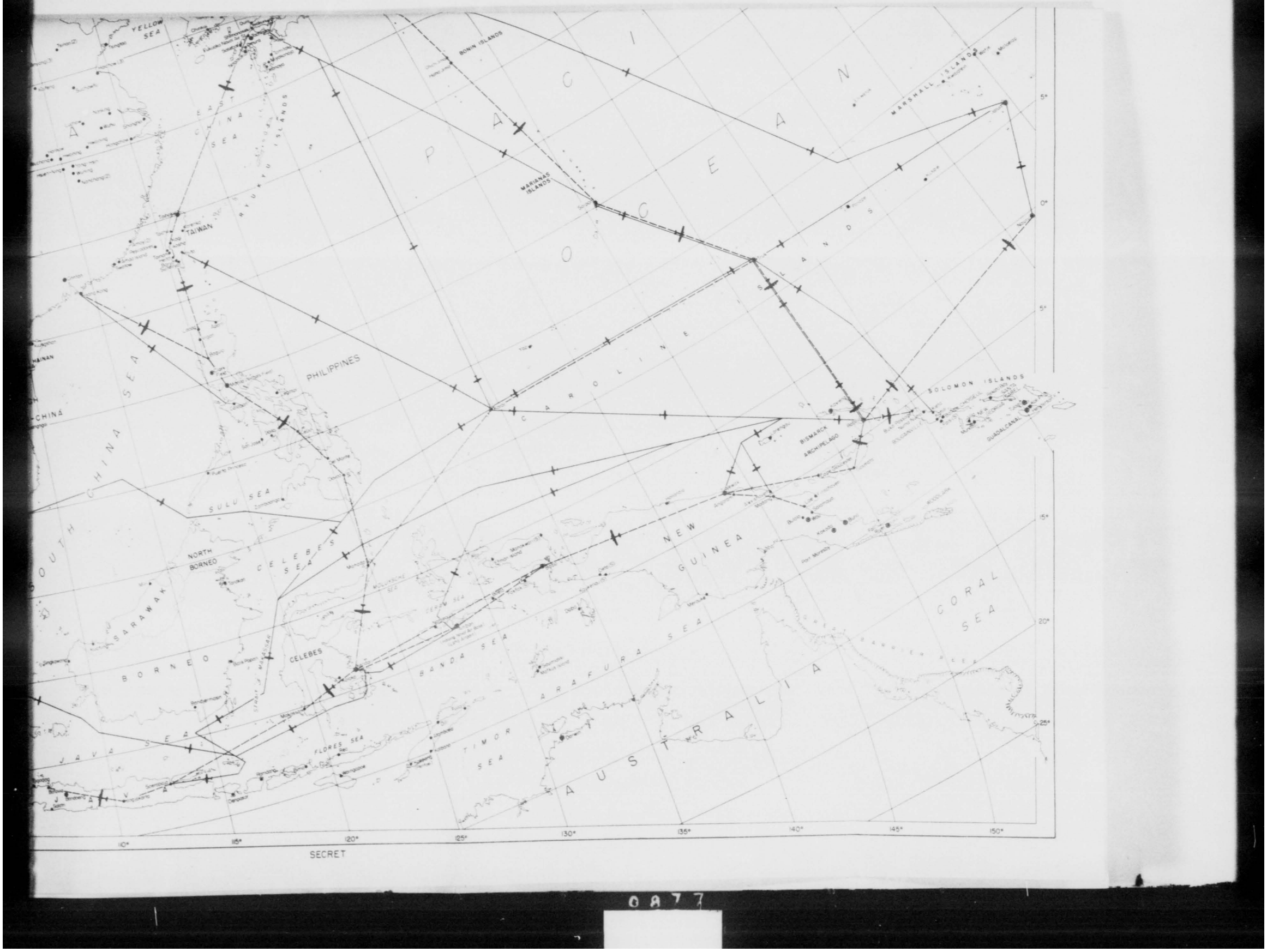
YELLOW SEA
EAST CHINA SEA
RYUKYU ISLANDS
BONIN ISLANDS
MARIANAS ISLANDS
MARSHALL ISLANDS
TAIWAN
PHILIPPINES
SOUTH CHINA SEA
SULU SEA
NORTH BORNEO
SARAWAK
BORNEO
CELEBES SEA
CELEBES
JAVA SEA
MOLUCCA SEA
FLORES SEA
BANDA SEA
CERAM SEA
TIMOR SEA
ARAFURA SEA
NEW GUINEA
BISMARCK ARCHIPELAGO
SOLOMON ISLANDS
GUADALCANAL
CORAL SEA
AUSTRALIA
PACIFIC OCEAN
CAROLINE ISLANDS
Port Moresby
Darwin
Singapore
Manila
Jakarta
Surabaya
Denpasar
Kupang
Ujung Pandang
Menado
Ambon
Kendari
Balikpapan
Banjermasin
Pontianak
Kuching
Sandakan
Jesselton
Kota Kinabalu
Zamboanga
Davao
Cebu
Iloilo
Legaspi
Aparri
Laoag
Basco
Tuguegarao
Baguio
Clark Field
Subic Bay
Naha
Okinawa
Iwo Jima
Chichi Jima
Truk
Ponape
Kwajalein
Majuro
Eniwetok
Rabaul
Guam
Saipan
Tinian
Palau
Yap
Koror
Biak
Hollandia
Manokwari
Merauke
Timika
Misool
Ceram
Ambon
Banda
Kai Is.
Aru Is.
Tanimbar Is.
Timor
Roti
Sumba
Flores
Sumbawa
Lombok
Bali
Java
Sumatra
Nias
Simeulue
Andaman Is.
Nicobar Is.
Car Nicobar
Port Blair
Rangoon
Mergui
Moulmein
Bangkok
Phuket
Songkhla
Penang
Kuala Lumpur
Malacca
Johore Bahru
Pulau Tioman
Pulau Aur
Pulau Tambelan
Natuna Is.
Anambas Is.
Pulau Laut
Pulau Bawean
Kangean Is.
Sapudi Is.
Madura
Bawean
Karimata Is.
Billiton
Bangka
Belitung
Hainan
Haikou
Zhanjiang
Beihai
Fangchenggang
Hong Kong
Macau
Shantou
Xiamen
Fuzhou
Wenzhou
Ningbo
Shanghai
Qingdao
Yantai
Dalian
Lushun
Tianjin
Beijing
Taiyuan
Hohhot
Datong
Shijiazhuang
Zhengzhou
Xuzhou
Nanjing
Hefei
Wuhan
Changsha
Nanchang
Guiyang
Kunming
Nanning
Liuzhou
Guilin
Chongqing
Chengdu
Xichang
Lanzhou
Xining
Urumqi
Turpan
Hami
Dunhuang
Golmud
Lhasa
Shigatse
Gyangtse
Gangtok
Thimphu
Paro
Kathmandu
Pokhara
Biratnagar
Janakpur
Nepalganj
Dhangarhi
Simara
Bhairawa
Tansen
Jumla
Dolpa
Mustang
Manang
Lo Manthang
Tsum Valley
Langtang
Helambu
Solu Khumbu
Everest
Kanchenjunga
Makalu
Lhotse
Nuptse
Pumori
Cho Oyu
Gyachung Kang
Ama Dablam
Thamserku
Kangtega
Tawoche
Pokalde
Kongde Ri
Khumbila
Kala Patthar
Gokyo
Dingboche
Pheriche
Namche Bazar
Lukla
Phaplu
Jiri
Charikot
Dhulikhel
Bhaktapur
Patan
Kirtipur
Thankot
Pharping
Godawari
Chitwan
Sauraha
Tikapur
Dhangarhi
Nepalganj
Surkhet
Jumla
Simikot

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MILITARY

Over 200 airports listed as targets in Objective Folders and a substantial number of other fields ranging from landing strips to completely equipped fields are located on the map at the end of this section which covers the Far East.

Since the significance of individual airfields is highly fluid, the map does not undertake to evaluate the operational importance of fields either individually or by areas.

Various of the installations in the Southwest Pacific are discussed below. The tabulation on the following page indicates the enemy air order of battle at various 1942 and 1943 dates.

The order of battle of the Japanese Army as of March 18, 1943 (M.I.S.) is included with a brief discussion.

AIR

Airport construction by Japan in the Southwest Pacific Area, as elsewhere, has been rapid and extensive. In less than a year Japan has completed a chain of air bases extending from the Netherlands East Indies through the Celebes and New Guinea to the Solomons. This intensive construction and development of airport facilities by the Japanese still is underway.

Bombers are ferried to active theatres in the Southwest Pacific through air connections between the area and bases on the main Japanese Islands. There are other air links with the strategic Japanese air-bases network in occupied areas of Asia.

In the past, fighter aircraft have been shipped to the area aboard converted carriers, with considerable final assembly at centers such as Kendari in the Celebes, Kavieng in New Ireland and Buka in the Solomons. Recent appearances of fighter reinforcements in Rabaul, with no carriers sighted, indicates a possibility that fighters now are ferried in from Truk Island and other bases to the North.

One of the air ferry routes reported most used by the Japanese runs from the Tokyo-Yokohama district, where important aircraft factories are located, to Chichi Jima Island in the Bonin Group; then to Saipan in the Mariana Islands just north of Guam, and on to Rabaul with a stop at Truk Island. Another goes from western Japan to Formosa; to Nichols Field in the Philippines; south to Davao Airport on Mindanao, and from there to Kendari by way of Menado on the northern tip of the Celebes. Aircraft flying from Kendari to New Guinea, either on ferrying or offensive missions, usually stop at Babo Airport in the western end of the island, a key staging and fuelling air center. (Major Japanese airports and air routes are shown on the accompanying map, which does not mark all landing strips and auxiliary fields.)

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	April 15, 1943							March 15, 1943							Feb. 15, 1943				
	F	B	O	FP	FB	Total A	Total N	F	B	O	FP	FB	Total A	Total N	F	B	O	FP	FB
1. Japanese Empire, Karafuto, Kuriles																			
Army	132	120	48	--	--	300	--	144	120	48	--	--	312	--	135	120	48	--	--
Navy																			
Ship-based	39	69	--	43	--	--	151	108	114	--	54	--	--	276	48	72	--	45	--
Land-based	84	150	--	33	32	--	299	135	185	6	18	24	--	368	117	114	6	12	24
2. Manchukuo - Korea																			
Army	192	180	36	--	--	408	--	228	216	36	--	--	480	--	240	216	36	--	--
Navy																			
Ship-based	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Land-based	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3. Formosa - Philippines																			
Army	24	36	12	--	--	72	--	24	24	24	--	--	72	--	15	36	24	--	--
Navy																			
Ship-based	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Land-based	--	--	--	--	--	--	--	18	27	--	--	--	--	45	18	27	--	--	--
4. China - Hainan																			
Army	84	96	36	--	--	216	--	84	96	36	--	--	216	--	75	132	36	--	--
Navy																			
Ship-based	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Land-based	--	--	--	6	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--
5. Burma - Thailand Indo-China																			
Army	132	132	36	--	--	300	--	132	120	36	--	--	288	--	135	132	36	--	--
Navy																			
Ship-based	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Land-based	--	--	--	6	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--
6. Malaya, Sumatra, Java, Andamans																			
Army	36	36	24	--	--	96	--	36	24	24	--	--	84	--	30	36	24	--	--
Navy																			
Ship-based	--	--	--	15	--	--	15	--	--	--	--	--	--	--	--	--	--	17	--
Land-based	--	21	--	9	--	--	30	--	21	--	9	--	--	30	9	21	--	--	--
7. Timor - Inner Seas																			
Army	96	72	12	--	--	180	--	36	60	12	--	--	108	--	30	36	12	--	--
Navy																			
Ship-based	--	--	--	2	--	--	2	-	--	--	2	--	--	2	-	--	--	--	--
Land-based	30	21	4	12	3	--	70	72	18	9	18	3	--	120	54	21	6	20	--
8. Melanesia - New Guinea, New Britain, Solomons																			
Army	96	108	24	--	--	228	--	72	84	12	--	--	168	--	60	36	24	--	--
Navy																			
Ship-based	81	51	--	52	--	--	184	--	--	--	60	--	--	60	--	--	--	89	--
Land-based	93	99	18	55	25	--	290	99	42	--	45	24	--	210	69	90	--	37	18
9. Micronesia - Carolines, Marshalls, Marianas																			
Army	--	--	--	--	--	--	--	24	24	--	--	--	48	--	15	24	--	--	--
Navy																			
Ship-based	27	45	--	48	--	--	120	27	9	--	68	--	--	104	81	120	--	60	--
Land-based	64	123	--	69	22	--	278	45	147	9	63	36	--	300	90	105	--	40	48
10. Ship-based (location unknown)	--	--	--	148	--	--	148	12	24	--	35	--	--	71	--	--	--	102	--
11. N.W. Pacific Area																			
Navy																			
Ship-based	--	--	--	2	--	--	2	--	--	--	1	--	--	1	--	--	--	2	--
Land-based	--	--	--	12	--	--	12	--	--	--	15	--	--	15	--	--	--	9	--
12. Aircraft in transit to combat theatres																			
Army	72	36	--	--	--	108	--	48	36	--	--	--	84	--	60	60	--	--	--
Navy	126	57	--	--	11	--	194	27	27	--	80	--	--	134	30	50	--	20	--
TOTALS	1408	1452	250	512	93	1908	1807	1371	1418	252	484	87	1860	1752	1311	1478	252	453	90
	Total Army 1908 Total Navy ship-based 622 Total Navy land-based 1185 3715							Total Army 1860 Total Navy ship-based 610 Total Navy land-based 1142 3612							Total Army 1863 Total Navy ship-based 636 Total Navy land-based 1085 3584				

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JAPANESE AIR ORDER OF BATTLE

Feb. 15, 1943							Jan. 15, 1943							Dec. 15, 1942							Oct. 31, 1942						
F	B	C	FP	FB	Total A	Total N	F	B	C	FP	FB	Total A	Total N	F	B	C	FP	FB	Total A	Total N	F	B	C	FP	FB	Tot A
135	120	48	--	--	303	--	135	96	48	--	--	279	--	135	96	48	--	--	279	--	120	96	48	--	--	264
48	72	--	45	--	--	165	65	112	--	71	--	--	248	77	129	--	94	--	--	300	--	--	--	59	--	--
117	144	6	12	24	--	303	84	162	--	12	18	--	276	75	183	--	12	18	--	288	150	165	--	12	14	--
240	216	36	--	--	492	--	240	252	36	--	--	528	--	240	300	36	--	--	576	--	330	332	36	--	--	698
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
15	36	24	--	--	75	--	15	48	24	--	--	87	--	15	48	24	--	--	87	--	30	24	24	--	--	78
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
18	27	--	--	--	--	45	27	36	--	-	--	--	63	18	18	--	--	--	--	36	18	18	3	--	--	--
75	132	36	--	--	243	--	60	132	36	--	--	228	--	120	120	48	--	--	342	--	120	120	60	--	--	300
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
135	132	36	--	--	303	--	120	144	48	--	--	312	--	150	144	48	--	--	342	--	150	144	48	--	--	342
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
30	36	24	--	--	90	--	60	36	24	--	--	120	--	45	48	36	--	--	129	--	60	96	24	--	--	180
--	--	--	17	--	--	17	--	--	--	64	--	--	64	--	--	--	--	--	--	--	--	--	--	13	--	--
9	21	--	--	--	--	30	45	27	--	--	--	--	72	30	45	--	27	--	--	108	27	27	--	--	--	--
30	36	12	--	--	78	--	18	36	12	--	--	66	--	30	24	--	--	--	54	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	62	78	--	187	--	--
54	21	6	20	--	--	101	18	27	6	18	--	--	69	54	47	6	--	--	--	107	90	141	6	3	32	--
60	36	24	--	--	120	--	30	48	12	--	--	90	--	45	12	24	--	--	81	--	--	--	--	--	--	--
--	--	--	89	--	--	89	--	--	--	79	--	--	79	21	33	--	130	--	--	184	62	78	--	187	--	--
69	90	--	37	18	--	214	80	62	6	9	18	--	175	108	115	6	9	18	--	256	90	141	6	3	24	--
15	24	--	--	--	39	--	--	24	--	--	--	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--
81	120	--	60	--	--	261	65	73	--	65	--	--	203	12	24	--	98	--	--	134	21	48	--	55	--	--
90	105	--	40	48	--	283	74	82	--	48	36	--	240	46	82	--	54	30	--	212	95	184	--	6	32	--
--	--	--	102	--	--	102	--	--	--	36	--	--	36	--	--	--	13	--	--	13	--	--	--	13	--	--
--	--	--	2	--	--	2	--	--	--	10	--	--	10	--	--	--	10	--	--	10	--	--	--	7	--	--
--	--	--	9	--	--	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
60	60	--	--	--	120	--	60	48	--	--	--	108	--	--	--	--	6	--	--	6						
30	50	--	20	--	--	100	50	50	--	30	--	--	130	--	--	--	--	--	--	--						
1311	1478	252	453	90	1863	1721	1246	1495	252	442	72	1842	1665	1227	1468	276	443	66	1836	1644	1334	1510	252	374	84	1862

Total Army	1863	Total Army	1842	Total Army	1836	Total Army	1862
Total Navy ship-based	636	Total Navy ship-based	634	Total Navy ship-based	637	Total Navy ship-based	544
Total Navy land-based	1085	Total Navy land-based	1031	Total Navy land-based	1007	Total Navy land-based	1148
	3584		3507		3480		3554

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Oct. 31, 1942							Sept. 30, 1942							Aug. 31, 1942							July 31, 1942							July 3, 1			
F	B	O	FP	FB	Total A	Total N	F	B	O	FP	FB	Total A	Total N	F	B	O	FP	FB	Total A	Total N	F	B	O	FP	FB	Total A	Total N	F	B	O	F
120	96	48	—	—	264	—	120	96	24	—	—	240	—	120	90	24	—	—	234	—	180	96	48	—	—	324	—	200	100	50	
—	—	—	59	—	—	59	58	98	—	62	—	—	218	70	122	—	104	—	—	296	132	227	—	153	—	—	512	51	72	—	11
150	165	—	12	14	—	341	132	181	—	—	14	—	327	156	217	—	8	20	—	401	201	323	—	8	20	—	552	120	184	—	
330	332	36	—	—	698	—	400	400	72	—	—	872	—	420	432	72	—	—	924	—	390	384	72	—	—	846	—	350	400	100	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
30	24	24	—	—	78	—	75	60	24	—	—	159	—	90	60	24	—	—	174	—	90	60	24	—	—	174	—	30	30	20	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
18	18	3	—	—	—	39	47	18	3	—	—	—	68	18	18	—	—	—	—	36	18	18	—	—	—	—	36	18	18	—	
120	120	60	—	—	300	—	105	108	60	—	—	273	—	90	144	48	—	—	282	—	120	132	36	—	—	288	—	100	180	50	
—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	10	—	—	—	—	—	10	10	—	—	—	—	—	10	—	—	—	—	—	—	—	—	—	—	
150	144	48	—	—	342	—	105	120	36	—	—	261	—	60	30	24	—	—	114	—	90	72	24	—	—	186	—	100	100	50	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13	—	—	13	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
60	96	24	—	—	180	—	—	36	—	—	—	36	—	30	—	—	—	—	30	—	—	—	—	—	—	—	—	9	9	—	
—	—	—	13	—	—	13	—	—	—	4	—	—	4	—	—	—	20	—	—	20	—	—	—	37	—	—	37	—	—	—	
27	27	—	—	—	—	54	9	36	—	—	—	—	48	36	115	—	12	8	—	171	33	39	—	12	8	—	92	112	42	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
62	78	—	187	—	—	327	—	—	—	—	—	—	—	—	—	—	13	—	—	13	—	—	—	26	—	—	26	—	—	—	
90	141	6	3	32	—	133	43	18	3	18	8	—	90	59	39	6	18	8	—	130	102	138	—	18	8	—	266	102	102	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	—	—	—	30	—	—	—	—	—	—	—	—	—	—	—	
62	78	—	187	—	—	327	21	42	—	166	—	—	229	8	10	—	57	—	—	75	—	—	—	34	—	—	34	—	—	—	
90	141	6	3	24	—	264	102	134	15	41	29	—	321	72	129	6	15	29	—	251	66	52	12	—	14	—	144	157	166	12	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
21	48	—	55	—	—	124	33	66	—	66	—	—	165	—	—	—	84	—	—	84	—	—	—	65	—	—	65	—	—	—	
95	184	—	6	32	—	317	105	162	—	3	29	—	299	120	155	—	3	26	—	304	133	145	—	12	44	—	334	126	196	—	
—	—	—	13	—	—	13	—	—	—	35	—	—	35	—	—	—	72	—	—	72	—	—	—	34	—	—	34	42	54	—	
—	—	—	7	—	—	7	—	—	—	6	—	—	6	—	—	—	6	—	—	6	—	—	—	32	—	—	32	55	76	—	
—	—	—	—	—	—	—	—	—	—	—	7	—	7	—	9	—	6	3	—	18	—	—	—	12	8	—	20	—	—	—	
1334	1510	252	374	84	1862	1692	1365	1578	237	402	87	1841	1828	1359	1600	204	431	94	1788	1900	1535	1686	216	443	102	1818	2184	1472	1729	282	

Total Army					1862		Total Army					1841		Total Army					1788		Total Army					1818		Total Army			
Total Navy ship-based					544		Total Navy ship-based					658		Total Navy ship-based					579		Total Navy ship-based					740		Total Navy ship-ba			
Total Navy land-based					1148		Total Navy land-based					1170		Total Navy land-based					1321		Total Navy land-based					1444		Total Navy land-ba			
					3554							3669							3688							4002					

SOURCE: Joint ONI - MIS Estima

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Sept. 30, 1942					Aug. 31, 1942							July 31, 1942							July 3, 1942						
O	FP	FB	Total A	Total N	F	B	O	FP	FB	Total A	Total N	F	B	O	FP	FB	Total A	Total N	F	B	O	FP	FB	Total A	Total N
24	--	--	240	--	120	90	24	--	--	234	--	180	96	48	--	--	324	--	200	100	50	--	--	350	--
--	62	--	--	218	70	122	--	104	--	--	296	132	227	--	153	--	--	512	51	72	--	118	--	--	241
--	--	14	--	327	156	217	--	8	20	--	401	201	323	--	8	20	--	552	120	134	--	8	12	--	274
72	--	--	872	--	420	432	72	--	--	924	--	390	384	72	--	--	846	--	350	400	100	--	--	850	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24	--	--	159	--	90	60	24	--	--	174	--	90	60	24	--	--	174	--	30	30	20	--	--	80	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3	--	--	--	68	18	18	--	--	--	--	36	18	18	--	--	--	--	36	18	18	--	--	--	--	36
60	--	--	273	--	90	144	48	--	--	282	--	120	132	36	--	--	288	--	100	180	50	--	--	330	--
1	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	10	10	--	--	--	--	--	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--
36	--	--	261	--	60	30	24	--	--	114	--	90	72	24	--	--	186	--	100	100	50	--	--	250	--
--	--	--	--	--	--	--	--	13	--	--	13	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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--	--	--	36	--	30	--	--	--	--	30	--	--	--	--	--	--	--	--	9	9	--	--	--	13	--
--	4	--	--	4	--	--	--	20	--	--	20	--	--	--	37	--	--	37	--	--	--	36	--	--	36
--	--	--	--	48	36	115	--	12	8	--	171	33	39	--	12	8	--	92	112	42	--	8	8	--	70
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3	18	8	--	90	59	39	6	13	--	--	13	--	--	--	26	--	--	26	--	--	--	41	--	--	41
								18	8	--	130	102	138	--	18	8	--	266	102	102	--	18	8	--	230
--	--	--	--	--	--	30	--	--	--	30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	166	--	--	229	8	10	--	57	--	--	75	--	--	--	34	--	--	34	--	--	--	20	--	--	20
15	41	29	--	321	72	129	6	15	29	--	251	66	52	12	--	14	--	144	157	166	12	--	34	--	369
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	66	--	--	165	--	--	--	84	--	--	84	--	--	--	65	--	--	65	--	--	--	32	--	--	32
--	3	29	--	299	120	155	--	3	26	--	304	133	145	--	12	44	--	334	126	196	--	12	30	--	364
--	35	--	--	35	--	--	--	72	--	--	72	--	--	--	34	--	--	34	42	54	--	15	--	--	111
--	6	--	--	6	--	--	--	6	--	--	6	--	--	--	32	--	--	32	55	75	--	49	--	--	180
--	--	7	--	7	--	9	--	6	3	--	18	--	--	--	12	8	--	20	--	--	--	12	12	--	24
97	402	87	1841	1828	1359	1600	204	431	94	1788	1900	1535	1686	216	443	102	1818	2184	1472	1729	282	369	104	1878	2078

p-based	1841
d-based	658
	1170
	3669

Total Army	1788
Total Navy ship-based	579
Total Navy land-based	1321
	3688

Total Army	1818
Total Navy ship-based	740
Total Navy land-based	1444
	4002

Total Army	1878
Total Navy ship-based	661
Total Navy land-based	1417
	3956

SOURCE: Joint ONI - MIS Estimate

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An important influence on airport building in this area is the close coordination by the Japanese of air activities and shipping movements. Japanese air units at bases on the north coast of New Guinea and the Solomons attempt to provide air cover for convoys and naval task forces moving eastward.

The area's largest and most important air centers invariably are the most important shipping centers. Rabaul, for example, with Lakunai fighter base, Vunakanau bomber base, and Rapopo bomber field always heavily staffed with planes, is the chief rendezvous port for transport and convoys operating in the South and Southwest Pacific. After the occupation of Rabaul by the Japanese and their utilization of the harbor as a major base for cargo ships, the harbor of Buin in the Solomons became for a time a major Japanese naval anchorage. It is bounded on the north by Bougainville Island and on the southwest by Shortland Island. As many as 50 ships including battleships, light and heavy cruisers, destroyers, transport and cargo-vessels, with occasional aircraft carriers, have been spotted in the Buin area, although no wharves or other installations exist. Supplies and troops were brought ashore in small boats. Since the loss of Guadalcanal, the Japanese have not concentrated naval units in the Buin area, but this inactivity may be temporary.

Buin has drawn air cover from three important nearby air bases: the seaplane base of Faisi in the Shortland Islands, which can accommodate 25 to 40 float plane fighters; the new Ballale Island airport with an estimated capacity for 70 aircraft, and Kahili on the south tip of Bougainville, which has accommodated as many as 105 airplanes at one time, mostly fighters. The appearance of large numbers of fighters or bombers at Buka, Ballale, and Kahili, usually anticipated naval or cargo shipping bound for the Solomons, during Japanese offensive operations there. Now Japan is on the defensive in the area.

Intensive work on the runways of the Japanese airdrome at Lae in northeast New Guinea has usually foreshadowed fighter reinforcements to cover shipping convoys into nearby Salamaua anchorage, which has served as an important staging point for supplies moved to Morobe (now in Allied hands) and other points to the South. Munda, the most advanced Japanese air base in the Solomons, was constructed to cover destroyers and convoys enroute to Guadalcanal before the Japanese withdrawal. Although no planes have recently been reported based there, the Japanese have continued to land planes there for reconnaissance. This practice has also been followed at Gasmata Airport, south of Rabaul, where aircraft, used to cover shipping movements, were withdrawn to Rabaul and Kavieng between protective operations.

Wewak Airport northwest of Lae, recently under active development, apparently is a strategically placed base for defense of shipping convoys moving from the Netherlands East Indies to Rabaul. Considerable shipping has been seen in Wewak Harbor since the first of the year. Laha Airdrome, on Ambon Island, a major air center, customarily shows increased air activity in connection with shipping movements. Madang Airport, recently enlarged, controls the western end of the strait separating New Guinea from New Britain and protects a harbor which has sheltered large convoys. The harbor is suited also to seaplane operations.

The speed of airport construction in the Southwest Pacific by the Japanese is noteworthy. Ballale Island air base was constructed in one month. Rapopo, the third airport of Rabaul, intended as an overflow field for the major airports of Lakunai and Vunakanau had 24 aircraft operating from it one month after construction activity first was observed on December 21. Disused or unserviceable airports also have been converted rapidly into operational bases. On February 23, 1943,

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the Lorengau Airport, of the Admiralty Islands, was reported in disuse. On March 6, reconnaissance showed it cleared and probably ready for operations. Buka Airport, on the Solomons, was in almost complete disuse at the time of the American invasion of August 7, 1942, but by early October as many as 66 planes were based there - mostly fighters acting as escorts for bomber formations from Rabaul on offensive missions over the Solomons. This airport is now a major assembly base.

Rapid development of potential airport sites apparently is a Japanese policy. Finsch Haven landing strip has not been actively used by the Japanese since their occupation of northern New Guinea, but the harbor is an excellent natural seaplane base and could quickly be made operational. Nearby Alexis Harbor (Alexishaven) airport came under extensive development early in February 1943 after months of disuse and unserviceability.

Weather

Typhoons and tropical cyclones, weather conditions having the most disruptive effect on military operations, are more common in the region of the Philippine Islands and Japan than anywhere else in the Pacific. Approximately 25 severe typhoons occur in this area annually, most frequently from June through November when the average is 2 to 3 a month. Storms of this type also occur occasionally over the Timor Sea between Australia and the Netherlands East Indies, and the vicinity of the Solomon Islands.

Thunderstorms are more frequent over the Netherlands East Indies and the Philippines than in any other area of the world. Over the mountains of these two regions, thunderstorms occur during all seasons but in general are more numerous during summer. Over the open sea and low tropical islands they take place most frequently at night and elsewhere occur usually in afternoon or late evening.

Icing conditions seldom are found in the Pacific except at high levels and in the northern portion.

Visibility is usually best during the summer season when it is most likely to be limited by rain. It is also limited by a persistent haze layer that forms during winter. Rains frequently reduce visibility to a quarter of a mile or less. Haze seldom reduces visibility to less than 6 miles, but causes poor perception from the air of objects on the ground.

Fog is found along the coasts of northern Indo-China, the northern half of Formosa and of Japan during late winter and early spring, when it may be heavy enough to restrict air operations on 3 or 4 mornings a month.

From Taiwan and Hongkong northward, cloudiness is greatest during the summer. During winter, cloud cover is most associated with cyclones. On the islands such as Taiwan and Honshu, main island of Japan, cloudiness is greatest on the western side during winter and on the eastern side during summer.

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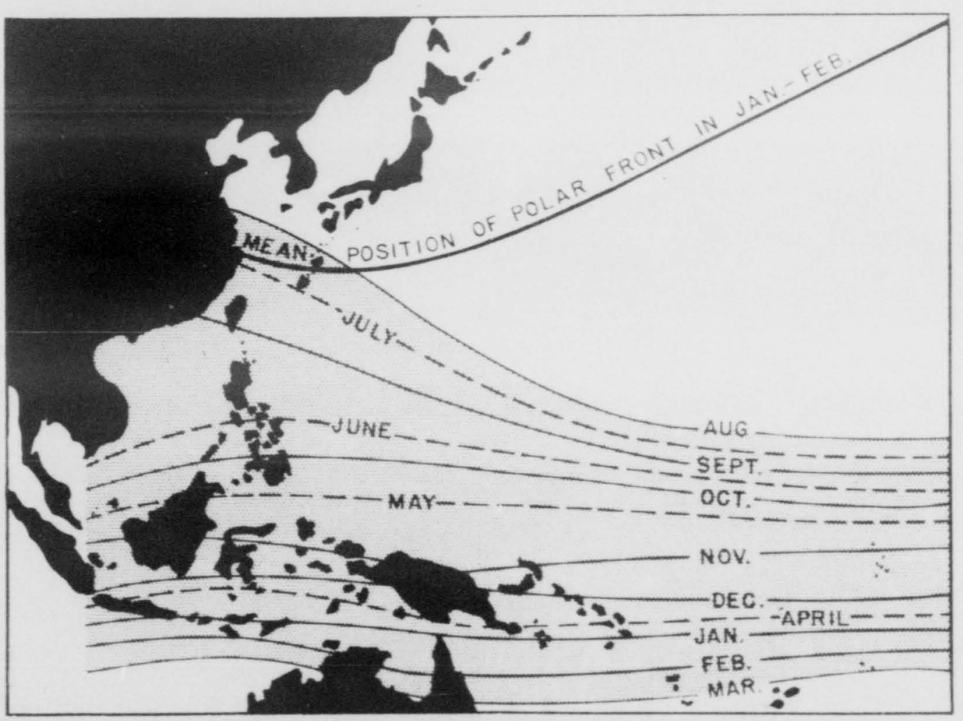

MEAN MONTHLY POSITIONS OF THE EQUATORIAL FRONT

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Surface or upper wind velocities rarely are found in sufficient strength to interfere with operations except in connection with thunderstorms or typhoons. Winds of gale force are most common up to 10 days a month during winter in Taiwan Strait, in connection with storms. In general, the major meteorological factors which might effect military, naval, or air operations are associated with the Equatorial front and the Polar front (see accompanying map).

The Equatorial front usually 50 to 200 miles wide may be defined as the zone of convergence for subtropical air moving in for both hemispheres. Its characteristics are squally weather and heavy rains; clouds are the massive thunderstorm type with their basis at 500 to 2500 feet and their tops at 30,000 feet or higher. When the front is moving most actively, operations of all types in the vicinity may be affected by low clouds and violent thunderstorms. There are occasional periods of quiescence.

Turbulence in the vicinity of massive thunderstorm clouds occurring along the Equatorial front (more commonly during summer than during winter) may restrict air operations.

The Polar front marks the boundary of air from the polar regions; and cold waves are caused by outbreaks of air beyond the boundary. The storms creating high winds and cyclones in Taiwan Strait, for example, take place along the Polar front, which changes position seasonally.

In Burma, military and air activity is brought to an almost complete standstill by the rainy season, and has permitted the Japanese to move aircraft and ground forces to other fronts. Some correlation between the disposition of Japanese Air Force units in the Southwest Pacific area and the weather has been noted, although only tentative deductions may be made without full knowledge of all strategic or tactical influences involved.

AIRPORTS

(General)

Before December, 1941, Japan completed a network of strategically-located air bases which made possible the rapid movement of Army and Navy aircraft to all war theatres and were important in early victories. Since then the Japanese have been industrious airport builders. Swift construction of new fields and enlargement of old airports has been a prime objective in every invasion. In Japanese cities baseball grounds and parks are reported to be equipped for small numbers of fighter aircraft. Every Japanese-held base throughout the Pacific is a potential defense against air attack.

Topography influenced Japan's choice of air base sites during peace and still is a factor. The mountainous terrain of the main Japanese islands was a handicap to air operations, so most of the largest and oldest fields are in the vicinity of Tokyo on the edge of one of the few extensive level areas of Japan. The nearness of aircraft supply sources in the Tokyo-Yokohama-Nagoya industrial districts was a further influence. Airports tended to adjoin population centers and most large Japanese cities are coastal.

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Both the Philippine Islands and the Netherlands East Indies have topography generally similar to Japan. Most of the airports in these regions are located in coastal or small inland plain or valley areas. The Bandung district of Java, the Manila Bay area of the Philippines and the Huon Gulf Region of south New Guinea proved excellent for airport development.

The Great Plains of China extending from 150 to 500 miles inland and the vast level stretches of Manchukuo (Manchuria) encouraged airport building. However, mountainous Taiwan (Formosa) and Chosen (Korea), a country with no plains, have numerous air bases. Here strategic considerations were a spur similar to peacetime demands for mining machinery and other supplies in remote Pacific interior regions, which caused airport building in poor terrain.

Profusion of Japanese airports and limitless amount of cheap labor for quick repairs to airports, particularly in occupied territories, makes it impossible for even a severe and simultaneous blow at all Japanese air bases classified as "key" to cripple Japan's air power. The importance of large air bases with elaborate installations has been decreasing constantly with repeated demonstration of the value of dispersing planes and facilities. But military necessity for concentrating large numbers of aircraft in certain areas has made it impractical for Japan to disperse repair and refuelling facilities from many large established bases.

Key air bases were selected as known concentration points for Japanese military and Naval aircraft. Some adjoin key aircraft manufacturing targets (see Aircraft Section) or serve as links in the defenses of such targets.

- - - - - -

GROUND

In connection with operations in the Southwest Pacific area, prisoner of war information has indicated three principal routes for Japanese military shipping: (1) from Japan or Manchukuo to Palau, thence to Rabaul, (2) from Japan or Manchukuo to Davao in the Philippines, thence to Rabaul, (3) from the China coast to Palau, thence to Rabaul (alternatively Kavieng or other destinations). There are indications that some merchant vessels carrying troops and military supplies have moved to the south through Truk and Saipan.

Enemy transport for the Burma front moves past Singapore through the Malacca Straits to Rangoon and thence by rail or water to Mandalay.

There are indications that southern troop training centers have been established around Haiphong and Hanoi in Indo-China and around Davao in the Philippines.

The order of battle of the Japanese Army as of March 18, 1943 follows.

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SUMMARIZED ORDER OF BATTLE OF JAPANESE ARMY - MARCH 18, 1943

LOCATION	DIVISIONS	TOTAL	IND MIXED BRIGS	CAV BRIGS	TANK REGTS	STRENGTHS
KISKA	Task force					10,000
SAKHALIN	7	1				20,000
JAPAN	Fourteen divs in training including corps & army troops. Permanent defense garrison.	14			One	280,000 150,000
KOREA	19 & two depot divs.	1				30,000
MANCHURIA Garrison Tps 36,000	1,10,11,12,14,23, 24,25,28,52,53,54, 71, & nine unidentified divs.	22		2,3, & one unidentified	Seven	497,500
N. CHINA (including Inner Mongolia)	17,26,27,35,36, 37,69, & 110	8	1,2,3,4, 5,6,7,8 10 & 15	1 & 4	One	267,000
C. CHINA	3,13,15,22,34, 39,40,58,60*, 70*, & 116	11	9,12,13, 14 & 17		One	252,000
S. CHINA	104	1	19 & 22			40,000
FORMOSA Garrison Tps 15,000	One depot division					20,000
HAINAN Garrison Tps 6,000						6,000
PHILIPPINES	Two unidentified	2				40,000
FR. INDO-CHINA	21	1				20,000
THAILAND	46 & one unidentified	2			One	42,000
BURMA	18,33,55, & 56	4			One	82,000
MALAYA	Gds	1			One	22,000
BORNEO NLP & Garrison Tps 10,000						10,000
SUMATRA	45	1				20,000
JAVA	9,57	2				40,000
CELEBES NLP & Garrison Tps 10,000						10,000
TIMOR-BANDA SEA AREA	5,48	2				40,000
NEW BRITAIN-SOLOMONS	6,16,38**,65* plus misc. units	4	21			64,000
NEW GUINEA & ENROUTE FROM PALAU	20,41, plus remnants of 51 and misc. units	2				47,000
MANDATED & OTHER PACIFIC ISLANDS	One unidentified	1				20,000
UNLOCATED	4,8,30,32	4			One	82,000
	TOTALS	84	18	5	14	2,111,500

* 2-regiment divisions strength estimated at 10,000.
** Strength reduced to approximately 3,000 men.

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March 1943

AIRPORTS

	KEY AIRPORTS			
	TARGET			
	No.	Name	Importance	Obj. Area
1	1466 &1491	Kasumigaura Naval Air Sta.	One of most imp.; probably mfg.	Mito (90.14)
2	298	Oppama Naval Air Station	Protects Yokosuka Naval Base	Tokyo (90.17)
3	N A	Chitose	Largest air base in N. Japan	Hokkaido (90.2)
4	1404	Tachikawa Army Air Base	Imp. Tokyo Bay defense; also mfg.	Tokyo (90.17)
5	1406	Tokorozawa Army Air Base	One of largest; repairs, training	Tokyo (90.17)
6	373	Kisarazu Naval Air Station	Land and sea planes; depot	Mito (90.14)
7	249	Kagamigahara Army Air Base	Major defense of Nagoya region	Nagoya (90.20)
8	1236	Tachiarai Army Air Base (Fukuoka)	Defends western Japan	Kurume (90.35)
9	52	Matsuyama	Main base of Taiwan (Formosa)	Taihoku (91.3)
10	69	Heijo	Major operat. & training base	Heijo (84.3)
11	47	Tin Ho (Canton)	Major base in S. China	Canton (83.4)
12	5	Gialam (Hanoi)	Major base for Burma campaign	Indo-China (85.1)
13	6	Don Muang (Bangkok)	Largest in Thailand	Thailand (98.1)
14	3	Mingaladon (Rangoon)	Main Jap base in Burma	Burma (82.2)
15	7	Seletar (Singapore)	Largest of 5 on Singapore island	Singapore (92.2)
16	76	Andir (Bandung, Java)	Major N.E.I. air base; repairs	Java (94.3)
17	26	Kainei Army Air Base	Major base near Siberian border	Seishin (84.1)
18	16	Clark Field	Largest in P.I.	P.I. (96.1)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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JAPAN-AIRPORTS

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
955	Toyohara Landing Ground	-	46°58'N 142°45'E	967
956	Otomari Seaplane Anchorage	-	46°37'N 142°45'E	966
957	Ochiai Civil Landing Ground	-	47°18'N 142°48'E	970
958	Nairo Civil Landing Ground	-	49°06'N 142°58'E	958
	NIIGATA (90.9)			
1028	Niigata Airport	Large, Naval air base & training school	37°57'N 139°08'E	1028
	TOYAMA (90.11)			
864	Toyama Airport	Secondary military	36°45'N 137°11'E	864
872	Kanazawa Airdrome	Three runways; 600 yards each	36°38'N 136°38'E	872
	NAGANO (90.12)			
1102	Nagano Airport	Rptd 700 x 200 yard runways	36°38'N 138°12'E	1098
1103	Takata Airport	Minor	37°05'N 138°14'E	1103
	TAKASAKI (90.13)			
1057	Kumagaya Airdrome	One of most important in Japan; heavy bombers	36°10'N 139°18'E	1057
1058	Kawakishi Testing Airfield	Assembly & testing for Nakajima Aircraft	36°14'N 139°23'E	789

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JAPAN-AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MITO (90.14)			
371	Tateyama Naval Air Station	Important; land and sea planes, depot	34°59'N 139°50'E	371
373	Kisarazu Navy Airbase	Important; land and sea planes, depot	35°24'N 139°55'E	373
1409	Narashino Army Airdrome	Tokyo inner defense unit	35°42'N 140°00'E	1519
1463	Anju Seaplane Base	Satellite of Target 1466	36°01'N 140°20'E	-
1464	Choshi Army Airdrome	Secondary	35°50'N 140°45'E	-
1465	Kashima Navy Airbase	Satellite of target 1466	35°59'N 140°39'E	-
1466	Kasumigaura Naval Air Station Airfield	Important; also rptd plane production	36°02'N 140°13'E	1466
1468	Mito Army Airdrome	Secondary, military	36°23'N 140°36'E	-
1470	Shimoshizu Army Airbase	One of oldest Army bases	35°39'N 140°09'E	-
1472	Tsukuba Navy Airdrome	Satellite of target 1466	36°12'N 140 06'E	-
1473	Tsuchiura Navy Airdrome	Satellite of Target 1466	36°05'N 140°15'E	1466
1474	Yatabe Navy Airdrome	Satellite of target 1466	36°02'N 140°05'E	-
1487	Hokoda Airdrome	Secondary, military	36°10'N 140°30'E	-
1488	Kioroshi Army Airdrome	Rptd large, fighter base	35°52'N 140°12'E	-
1489	Tomobe Navy Airdrome	Secondary, military	36°20'N 140°19'E	-
1490	Tsudanuma Airdrome	Secondary	35°41'N 140°05'E	1519
1491	Kasumigaura Naval Air Station Seaplane Base	Important; also rptd plane production	36°03'N 140°13'E	1466
	TOKYO (90.17)			
82	Totsuka	Important; paratroop training, Japan aircraft testing	35°24'N 139°33'E	NA
298	Oppama Naval Air Station	Very important; protects Yokosuka naval base	35°19'N 139°39'E	"
337	Haneda	Large; also research & manufacturing	35°34'N 139°46'E	"
1402	Yokohama Naval Air Station	Flying boat patrols	35°25'N 139°38'E	"

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JAPAN-AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
1403	Tomioka Sea plane Base	Repairs; adjoins plane factory	35°23'N 139°38'E	NA
1404	Tachikawa	One of largest Army bases; adjoining aircraft plant	35°42'N 139°25'E	"
1405	Sunamachi	Important, new	35°39'N 139°50'E	"
1406	Tokorazawa	Important; also training center	35°48'N 139°29'E	"
1407	Showa	Flight testing	35°44'N 139°22'E	"
1408	Sayama	Training field of Toyooka air academy	35°47'N 139°23'E	"
1409	Narashino	Paratroop training; inner Tokyo defense base	35°43'N 140°00'E	"
1410	Shinosaki	Training center	35°43'N 139°54'E	"
1411	Susaki	Large, formerly commercial	35°39'N 139°48'E	"
1412	Chofu	Large, rptd 600 acres	35°40'N 139°30'E	"
1413	Shinagawa	Land & seaplanes; paratroops, flight testing	35°36'N 139°45'E	"
1414	Urawa	Full facilities	35°51'N 139°40'E	"
1415	Takahagi	Medium bomber base	35°51'N 139°24'E	"
1416	Matsudo	Fighter & heavy bomber base	35°46'N 139°54'E	"
1417	Otawa Bay	Secondary importance	35°13'N 139°38'E	"
	SHIZUOKA (90.18)			
1183	Airfield (Shimizu)	Large, seaplane base adjoining	35°00'N 138°32'E	1176
	NAGOYA (90.20)			
248	Nagoya Civil Airport	Minor	35°04'N 136°51'E	194
249	Kagamigahara Military Airport	Major Airbase	35°23'N 136°51'E	240
1130	Suzuka Naval Airbase	Important, land and seaplanes	34°55'N 136°39'E	1152
1131	Tomita Airbase	Minor, glider training	35°01'N 136°41'E	1134a
	HAMAMATSU (90.21)			
1222	Mikatahara Army Airfield	Major Operational & training	34°47'N 137°42'E	1222

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JAPAN-AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MAIZURU (90.22)			
1046	Naval Air Station	Important, seaplane base	35°32'N 135°14'E	1046
1047	Aerodrome	Primary military	35°27'N 135°25'E	1039
	KYOTO (90.23)			
1168	3rd Air Regiment Airdrome		35°06'N 136°12'E	1168
	KUMANO (90.24)			
1213	Akeno Military Aviation School & Field	Military field, aerial gunnery	34°32'N 136°40'E	1213
	OSAKA (90.25)			
1187	Osaka Airdrome	Substantial	34°38'N 135°28'E	325
	KOCHI (90.28)			
1523	Ino Island Airport (I Shima)	Secondary, military	33°51'N 134°49'E	1523
	KURE (90.30)			
656	Kure Naval Air Station	Major; part of Kure Naval Base	34°13'N 132°36'E	656
731	Otake Naval Airfield	Minor, land planes only	34°13'N 132°14'E	731
732	Iwakuni Naval Air Station	Major, land and seaplane base	34°08'N 132°14'E	732
734	Nakamita Airdrome	Rptd paratroop training center	34°31'N 132°36'E	734
795	Hiroshima Airfield	Civil landing field	34°24'N 132°29'E	739

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JAPAN-AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KYUSHU EAST (90.33)			
1306	Saeki Naval Air Station	Major operational airbase	32°57'N 131°55'E	1306
1307	Usa Naval Air Station	Secondary operational airbase	33°34'N 131°25'E	1307
1308	Oita Naval Air Station	Secondary operational airbase	33°15'N 131°37'E	1329
1309	Tomitaka Naval Airfield	Auxiliary field	32°24'N 131°38'E	1309
	SHIMONOSEKI (90.34)			
1117	Shimonoseki Airport	Rptd auxiliary	35°58'N 130°57'E	44a
1120	Oura Naval Air Station	Secondary seaplane base	34°24'N 130°58'E	1120
1121	Ozuki Airport	Secondary	34°04'N 131°02'E	1121
1125	Onga Army Airfield	New army field, rptd important	33°54'N 130°41'E	1125
	KURUME (90.35)			
663	Fukuoka Naval Air Station	Large airbase	33°41'N 130°24'E	664
1236	Tachiarai Army Airfield	Major military airbase	33°24'N 130°37'E	1236
1237	Najima Seaplane Base (Fukuoka)	Terminal Japan-Korea-Taiwan airline	33°39'N 130°25'E	664
	SASEBO (90.36)			
754	Sasebo Naval Air Station	Important	33°08'N 129°43'E	755
849	Omura Naval Air Station	Important	32°56'N 129°56'E	849
850	Nagasaki Airport	Minor	32°43'N 129°50'E	-

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	YATSUSHIRO (90.37) KYUSHU SOUTH (90.38)			
1378	Kanoya Naval Air Station	Vital southern airbase, supplies, major repairs	31°23'N 130°52'E	MA
1379	Miyakonojo Army Airfield	Important army airbase, supplies, repairs	31°44'N 131°03'E	"
1534	Kagoshima Airfield	Large - built since war began	31°33'N 130°33'E	"
	JAPANESE ISLANDS (91)			
	KURILE ISLANDS (91.1)			
124	Seaplane Anchorage	On Lake Toshimoye	45°02'N 147°43'E	124
143	Shimushu Airbase	Possible large airbase	50°45'N 156°20'E	143
	TAIHOKU (91.3)			
52	Matsuyama Airport	A primary operational airbase	25°03'N 121°33'E	32
53	Koko Airport	Major military base	24°52'N 121°03'E	53
54	Itahashi Airport	Secondary, military	24°59'N 121°27'E	50
	TAIWAN WEST (91.4)			
96	Kagi Airbase	Important	23°27'N 120°23'E	96
97	Eikosho Airport (Tainan)	Secondary	23°02'N 120°12'E	97
98	Taichu Airport	Secondary	24°10'N 120°41'E	91
99	Jitsugetsutan Seaplane Anchorage	No details	23°52'N 120°55'E	-
	TAIWAN EAST (91.5)			
74	Karenko Airport	Rptd principal Taiwan military base	24°01'N 121°38'E	61

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JAPAN-AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAIWAN EAST (91.5) (Continued)			
75	Taito Airport	Secondary	22°46'N 121°05'E	67
76	Giran Airport	Military	24°45'N 120°45'E	69
77	Suo Airport	Military	24°35'N 121°52'E	-
78	Garambi Airport (Koshun)	Military	21°58'N 120°48'E	78
	TAKAO (91.6)			
57	Heito Airport	Rptd most important operational base in area	22°40'N 120°27'E	55
58	Okayama Airport	Recently enlarged	22°48'N 120°16'E	58
59	Suiteiryo Airport (Takao)	Believed secondary	22°27'N 120°27'E	59
	PESCADORES (91.7)			
154	Keimo-U Airdrome	Principal airport of Pescadores, all facilities	23°34'N 119°36'E	148
155	Risei-Kaku Airdrome	Secondary Airport in Pescadores	23°33'N 119°41'E	148
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
25	Seishin Airfield	Commerical, Korea-Siberia border defense unit	41°47'N 129°45'E	25
26	Kainei Airfield	Strategic base in border area	42°25'N 129°44'E	26
	HEIJO (84.3)			
69	Heijo Airdrome	Important, military, training center	39°02'N 125°47'E	71

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HEIJO (84.3) (Continued)			
70	Ryuko Airdrome	Chinnampo defense unit	38°56'N 125°13'E	-
	GENZAN (84.4)			
86	Genzan Naval Air Base	Large, new, sea and land planes	39°10'N 127°29'E	88
	CHOSEN EAST (84.5)			
48	Koryo Airfield	Auxiliary	37°44'N 128°53'E	48
	KEIJO (84.6)			
36	Heitaku Airport	Auxiliary	36°58'N 127°05'E	36
37	Hakusen Airfield (Keijo)	Probable large airbase	37°57'N 126°19'E	37
38	Keijo Airfield	Probable airbase	37°31'N 126°56'E	42
39	Koshu Airfield	Auxiliary	36°26'N 127°08'E	39
40	Bunzan Airfield	Auxiliary	37°52'N 126°43'E	40
41	Tyotiin (Chochiin) Airfield	Auxiliary	36°36'N 127°18'E	41
	FUSAN (84.7)			
93	Chinkai Naval Air Station	Seaplane base for Chinkai naval Base	35°08'N 128°40'E	101
94	Urusan Airfield	Military	35°32'N 129°21'E	94
95	Taikyu Airfield	Military	35°54'N 128°39'E	95

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (MANCHURIA) (93)			
	MUKDEN (93.3)			
48	Military & Commercial Airport	Important	41°47'N 123°30'E	46
49	Military Airfield	Important, possibly same plane assembly	41°45'N 123°21'E	49
	DAIREN (93.5)			
12	Dairen Airport	Military & commercial	38°57'N 121°32'E	12-
	CHINA (83)			
	CANTON (83.4)			
45	Kaitak Airport	Only major airport Hong Kong-Kowloon district	22°20'N 114°12'E	55
46	White Cloud Airdrome	Large, rptd improved by Japs	23°09'N 113°18'E	47
47	Tin Ho Airdrome	Rptd main Jap base, handles all types	23°08'N 113°20'E	47
62	Sanchau Island Airdrome	Major, on staging route to southern area	22°02'N 113°24'E	62
	HAINAN (83.6)			
30	Kungshan Aerodrome	Important military aerodrome	20°02'N 110°20'E	30
31	Sama Aerodrome	Important	18°17'N 109°25'E	31
32	Sama Seaplane Base	Important base	18°15'N 109°30'E	32

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	FRENCH INDO-CHINA (85)			
	FRENCH INDO-CHINA NORTH (85.1)			
4	Tourane	Major land-seaplane, bomber school, refuels N-S traffic	16°02'N 108°12'E	N A
5	Gialam	Major bomber base	21°03'N 105°53'E	"
6	Bach Mai	Main French army field for defense Hanoi; bomber base	21°00'N 105°49'E	"
9	Haiphong	Secondary	20°53'N 106°42'E	"
10	Haiphong Seaplane Base	Major seaplane base	20°32'N 106°40'E	"
15	Tong	Very important military field	21°08'N 105°30'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
6	Don Muang Airdrome	Rptd largest in Thailand; military	13°55'N 100°37'E	6
7	Koke Kathiem Airdrome	Large, military	14°50'N 100°38'E	7
8	Korat Airdrome	Rptd bomber base	14°58'N 102°07'E	8
9	Mesod Airdrome	All-weather	16°41'N 98°31'E	9
10	Pitsanuloke Airdrome	Rptd two fields consolidated	16°49'N 100°16'E	10
11	Prachuab Kirikhan Airdrome	On coast, land and seaplanes	11°46'N 99°48'E	11
12	Satahib Airdrome	Navy station	12°39'N 100°53'E	12
13	Singora Airdrome	Land & seaplanes	7°11'N 100°38'E	13
14	Udorn Airdrome	Rptd small	17°24'N 102°40'E	14
65	Nontaburi Seaplane Base	Rptd best seaplane base in Thailand	13°54'N 100°30'E	65

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES NORTH (92.1)			
1	Alor Star Airfield	Military	6°12'N 100°25'E	1
2	Butterworth Airfield	Military	5°27'N 100°23'E	2
3	Gong Kedah Airfield	Military	5°48'N 102°29'E	3
4	Penang Airfield	Military airbase	5°17'N 100°16'E	4
	SINGAPORE (92.2)			
5	Singapore (Buloh) Airfield	Large RAF base	1°26'N 103°42'E	5
6	Singapore (Kalang) Airdrome	Large civil & military base	1°18'N 103°53'E	52
7	Singapore (Seletar) Airdrome	Large RAF base, land & seaplane	1°25'N 103°52'E	7
8	Singapore (Sembawang) Airdrome	Large RAF base	1°25'N 103°49'E	7
9	Singapore (Tengah)	Large RAF base	1°23'N 103°43'E	9
	BURMA (82)			
	BURMA NORTH (82.1)			
30	Heho Airdrome	All-weather; facilities & bomb storage	20°45'N 96°48'E	30
31	Lashio Airdrome	All-weather; facilities & bomb storage	22°59'N 97°45'E	31
32	Magwe Airdrome	All-weather; 3 runways, facilities	20°10'N 94°57'E	32
33	Myitkyina Airdrome	Rptd one metal runway, two others	25°23'N 97°21'E	33
34	Namsang Airdrome	All-weather, facilities, bomb storage	20°54'N 97°44'E	34
35	Shwebo Landing Ground	Approximately 50 miles from Mandalay	22°35'N 95°42'E	35

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JAPAN-AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BURMA NORTH (82.1) (Continued)			
36	Kutkai Landing Ground	Approximately 40 miles from Lashio	23°27'N 97°56'E	-
37	Bhamo Landing Ground	No details	24°16'N 97°14'E	-
38	Akyab Airdrome	All-weather, facilities	20°08'N 92°53'E	38
39	Pakokku Airdrome	Rptd new Jap built field, approx 70 mi Mandalay	21°21'N 95°07'E	39
40	Meiktila Landing Ground	Rptd being expanded	20°52'N 95°54'E	40
	BURMA SOUTH (82.2)			
1	Bassein Landing Field	Small field rptd being extended	16°49'N 94°47'E	1
2	Mergui Landing Field	All-weather, rptd important	12°27'N 98°41'E	2
3	Mingaladon Airdrome (Rangoon)	Largest in Burma	16°54'N 96° 8'E	3
4	Moulmein Airdrome	All-weather, facilities, important	16°26'N 97°39'E	4
5	Tennant Landing Field	All-weather	19° 4'N 96°22'E	5
6	Toungoo Airdrome	All-weather, facilities, important	19°00'N 96°24'E	5
7	Victoria Point Airdrome	All-weather	10° 3'N 98°33'E	7
8	Zayatkwin Landing Field	Approximately 30 miles NE Rangoon	17° 7'N 96°20'E	8
	NETHERLANDS EAST INDIES (94)			
	NORTH SUMATRA (94.1)			
1	Sabang Airfield	Military, near Sabang Harbor	5°53'N 95°20'E	1
2	Lho' Nga Airfield (Koetaradja)	Small	5°30'N 95°17'E	2
3	Bireuen Airfield	Small	5°12'N 96°44'E	3
4	Lho' Seumaweh Airfield	Small	5°12'N 97°07'E	4
5	Medan Airfield	Large military airbase	3°34'N 98°40'E	5

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JAPAN - AIRPORTS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NORTH SUMATRA (94.1)(Continued)			
6	Brastagi Airfield	Small	3°11'N 98°30'E	6
8	Labuan Roekoe Airfield	Small	3°11'N 99°28'E	8
9	Rantau Prapat Airfield	Small	2°09'N 99°50'E	9
10	Kota Pinang Airfield	Small	1°48'N 100°02'E	10
11	Kota Tengah Airfield	Small	1°04'N 100°32'E	11
12	Pakan Baroe Airfield	Small military airbase	0°28'N 101°26'E	12
	SOUTH SUMATRA (94.2)			
36	Palembang Airfield #1	-	02°54'S 104°42'E	36
37	Palembang Airfield #2	-	03°20'S 104°24'E	37
38	Palembang Airfield #3	-	03°22'S 104°17'E	38
39	Palembang Airfield #4	-	03°18'S 104°38'E	39
40	Muntok Airfield (Banka Island)	-	02°03'S 105°13'E	57
	JAVA (94.3)			
76	Bandung (Andir) Airdrome	Military, major facilities	06°54'S 107°35'E	159
77	Batavia (Kemajoran) Airdrome	Military, 3 mi E of Batavia	06°09'S 106°51'E	166
78	Batavia (Tjilitian) Airdrome	Military, 8 mi SSE of Batavia	06°16'S 106°54'E	78
79	Surabaya (Tandjong Perak) Airdrome	Military, 2 mi NW of Surabaya	07°12'S 112°43'E	174
80	Surabaya (Dermo) Airdrome	Was Secondary	07°18'S 112°43'E	174
81	Madium Airfield	Military	07°40'S 111°24'E	81
84	Kalidjati Airfield	Military	06°32'S 107°40'E	84
85	Malang Airfield	Military	07°54'S 112°42'E	85

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JAPAN - AIRPORTS

TARGET NO.	TARGET	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAVA (94.3) (Continued)			
86	Bandung (Tjitarum) Airfield	Military	06°57'S 107°28'E	-
123	Surabaya (Morokrembangan) Naval Air Sta	At harbor	07°13'S 112°43'E	174
	CELEBES-TIMOR (94.5)			
197	Kendari Airfield, Celebes	Military	04°06'S 122°26'E	197
198	Macasser (Mendai) Airfield, Celebes	Major	05°04'S 119°32'E	198
199	Bima Airfield, Soembawa	Civil airfield	08°30'S 118°44'E	199
200	Den Pasar Airfield, Bali	Military	08°45'S 115°10'E	200
201	Koepang (Penfooi) Airfield, Timor	Military	10°10'S 123°39'E	201
	PHILIPPINES (96)			
	PHILIPPINES NORTH (96.1) PHILIPPINES SOUTH (96.2)			
16	Clark Field	Largest airport in Philippines, enemy base	15°10'N 120°33'E	N A
17	Nichols Field	Important in defense of Manila, enlarged	14°31'N 121°00'E	"
18	Nielson Airport	Enemy bomber base near Manila	14°34'N 121°01'E	"
55	Burnside Field	Important defense of enemy base at Iloilo	10°42'N 122°35'E	"
63	Malabang Field	Enemy base in Mindanao	7°37'N 124°04'E	"
68	Sanborn Field	Base for defense of S Luzon	13°10'N 123°44'E	"
69	Iwahag Field	Rptd one of principal Philippine bases	9°45'N 118°38'E	"

* New Target to be included in Folder revision
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JAPAN - DEFENSES

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	AKITA (90.6)			
1071	Akita Barracks	Minor	39°45'N 140°17'E	1071
	FUKUSHIMA (90.10)			
1080	Infantry, 32nd Inf Regiment Post	No details	38°15'N 140°20'E	1082
	TAKASAKI (90.13)			
1062	Army Regiment #15	Also arsenal	36°19'N 139°00'E	1051
1063 a,b,c,&d	Utsunomiya Military Installations	Large	36°34'N 139°52'E	1056
	MITO (90.14)			
304	Futtsu Point Forts	Defend channel into Tokyo Bay	35°19'N 139°46'E	304
	TOKYO (90.17)			
1494	Kannon Point Fortifications	Strong fortification commanding Tokyo Bay entrance	35°15'N 139°44'E	N A
	NAGOYA (90.20)			
252	Third Division Military HQ	Minor	35°10'N 136°54'E	250a
	KYOTO (90.23)			
1170	16th Division Barrack Area & Drill Ground	Large	34°57'N 135°46'E	1170

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JAPAN - DEFENSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OKAYAMA (90.27)			
1291	Himeji Barracks #1	Extensive barracks, paratroop school	34°51'N 134°42'E	1291
1292	Himeji Barracks #2	Extensive barracks	34°50'N 134°42'E	1291
1293	Marugame Barracks	Extensive barracks, storehouses	34°17'N 133°48'E	1303
1294	Okayama Barracks & Ordnance Depot	Extensive barracks, stores	34°41'N 133°55'E	1294
	KYUSHU EAST (90.33)			
1319	Oita Barracks	Minor	33°14'N 131°35'E	1329
	SHIMONOSEKI (90.34)			
47	Shimonoseki Military HQ	Minor	33°58'N 130°56'E	99
534	District Command HQ	Secondary	33°53'N 130°53'E	168
	KURUME (90.35)			
1247	Kurume Military Zone	Secondary barracks & ordnance depot	33°17'N 130°32'E	1263
1248	Kumamoto Military Zone	Minor barracks & military stores	32°48'N 130°43'E	1248
	SASEBO (90.36)			
853	Nagasaki Defense Command	Minor	32°45'N 129°52'E	542

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	YATSUSHIRO (90.37) KYUSHU SOUTH (90.38)			
1380	Kagoshima Army Post	Training center, rptd bomb, torpedo loading	31°37'N 130°33'E	-
1381	Miyakonojo Army Post	Important training center	31°43'N 131°12'E	-
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
17	Keelung Artillery Barracks	Minor	25°08'N 121°44'E	15a
48	Taihoku Barracks	Secondary	25°03'N 121°31'E	47
	TAIWAN WEST (91.4)			
112	Tainan Barracks	Secondary	23°00'N 120°12'E	112
113	South Tainan Barracks	Minor	22°56'N 120°11'E	-
114	Kagi Barracks	Secondary	23°26'N 120°25'E	-
115	Taichu Barracks	Secondary	24°08'N 120°42'E	98
	TAIWAN EAST (91.5)			
73	HQ & Barracks (Karenko)	Secondary	23°59'N 121°36'E	66

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
23	Rashin Barracks	Accommodate over 100,000 men	42°13'N 130°18'E	14
24	Ranan Barracks	Base, rptd greatly enlarged	41°43'N 129°41'E	22
	HEIJO (84.3)			
71	Heijo Barracks	In large military center	39°01'N 125°44'E	71
72	South Heijo Camp	Large training camp	38°59'N 125°46'E	71
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
75	Garrison, Antung	-	40°10'N 124°20'E	72
	MUKDEN (93.3)			
69	Garrison	-	41°47'N 123°23'E	50
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
16	Japanese Army Camp	Rptd quarters Bangkok occupation troops	13°44'N 100°33'E	26
18	Naval Station & Ammunition Dump	Important	13°40'N 100°35'E	31

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	THAILAND (98.1,98.2,98.3)(Continued)			
19	Fort Pisuasmut Naval Station	Rptd well fortified	13°35'N 100°35'E	19
20	Military Installations (Lop Buri)	One of largest military centers in Thailand	N limit 14°48'N S limit 14°47'N E limit 100°41'E W limit 100°38'E	20
58	Ministry of Defense & Oil Stores	Central QM storage	13°45'N 100°30'E	26
	BURMA (82)			
	BURMA SOUTH (82.2)			
9	AA Emplacement (Rangoon)	"Old Racecourse" AA position	16°47'N 96°09'E	14
	PHILIPPINES (96)			
	PHILIPPINES NORTH (96.1) PHILIPPINES SOUTH (96.2)			
29	Fort Wint (Grande Island)	Principal defense of Subic Bay	14°46'N 120°14'E	-
43	Fort Mills (Corregidor Island)	Principal defense Manila harbor	14°23'N 120°35'E	-
44	Fort Hughes (Caballo Island)	Fortified island Manila harbor	14°22'N 120°36'E	-
45	Fort Drum (El Fraile Island)	Fortified island Manila harbor	14°19'N 120°36'E	-
46	Fort Frank (Carabao Island)	Fortified island Manila harbor	14°17'N 120°36'E	-

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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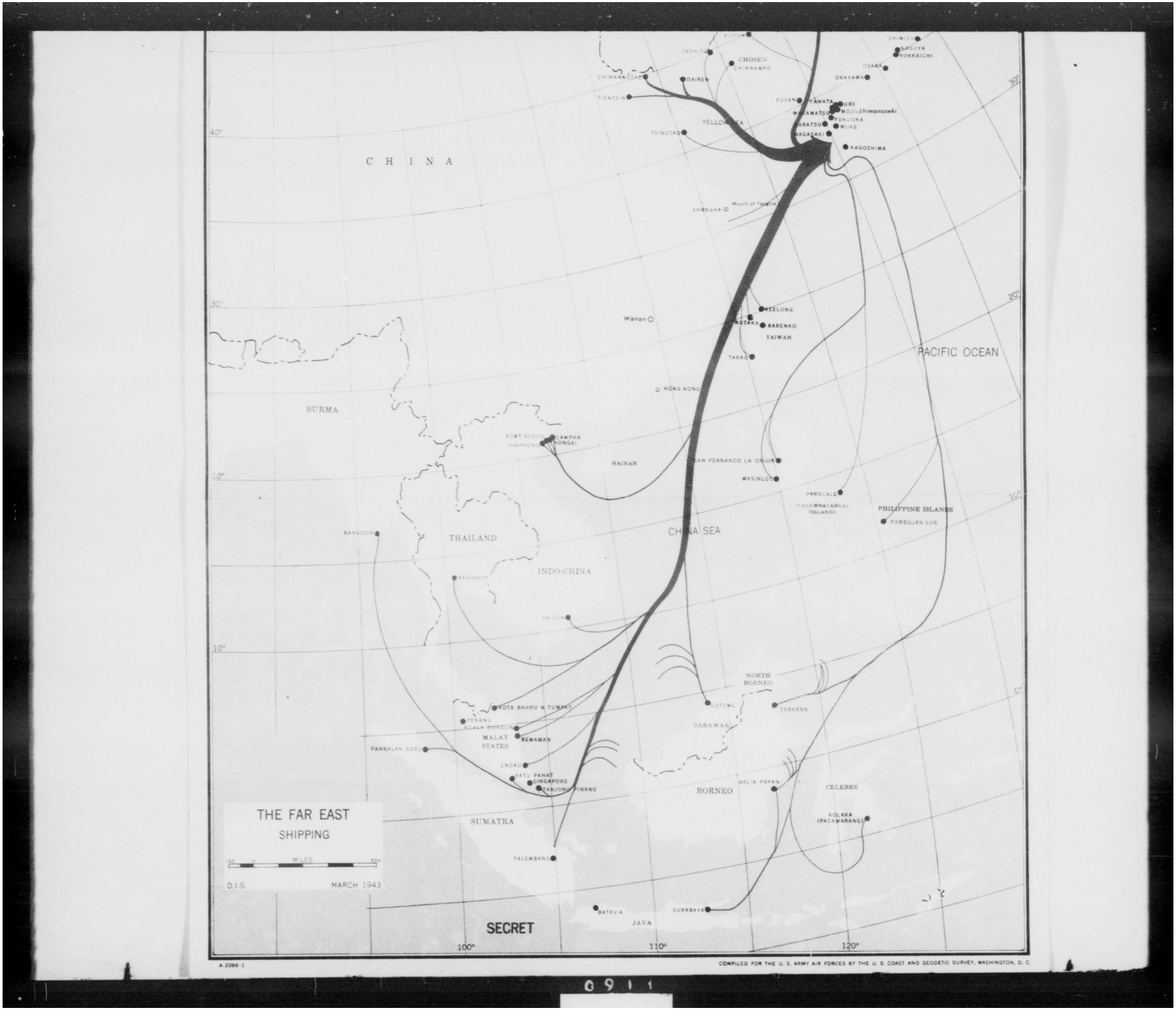

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April 1943

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JAPANESE SHIPPING

Shipping is one of the most vital links in Japan's war economy, and is the link presently most exposed to air attack.

Industrial war production in Japan Proper depends upon large sea-borne tonnages of basic commodities moving out of ports which extend from the north Asia mainland through the South Pacific islands. Destruction of shipping concentrated in these ports will directly affect the war production of major industrial plants located in the zone of the interior.

Vessel appearance in the more important of these harbors is not intermittent. The flow of basic commodities from certain ports is on a large scale, and in many cases is of a highly hand-to-mouth character. The ships are not isolated, fleeting targets. Alongside quays and docks and moored in roadsteads for days at a time while loading or discharging cargo, these vessels are relatively fixed objectives.

While the lanes by which these tonnages move are not fixed, there are areas, such as the strait between Taiwan and the mainland, where there has been consistent congestion of ships transporting raw materials from, and military supplies and troops to, the South Pacific. Additional outlying points for attack are ship building and repair facilities (such as Hong Kong, Singapore) which are important in themselves and at which ships requiring repairs tend to concentrate. These outlying ship facilities would assume increased importance as result of successful attack on ships.

Attack on shipping from presently-held bases will directly affect Japan's war potential in one or more of the following ways:

1) Increase the rate of ship losses, which already exceeds replacement capacity;

2) Force shipping into more circuitous lanes - reducing the effectiveness of the merchant fleet, and forcing ships out of protected lanes into waters more exposed to submarine attack;

3) Force resort to slow, heavily-escorted convoys, decreasing the effectiveness of the merchant fleet tonnage;

4) Reduce the flow of essential raw materials;

5) Interfere with military operations in the South Pacific combat areas.

Principal factors in the Japanese shipping position, which are discussed in detail in the following sections, are:

1) Origin, volume and flow of basic commodities, and the resultant concentrations of ships;

2) The Japanese merchant fleet position, i.e., the fleet available (allowing for war losses, acquisitions, and construction) to move the required volume of basic commodities;

3) Ship building and repair facilities, which determine ability to maintain the required merchant fleet position.

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April 1943

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COMMODITY MOVEMENTS AND SHIP CONCENTRATIONS

Japan's war effort depends upon the seaborne movement of a vast tonnage of raw materials. Japan has available to her sufficient supplies of food (principally rice) and of most raw materials. A major proportion of these commodities must be shipped, either from overseas ports to the Japanese Islands, or between the various harbors of the Japanese Islands themselves.

In order to transport the requisite amounts of basic raw materials and food from their sources to centers of consumption, in 1943 Japan must ship a total cargo of approximately 69,000,000 tons. This figure represents the amount which she must obtain from overseas and which she must move from one place to another within the Japanese Islands in order to ensure the industrial production requisite for the present level of war effort. Shipments of many miscellaneous semi-manufactured and finished goods, military supplies, and troops are excluded. Of the total cargo of 69,000,000 tons, 77% is represented by coal, iron ore and pig iron, and 85% by coal, iron ore, pig iron, and petroleum.

The general geographical distribution of shipments is as follows:

a) 35,265,000 tons, or 51% of the total, originate in ports in Japan Proper and go to Japanese destinations.

b) 20,628,000 tons, or 30%, originate in Chosen, Manchukuo, China and Taiwan.

c) Thus 55,893,000 tons, or 81% of total shipments to Japan originate within the "inner zone." (Japan, Chosen, Manchukuo, North China and Taiwan)

d) The remaining 13,147,000 tons, or 19%, originate in latitudes south of Taiwan. While this tonnage is relatively small it includes the bulk of Japan's supplies of non-ferrous ores and metals, and petroleum. Of all the petroleum shipped from Indies ports only one-third will go to Japan Proper; two-thirds will go to other destinations in the Far East, principally to combat zones.

Table I on the following page shows the source of each basic commodity, giving the estimated amounts coming from every country and from each major harbor during 1943. While Japan has stockpiles of many materials sufficient to last from 1 to 3 years or more, it is believed that she will endeavor to maintain and increase these and that their presence will not cause a reduction in the movement of commodities until the military situation or a shipping stringency causes a curtailment. In any case, no inventories of iron ore and coal, which constitute the bulk of shipments, have been accumulated and their consumption is on a hand-to-mouth basis. Any interruption of their flow is an immediate blow to Japanese industry.

The movement of 69,000,000 tons of cargo will result (on average) in a certain number of ships being in each harbor from which commodities flow and in each harbor at which they arrive, at any one time. On the basis of the commodity shipment statistics, and supplementary data not included in this report, the table presented below has been constructed. This table shows an average expectancy in the number of ships per week in each harbor, the average size of these ships, and their total tonnage. In order to avoid figures showing a fraction of a ship, a week is used as the unit of time rather than a day. (See Table II.)

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(All figures in metric tons)

JAPAN 1943 - - COMMODITY SHIPMENTS FO

HARBOR	TOTAL	BAUXITE	CHROMIUM	COAL Coking	COAL Non-Coking	COPPER	COTTON	FERTILIZER Nitrogenous	FERTILIZER Phosphate	FERTILIZER Soybean
JAPAN	30,465,300			2,000,000	27,100,000			200,000		
Esutoru	800,000			600,000						
Fukuoka	1,000,000				1,000,000					
Honto	600,000			400,000						
Karatsu	1,000,000				1,000,000					
Kushiro	1,000,000				1,000,000					
Maoka	700,000			500,000						
Miike	3,100,000				3,100,000					
Moji	2,600,000				2,600,000					
Muroran	5,500,000				5,500,000					
Okha a)	131,600									
Otaru	2,500,000				2,500,000					
Otamari	500,000			300,000						
Shikuka	400,000			200,000						
Ube	1,400,000				1,400,000					
Wakamatsu	9,000,000				9,000,000					
Yokohama	233,700							200,000		
KOREA	5,021,200				2,000,000			300,000		
Chinnampo	2,805,000				2,000,000			30,000		
Fusan	146,200									
Konan	270,000							270,000		
Nashin	500,000									
Seishin	1,300,000									
MANCHURIA	3,995,000				1,200,000			80,000		850,000
Dairen	3,623,750				1,200,000			80,000		750,000
Tashito b)	371,250									100,000
CHINA	9,026,200			5,300,000	1,200,000		200,000		80,000	
Chinwangtao	3,600,000			3,300,000	300,000					
Tientsin	1,400,000				350,000		150,000			
Tsingtao	2,900,000			2,000,000	550,000		50,000			
Yangtze	1,126,200								80,000	
FORMOSA	2,585,000				500,000	100,000				
Kealung	1,671,000				500,000	100,000				
Niitaka	237,000									
Takao	677,000									
PHILIPPINES	1,560,000		180,000			80,000				
Masinloc	180,000		180,000							
Pambujan Sur (Samar)	200,000									
Paracale (Calumbayanga Is)	1,100,000									
San Fernando La Union	80,000					80,000				
INDO-CHINA	2,284,900				1,300,000				160,000	
Campha	500,000				500,000					
Haiphong	249,900								160,000	
Hongai	500,000				500,000					
Port Redon	300,000				300,000					
Saigon	735,000									
THAILAND	319,400									
Bangkok	319,400									
MALAYA	1,522,000	100,000								
Batu Pahat	450,000	100,000								
Endau	100,000									
Kemaman	100,000									
Kota Bahru & Tumpat	172,000									
Kuala Dungun	700,000									
NETHERLANDS EAST INDIES	6,272,800	300,000								
Balikpapan	391,400									
Kolaka (Padamarang)	180,000									
Lutong	2,536,400									
Palembang	1,269,000									
Pankalan Susu	771,900									
Surabaya	560,500									
Tandjong Pinang	300,000	300,000								
Tarakan	263,600									
BURMA	219,000									
Rangoon	219,000									
TOTAL TONNAGE ASSIGNABLE TO SPECIFIED HARBORS	63,270,800	400,000	180,000	7,300,000	33,300,000	180,000	200,000	580,000	240,000	850,000
ADD: NON-ASSIGNABLE TONNAGE	5,769,000	100,000			4,800,000				750,000	
JAPAN	4,800,000				4,800,000					
CHINA	54,000									
PHILIPPINES	60,000									
MISCELLANEOUS SOURCES	855,000	100,000 c)							750,000 d)	
GRAND TOTAL	69,039,800	500,000	180,000	7,300,000	38,100,000	180,000	200,000	580,000	990,000	850,000

a) Russian Saghalien
b) In Korea, just across Manchurian border.
c) Mand
e) Java

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JAPAN 1943 - - COMMODITY SHIPMENTS FOR ESSENTIAL INDUSTRIAL REQUIREMENTS BY PORT OF ORIGIN

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king	COPPER	COTTON	FERTILIZER Nitrogenous	FERTILIZER Phosphate	FERTILIZER Soybean	IRON ORE & PIG IRON Iron Ore	IRON ORE & PIG IRON Pig Iron	LEAD	LUMBER PAPER PULP	MANGANESE	NICKEL	PETROLEUM	RICE	RUBBER	SALT	SUG
0,000			200,000						1,000,000			165,300				
0,000									200,000							
									200,000							
0,000																
0,000									200,000							
0,000																
0,000																
0,000												131,600				
									200,000							
									200,000							
0,000																
0,000																
			200,000									33,700				
0,000			300,000			2,080,000	495,000						146,200			
0,000			30,000			280,000	495,000									
													146,200			
			270,000													
						500,000										
						1,300,000										
0,000			80,000		850,000	180,000	1,085,000								600,000	
0,000			80,000		750,000	180,000	813,750								600,000	
					100,000		271,250									
0,000		200,000		80,000		1,100,000	100,000						146,200		900,000	
0,000																
0,000		150,000				200,000	100,000								600,000	
0,000		50,000													300,000	
				80,000		900,000							146,200			
0,000	100,000												585,000		200,000	1,2
0,000	100,000												351,000			
													117,000			
													117,000		200,000	
	80,000					1,300,000										
						200,000										
	80,000					1,100,000										
0,000				160,000						3,000			585,000		100,000	
0,000				160,000						3,000					25,000	
0,000																
0,000													585,000	75,000	75,000	
													219,400		100,000	
													219,400		100,000	
						1,400,000				22,000						
						350,000										
						100,000										
						100,000										
						150,000				22,000						
						700,000										
											180,000	5,692,800			100,000	
												391,400				
											180,000					
												2,536,400				
												1,269,000				
												771,900				
												460,500			100,000	
												263,600				
								80,000			5,900		73,100			
								80,000			5,900		73,100			
000	180,000	200,000	580,000	240,000	850,000	6,060,000	1,680,000	80,000	1,000,000	25,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,2
000				750,000				54,000		85,000						
000								54,000		60,000 e)						
				750,000 d)						5,000 e)						
000	180,000	200,000	580,000	990,000	850,000	6,060,000	1,680,000	134,000	1,000,000	90,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,2

across Manchurian border. c) Mandated Islands & Carolines: 60,000; Indo-China & Hainan: 40,000 d) Christmas Is., Luchu & Man

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IPMENTS FOR ESSENTIAL INDUSTRIAL REQUIREMENTS BY PORT OF ORIGIN

LIZER te Soybean	IRON ORE & PIG IRON Iron Ore	Pig Iron	LEAD	LUMBER PAPER PULP	MANGAN-ESE	NICKEL	PETROLEUM	RICE	RUBBER	SALT	SUGAR	ZINC
				1,000,000			165,300					
				200,000								
				200,000								
				200,000								
							131,600					
				200,000								
				200,000								
							33,700					
	2,080,000	495,000						146,200				
	280,000	495,000						146,200				
	500,000											
	1,300,000											
850,000	180,000	1,085,000								600,000		
750,000	180,000	813,750								600,000		
100,000		271,250										
	1,100,000	100,000						146,200		900,000		
	200,000	100,000								600,000		
										300,000		
	900,000							146,200				
								585,000		200,000	1,200,000	
								351,000			720,000	
								117,000			120,000	
								117,000		200,000	360,000	
	1,300,000											
	200,000											
	1,100,000											
					3,000			585,000		100,000		61,900
					3,000					25,000		61,900
								585,000	75,000	75,000		
								219,400		100,000		
								219,400		100,000		
	1,400,000				22,000							
	350,000											
	100,000											
	100,000											
	150,000				22,000							
	700,000											
						180,000	5,692,800			100,000		
							391,400					
						180,000						
							2,536,400					
							1,269,000					
							771,900					
							460,500			100,000		
							263,600					
			80,000			5,900		73,100				60,000
			80,000			5,900		73,100				60,000
850,000	6,060,000	1,680,000	80,000	1,000,000	25,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,200,000	121,900
			54,000		65,000							
			54,000									
					60,000							
					5,000	e)						
850,000	6,060,000	1,680,000	134,000	1,000,000	90,000	185,900	5,858,100	1,754,900	75,000	2,000,000	1,200,000	121,900

c) Mandated Islands & Carolines: 60,000; Indo-China & Hainan: 40,000

d) Christmas Is., Luchu & Mandated Islands.

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TABLE II.

SELECTED HARBORS ARRANGED ACCORDING TO SHIPS IN PORT PER WEEK

HARBOR		SHIPS IN PORT PER WEEK	AVERAGE SIZE (TONS)	TOTAL TONNAGE PER WEEK
Wakamatsu	Japan	630	2,400	1,512,000
Osaka	"	364	2,300	837,200
Tokyo	"	336	2,100	705,600
Moji	"	144	3,700	532,800
Nagoya	"	140	2,100	294,000
Muroran	"	120	2,200	264,000
Yokohama	"	102	5,000	510,000
Yangtze	China	96	3,600	345,600
Dairen	Manchukuo	66	4,700	310,200
Tsingtao	China	61	3,700	225,700
Miike	Japan	60	2,000	120,000
Ube	"	52	1,000	52,000
Otaru	"	48	2,000	96,000
Keelung	Taiwan	48	4,000	192,000
Chinwangtao	China	45	4,700	211,500
Chinnampo	Chosen	43	5,000	215,000
Karatsu	Japan	38	2,000	76,000
Fukuoka	"	38	2,000	76,000
Kuala Dungun	Malaya	37	5,000	185,000
Shimizu	Japan	35	2,000	70,000
Paracale (Calambayanga)	Phil.	34	5,000	170,000
Esutoru	Karafuto	25	2,500	62,500
Maoka	"	22	2,500	55,000
Tientsin	China	21	3,000	63,000
Lutong	Borneo	20	10,000	200,000
Takao	Taiwan	20	4,000	80,000
Honto	Karafuto	19	2,500	47,500
Kushiro	Japan	19	2,000	38,000
Otamari	Karafuto	15	2,500	37,500
Seishin	Chosen	15	5,000	75,000
Saigon	Indo-China	14	5,000	70,000
Batu Pahat	Malaya	14	5,000	70,000
Palembang	Borneo	13	10,000	130,000
Shikuka	Karafuto	12	2,500	30,000
Bangkok	Thailand	12	5,000	60,000
Tandjong Pinang	Sumatra	9	5,000	45,000
Campha	Indo-China	8	5,000	40,000
Hongai	"	8	5,000	40,000
Konan	Chosen	7	3,000	21,000
Tashito	"	7	4,000	28,000
Rashin	"	6	5,000	30,000
Niitaka	Taiwan	6	4,000	24,000
Masinloc	Phil.	6	5,000	30,000
Endau	Malaya	6	5,000	30,000
Kota Bahru-Tumpat	"	6	5,000	30,000
Kolaka (Padamarang)	Celebes	6	5,000	30,000
Pankalan Susu	Sumatra	6	10,000	60,000
Surabaya	Java	5	5,000	25,000
Port Redon	Indo-China	5	5,000	25,000
Haiphong	"	4	5,000	20,000
Rangoon	Burma	4	5,000	20,000
Kemaman	Malaya	3	5,000	15,000
Balikpapan	Borneo	3	10,000	30,000
San Fernando La Union	Phil.	2	5,000	10,000
Fusan	Chosen	2	3,000	6,000
Tarakan	Borneo	2	10,000	20,000
Pambujan Sur	Phil.	1	5,000	5,000

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The method of calculating the number of ships in port per week in Table II is as follows, using the harbor of Konan (Chosen) as an example.

1) From Konan 270,000 tons of cargo are shipped per year, or 720 tons per day.

2) The average size of ship appearing in Konan harbor is approximately 3000 tons deadweight.

3) Therefore the removal of 720 tons of cargo per day will require $\frac{720}{3000}$ or .247 ships per day.

4) Average loading time at Konan is four days.

5) Average number of ships in port per week equals the number of ship arrivals per day (.247) x loading time (4) x days per week (7). For Konan the equation reads:

   Ships in port per week = .247 x 4 x 7 = 6.9 or in round number 7 ships in port per week.

6) The number of ships in port per day equals the number per week divided by 7.

Since the effective deadweight tonnage of a ship (the weight of cargo it can carry) is somewhat less than its deadweight tonnage (weight of cargo, fuel and stores) the use of the latter tonnage in this calculation serves to understate the number of ships required.

The harbors of Osaka, Tokyo, Wakamatsu, Nagoya, Yokohama, Moji, Shimizu and the Yangtze are points of destination and to allow for this fact a calculation similar to the above is made in estimating their ship concentrations.

The figures in Table II are estimates. They are subject to certain modifications, some of which are discussed under seasonal movements of commodities, and military shipping. The figures in the table are based on assumption of a uniform flow of commodities throughout the year. In actual fact the flow may vary considerably, due to military contingencies and the relative strength of various demands upon the available supply of bottoms. As shown above, two of the factors employed in calculating the size of weekly ship concentrations are the average tonnage of the vessels appearing in each port and the average time necessary to load these vessels. The data for each harbor on those two factors is based upon peace-time experience and an estimated current pattern of use of the merchant fleet. Actual Japanese practice will obviously cause deviation from the estimates used here, and these deviations will cause the sizes of ship concentrations found in Far Eastern harbors to vary from those presented in Table II. The purpose of the table is to provide a measure of the relative importance of these harbors, and to indicate (with allowance for the factors mentioned) an average expectancy.

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SEASONAL FACTORS IN SHIP CONCENTRATIONS

Commodities

The figures in Table II showing the number of ships per port are subject to modification in certain cases because of the seasonal movement of rice and sugar. Principal ports in this category are Rangoon, Bangkok, Saigon, and the Taiwan ports of Keelung, Niitaka and Takao.

There is a seasonal pattern in the export of rice from all of these harbors, and in the movement of sugar from the three Taiwan ports. The following tabulation shows the figures from Table II for all commodities for these 6 ports, and these figures adjusted to reflect seasonal production and export of rice and sugar.

SHIPS IN PORT PER WEEK

Adjusted for Seasonal Factors

	Month J	F	M	A	M	J	J	A	S	O	N	D	Average From Table II
Rangoon (Burma)	5					4				3			4
Bangkok (Thailand)	8					19				5			12
Saigon (Indo-China)	10			23				12					14
Keelung (Taiwan)	63			42			51			31			48
Takao (Taiwan)	26			17			21			8			20
Niitaka (Taiwan)	8			5			4						6

NOTE: Shaded areas are peak periods

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The increase in the number of ships in these ports during the rice and sugar export seasons is not great enough to materially reduce ship concentrations to be expected in other harbors during these same seasons. Considering all these ports, only 60 more ships per week are required during the season of greatest movement of these commodities than are required during the period of least movement. This total is an insignificant percentage of the total number of ships in port per week for all harbors in the Far East throughout the year - approximately 1300.

In addition to the above harbors, rice moves from Fusan and from the Yangtze. However, the tonnages involved are so small in relation to the total tonnage of all commodities moving from the Yangtze that the seasonal effect of rice movement is nominal. While rice is the only major commodity moving in bulk from Fusan, this harbor is constantly filled with ferry traffic between Chosen and Japan and the shipment of only 146,000 tons of rice from this point will employ a small number of ships compared to the total using the port.

Weather

Winter weather conditions obtaining between November-December and March curtail in varying degree the number of ships in the northern ports in Karafuto and Hokkaido. These ports are Esutoru, Honto, Kushiro, Maoka, Muroran, Otamari and Otaru. While the harbors are generally usable at this season, high winds and ice conditions will undoubtedly reduce the weekly ship concentrations in these ports during the winter. This seasonal factor cannot be evaluated quantitatively; the figures in Table II are on the basis of uniform flow throughout the year.

In the case of the east coast Malayan harbors of Kuala Dungun and Endau it is possible to allow for the effects of the NE monsoon which blows with great regularity. The monsoon renders these harbors unusable from November through March each year. The harbors are too shallow for ocean-going vessels and cargo is loaded from lighters in the roadstead; heavy swells make this impossible during the NE monsoon season. No shipping will be found from November through March. In Table II ship concentrations for Kuala Dungun and Endau are calculated on the basis of 7 months, April through October.

To a lesser degree the NE monsoon will reduce the ship concentrations in Kota Bahru-Tumpat and Kemaman.

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MILITARY SHIPPING

The amount of shipping which Japan presently requires to maintain her ground and air forces throughout the Far East is small relative to the sea-borne transport of basic commodities to Japan Proper.

To maintain these forces, it is indicated that approximately 155,000 tons of military supplies per week must be transported. This is based on the enemy order of battle for March 1943, and an estimate of over-all Japanese military shipping requirement of 1 gross ton per man per 60 days.

This 155,000 tons compares with approximately 1,327,000 sea-borne tons per week of commodities essential for the maintenance of the present Japanese war effort. The movement of military supplies (excluding initial invasion) thus represents about 10%, and the movement of industrial commodities about 90% of total shipping requirements.

In all areas except the SWP combat zone (New Guinea, New Britain, the Solomons) and the Aleutians, the number of ships arriving from Japan to load cargoes of basic commodities is substantially in excess of the number of ships required to transport military supplies to those areas. The number of ships arriving from Japan in Rangoon, Saigon and the Yangtze to pick up lead, rice and iron ore is greater than the number required to bring military supplies into those harbors. In general, therefore, the necessity of transporting military supplies does not mean a corresponding tonnage in addition to the ships going out light to pick up commodities, and can be expected not to materially alter the number of ships per week in the harbors listed in Table II, although unloading of military supplies will increase time in port.

Under present conditions, military supplies will not move into certain ports (such as Kuala Dungun, Paracale, Lutong, etc.) but may move in considerable volume into such ports as Singapore, Penang, Hong Kong through which the outward movement of commodities is not significant.

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SELECTED SHIP CONCENTRATIONS

Seventeen harbors from Table II are listed as key ports, because of the large amount of shipping which can be expected in them at any one time, and because of the importance of the commodities handled. These harbors are:

Port	Country	Port	Country
Wakamatsu-Yawata	Japan	Tsingtao	China
Osaka	Japan	Miike	Japan
Tokyo	Japan	Keelung	Taiwan
Moji	Japan	Chinwangtao	China
Nagoya	Japan	Chinnampo	Chosen
Muroran	Japan	Kuala Dungun	Malaya
Yokohama	Japan	Paracale	Philippines
Yangtze	China	(Calambayanga Is.)	
Dairen	Manchukuo	Lutong	British Borneo

(Priority ports are underscored)

Wakamatsu is the busiest harbor in the Far East and an average of over 600 ships can be expected here during any week of the year. This is the greatest coal shipping port, and also the destination of many ships bound for Japan. Moji is likewise both the source and destination of large shipments. Osaka, Tokyo, Nagoya and Yokohama are all important destination ports in Japan. Miike is a source of non-coking coal; Muroran is the important outlet for Hokkaido coal.

Considerable pig iron and coal cargoes are moved from Chinnampo in Chosen. Dairen is the outlet for Manchurian coal, pig iron, salt, and fertilizer. There is a steady flow of coking coal, pig iron, cotton, and salt out of the Chinese ports of Chinwangtao and Tsingtao. The Yangtze is an increasing source of iron ore, and a major military route.

Keelung is the principal port of Taiwan, from which rice, sugar, non-coking coal and copper are the chief exports. Paracale (Calambayanga Island) in the Philippines is a harbor for vessels handling over 1,000,000 estimated tons of high-grade iron ore a year.

Kuala Dungun in Malaya, used only during the SW monsoon April-November, is an important iron ore export point. Lutong is Japan's largest single source of crude oil, particularly fuel oil, and the 10,000 ton tankers likely to be found there are extremely valuable ships.

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Listed below are a number of harbors, some of which are not included in Table II, whose importance rests largely on other factors than commodity volume. A brief indication is given of the function of each harbor.

Aomori	Port for ferries between Honshu and Hokkaido.
Batavia	Large N.E.I. harbor; export point for miscellaneous commodities.
Fusan	Port for ferries between Chosen and Japan.
Hakodate	Port for ferries between Hokkaido and Honshu.
Hong Kong	Convoy assembly and ship repairs.
Kagoshima	Possibly a base for naval task forces.
Karenko	Destination port for bauxite and ore.
Nagasaki	Military embarkation point; ferries and miscellaneous shipping to China and Chosen.
Okayama (Uno), Takamatsu	Inland Sea transit points; connections with Shikoku.
Penang	Transit point and submarine base.
Shimonoseki	Military shipping; ferries to Chosen.
Singapore	Large harbor and transit point. Major naval base on north side of island.
Surabaya	Naval base; miscellaneous shipping.
Toyama	Destination of much bauxite ore.
Yokkaichi	Naval supply depot.

The accompanying Shipping map shows all ports discussed in this study, and the flow of commodities from each of them is indicated in broad outline.

(Note: The special report on "Japanese Shipping - Air Attack Data - April 1943" includes more detailed descriptions of harbor characteristics, harbor charts and available photographs.)

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MERCHANT FLEET POSITION

To move the commodity tonnages indicated in the preceding section, plus such military shipping as will require additional vessels, it is estimated that Japan in 1943 will require a merchant fleet of 4,500,000 to 5,000,000 gross tons.

JAPANESE SHIPPING POSITION AS OF JANUARY 1, 1943

Tonnage available Dec. 1, 1941 (Vessels of 100 gross tons or over, including those under Chinese and Manchurian flags, but excluding fishing craft, barges, etc.)	6,700,000	
New construction to Jan. 1, 1943	320,000	
Axis and French tonnage available	250,000	
Allied tonnage captured	250,000	
Allied sunken vessels raised and repaired	80,000	
TOTAL		7,600,000
Vessels sunk by Allied action to Jan. 1, 1943	1,600,000	
Ordinary marine losses	70,000	
Vessels seriously damaged in the War	400,000	
Vessels laid up for ordinary repairs	400,000	
Vessels captured which do not add to Japanese shipping potential (i.e. in essential local trade, etc.)	80,000	
Ferries, floating canneries, etc. not suitable for ordinary commercial use	80,000	
TOTAL		2,650,000
NET TOTAL		4,950,000

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Japan's shipbuilding capacity does not appear adequate to better her ship tonnage position in the near future.

As shown in the preceding table, Japan's losses up to January 1, 1943, were approximately 1,600,000 tons of merchant shipping. Estimated new construction for this period was 320,000 tons. Merchant ship construction for 1943 is estimated to be approximately:

Steel ships	650,000 gross tons
Wooden ships (in terms of steel ship efficiency: 3 tons of wood = 1 ton of steel)	200,000 gross tons
TOTAL	850,000 gross tons

Reference is made to the section on Naval Bases and Shipyards.

It is evident that, despite an accelerated program of new construction, Japan's current rate of ship loss exceeds her replacement capacity. Any additional losses imposed on Japan through air attack from China bases will further increase the ratio of loss to replacement.

In event of sufficient increase in shipping losses on the long South Pacific hauls and/or major change in the military situation, the Japanese alternative would be withdrawal toward or into the "inner triangle" northward from Taiwan. This would, however, have no appreciable effect on the shipment of commodities within the inner zone, which is estimated to currently represent approximately 80% of total Japanese seaborne commodity transport, or on the ship concentrations in the northern ports.

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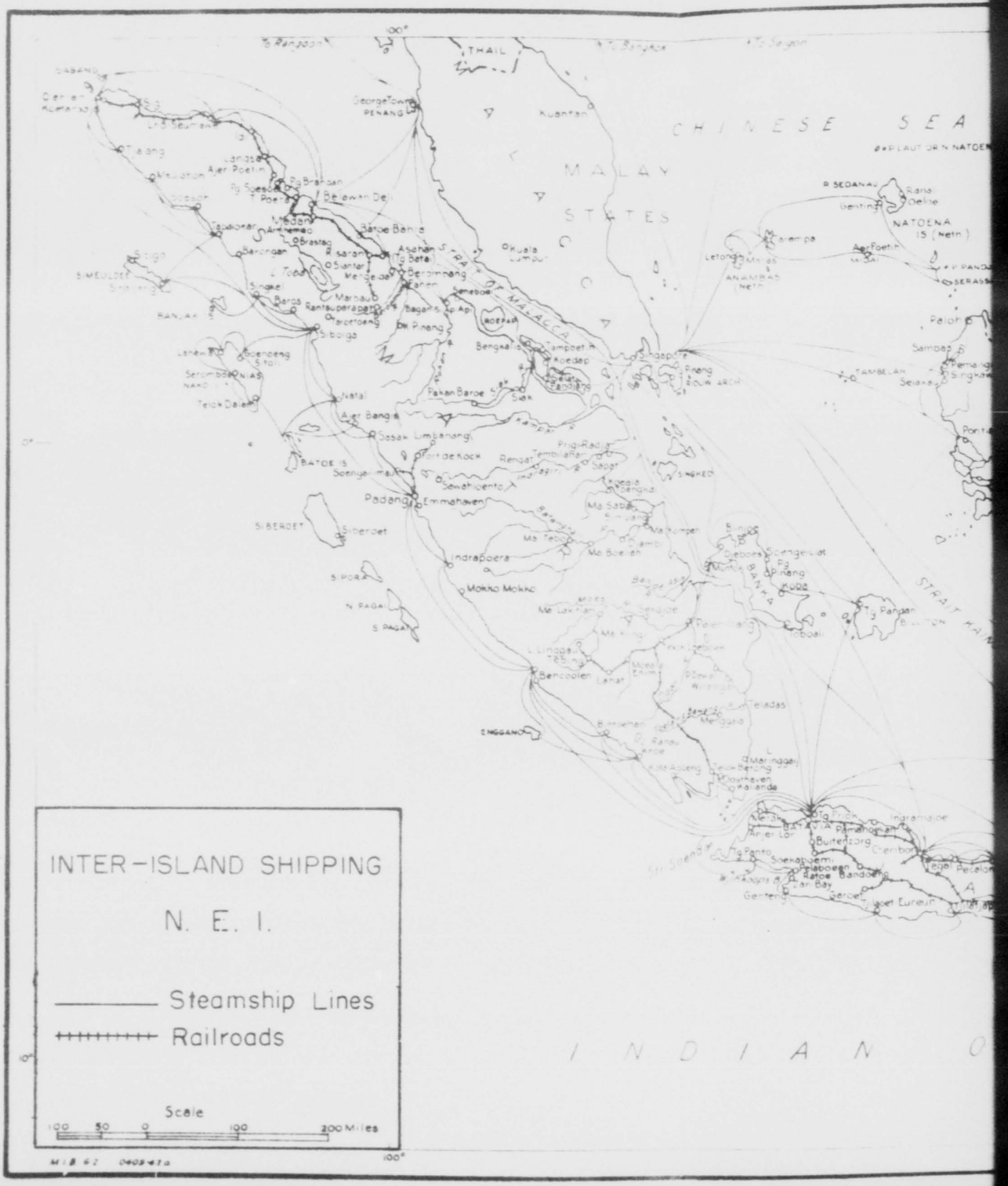

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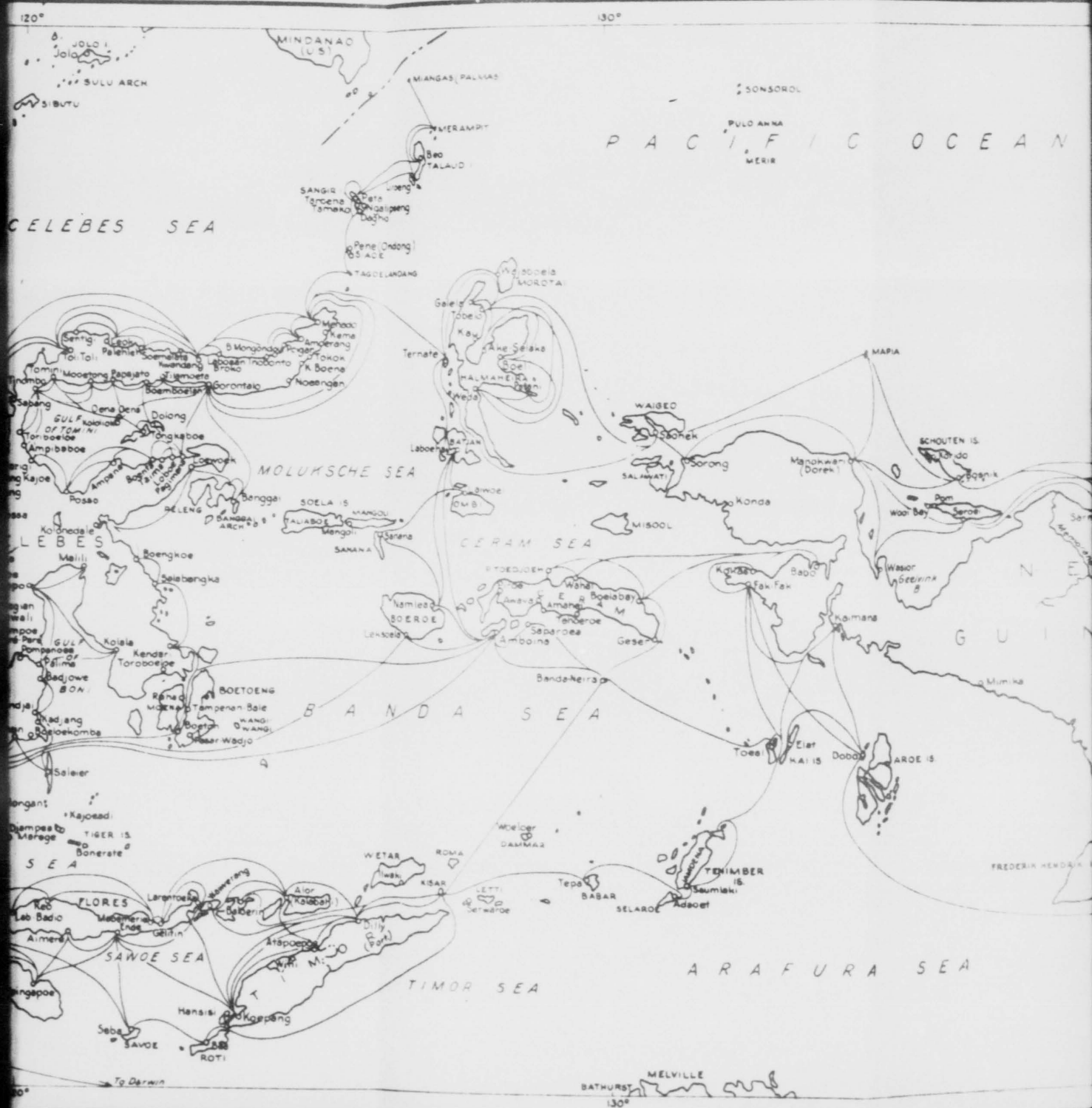

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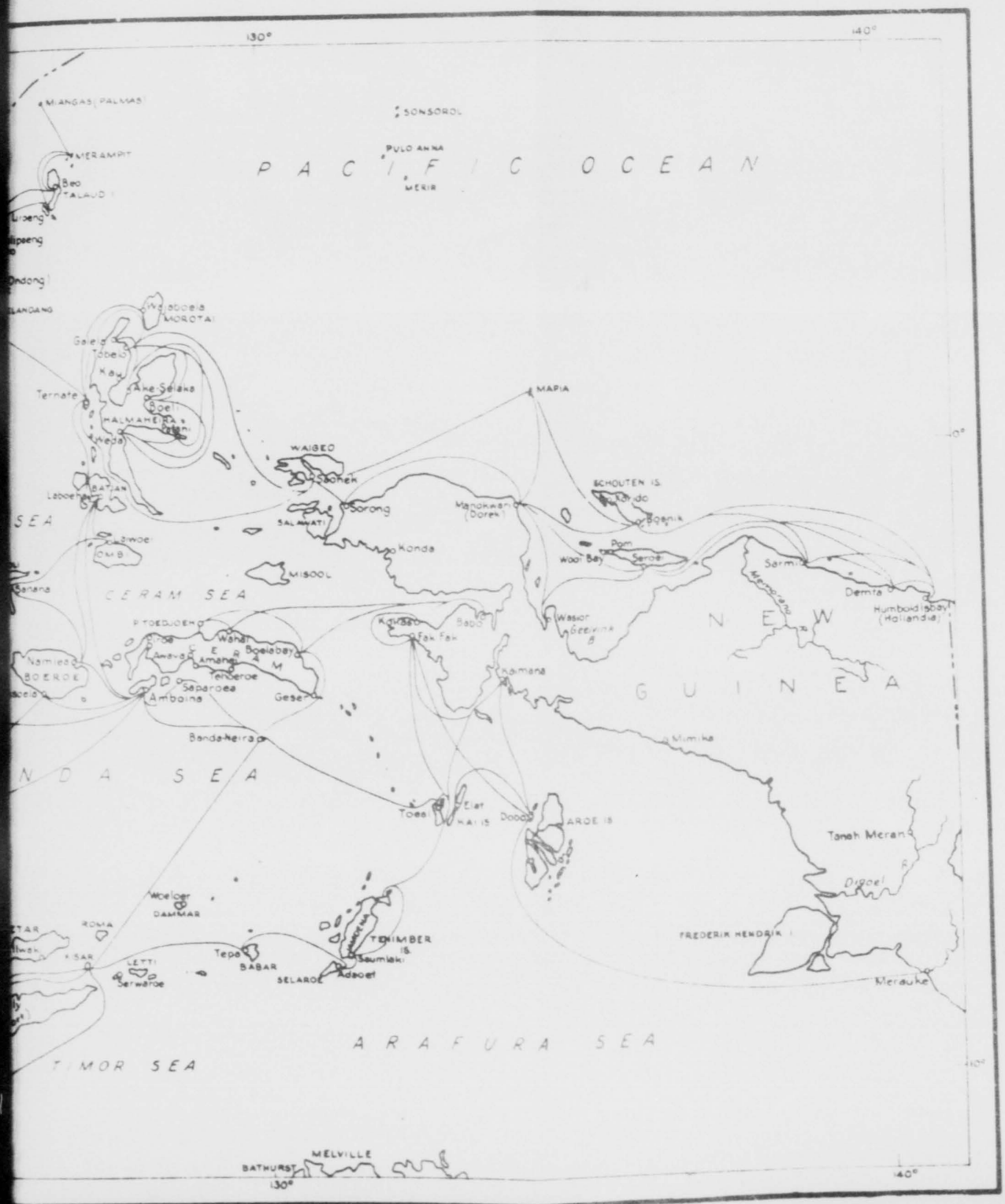

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All targets in folders to 3/1/43, grouped by Areas

JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
951	Port of Esutoru	One of 2 largest coal ports in Karafuto	49°08'N 142°02'E	973
952	Port of Maoka	One of Karafuto's two chief ports	47°03'N 142°03'E	968
953	Port of Otomari	One of Karafuto's two chief ports	46°38'N 142°46'E	966
954	Port of Honto	Only ice-free port in Karafuto	46°41'N 141°51'E	954
	HOKKAIDO NORTH (90.2)			
1048	Train Ferry Dock, Wakkanai	Terminal for train ferry Hokkaido-Karafuto	45°24'N 141°40'E	1048
	MURORAN (90.3)			
381a-d	Muroran Harbor Facilities	Important coaling piers	42°19'N 140°59'E	378
992a,b	Port of Otaru Facilities	Important coaling piers	43°12'N 141°00'E	992a
	HAKODATE (90.4)			
975	Western Wharf & Warehouses	Minor	41°46'N 140°43'E	974
976	Eastern Wharves & Warehouses	Minor	41°46'N 140°43'E	974
	AOMORI (90.5)			
993	Train Ferry Terminus (Aomori)	Important; terminus RR car ferry	40°50'N 140°44'E	993

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	AOMORI (90.5) (Continued)			
994	Warehouse Area (Aomori)	Minor	40°50'N 140°44'E	993
	AKITA (90.6)			
1069	Tsuchizaki Wharf	Port for Akita, small	39°45'N 140°04'E	1066
	KAMAISHI (90.8)			
190	Kamaishi Harbor	Important for area	39°16'N 141°54'E	189
	NIIGATA (90.9)			
1021	Wharves 1 & 2	Large warehouses; RR feeder lines	37°57'N 139°05'E	998
1022	Wharves 4 & 5	Large warehouses; feeder lines	37°56'N 139°04'E	998
1025	Wharf #3	Central warehouse	37°57'N 139°05'E	1005
	TOYAMA (90.11)			
862	Higashi Iwase Docks & Harbor	Rptd facilities for 10,000-ton vessels	36°46'N 137°14'E	862
867	Fushiki Docks & Harbor	No details	36°47'N 137°04'E	867
870	Nanao Docks & Harbor	Large, transhipment port, seaplane anchorage	37°02'N 137°00'E	870
	TOKYO (90.17)			
191	Mitsubishi Coal Depot	Only large coal depot in Kawasaki-Yokohama	35°30'N 139°43'E	NA

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
885	Takeshiba Pier	New construction	35°39'N 139°46'E	NA
886	Hinode Cho Pier	New, can handle six 2,000-ton ships	35°39'N 139°46'E	"
887	Shibaura Wharf	Accommodates seven 6,000-ton ships	35°38'N 139°46'E	"
1432	Yokohama Harbor Passenger Wharves	Can handle 50,000-ton ships	35°27'N 139°39'E	"
1433	Yokohama Main Pier	Largest pier in Yokohama	35°27'N 139°39'E	"
1434	Fukagawa Pier)		35°39'N 139°48'E	"
1435	Tsukishima Pier)	3 piers can handle 18 ships-2,000 to 6,000 tons	35°39'N 139°47'E	"
1436	Tsukishima East Wharf)		35°39'N 139°47'E	"
1437	Mitsubishi Piecegoods Wharf, Warehouses	Handle war supply shipments	35°30'N 139°43'E	"
1438	Kyoritsu Warehouse	Stores frozen foods	35°27'N 139°38'E	"
1439	Yokohama Central Wholesale Market	Stores fresh food & fish	35°28'N 139°38'E	"
1440	Mitsubishi Warehouse	Handles war supplies	35°27'N 139°39'E	"
1441	Yokohama Warehouse, North	Important storage	35°29'N 139°40'E	"
1442	Yokohama Warehouse, South	Important storage	35°28'N 139°39'E	"
1443	National Silk Conditioning House	Large, present use unknown	35°27'N 139°39'E	"
1444	Yokohama Harbor Timber Basin	Large	35°26'N 139°40'E	"
1445	Yokohama Harbor Co-op Purchasing Whses	Important warehouses	35°29'N 139°39'E	"
1446	East Asia Development Co Whses	Present use unknown	35°29'N 139°39'E	"
1447	Hiraidzumi Drug Depot	Present use unknown	35°29'N 139°40'E	"
1448	Tsukiji Market & Wholesale Warehouse	Important food distributing center	35°40'N 139°46'E	"
1449	Kanda Market (Tokyo)	Supplements Tsukiji Market	35°42'N 139°47'E	"
1450	Koto Market (Tokyo)	Supplements Tsukiji Market	35°41'N 139°48'E	"
1451	Naniwa Warehouse	Present use unknown	35°28'N 139°39'E	"
1485	South Manchurian Wharf & Whses	Large, has two travelling cranes	35°30'N 139°44'E	"
1493	Toshin & Shinko Warehouses	War shipping	35°27'N 139°39'E	"

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIZUOKA (90.18)			
1178	Docks & Harbor Facilities (Shimizu)	No details	35°00'N 138°30'E	1176
	NAGOYA (90.20)			
251	Nagoya Harbor	Important; 4th largest peace-time port	35°05'N 136°53'E	194
	MAIZURU (90.22)			
1032	Wharf 1-Tsuruga	Part of important military transhipment port	35°40'N 136°05'E	1033
1033	Wharf 2-Tsuruga	Part of important military transhipment port	35°40'N 136°05'E	1033
1034	Wharf 3-Tsuruga	Part of important military transhipment port	35°39'N 136°04'E	1033
1044	Maizuru Docks & Harbor Facilities	Rptd recent expansion	35°27'N 135°20'E	1039
	OSAKA (90.25)			
22	Kobe Harbor District #1	Most important section of Kobe Harbor	34°41'N 135°12'E	5
34	Kobe Harbor District #2	Important for coast-wise shipping	34°40'N 135°11'E	10
53	Osaka Harbor	One of Japan's important harbors	24°39'N 135°27'E	263
	OKAYAMA (90.27)			
1289	Uno Transport Base	Important port of embarkation	34°29'N 133°57'E	1295
	KURE (90.30)			
657	Kure Naval Base	Primary naval base	34°14'N 132°33'E	657

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURE (90.30) (Continued)			
658	Kure Submarine Base	Submarine base, school, depot	34°15'N 132°32'E	658
735	Army Transport Base	Ujina Port, principal military harbor	34°21'N 132°28'E	735
	SHIMONOSEKI (90.34)			
31	Port of Yawata	Important	33°52'N 130°48'E	28
32	Port of Wakamatsu	Very important coal & ore port	33°53'N 130°48'E	28
33	Port of Tobata	Secondary	33°54'N 130°49'E	29
42	Port of Shimonoseki	Important, port of embarkation	33°57'N 130°56'E	43a
44a	Moji Central Wharf	Important	33°57'N 130°58'E	44a
44b	Moji Southern Wharf	Important, takes ocean-going ships	33°58'N 130°57'E	43a
44c	Moji Coaling Station	Important	33°56'N 130°58'E	43a
44d	Komoriye Wharf	Secondary	33°55'N 130°57'E	43a
	KURUME (90.35)			
1254	Miike Harbor (Mikawa)	Important coal export port	33°00'N 130°25'E	1243
1255	Hakata Harbor (Fukuoka)	Secondary	33°36'N 130°24'E	664
	SASEBO (90.36)			
835	Nagasaki Wharves & Freight Yd	Important military traffic, terminus Shanghai run	32°45'N 129°52'E	835
836	Dejima Wharf, Nagasaki	Secondary	32°44'N 129°52'E	835
845	Sasebo Outfitting Wharf	Important, navy supply point	33°10'N 129°43'E	752

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JAPAN-HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SASEBO (90.36) (Continued)			
837	Imari Naval Harbor	Rptd minor naval station	33°16'N 129°53'E	
	JAPANESE ISLANDS (91)			
	KURILE ISLANDS (91.1)			
120	Kakumabetsu Harbor	Base for seaplanes, submarines, destroyers	50°23'N 155°37'E	120
121	Buroton Harbor	Small vessels & seaplane base	47°09'N 152°13'E	121
122	Hitokappu Harbor	Possibly air & submarine base	44°59'N 147°43'E	122
123	Matsugahama Harbor	Rptd best harbor in Kurile group	43°44'N 146°42'E	123
125	Shiramuka Anchorage	More data required	44°21'N 146°27'E	125
126	Chinomiji Hakuchi Anchorage	More data required	44°15'N 146°10'E	126
127	Tomari Anchorage	More data required	43°43'N 145°31'E	127
128	Inemoshiri Anchorage	More data required	43°48'N 146°50'E	128
129	Shakotan Anchorage	More data required	43°52'N 146°49'E	129
130	Nemo Anchorage	More data required	49°36'N 154°48'E	130
131	Kuroishi Anchorage	More data required	49°25'N 154°49'E	131
132	Kashiwabara Anchorage	Possibly developed for destroyers or sea-planes	50°41'N 156°08'E	132
133	Otamaye Anchorage	More data required	50°11'N 155°39'E	133
134	Musashi Anchorage	More data required	50°00'N 155°23'E	134
135	Kujira Anchorage	More data required	50°17'N 155°21'E	135
136	Yotsuiwa Anchorage	More data required	50°17'N 155°55'E	136
137	Tokotan Anchorage	More data required	45°52'N 149°48'E	137
138	Tsurigane Anchorage	More data required	46°06'N 150°10'E	138

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURILE ISLANDS (91.1)(Continued)			
139	Shimushiru Anchorage	More data required	46°52'N 151°51'E	139
140	Moyoro Anchorage	More data required	45°26'N 148°51'E	140
141	Tannemoye Anchorage	More data required	44°33'N 146°57'E	141
142	Naibo Anchorage	More data required	44°44'N 147°11'E	142
144	Bettobu Anchorage	More data required	45°17'N 148°03'E	144
	TAIHOKU (91.3)			
15a	Northwest Keelung Wharves	Important	25°09'N 121°44'E	15a
15c	Southwest Keelung Wharves	Important	25°08'N 121°44'E	15a
16	Eastern Keelung Wharves	Minor	25°08'N 121°44'E	15a
	TAIWAN WEST (91.4)			
100	Gosei Harbor	Expanded, believed important	24°15'N 120°32'E	100
101	Anping Harbor (Tainan)	Secondary	22°55'N 120°09'E	89
	TAIWAN EAST (91.5)			
64	Karenko Wharves	Most important harbor E coast Taiwan	24°00'N 121°38'E	61
65	Suo Basin	Rptd development into naval station	24°35'N 121°52'E	65

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAO (91.6)			
8a	Military Storehouses (Takao)	Important	22°37'N 120°17'E	8a
8b	Military Storehouses (Takao)	New; more data required	22°37'N 120°17'E	8a
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
13	Seishin Harbor	Important commercial, military port	41°47'N 129°50'E	13
14	Rashin Harbor	Major military & commercial port	42°13'N 130°18'E	14
15	Yuki Harbor	Important military & commercial port	42°20'N 130°24'E	15
	HEIJO (84.3)			
76	Cainnampo Harbor	Second largest tonnage handled in Chosen	38°43'N 125°25'E	76
77	Cainnampo Naval Fuel Depot	Coal storage	38°43'N 125°25'E	76
78	Rice Warehouses (Chinnampo)	One of largest rice storage depots in Chosen	38°44'N 125°25'E	76
79	Kenjiho Harbor	Serves Japan Iron Co Takes ships to 5,000 tons	38°44'N 125°38'E	66
80	Hosan Harbor	New, for ships to 4,000 tons	38°53'N 125°35'E	80
	GENZAN (84.4)			
89	Genzan Harbor	Growing modern all-purpose port	39°10'N 127°26'E	88
	CHOSEN EAST (84.5)			
49	Chumonshin Harbor	Small	37°54'N 128°50'E	49

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN EAST (84.5) (Continued)			
50	Hosui Harbor	Small	38°40'N 128°22'E	50
51	Sokuso Harbor	Small	38°12'N 128°36'E	51
52	Teira Harbor	Small	37°26'N 129°12'E	52
53	Koho Harbor	Small	36°41'N 129°28'E	53
54	Koko Harbor	Small	36°22'N 129°24'E	54
55	Hoko Harbor	Rptd submarine base	36°03'N 129°23'E	55
57	Taiho Harbor	Small	38°10'N 128°37'E	51
58	Bokuko Harbor	Small	37°33'N 129°07'E	58
	KEIJO (84.6)			
45	Jinsen Harbor	Large W Coast harbor	37°28'N 126°37'E	44
	FUSAN (84.7)			
97	Fusan Harbor	Principal commercial port in Chosen	35°06'N 129°03'E	97
	KOSHU (84.8)			
98	Reisui Harbor	Recently constructed port	34°44'N 127°44'E	98
99	Moppo Harbor	Growing importance, for small & medium ships	34°46'N 126°23'E	99
100	Kunsan (Gunsan) Harbor	One of primary Chosen rice shipping ports	35°59'N 126°41'E	100

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
85	Tashito Harbor Facilities	New, rptd large	39°50'N 124°25'E	85
	DAIREN (93.5)			
13	South Manchurian RR Piers	Very important facilities	38°56'N 121°40'E	1
14	Oil Piers	Major oil shipment point	38°55'N 121°41'E	2
15	Coal Pier	Major shipping point Manchukuo coal	38°58'N 121°38'E	1
	CHINA (83)			
	CANTON (83.4)			
50	Kowloon Wharves	Main wharfage; handles vessels of all sizes	22°18'N 114°10'E	55
51	Whampoa Wharves	New deepwater port for Canton; Jap transport point	23°06'N 113°26'E	51
52	Typhoon Refuge Harbor	Large protected junk harbor	22°19'N 114°10'E	55
	TSINGTAO (83.11)			
78	Piers & Whses (Tsingtao)	Largest concentration shipping between Chinwangtao & Yangtze River	36°05'N 120°19'E	78
79	Piers (Laoyao)	Rptd Japs dredging to handle output Tsaochwang mines (#65)	34°44'N 119°27'E	79

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TIENTSIN (83.12)			
1	New Japanese Coal & Ore Wharf	New, important, iron ore transhipment	39°01'N 117°39'E	4
3	Butterfield & Swire Co Wharves	Important shipping target	39°00'N 117°41'E	4
7	General Wharf Area	Important shipping target	39°00'N 117°40'E	4
14	Jardine Matheson Wharves	Important shipping target	39°07'N 117°12'E	11
22	Anchorage (Taku Bar)	Important shipping target	38°50'N 117°50'E	-
24	Piers (Chinwangtao)	Important shipping target, ice-free coal port	39°55'N 119°37'E	26
	FRENCH INDO-CHINA (85)			
	INDO-CHINA NORTH (85.1)			
28	Haiphong Docks	Second most important Indo-China port	20°52'N 106°41'E	N A
29	Coaling Station - Haiphong Harbor	Small	20°52'N 106°41'E	"
30	Port Redon Coal Storage & Dockyards	Handle approx 20% all Indo-China coal	20°59'N 106°45'E	"
31	Hongai Docks & Loading Facilities	Handle approx 35% Indo-China coal trade	20°57'N 107°04'E	"
32	Campha Port & Loading Facilities	Handle approx 30% Indo-China coal trade	21°01'N 107°21'E	"
33	Soc Anonyme d Const' Mecaniques	Only N Indo-China ship repair & heavy mach shop	20°51'N 106°40'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
28	New Government Port Area	New, extensive	13°42'N 100°35'E	31
29	Borneo Co Wharves	Also warehouses	13°43'N 100°31'E	26
30	China Thai Wharf Co	Cargo	13°43'N 100°31'E	26

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
24-32	Penang Harbor	Malaya's second largest harbor; see targets below	5°25'N 100°21'E	
24	Government Pier (Penang)	Government marine depot	5°22'N 100°19'E	27
25	Shell Oil Pier, Penang	Fueling jetty	5°24'N 100°19'E	27
26	Church Street & RR Wharves	2 piers for small vessels	5°25'N 100°21'E	27
27	Swettenham & Victoria Piers, Penang	Main piers of harbor; ocean-going vessels	5°25'N 100°21'E	27
28	Mitchell's Piers, Penang	Small	5°24'N 100°22'E	27
29	Lighter Pier, Penang	Small	5°23'N 100°23'E	27
30	Coal Wharf Area, Penang	Coaling quay for lighters	5°23'N 100°23'E	27
31	Penang Harbor Board Area	Workshops, graving dock, slipway	5°24'N 100°23'E	27
32	Straits S.S. Dockyard, Penang	Small slipway, shops	5°24'N 100°23'E	27
33-36	Port Swettenham	Malaya's third largest harbor; see targets below	3°00'N 101°24'E	
33	Shell Oil Pier	Fueling pier, small storage	3°00'N 101°23'E	35
34	Northern Wharves Area	Small Wharves	3°00'N 101°23'E	35
35	Southern Wharves Area	Large Wharves	3°00'N 101°23'E	35
36	Standard Oil Co Pier	Fueling pier storage	3°00'N 101°23'E	35
37	Kuala Dungun Harbor	Iron ore export; million tons during S W monsoon	4°47'N 103°26'E	37
39	Tumpat Harbor	Iron & manganese ore exportn	6°13'N 102°11'E	39
40	Kota Bahru Harbor	Iron ore export	6°09'N 102°14'E	40
41	Endau Harbor	Iron ore export, April-Oct.	2°40'N 103°38'E	41
42	Kemaman Harbor	Iron ore export	4°15'N 103°26'E	42

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SINGAPORE (92.2)			
10-14	Singapore Harbor	One of world's largest; see targets below	1°16'N 103°51'E	52
10	Singapore Harbor Board Area	Wharves & shops, two large drydocks, power plant	1°16'N 103°49'E	52
11	P-O & West Wharf Area	Large wharves & warehouses	1°16'N 103°50'E	52
12	Empire Dock Area	Ship basin, wharves, warehouses	1°16'N 103°50'E	52
13	Victoria & Albert Dry Dock Area	Two large drydocks, workshops	1°16'N 103°51'E	52
14	Telok Ayer Basin Area	Lighter basin	1°17'N 103°51'E	52
38	Batu Pahat Harbor	Iron & bauxite ore export	1°52'N 102°55'E	38
	BURMA (82)			
	BURMA SOUTH (82.2)			
11	Dock area (Rangoon)	Facilities for 20-30 deep-sea ships	16°46'N 96°10'E	14
12	Port Comm. Shops (Rangoon)	Maintains dredges, tugs, etc for port	16°46'N 96°10'E	14
13	Moulmein Harbor	Small wharves, light construction	16°29'N 97°37'E	4
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
13	Sabang Harbor	Jap fueling station & naval base	5°53'N 95°19'E	1
14	Belawan-Deli Harbor (Port Belawan)	Chief harbor of Sumatra	3°47'N 98°41'E	23
15	Pankalan Brandon Harbor	Oil export harbor	4°02'N 98°17'E	15
16	Pankalan Susu Harbor	Major oil export harbor	4°07'N 98°12'E	16

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SUMATRA NORTH (94.1) (Continued)			
17	Tanjoeng Oeban Harbor	Oil fueling station	1°04'N 104°12'E	17
18	Tanjoeng Pinang Harbor	Bauxite export harbor	0°55'N 104°27'E	18
19	Olehleh Harbor	Harbor for connection to Sabang Island	5°34'N 95°18'E	19
20	Lho' Seumaweh Harbor	Small	5°11'N 97°08'E	4
21	Bengkalis Harbor	Fishing port	1°28'N 102°06'E	21
22	Sibolga Harbor (Tapanuli Bay)	Main W coast harbor	1°44'N 98°45'E	22
	SUMATRA SOUTH (94.2)			
53	Palembang Harbor	Large; oil export	2°59'S 104°47'E	53a
53a	Palembang Harbor Coaling Wharf	-	3°01'S 104°45'E	53a
53b	Government Wharf & Warehouses	-	2°59'S 104°46'E	53a
53c	Small Tanker Dock	At Pladjoe refinery	2°59'S 104°48'E	61
53d	Large Tanker Dock - Shell	For Pladjoe refinery	2°59'S 104°50'E	61
53e	Large Tanker Dock - Standard	For Standard refinery	2°59'S 104°50'E	61
53f	N.V. Industrieele Mij	Small shipyard at Palembang	2°59'S 104°45'E	75
54	Emma Haven Harbor	Main W coast harbor	1°00'S 100°22'E	54
54a	Wharves & Warehouses	Four wharves at Emma Haven	1°00'S 100°22'E	54
54b	Emma Haven Coaling Quay	Outlet for Umbilan coal mines	1°00'S 100°22'E	54
54c	Wharf Workshop	Minor repairs	1°00'S 100°22'E	54
55	Oosthaven Harbor	Nearest harbor to Java	5°28'S 105°19'E	55
56	Tandjoeng Pandan Harbor	Tin ore export, Billiton Island	2°45'S 107°38'E	56
57	Muntok Harbor	Tin export	2°04'S 105°10'E	57
58	Pangkal Pinang Harbor	Tin export	2°08'S 106°09'E	58

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SUMATRA SOUTH (94.2) (Continued)			
59	Blinyu Harbor (Banka Island)	Minor	1°38'S 105°47'E	59
60	Sungei-Liat Harbor (Banka Island)	Minor	1°51'S 106°08'E	60
	JAVA (94.3)			
145a	Surabaya Commercial Harbor	Largest in N E I	7°12'S 112°43'E	174
145b	Surabaya Naval Harbor	Largest in N E I	7°12'S 112°44'E	174
146	Tandjong Prick Harbor	Batavia's harbor	6°06'S 106°53'E	177
147	Cheribon Harbor	Small N coast harbor	6°43'S 108°34'E	147
148	Semarang Harbor	Medium sized N coast harbor	6°57'S 110°25'E	148
149	Tjilatjap Harbor	Only good S coast harbor	7°44'S 109°00'E	149
150	Tegal Harbor	Small	6°51'S 109°08'E	150
151	Pekalongan Harbor	Small	6°51'S 109°41'E	151
152	Rembang Harbor	Small	6°41'S 111°21'E	152
153	Pasuruan Harbor	Small	7°42'S 112°56'E	153
154	Probolingo Harbor	Small	7°43'S 113°13'E	154
155	Panarukan Harbor	Small	7°41'S 113°56'E	155
156	Kalianget Harbor	Salt export	7°03'S 113°57'E	156
157	Banyuwangi Harbor	Nearest to Bali	8°13'S 114°23'E	157
158	Merak Harbor	Nearest to Sumatra	5°56'S 106°00'E	158
	BORNEO SOUTH (94.4)			
220	Balikpapan Harbor	Oil export; suitable for large naval base	1°16'S 116°49'E	219
221	Tarakan (Linkas) Harbor	Fuel Oil export point	3°17'N 117°36'E	221
222	Pontianak Harbor	Main W coast harbor	0°01'N 109°20'E	2

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BORNEO SOUTH (94.4)(Continued)			
223	Banjermasin Harbor	Main S coast harbor	3°20'S 114°35'E	223
	CALEBES - TIMOR (94.5)			
205	Ampenan Harbor	Small; Lombok's main trading center	8°34'S 116°04'E	205
206	Amoerang Harbor	Minor	1°12'N 124°34'E	206
207	Buleleng Harbor, Singaradia	Small; Bali's main trading center	8°06'S 115°06'E	207
208	Dilly Harbor	Main port of Portuguese Timor	8°34'S 125°37'E	208
209	Gorontalo Harbor	Minor	0°30'N 123°08'E	209
210	Kema Harbor	Minor	1°22'N 125°05'E	210
211	Kendari Harbor	Believed to be Jap base	4°02'S 122°40'E	211
212	Kolaka Harbor	Nickel ore export point	4°03'S 121°25'E	212
213	Koepang Harbor	Main port of Dutch Timor	10°10'S 123°35'E	213
214	Koeandang Harbor	Minor	0°51'N 122°55'E	214
215	Labuan Haji Harbor	Minor	8°42'S 116°34'E	215
216	Macassar Harbor	Main harbor in Celebes	5°08'S 119°24'E	202
217	Manado Harbor	Minor	1°30'N 124°50'E	217
218	Pare Pare Harbor	Minor	3°59'S 119°37'E	218
	PHILIPPINES (96)			
	P. I. (NORTH 96.1, SOUTH 96.2)			
2	Portmbayanga	Port for largest iron mine in Philippines	14°19'N 122°40'E	N A
3	Malaguit Bay	Port for third largest iron mine in Philippines	14°17'N 122°48'E	"
5	Masinloc	Port largest chrome production Philippines	15°33'N 119°56'E	"

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JAPAN - HARBOR FACILITIES AND WAREHOUSES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	PHILIPPINES (96.1,96.2)(Continued)			
7	Balurute	Port for high grade chrome ore shipment	15°45'N 119°53'E	N A
9	San Fernando la Union	Shipping point 90% Philippine copper ore	16°37'N 120°19'E	"
11	Manila piers, Port district	Center Manila shipping & storage	14°35'N 120°58'E	"
51	Pambujan Sur	Port for second largest iron ore producer	11°19'N 125°40'E	"
61	Cebu Port	Port of second largest city in Philippines	10°20'N 123°55'E	"
66	Santa Anna	Port of Davao; southern enemy base	7°04'N 125°36'E	"
67	Legaspi	Southern Luzon shipping, RR terminus	13°10'N 123°44'E	"
	BRITISH PACIFIC ISLANDS (81)			
	BORNEO NORTH (81.1)			
1	Kuching Harbor	Fuel, repair facilities	1°34'N 110°21'E	1
2	Sadong Harbor	Small coal port	1°23'N 110°45'E	2
3	Miri Harbor	Oil export	4°24'N 114°00'E	3
4	Jesselton Harbor	N terminus of RR	5°59'N 116°05'E	4
5	Kudat Harbor	Small	6°53'N 116°51'E	5
6	Sandakan Harbor	Large; fuel, repairs	5°50'N 118°07'E	6

*New target to be included in Folder revision

N A No number yet assigned when this list prepared

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March 1943 **NAVAL BASES AND SHIPYARDS**

	KEY TARGETS			
	TARGET			
	No.	Name	Importance	Obj. Area
1	171	Kawasaki Dockyard Co.	Ships- 18.3% Engines- 19.8%	Osaka (90.25)
2	542-544	Mitsubishi Shpyd & Eng. Wks.	Ships- 12.2% Engines- 14.6%	Sasebo (90.36)
3	1295	Mitsui Tama Shipyard	Ships- 11.6% Engines- 6.5%	Okayama (90.27)
4	69	Yokohama Dockyard	Ships- 8.9% Engines- 5.7%	Tokyo (90.17)
5	1460-1461	Uraga Dockyard	Ships- 5.5% Engines- 6.9%	Tokyo (90.17)
6	169	Mitsubishi Dockyard, Kobe	Ships- 5.3% Engines- 2.8%	Osaka (90.25)
7	657	Kure Naval Base	Ships- 1.5% Engines- 1.5%	Kure (90.30)
8	752	Sasebo Naval Base	Ships- 1.2% Engines- 5.9%	Sasebo (90.36)
9	274	Yokosuka Naval Base	Ships- 1.6% Engines- 3.1%	Tokyo (90.17)
10	860	Koyagi Shima Shipyard	Ships- 2.6% Engines- 1.2%	Sasebo (90.36)
11	1296	Harima Shipyard	Ships- 8.6% Engines- 1.0%	Okayama (90.27)
12	1037-1043	Maizuru Naval Base	Ships- 0.6% Engines- 6.9%	Maizuru (90.22)
13	272-699	Osaka Iron Works	Ships- 6.5% Engines- 2.2%	Osaka (90.25)
14	273	Fujinagata Shipyard	Engines- 8.4%	Osaka (90.25)
15	N A	Dockyards at Shanghai	Important bldg. and repairs	Shanghai (83.1)
16	974	Hakodate Dockyard	Important repair yard some building	Hakodate (90.4)
17	20-22	Singapore Naval Base	Fueling, supply, and repair base	Singapore (92.2)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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NAVAL BASES AND SHIPYARDS

The indicated dependence of Japan upon water-borne transportation and the comparative stringency of her present shipping position give critical importance to the fact that the drydocks and other repair facilities are necessary in order to maintain and restore vessels damaged in action, and the further fact that the shipbuilding yards have the capacity to launch an annual tonnage equal to one-fifth of the total vessel tonnage afloat.

It is estimated that the shipbuilding yards in Japan Proper and Japanese-controlled territory are capable of constructing 800,000 - 1,000,000 gross tons of commercial and naval ships in 1943. This figure represents the capacities of the known building yards, as demonstrated by past achievement or reliable information concerning current capacities. (Since the private yards are used extensively for naval construction and repair, the naval yards and commercial yards are considered together in this report.)

It seems clear from information coming out of Japan, however, that the shipbuilding industry was unable to operate at any level close to capacity in 1940 and 1941. The failure of the shipbuilding industry to reach capacity output has been variously attributed to shortages of materials, lack of skilled labor, and delays in transportation of supplies. Undoubtedly, all these factors have been at work in the years 1940-1942, and will persist to some extent in 1943. The drainage of manpower into the armed forces has impaired the output in this as in other industries. Since steel is the principal material used in the shipbuilding industry, the possibility of reaching capacity in the shipyards is dependent upon the availability of an adequate quantity of steel plate. As is indicated in the Iron & Steel section of this report, the steel rolling mills in the Far East appear to be capable of rolling nearly three times the quantity of steel plate which would be required in the shipbuilding industry if it were operating at a rate of a million tons per year. It seems probable, therefore, that any shortage of steel plate cannot be attributed to lack of plate-making capacity, but rather to the general steel shortage which makes it necessary for the Japanese to limit the amount which may be allocated to the shipbuilding industry.

It seems possible that by resorting to wooden ship construction, by stimulating steel plate production, and by assuring an adequate skilled labor supply to the shipbuilding trade, the quantity of shipping tonnage launched in 1943 may exceed that in recent years and may even approach the indicated capacity mentioned above.

The yards engaged in the building and repairing of ships are widely scattered throughout the Far East but those which are significant contributors to the total shipbuilding output are comparatively few. The five leading shipyards, all located in the western half of Japan, account for about 60% of the bottoms launched and 48% of the marine engines built. Since the facilities for repairing vessels are in most cases connected with the shipbuilding yards, the targets important in ship construction are also significant in the repairing branch of the industry. The seventeen key targets listed in the accompanying table appear to construct about 84% of the vessels and 87% of the marine engines, and they perform perhaps 50-60% of the repair work.

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The four major naval bases in Japan Proper and the Singapore base constitute key targets because of their important repair, fueling, and supply facilities. The four Japanese Navy Yards are important also in the construction of naval vessels and the machinery and ordnance therefor. Damage to the facilities at the naval bases or to warships lying at anchor there would interfere with operations necessary to keep the fleet in combat condition.

The engine works and machine shops at shipyards warrant special attention as targets. This is true not only because the marine engine industry is highly centralized in a few large plants, but also because it would be difficult and time-consuming to replace these plants. The drydocks used for repairing vessels are perhaps the least vulnerable because of their heavy concrete construction. Considerable interruption could be achieved in the work of the shipyard by hitting ships which are still on the building ways but are nearly completed. Such destruction would not only demolish the ship itself but would tie up the way for several weeks or months.

It is estimated by shipbuilding engineers that a building way can be constructed in about two months and a drydock in about six months, given conditions of available building materials and construction labor. Successful air attack upon a shipbuilding and repair yard would therefore create a considerable and costly delay before the facilities could be restored. So far as damage to building ways is concerned, the effects of air attack would be more temporary and more easily remedied than the damage from attacks which concentrated on plants important in the marine engine business. Any substantial curtailment of the output of these plants would be directly effective in cutting the output of new ships, inasmuch as there is almost certainly no stockpile or inventory of ship propulsion machinery.

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	HAKODATE (90.4)			
974	Hakodate Dock Yard	Secondary ship repair yard	41°47'N 140°42'E	974
	AOMORI (90.5)			
996	Naval Base and Air Sta (Ominato)	Secondary base for destroyers, aircraft, etc.	41°16'N 141°09'E	996
	MITO (90.14)			
1477	Kisarazu Fleet Fueling Base	Important; Tokyo Bay fueling base for fleet	35°23'N 139°55'E	373
	TOKYO (90.17)			
	NAVAL BASES			
	Yokosuka Naval Base	Targets 274-1486 Navy Adm HQ, capital ship bldg	35°17'N 139°40'E	
274	Shipyard & Docks, Yokosuka Naval Base	(See Shipyards)	35°17'N 139°40'E	N A
276	Experimental Laboratories & Ordnance Plants	Very important	35°17'N 139°40'E	"
277	Refitting Berths for Battleships & Cruisers	Large capacity	35°17'N 139°40'E	"
278	Yokosuka Naval Barracks	Base personnel	35°17'N 139°41'E	"
282	Yokosuka Arsenal & Armaments Works	Large, important	35°18'N 139°38'E	"

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
295	Yokosuka RR Station Oil Tanks	Surface tanks	35°17'N 139°39'E	N A
296	Mine & Aircraft Stores	Large & important	35°18'N 139°39'E	"
297	Hako Point Oil Tanks (Yokosuka)	Surface & underground tanks	35°18'N 139°39'E	"
298	Yokosuka Naval Air Station	(See Airports)	35°19'N 139°39'E	"
1392	Naval Aircraft Factory & Research Center	Key naval air experimental center	35°18'N 139°38'E	"
1452	Base Headquarters	Includes residence C-in-C	35°17'N 139°40'E	"
1453	Gunnery & Navigation Schools	Training center	35°18'N 139°40'E	"
1454	Hanare Drydock	Large, new drydock	35°18'N 139°40'E	"
1455	Oyama Point Ammunition & Powder Stores	Large	35°18'N 139°38'E	"
1456	Torpedo & Wireless School	Important source fleet personnel	35°18'N 139°38'E	"
1457	Montonaga Inlet Oil Tanks (Yokosuka)	7 or more oil tanks	35°18'N 139°39'E	"
1458	Yokosuka Naval Radio	Range 1500-2000 nautical miles	35°17'N 139°39'E	"
1486	Old Aircraft Center	Supplements #1392	35°18'N 139°38'E	"
	SHIPYARDS			
69	Yokohama Dockyard Mitsubishi Heavy Industries	One of largest in Japan	35°27'N 139°38'E	N A
70	Asano Dockyard (Yokohama)	Almost entirely a repair yard	35°28'N 139°39'E	"
71	Uraga Dockyard #3 (Yokohama)	Small branch of Uraga Shipbuilding Yard	35°27'N 139°38'E	"
122	Tsurumi Steel & Shipbuilding (Yokohama)	Ocean-going tankers, other ships; rptd also cruisers	35°29'N 139°42'E	"
274	Shipyard of Yokosuka Naval Base	Very important; among largest yards in Japan	35°17'N 139°40'E	"
330	Ishikawajima Dockyard Ishikawajima Shipbldg & Engineering	Important engineering works, shipbuilding yard	35°40'N 139°47'E	"

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
1459	Susaki Dkyd Ishikawajima Shipbldg & Engineering	At least one 20,000-ton drydock, 3-4 bldg slips, gantries	35°39'N 139°48'E	N A
1460	Uraga Dockyard #1 (Yokosuka)	Can build all types naval vessels up to large cruisers	35°15'N 139°43'E	"
1461	Uraga Dockyard #2 (Yokosuka)	Integrated operation with Dockyard #1	35°15'N 139°43'E	"
1462	Shinagawa Shipyard (Tokyo)	Repairs merchant ships; 4 ways, 3000-ton drydock	35°36'N 139°45'E	"
	SHIZUOKA (90.18)			
1185	Shipyard (Shimizu)	Minor shipyard	35°00'N 138°31'E	1176
	MAIZURU (90.22)			
1037-1043	Maizuru Naval Base	Rptd 4th largest in Japan	35°29'N 135°22'E	1039
	KUMANO (90.24)			
1216	Toba Dockyard	Builds small fishing & coastwise boats	34°28'N 136°51'E	1215
	OSAKA (90.25)			
169	Mitsubishi Dockyard	Important; building & repair, capital ships	34°39'N 135°11'E	10
171	Kawasaki Dockyard Co	Important; can build capital ships	34°40'N 135°11'E	10
272	Osaka Iron Works Unit #1	Important; can build ships of 12,000-ton class	34°40'N 135°27'E	263
273	Fujinagata Shipyard	Light cruisers, destroyers, submarines	34°37'N 135°28'E	325
699	Osaka Iron Works Unit #2	Operates in conjunction #272	34°38'N 135°28'E	325

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OKAYAMA (90.27)			
1295	Mitsui Tama Shipyard	Major shipyard	34°28'N 133°56'E	1295
1296	Harima Shipyard	Rptd more than 10% commercial shipbuilding	34°47'N 134°28'E	1296
	NIIHAMA (90.29)			
927-a	Habu Works of Osaka Iron Works Innoshima Shipyards	One of largest repair yards, also bldg	34°16'N 133°11'E	927-a
927-b	Shannosho Works of Osaka Iron Works Innoshima Shipyards	One of largest repair yards, also bldg	34°16'N 133°11'E	927-a
928	Mukaishima Drydock Co	Repairs, possibly some bldg	34°24'N 133°13'E	928
929	Mihara Shipyards	Rptd new yard, no details	34°23'N 133°05'E	933
930	Saizaki Dockyard	Rptd new yard, no details	34°20'N 133°02'E	None
	KURE (90.30)			
657-b	Kure Naval Shipyard	Largest in Japan	34°14'N 132°33'E	657
	TOKUYAMA (90.32)			
668	Kasado Jima Dock Co & Osaka Iron Works	2 docks & at least 2 drydocks	33°57'N 131°51'E	672

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIMONOSEKI (90.34)			
43-a	Hiko I Shipyards & Engine Works	Important; patrol boats, repairs ships to 6,000 tons	33°56'N 130°56'E	43-a
43-b	Osaka Iron Works Drydocks	Important ship repair	33°56'N 130°56'E	43-a
558	Tochigi Shipbuilding Yards	Rptd secondary but expanding	33°55'N 130°49'E	29
	SASEBO (90.36)			
542	Akunoura Engine Works (Nagasaki)	Very important, marine engine production	32°44'N 129°52'E	542
543	Mitsubishi Dockyard (Nagasaki)	Important repair dockyard	32°44'N 129°51'E	544
544	Tategami Shipyard (Nagasaki)	Very important naval & commercial shipbuilding	32°44'N 129°51'E	544
752	Sasebo Naval Dockyard	Very important; bldg, principal navy repair base	33°10'N 129°42'E	752
828	Matsuo Engine Works (Nagasaki)	Secondary, marine engine production	32°45'N 129°52'E	542
860	Koyagi Shima Shipyard, Matsuo Iron Works	Secondary shipbuilding	32°42'N 129°49'E	542
	JAPANESE PACIFIC ISLANDS (91)			
	TAIHOKU (91.3)			
15-b	Gyucho Harbor Dockyard, Taiwan Dockyard Co	Important; only large dockyard in Taiwan	25°09'N 121°44'E	15-a
23	Sharyo To Shipyard	Small shipyard	25°10'N 121°45'E	15-a
24	Keelung Submarine Base	Rptd converted to submarine base	25°09'N 121°45'E	15-a

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAO (91.6)			
7	Kigo Naval Dockyard (Takao)	Only shipyard southern Taiwan	22°37'N 120°16'E	7
56	Toshien Dockyard (Toshien)	New yard, size not known	22°41'N 120°16'E	56
	PESCADORES (91.7)			
145-147, 149-153, 156,158	Ansan Naval Base	Key to naval defense of Taiwan	23°33'N 119°34'E	148
148	Kotei Naval Anchorage	Cruisers, submarine, motor-torpedo boat base	23°35'N 119°38'E	148
	CHOSEN (84)			
	GENZAN (84.4)			
87	Genzan Submarine Base	New submarine base	39°12'N 127°29'E	88
	FUSAN (84.7)			
101	Chinkai Naval Base	Fleet anchorage, minor naval sta, mine base	35°09'N 128°38'E	101
102	Chinkai Naval Shipyard	Small ships, minor repairs to destroyer class	35°09'N 128°38'E	101

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (93)			
	DAIREN (93.5)			
10	Manchuria Dockyard Co	Most important dockyard in Manchukuo	38°56'N 121°39'E	1
11	Naval Dockyard	2 graving docks; one building slip	38°48'N 121°16'E	11
	CHINA (83)			
	CANTON (83.4)			
53	Taikoo Dockyard	Large yd, drydock, slipways, all repairs	22°17'N 114°13'E	55
54	Royal Navy Yard	Small but modern & well equipped	22°17'N 114°10'E	55
55	Kowloon Dockyard	Large yd, builds ships to 10,000 tons, repairs	22°18'N 114°10'E	55
56	Cosmopolitan Dock	Large, all types repairs, builds medium freighters	22°19'N 114°10'E	55
57	Aberdeen Dock	Small	22°17'N 114°09'E	55
	HAINAN (83.6)			
33	Yulinkan Harbor Naval Base	Important submarine base	18°13'N 109°32'E	33
	TSINGTAO (83.11)			
93	Drydock (Tsingtao)	Can handle destroyers; repairs	36°04'N 120°18'E	78
94	Jap Naval Repair Shop (Tsingtao)	Small navy yard	36°05'N 120°19'E	78

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TIENTSIN (83.12)			
2	Taku Tug & Lighterage Co (Taku)	Important; repairs, concentration tugs, lighters	39°00'N 117°42'E	4
6	Chinese Naval Dockyard (Taku)	Repairs for local shipping	38°59'N 117°40'E	4
20	Hai Ho Conservancy Board Dockyard (Tientsin)	Harbor maintenance equipment	39°06'N 117°13'E	11
29	Tientsin Lighter Co (Taku)	Important; repairs, concentration tugs, lighters	39°00'N 117°41'E	4
	THAILAND (98)			
	THAILAND (98.1, 98.2, 98.3)			
53	Bangkok Dock Co	Chief commercial ship repairs in Bangkok	13°43'N 100°31'E	26
54	Ministry of Marine Compound	Naval dockyard, machine shops; fortified	13°45'N 100°29'E	26
55	Fort Chulachomklao (Bangkok)	Rptd main fort, also drydocks, workshops	13°32'N 100°35'E	55
56	Royal Irrigation Dept	Repairs large diesel dredgers	13°47'N 100°31'E	26
57	Satahib Naval Base	Rptd new main naval base of Thai Navy	12°40'N 100°53'E	12
	BRITISH MALAYA (92)			
	SINGAPORE (92.2)			
15-23	Singapore Naval Base	Very important; see targets below	01°28'N 103°50'E	

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JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SINGAPORE (92.2) (Continued)			
15	Shell Oil Co Facilities	Storage & fueling jetty	01°27'N 103°46'E	17
16	Ammunition Depot Jetty Area	Military stores; jetty	01°28'N 103°48'E	17
17	Fourth Senoko Oil Depot	Rptd 39 tanks 3,275,000 bbls capacity	01°27'N 103°48'E	17
18	Naval Base Radio Station	Powerful; overseas communication	01°28'N 103°49'E	17
19	Sembawang River Area	Piers, warehouses, cement plant	01°28'N 103°49'E	17
20	Drydock and West Wall Area	1000 ft graving dock, large berthing space, cranes	01°28'N 103°50'E	17
21	Workshop Area	Shops for all repairs to largest ships	01°28'N 103°50'E	17
22	North Wharf Area	2200 ft dock, 50,000 ton & 5000 ton floating drydocks	01°28'N 103°50'E	17
23	Naval Stores Basin Area	Large basin, warehouses	01°28'N 103°50'E	17
51	Tandjong Rhu Shipyards	Three shipyards for bldg, repairing small ships	01°18'N 103°52'E	52
	BURMA (82)			
	BURMA SOUTH (82.2)			
14	Dalla Dockyard (Rangoon)	Repairs some ocean ships, builds river boats	16°46'N 96°10'E	14
15	Ahlone Foundry (Rangoon)	Castings for river boats	16°47'N 96°08'E	14
16	Pazundaung Foundry (Rangoon)	Rptd expanded by Japs for truck repair	16°46'N 96°11'E	14

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - NAVAL BASES AND SHIPYARDS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	PHILIPPINES (96)			
	PHILIPPINE ISLANDS NORTH (96.1) PHILIPPINE ISLANDS SOUTH (96.2)			
19	Cavite	Naval base restored by enemy	14°29'N 120°54'E	NA
33	Philippine Slipways	Small wooden boat construction	14°35'N 120°59'E	"
34	Varedero Slipways	Small wooden boat construction	14°35'N 120°59'E	"

N A - No number yet assigned when this list prepared

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March 1943

AIRCRAFT

	KEY TARGETS			
	TARGET			
	No.	Name	Importance	Obj. Area
1	10	Kawasaki Aircraft	) 15% of engine cap.) 15% " plane "	Osaka (90.25)
2	11	Kawasaki Dkyi Aircraft Plant	))	Osaka (90.25)
3	193	Mitsubishi Engine Plant	) 16% of engine cap.) 15% " plane "	Nagoya (90.20)
4	194	Mitsubishi Aircraft	))	Nagoya (90.20)
5	356	Nakajima Airc. Ogikubo plant	) 15% of engine cap.)	Tokyo (90.17)
6	357	Nakajima Airc. Musashino plant	))	Tokyo (90.17)
7	789	Nakajima, Ota Plant	15% of plane cap.	Takasaki (90.13)
8	18	Kawanishi Airplane	) 5% of engine cap.) 5% " plane "	Osaka (90.25)
9	198	Aichi Aircraft	3% of engine cap. 3% " plane "	Nagoya (90.20)
10	791	Showa Aircraft	3% engines, planes; probably more	Tokyo (90.17)
11	331	Tokyo Gas & El Engineering	4% engines, planes	Tokyo (90.17)
12	792	Tachikawa Aircraft	3% engines, planes; probably more	Tokyo (90.17)
13	1391	Ishikawajima Engine plant	3% engines, planes	Tokyo (90.17)
14	799	Mitsubishi, Oimachi plant	At least 2% engines	Tokyo (90.17)
15	240	Kawasaki Kaganigahara plant	Large plane prod.	Nagoya (90.20)
16	539	Nakajima Airc, Tanashi fndry	Key aluminum castings foundry	Tokyo (90.17)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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AIRCRAFT

The indicated annual production of the Japanese industry is approximately 10,000 airplanes of all types and 25,000 engines.

Capacity estimates range from 5,000 airplanes to more than 20,000. Factors against such high volume are (aside from strategic policies, pilot personnel, etc.) supply of skilled labor and specialized production of equipment, particularly engines. Well-organized Japanese engine maintenance tends to reduce total power plant requirements, but supply of engines is believed to be a principal limitation on plane production. In turn, this is controlled by availability and production of machine tools, bearings, etc., to an extent indicating around 10,000 airplanes as a reasonable present capacity.

Over 60% of engine production is concentrated in the Nagoya and Tokyo areas (approximately 25% each) and the Kobe-Osaka area (20%). This production is principally from 6 plants.

15% of total engines is credited to the two adjacent Kawasaki plants at Kobe. Another combined 15% is estimated for the newer Mitsubishi plant (ostensibly a spinning mill) and the nearby older Mitsubishi plant at Nagoya. Nakajima's Musashino and Ogikubo plants at Tokyo are rated 12-15% of total engines. Nakajima's Tanashi foundry at Tokyo is a key supplier to these and other aircraft plants. Capacity of the established plants has been considerably supplemented by conversion of automobile plants, use of spinning-mill type structures, etc. This expansion has been in these same general areas of engine production. Production in the Nagoya area, for example, reportedly has been considerably increased by construction of a new Aichi plant and conversion of the Toyoda Automobile plant at Koromo.

Over 60% of plane production also is in the Tokyo (including Ota) and Nagoya areas (approximately 25% each) and the Kobe-Osaka (20%) area. The largest known assembly capacity is Nakajima at Ota, approximately 15% o the Japanese total. The combined output of the two Kawasaki plants at Kobe and of the two Mitsubishi plants at Nagoya (see engines, above) is around 15% in each case. Kawanishi at Kobe and the Kawasaki plant at Kagamigahara near Nagoya probably each produce 5% of planes; of comparable importance are Showa, Tachikawa and Tokyo Gas & Electric Engineering, all at Tokyo. There are known to be new and important plane plants in Mukden (Manchukuo) and Heijo (Chosen); partly supplied with equipment from plants in Japan proper, they have been reported to each have assembly capacity comparable to the larger plants in Japan but there is no accurate information.

Many other plants, listed in the Automobile, Machine Tool and other sections of this report, are of known but not closely determinable importance in Japanese aircraft production. There are also hundreds of "backyard industry" units. This type of capacity is widely dispersed.

Of major importance in aircraft production are Japan's capacities in alumina and aluminum. As indicated in the Non-Ferrous Metals section, the aluminum position is estimated to be such (allowing for stockpiles, etc.) that it is not currently a limiting factor in aircraft production. Aircraft requirements should be comfortably covered by 50% of estimated present aluminum production. Reduction of aluminum output below this level, which could be accomplished by destruction of the two largest alumina plants, would give critical leverage to direct impairment of plane and engine capacity.

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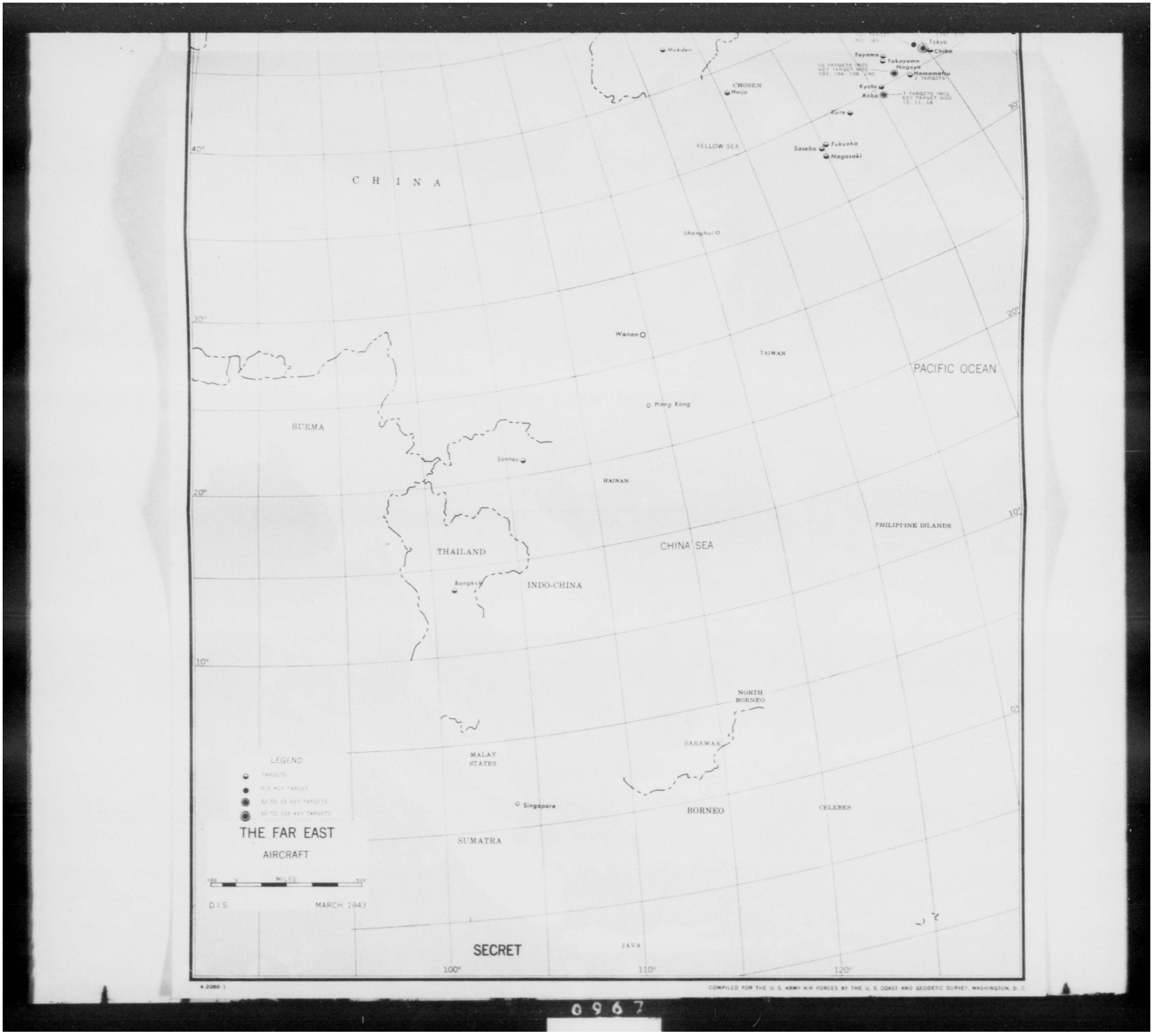

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - AIRCRAFT INDUSTRY

TARGET NO.	TARGET	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	TOYAMA (90.11)			
941	Fuji Special Steel Co.	Parts, tools	36°41'N 137°14'E	941
	TAKASAKI (90.13)			
789	Nakajima Aircraft, Ota plant	One of largest; estimated 15% Jap planes	36°18'N 139°22'E	789
	MITO (90.14)			
1519	Ito Aircraft	Secondary production planes	35°40'N 140°02'E	1519
	TAKAYAMA (90.15)			
1480	Hida Hokko Co (Takayama)	Minor production planes	36°08'N 137°16'E	1480
	TOKYO (90.17)			
327	Mitsubishi Aircraft, Shibaura plant	Engines, parts	35°38'N 139°45'E	N A
331	Tokyo Gas & Elec Engineering	Important production planes, engines, parts	35°36'N 139°44'E	"
332	Nakajima Seaplane Works	Little known	35°36'N 139°44'E	"
356	Nakajima Aircraft, Ogikubo plant	With #357, estimated 15% engine production	35°42'N 139°37'E	"
357	Nakajima Aircraft, Musashino plant	With #356, estimated 15% engine production	35°42'N 139°35'E	"
368	Aeronautical Instruments plant	No details	35°36'N 139°43'E	"
539	Nakajima Aircraft, Tanashi plant	Key foundry for area aircraft industry	35°44'N 139°34'E	"
791	Showa Aircraft	Important engine, plane production	35°44'N 139°22'E	"

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JAPAN - AIRCRAFT INDUSTRY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
792	Tachikawa Aircraft	Important production planes, engines	35°42'N 139°24'E	N A
799	Mitsubishi Aircraft, Oimachi plant	Important production engines, parts, instruments	35°36'N 139°44'E	"
919	Tokyo Measuring Works	Rptd largest instrument plant Far Eas	35°33'N 139°44'E	"
1390	Hitachi-Solex Aircraft	Engines, parts, ordnance	35°24'N 139°32'E	"
1391	Ishikewajima Engine plant	Engines, components	35°22'N 139°38'E	"
1392	Yokosuka Naval Aircraft plant	Navy engine, plane production, research	35°18'N 139°39'E	"
1393	Aeronautical Experimental plant	Research, some plane production	35°40'N 139°41'E	"
1394	Kanegafuchi Spinning Mill	Large, rptd converted to plane production	35°44'N 139°49'E	"
1395	Shoda Aircraft	Little known	35°41'N 139°35'E	"
	NAGOYA (90.20)			
193	Mitsubishi Aircraft Engine plant	One of most important engine plants	35°11'N 136°57'E	196
194	Mitsubishi Aircraft	Important research; also planes, engines	35°05'N 136°54'E	194
196	Nagoya Arsenal, Chigusa plant	Engines, instruments, ordnance	35°10'N 136°55'E	196
197	Nagoya Arsenal, Atsuta plant	Ordnance, also aircraft components	35°08'N 136°55'E	197
198	Aichi Aircraft	Planes, engines, instruments	35°07'N 136°54'E	194
199	Aichi Aircraft, Mizuho plant	Parts, possibly engines	35°08'N 136°55'E	197
240	Kagamigahara Aircraft	Plane production, major repair	35°23'N 136°52'E	240
242	Okamoto Industrial Co	Parts	35°08'N 136°55'E	197
1129	Okamoto Industrial Co, Kasadera Branch	Parts	35°05'N 136°57'E	194
	HAMAMATSU (90.21)			
1219	Japan Musical Instrument Co	Rptd one of 2 largest propeller plants	34°43'N 137°44'E	1219
1220	Hamamatsu Airplane Mfg Co	Primarily repairs	34°45'N 137°43'E	1219
	KYOTO (90.23)			
1167	Int'l Aeronautical Indus Co.	No details	34°57'N 135°46'E	N A

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JAPAN - AIRCRAFT INDUSTRY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90,25)			
10	Kawasaki Aircraft	One of largest plane, engine plants	34°39'N 135°10'E	10
11	Kawasaki Dockyard, aircraft plant	One of largest plane, engine plants	34°39'N 135°10'E	10
18	Kawanishi Airplane	Important production planes, engines	34°43'N 135°23'E	18
210	Kawasaki Dockyard, Point Kawa plant	Rptd under construction, more data required	34°40'N 135°11'E	10
775	Yamamoto Airplane Implements	No details	34°39'N 135°08'E	10
793	Kukada Light Airplane Co	Light planes, gliders	34°43'N 135°27'E	695
1188	Kawanishi Airplane Co new plant	New, rptd large, but no details	34°43'N 135°23'E	18
	KURE (90,30)			
660	Hiro Naval Aircraft factory	Planes, engines, believed small	34°13'N 132°36'E	656
	KURUME (90,35)			
662	Watanabe Aircraft	Major repair, parts, some plane production	33°32'N 130°28'E	662
	SASEBO (90,36)			
802	Mitsubishi Aircraft, Nagasaki plant	Secondary production engines	32°45'N 129°52'E	542
834	Sasebo Aircraft	Important repairs, secondary production	33°10'N 129°43'E	757
	CHOSEN (84)			
	HEIJO (84.3)			
65	Showa Aircraft, Heijo plant	Rpt new, large; production not known	39°02'N 125°47'E	71

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JAPAN - AIRCRAFT INDUSTRY

TARGET No.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (93)			
	MUKDEN (93.3)			
45	Manchukuo Airplane Mfg Co	Rptd important, largest in Manchukuo	41°50'N 123°30'E	45
	INDO-CHINA (85)			
	INDO-CHINA NORTH (85.1)			
1	Tong Aircraft Factory (Sontay)	Planes, engines, depends on imported materials	21°08'N 105°30'E	N A
	THAILAND (98)			
	BANGKOK (98.2)			
1	R A F shops	Assembly, secondary production	13°48'N 100°32'E	37

* New Targets to be included in Folder revision
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ARMS, MUNITIONS

	KEY TARGETS			
	TARGET		Importance	Obj. Area
	No.	Name		
1	201-9 217-18 1335	Tokyo Arsenal Area	Heart arsenal area large & important	Tokyo (90.17)
2	1334	Asano Kasite Co. (Yokohama)	Explosives	Tokyo (90.17)
3	1336	Naval Arsenal (Hiratsuka)	Explosives for Navy	Tokyo (90.17)
* 4	282	Yokosuka Arsenal & Works	Naval ordnance	Tokyo (90.17)
5	200	Toriimatsu Fcty, Nagoya Arsenal	Ordnance	Nagoya (90.20)
6	241	Nihon Vehicle Co.	Tanks & munitions	Nagoya (90.20)
* 7	197	Atsuta Fcty, Nagoya Nagoya Arsenal	Ordnance	Nagoya (90.20)
8	382	Osaka Arsenal	One of principal arsenals	Osaka (90.25)
9	657a	Kure Naval Arsenal	Principal naval arsenal	Kure (90.30)
10	671	Hikari Naval Arsenal	Ordnance and munitions	Tokuyama (90.32)
11	1310	Asahi Bemberg Gunpowder Plant	Powder	Kyushu (90.33)
12	168	Kokura Arsenal	Principal ordnance arsenal; gas	Shimon'ki (90.34)
13	758	Naval Arsenal & Eng. Dept.	Major naval arsenal	Sasebo (90.36)
14	60	Japan Explosives Co.	Largest in Chosen	Heijo (84.3)
15	61	Heijo Army Arsenal	Ordnance	Heijo (84.3)
16	46	Mukden Arsenal	Most important in Manchukuo	Mukden (93.3)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

* Also listed under another category.

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ARMS, MUNITIONS

Arms and Munitions production in Japan is widely dispersed. Although her peacetime plants numbered but approximately 90, of which 25 might be considered important or vital, there has been wartime conversion of much of the Machine Tool, Automobile and Motors, Chemicals, Textiles, and other industries. While the areas of concentration of these industries roughly coincide with those of Arms and Munitions, a careful study of these installations should be made in their respective sections of this report.

The majority of the established Arms and Munitions plants were government owned or controlled and so cloaked in official secrecy that they cannot be accurately evaluated and wartime conversion has changed their relative importance. Production has been dispersed.

Japan does not appear to be vulnerable in either the production of explosives or arms. Because of their small size and type of construction, explosives plants are difficult to destroy. The structures are easily and cheaply rebuilt, and the machinery simple and not difficult to replace. As pointed out in the chemical section, the sources of raw material would be hard to disrupt.

Because the production of arms and all types of ordnance is now distributed among many industries, large-scale attacks would be required. This production can be most effectively attacked by destruction of the steel industry supplying it.

As the available information will not serve as a basis for a proper evaluation of the component parts of the Arms and Munitions industry, it is possible only to list the chief plants by areas of concentration. As nearly as can be ascertained, these installations are of somewhat equal importance and may be considered as the heart of the established industry.

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - ARMS, MUNITIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	TOKYO (90.17)			
78	Nirada Firecracker Factory	Rptd converted to munitions	35°26'N 139°36'E	N A
142	Unidentified Arms Pl (Kawasaki)	Guns, aircraft motors	35°32'N 139°45'E	"
	Arsenals & Stores, Oji Ward, Tokyo	Heart of "Arsenal Area"; very important & large; Targets through 1335 produce ordnance, ammunition, bombs, instruments & include major stores & Hq		
201	Ordnance Storehouse, Ammunition		35°46'N 139°43'E	"
202	Army Central Clothing Depot		35°46'N 139°43'E	"
203	Ordnance Supply Depots (Powder Magazines)		35°45'N 139°43'E	"
206	Army Arsenal		35°45'N 139°44'E	"
207	Military Gunpowder Works		35°45'N 139°45'E	"
208	Army Branch Powder Factory		35°45'N 139°45'E	"
209	Military Works		35°45'N 139°44'E	"
217	Powder Factory		35°46'N 139°43'E	"
218	Ordnance Storehouse		35°46'N 139°43'E	"
219	Powder Magazine		35°45'N 139°43'E	"
1335	Naval Gunpowder Works		35°44'N 139°45'E	"
	Arsenals & Stores, Itabashi Ward, Tokyo	Restricted area around #205 includes Army Ordnance Supply, Tokyo #2 Army Arsenal etc, producing ordnance		
205	Army Arsenal & Military Gunpowder Wks		35°45'N 139°43'E	"

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JAPAN - ARMS, MUNITIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
	Arsenals & Stores, Koishikawa Ward	Includes Targets 214, 352 probably others not identified		
214	Armory		35°43'N 139°44'E	N A
352	Army Arsenal & Engineering School		35°42'N 139°45'E	"
355	Army Provisions Depot, Tokyo	Depot near Ishikawajima Dockyard	35°40'N 139°48'E	"
366	Steel Eng & Rolling Stock Mfg	Converted to ordnance, armored trains, tanks	36°40'N 139°49'E	"
498	Kurada Iron Wks (Yokohama)	Builds steel hulls	35°29'N 139°31'E	"
515	Three Powder Magazines (Yokohama)	In low hills	35°26'N 139°36'E	"
516	Powder Magazines (Yokohama)	No details	35°26'N 139°37'E	"
541	Oriental Otis Elevator (Tokyo)	Converted to bomb racks, gun turrets & mountings	35°33'N 139°43'E	"
898	Japan Military Goods Explosives Pl	Produces Oerlikon ammunition	35°21'N 139°38'E	"
899	Japan Military Goods (Tomioka)	Oerlikon air cannon, explosives, ordnance	35°22'N 139°38'E	"
1331	Koyabe Engineering Co (Tokyo)	Oerlikon cannon, airplane parts, flotation gear	35°38'N 139°46'E	"
1332	Rolling Stock Co (Tokyo)	Converted to tanks, ordnance	35°34'N 139°43'E	"
1333	Nippon Typewriter Co (Tokyo)	Converted to small gun parts	35°40'N 139°41'E	"
1334	Asano Karite Co, Ltd	Highly important explosives plant	35°27'N 139°35'E	"
1336	Navy Arsenal (Hiratsuka)	Important production explosives for Navy	35°20'N 139°21'E	"
1337	Tsuruni Army & Navy Stores (Yokohama)	Rptd tarpaulin-covered stores, heavily defended	35°29'N 139°41'E	"
1338	Inflammable Storage Docks (Yokohama)	Powder and/or gasoline, low whses in fire area	35°26'N 139°40'E	"
1339	Ammunition Storage (Yokohama)	Storage in hill	35°25'N 139°37'E	"
	NAGOYA (90.20)			
200	Toriimatsu Fcty, Nagoya Arsenal	New, large, important ordnance production	35°13'N 136°58'E	196
241	Mihon Vehicle Co	Important tank & munitions production	35°07'N 136°55'E	197
1138	Imperial Explosives Works	Large cordite plant	34°52'N 136°55'E	1138

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JAPAN - ARMS, MUNITIONS

TARGET NO.	TARGET	CONTENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HAMAMATSU (90.21)			
1224	Army Base & Arsenal (Toyohashi)	Secondary	34°44'N 137°23'E	1234
	KYOTO (90.23)			
1169	Uji Seizojo Powder Factory & Magazines	More data required	34°55'N 135°48'E	1170
	KUMANO (90.24)			
1214	33rd Infantry Regiment & Arsenal		34°40'N 136°29'E	1214
	OSAKA (90.25)			
382	Osaka Arsenal	One of most important arsenals	34°41'N 135°32'E	382
384	Asahi Arms Factory	No details	34°40'N 135°31'E	661
385	Asahi Communications & Arms Factory	No details	34°41'N 135°30'E	661
386	Kawaka Electric Machinery Co	Projectiles	34°40'N 135°33'E	382
387	Kyohan Arms Mfg Co	No details	34°42'N 135°32'E	382
388	Osaka Machinery Co (Arms)	No details	34°42'N 135°30'E	695
389	Sonobe Iron Works	Army & Navy Ordnance	34°41'N 135°28'E	263
390	Taido Metal Works	Rptd war conversion; no details	34°40'N 135°33'E	382
391	Toyo Machinery	Ordnance, no details	34°39'N 135°28'E	661
392	Toyokuni Machinery	Arms & aircraft parts	34°40'N 135°29'E	661

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JAPAN - ARMS, MUNITIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25) (Continued)			
393	Iron Works for Army & Navy	No details	34°40'N 135°28'E	263
548	Locomotive Mfg Co	Large, rptd converted to ordnance	34°40'N 135°27'E	263
645	Osaka Zoki	Arms, munitions & machinery	34°41'N 135°28'E	263
783	Army Ordnance Manufacture	No details	34°40'N 135°09'E	10
	KURE (90.30)			
657a	Kure Naval Arsenal	Principal naval arsenal	34°14'N 132°33'E	657
657c	Torpedo Boat & Mine Depot	Supplies Kure Naval Base	34°14'N 132°33'E	657
657d	Victualling & Clothing Depot	Supplies Kure Naval Base	34°14'N 132°33'E	657
657e	Naval Ordnance Stores	Supplies Kure Naval Base	34°14'N 132°33'E	657
736	Army Ordnance Depot	Large army depot for Hiroshima-Ujina port	34°23'N 132°27'E	736
737	Army Food Depot	Same - Large army depot for Hiroshima-Ujina port	34°22'N 132°28'E	737
738	Army Clothing Depot	Large army depot for Hiroshima-Ujina port	34°23'N 132°27'E	738
739	Army Division Ordnance Stores	Large army depot for Hiroshima-Ujina port	34°23'N 132°27'E	739
750	Moto-Cho Warehouse	Large army depot for Hiroshima-Ujina port	34°23'N 132°27'E	739
794	Hiro Arsenal	Extension of Kure Naval Arsenal	34°13'N 132°36'E	656
	TOKUYAMA (90.32)			
671	Hikari Naval Arsenal	Rptd large ordnance & munitions development	33°57'N 131°57'E	671
820	Japan Powder Mfg Co, Asa	Dynamite, safety explosives	34°03'N 131°10'E	820

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JAPAN - ARMS, MUNITIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	KYUSHU EAST (90.33)			
1310	Asahi Bemberg Gunpowder plant	Important powder production	32°35'N 131°40'E	1311
1311	Kawashima Pl, Nippon Nitrogen Explosives	Explosives; extensive magazines	32°37'N 131°42'E	1311
1312	Tsunetomimura Pl, Nippon Nitrogen Explosives	Secondary explosives production	32°33'N 131°41'E	1311
	SHIMONOSEKI (90.34)			
48	Shimonoseki Ordnance Storage	Minor	33°58'N 130°56'E	44a
49	Moji Ordnance Storage	Secondary	33°57'N 130°58'E	44a
168	Kokura Arsenal	Japan's principal ordnance, poison gas arsenal	33°53'N 130°53'E	168
	KURUME (90.35)			
1238	Watanabe Iron Works, Pl #1	Naval munitions, machinery, aircraft parts	33°36'N 130°25'E	1238
1239	Watanabe Iron Works, Pl #2	Naval munitions, aircraft parts	33°33'N 130°28'E	662
1240	Watanabe Iron Works, Pl #3	Naval munitions, etc	33°36'N 130°25'E	664
	SASEBO (90.36)			
546	Mitsubishi Steel & Arms Works	Important, naval munitions	32°45'N 129°52'E	546
757	Sasebo Mine & Torpedo Storage	Secondary	33°09'N 129°43'E	757
758	Naval Arsenal & Eng Dept	Major naval arsenal	33°10'N 129°42'E	752
762	Sasebo Fuel & Munitions Depot	Secondary	33°09'N 129°43'E	755

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JAPAN - ARMS, MUNITIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (84)			
	HEIJO (84.3)			
60	Japan Explosives Co	Large; explosives, shell filling	38°01'N 125°42'E	
61	Heijo Army Arsenal	Large; produces all types ordnance	39°00'N 125°44'E	71
62	Kanebo Mills, Heijo	Rptd converted to munitions	38°59'N 125°45'E	71
63	Japan Corn Products, Heijo	Large alcohol production	38°59'N 125°45'E	71
64	Sugar Refinery, Heijo	Alcohol	39°00'N 125°46'E	71
	FUSAN (84.7)			
103	Chinkai Mine Storage	Rptd primarily mine laying base	35°09'N 128°38'E	101
	MANCHUKUO (93)			
	MUKDEN (93.3)			
46	Mukden Arsenal	Most important arsenal in Manchukuo	41°47'N 123°30'E	46
67	Military Stores	---	41°47'N 123°23'E	50
	DAIREN (93.5)			
21	Explosive Storage	More data required	38°55'N 121°42'E	2
22	Military Stores	More data required	38°55'N 121°39'E	1
24	Army Stores	More data required	38°56'N 121°39'E	1
	THAILAND (98)			
	THAILAND (98.1,98.2,98.3)			
2	Royal Ordnance Factory	Large, rptd best equipped in Thailand	13°48'N 100°32'E	26

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JAPAN - ARMS, MUNITIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHAPT NO.
	THAILAND (98.1,98.2,98.3) (Cont'd)			
3	Ban Khaen Army Chemical Wks	Rptd new, for chemical warfare production	13°51'N 100°36'E	3
63	Ban Mah Arsenal	Rptd only explosives plant in Thailand	14°21'N 100°35'E	63

* New Target to be included in Folder revision

N A - No target number yet assigned when this sheet prepared

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March 1943

AUTOMOBILES AND MOTORS

KEY TARGETS

	TARGET No.	TARGET Name	Importance	Obj. Area
1	522	Nissan Auto Co Yokohama	Mil Vehicles; 40% Total Motor Vehicles Prod	Tokyo (90.17)
2	1139	Toyoda Automobile Wks Koromo	40% Total Motor Vehicle Prod; Rptd Converted to Airc	Nagoya (90.20)
3	72	Ford Motor Co Yokohama	Light trucks, tanks, ordnance; 4% Total Motor Vehicle Prod	Tokyo (90.17)
4	1140	Toyoda Automobile Wks Kariya	Large; Automotive Parts and Engines for Koromo Plant Rptd Light Tanks	Nagoya (90.20)
5	573	Miyata Engineering Wks Tokyo	Motorcycles, Bicycles, Landing Barge Motors, Airc Parts	Tokyo (90.17)
6	883	Ikegai Motor Plant, Tokyo	Engines	Tokyo (90.17)
7	1340	Harley Davidson Motorcycle Tokyo	Large; Motorcycles, Sidecars	Tokyo (90.17)
8	1341	Rikuo Engine Co, Tokyo	Motorcycles, Bicycles	Tokyo (90.17)
9	1343	Ishikawajima Motor	Mil Vehicles, Diesel Engines, Gun Carriages	Tokyo (90.17)

(Priority targets are underlined)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943

A U T O M O B I L E S, M O T O R S

The indicated annual production of the Japanese industry is approximately 31,000 trucks and 8,000 automobiles, tanks, armored cars, etc.

Capacity estimates approximate 40,000 units (trucks and automobiles, tanks, armored cars, etc.). Capacity would be limited by Japan's facilities for increasing tool production in such categories as jigs and dies, gear and spline-cutting and hob-making tools, and antifriction bearings. Both the supply of engines available to motor vehicles, and of transmission and axle gearing units are believed to be controlling factors in limiting production.

Approximately 62% of motor vehicle production is concentrated in the Tokyo-Yokohama area and about 30% in the Nagoya area, principally in Koromo.

The two principal manufacturers of motor vehicles (80% of total production) are Nissan in Yamamugi (Yokohama) and Toyoda Automobile Works which has its principal plant in Koromo (reported to be the largest auto plant in Japan and possibly now converted to aircraft production), another plant in Kariya (normally a large producer of automotive parts and engines, now reported as producing light tanks), and a small plant in Nagoya producing automotive parts.

Passenger car production declined from the start of the China incident (1937) and the armored car and tank types have replaced this item. Trucks continue to be made for military use, practically all production going to China and other occupied territory. Tanks are reported produced in mass quantities at the steel plants at Muroran and Yawata and at the various army arsenals. The Tokyo Gasu Denki Automobile Company, the Ishikawajima (Tokyo Jidosha), as well as the arsenals at Osaka, Nagoya, and Kokura and the Kawasaki Railroad Car plant in Kobe have had experience in tank manufacture. The Ford Motor Yokohama plant is reported to have been moved to Antung, Manchuria, Mitsubishi taking over the machinery to produce marine engines, and the old plant converted to armament production. Three of the six key targets in the Tokyo area produce motorcycles, sidecars, bicycles, and landing barge motors, which products are highly important in Japan's war effort.

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JAPAN - AUTOMOBILES, MOTORS

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	TOKYO (90.17)			
72	Ford Motor Co (Yokohama)	Light trucks, tanks, probably ordnance	35°29'N 139°39'E	N A
135	Co-op Auto Works (Kawasaki)	Secondary auto plant	35°30'N 139°42'E	"
522	Nissan Auto Co (Yokohama)	Highly important, produces military vehicles	35°29'N 139°40'E	"
573	Miyata Engineering Works (Tokyo)	Motorcycles, aircraft parts, landing barge motors	35°33'N 139°43'E	"
883	Ikegai Motor Plant (Tokyo)	Internal combustion engines	35°39'N 139°45'E	"
1340	Harley-Davidson Motorcycle (Tokyo)	Large; builds motorcycles, sidecars	35°40'N 139°45'E	"
1341	Rikuo Engine Co (Tokyo)	Motorcycles	Location uncertain	"
1342	Japan Machine Industry (Tokyo)	Airplane & auto parts; rptd some aircraft assembly	35°42'N 139°49'E	"
1343	Ishikawajima Motor (Yokohama)	Military vehicles, Diesel engines, gun carriages	35°29'N 139°42'E	"
1344	Japan Auto Co (Tokyo)	Diesel engines, autos, airplane parts	35°42'N 139°41'E	"
	NAGOYA (90.20)			
430	Toyoda Machinery Mfg Co	Secondary production automotive parts	35°11'N 136°53'E	250a
1139	Toyoda Automobile Works (Koromo)	Rptd largest auto plant in Japan, possibly aircraft	35°03'N 137°10'E	1139
1140	Toyoda Automobile Works (Kariya)	Large automotive parts & engine production	34°59'N 137°00'E	1137
1141	Shinkawa Plant, Toyoda Automobile Co	Secondary production automotive parts	35°12'N 136°52'E	250a
	OSAKA (90.25)			
643	Osaka Kotsu Auto Mfg	More Data Required	34°42'N 135°28'E	661
1189	Nissan Jidosha	Cars, trucks, buses	34°38'N 135°29'E	325
1190	Teikoku Rivet Co	Auto parts	34°39'N 135°27'E	325
1192	Osaka Al. Seisakasho	Auto parts, machines & aircraft	34°40'N 135°30'E	661

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURUME (90.35)			
1241	Miyata Motor Works	Large; motors, tools, ordnance	33°32'N 130°29'E	662
	NETHERLANDS EAST INDIES (94)			
	JAVA (94.3)			
163	General Motors Assembly Plant	More Data Required	06°06'S 106°53'E	177

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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March 1943

C H E M I C A L S

	KEY TARGETS			
	TARGET		Importance	Obj. Area
	No.	Name		
* 1	29	Showa Steel (Ansan)	35% Empire coke by-prod.	Mukden (93.3)
* 2	28	Imperial Steel (Yawata)	18% Empire coke by-prod.	Shi'seki (90.34)
* 3	30	Honkeiko Steel (Penhsi-hu)	11% Empire coke by-prod.	Mukden (93.3)
4	1243	Miike Dyestuffs (Omuta)	Explosives and all coke by-products	Kurume (90.35)
5	1	Chosen Fertilizer (Konan)	Largest nitrogen & sulphuric acid plant	Konan (84.2)
6	1113	Japan Fertilizer (Kurosaki)	Explosives, 15% Empire nitrogen	Shi'seki (90.34)
7	1537	Tokuyama Soda (Tokuyama)	30% Empire soda ash 28% " caustic	Tokuyama (90.32)
8	134	Asahi Glass (Yokohama)	29% Empire soda ash 17% " caustic	Tokyo (90.17)
9	1244	Tokyo Chemical (Omuta)	10% Empire nitrogen fixation	Kurume (90.35)
10	137	Showa Fertilizer (Kawasaki)	10% Empire nitrogen fixation	Tokyo (90.17)
11	923	Sumitomo K.K. (Niihama)	9% Empire nitrogen fixation	Niihama (90.29)
12	818	Ube Fertilizer (Ube)	8% Emp. nitr'n. fix'n.	Tokuyama (90.32)
13	598	Nippon Dyestuffs (Osaka)	Large explosives and poison gas plant	Osaka (90.25)
14	1317	Nippon Dyestuff (Tsurusaki)	Large explosives and poison gas plant	Kyushu (90.33)
15	675	Toyo Soda (Machido)	14% Empire soda ash 11% " caustic	Tokyo (90.17)
16	1246	Denki Kagaku (Omuta)	Large % Empire acetone	Kurume (90.35)
17	1536	Showa F'lizer (Kanose)	18% Empire acetone	Niigata (90.9)
18	1386	Japan Nitrogen (Minamata)	Largest nitric acid acetone	Yatsushiro(90.37)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

*Also listed another category

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CHEMICAL INDUSTRY

While the "heavy chemicals" are essential to the Japanese war effort, the manufacture of war materials requires only a part of the Japanese plant capacity for some of them. The greater part of the production of nitrogen, sulphuric acid, calcium carbide and other chemicals goes into production of fertilizers and manufactured products not directly useful in war. It is estimated that about one-half of nitrogen and sulphuric acid production, and a somewhat less proportion of the soda ash, caustic soda and industrial alcohol production are used directly in the manufacture of arms and munitions. Since military requirements will almost certainly be met, crippling of the chemical industry will not necessarily restrict the production of military supplies.

The coal coking industry is an exception. The coke is necessary in the manufacture of steel, and the by-products -- benzene, toluene, naphthalene, phenol, and cresol -- are used almost entirely in the manufacture of war materials. It is estimated that by-product capacity is not greater than the minimum demands for the materials produced, and therefore, that reduction of coking capacity will be reflected immediately in the production of war supplies. The Japanese coking industry is highly concentrated and is believed to be vulnerable to air attack.

Even though drastic reduction in Japanese capacity to produce most of the heavy chemicals would probably not be felt immediately in the production of war materials, its long range effect would dislocate the Japanese war effort in many ways. Japan is dependent upon chemical fertilizers to maintain its present degree of self-sufficiency in food, and most of the larger plants either produce, or contribute to the production of chemical fertilizers. Serious reduction of the supply of these fertilizers would mean hungry civilians or increased shipments of food into the main islands. Shortage of the heavy chemicals would be felt in virtually all industry and could not fail to have a long range effect on war production.

COAL CARBONIZATION

By-product coke ovens are the principal sources of Japan's metallurgical coke, benzene, toluene, naphthalene, phenol and cresol, all highly important raw materials for the manufacture of war supplies.

It is estimated that the Japanese capacity to produce coal by-products does not exceed the essential wartime requirements of the Empire. Interference with by-product ovens will be directly reflected in the production of war materials. Two neighboring plants in Manchukuo produce about 46% of Japanese coal by-products, and three in North Kyushu produce 24%. All are shown in the list of key targets. Coke ovens are among the most vulnerable targets to air attack found in the chemical industry. A direct hit on the battery will put many ovens out of commission for months and even a near miss can cause serious damage.

DYES AND INTERMEDIATES

It is estimated that 50% of the Japanese dye industry has been converted to the manufacture of explosives and poison gases. The important plants are listed among the selected targets.

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CHEMICAL NITROGEN

Nitrogen is the base for the nitric acid used in all explosives, and also for the principal fertilizers used in the Japanese Empire. Other uses require a relatively small quantity.

Japanese requirements of nitrogen for all uses are 600,000 - 650,000 metric tons per year, only about one half of which is used directly in the manufacture of war materials. Capacity in 1938 was above requirements, but present production is believed to be slightly below total requirements, possibly due to a stringency of electric power and conversion of some capacity to other war materials. Shortages of coke or sulphuric acid might further restrict production.

66% of the chemical nitrogen in the Japanese Empire is produced in 6 plants listed among key targets. The plants are large. Critical units are hard to locate from the air and can be protected.

NITRIC ACID

Substantially the entire nitric acid output goes directly into the war effort. The nitrating capacity of Japan is estimated to be equal to requirements. The raw materials required are ammonia and air. There is in Japan an excess of ammonia over munitions requirements. No large amounts of power are required. Many ammonia plants have nitrating units. The Konan, Niihama, Kawasaki and Ube nitrogen plants are large producers of nitric acid. Nippon Nitrogen Fertilizer plant at Minamata is the largest peacetime producer. These plants account for perhaps 50% of Japan's requirements. Their destruction would reduce supply of a basic war material, but new plants could be built in a relatively short time.

SULPHURIC ACID

The fertilizer industry consumes about two-thirds (2/3) of the sulphuric acid normally used in Japan. The remainder is used in the manufacture of explosives, cellulose products, dye stuffs and intermediates, in petroleum refining and in the production of other products, many of which are essential war materials.

Sulphuric acid produced by the contact process is ordinarily used in the manufacture of explosives, although other acid may be used. There are more than fifty contact process plants in Japan, no one of which is known to produce a substantial proportion of total sulphuric acid needed for use in explosives. However, the Konan plant of Chosen Chisso Hiryo K.K. listed as the principal producer of ammonia is also the largest single producer of sulphuric acid in the Japanese Empire.

Large quantities of electric power are not required. With the possible exception of pyrites, raw materials are not a problem.

ALKALI INDUSTRY

Only a small percentage of either of the two principal alkalies, soda ash and caustic soda, is used directly in the war effort, although both are important in the production of glass, textiles, etc.

All raw materials are plentiful with the exception of ammonia

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and salt. Although production of salt within the Empire is sufficient to supply all requirements of the chemical industry only, supply has been considerably reduced by loss of former sources.

About 73% of the known soda ash capacity and about 56% of the known caustic soda capacity is in the three plants listed among key targets.

Electrolitic plants produce chlorine as a by-product. A large reduction in chlorine capacity would not bring production below war needs.

INDUSTRIAL ALCOHOL

Although alcohol is an essential chemical, the number of plants capable of producing it are so numerous and raw materials are so varied that it is not considered a vulnerable industry for the purposes of this study.

CALCIUM CARBIDE

In war, calcium carbide is important as the source of acetylene gas used for cutting and welding metal. More than half of the Japanese production, however, goes into the manufacture of fertilizer. Since a small proportion of plants will furnish requirements of acetylene, and the calcium fertilizer production is relatively small, no carbide plants are among key targets.

ACETONE

Acetone is an essential solvent in many chemical processes and reduction of the supply would hamper many war industries. Two plants, producing acetone, are among key targets.

CELLULOSE

While cellulose is important in the manufacture of explosives, the production formerly going into the large Japanese rayon industry is available for war use. Since destruction of many plants would be necessary to reduce the supply below military requirements, none are among the key targets.

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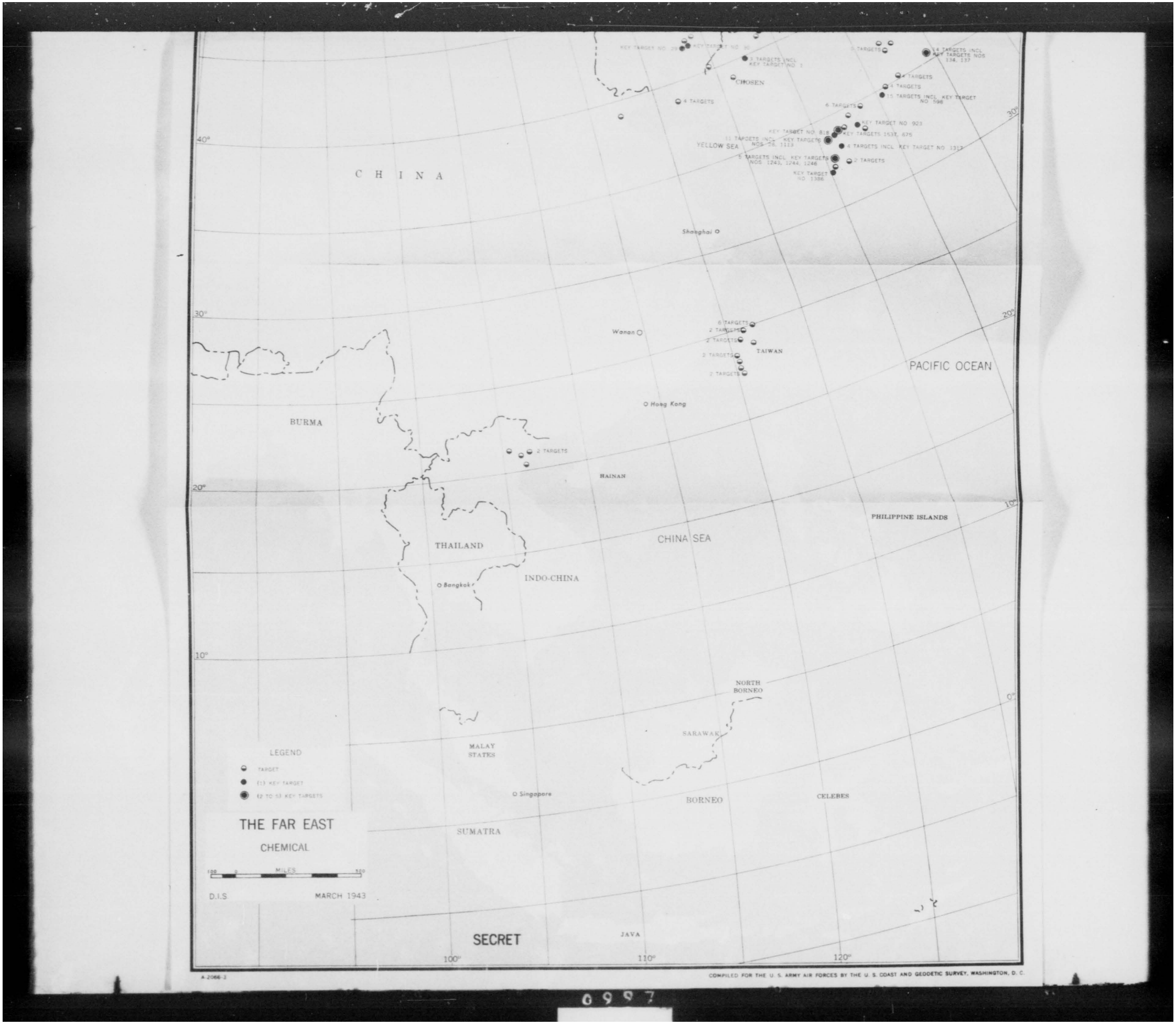

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JAPAN - CHEMICALS

All targets in folders to 3/1/43, grouped by Areas

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	NIIGATA (90.9)			
1001	Niigata Ryusan Co	Large; sulphuric acid, fertilizers, etc.	37°56'N 139°05'E	998
1002	Niigata Carbide Co	No details	37°57'N 139°05'E	998
1006	Sulphuric Acid Plant	No details	37°54'N 139°01'E	1006
1009	Niigata Chemical Industry	Rptd war chemicals	37°57'N 139°05'E	1005
1536	*Showa Fertilizer Co.	Large production fertilizer & acetone	37°42'N 139°28'E	N A
	FUKUSHIMA (90.10)			
1083	Yamagata Paper Mill	No details	38°15'N 140°21'E	1082
1088	Phosphorus Plant, Nihon Mining	Rptd largest phosphorus plant in Japan	37°23'N 140°24'E	1088
	TOYAMA (90.11)			
865	Nitrogen Works (Nippon Carbide Co)	Large; nitrogen, other chemicals	36°49'N 137°24'E	865
868	Fushiki Fertilizer Plant	Fertilizer, chemicals	36°47'N 137°04'E	867
936	Nissan Chemical Co #1	Ammonia, fertilizer, etc.	36°40'N 137°11'E	936
937	Nissan Chemical Co #2	Same	36°47'N 137°03'E	867
938	Nissan Chemical Co #3	Same	37°02'N 137°00'E	870
939	Hokkai Soda Co (Niijima)	Chemicals	36°47'N 137°04'E	867
	NAGANO (90.12)			
1101	Electro-Chemical Co, Aomi plant	Large; calcium carbide, mitrogen, etc	37°00'N 137°47'E	1101
	MITO (90.14)			
1521	Showa Chemical and Fertilizer Plant	Local importance	35°08'N 140°16'E	-

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17)			
80	Niigata Sulphuric Acid Co	Large, new, built by U. S. technicians	35°29'N 139°40'E	N A
134	Asahi Glass Co (Yokohama)	Glass products of all kinds	35°29'N 139°41'E	"
137	Showa Fertilizer (Kawasaki)	Vital importance; one of largest in Empire	35°30'N 139°44'E	"
204	Japan Artificial Fertilizer #1	Rptd expanded; caustic soda, chlorine by-products	35°45'N 139°45'E	"
479	Japan Artificial Fertilizer	Important; nitrogen fixation, other chemicals	35°30'N 139°42'E	"
481	Tokyo Gas, Tsurumi branch	Most important branch Tokyo Gas Co	35°30'N 139°42'E	"
499	Nippon Carbon Co (Yokohama)	Largest unit principal Jap producer carbon electrodes	35°29'N 139°39'E	"
907	Tokyo Gas, Sunamachi branch	Smaller branch plant	35°41'N 139°48'E	"
1396	Tsurumi Soda Co (Yokohama)	New, probably enlarged; by-product chlorine	35°29'N 139°41'E	"
1397	Japan Refining Works (Tokyo)	General chemicals	35°41'N 139°51'E	"
1398	Tokyo Gas, Omori branch	Large coking capacity	35°34'N 139°45'E	"
1399	Hodogaya Soda (Yokohama)	Rptd one of important chemical targets in Empire	35°27'N 139°36'E	"
1400	Hodogaya Soda (Tokyo)	Branch of #1399	35°45'N 139°44'E	"
1401	Japan Artificial Fertilizer #2	Branch of #204	35°41'N 139°51'E	"
	NAGOYA (90.20)			
253	Japan Artificial Fertilizer Co	Nitric acid, possibly direct munitions	35°05'N 136°52'E	194
255	Yahagi Electro-Chemical Plant	Nitric acid, rptd light-metal alloys	35°05'N 136°54'E	194
466	Tokai Soda Co	Secondary, caustic soda, etc	35°05'N 136°54'E	194
467	Showa Soda Co	Caustic soda, liquid chlorine, etc	35°05'N 136°52'E	194
	KYOTO (90.23)			
1163	Asahi Bemberg Co	Large production rayon	34°59'N 135°54'E	1163
1164	Toyo Rayon Co, Otsu plant	Same	34°59'N 135°54'E	1163
1165	Toyo Rayon Co, Seta plant	Same	34°59'N 135°55'E	1163
1166	Japan Rayon Co	Same	34°53'N 135°49'E	-

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
15	Kaneyama Chemical Works	More data required	34°42'N 135°12'E	5
383	Dia Nippon Celluloid Factory	Rptd large producer explosives	34°36'N 135°29'E	325
547	Nihon Glycerine Factory	More data required	34°43'N 135°27'E	695
587	Kobe Acetic Acid Co	More data required	34°43'N 135°27'E	695
591	Lto Acid Factory	Same	34°42'N 135°27'E	695
615	Sulphuric Acid Plant	Same	34°38'N 135°28'E	325
625	Aoki Chemical Works	Same	34°41'N 135°26'E	263
642	Osaka Glycerine Co	Same	34°41'N 135°32'E	382
647	Sumitomo Chemical Industry	Important; ammonia and phosphate	34°41'N 135°30'E	661
785	Sakafuchi Soda & Magnesium Factory	More data required	34°39'N 135°10'E	10
787	Asahi Carbonic Acid Gas Works	Same	34°40'N 135°10'E	10
1199	Taiwan Sugar Refinery	Important; sugar and alcohol	34°39'N 135°10'E	10
1200	Meiji Sugar Refinery	Sugar & alcohol	34°39'N 135°10'E	10
1201	Mitsui Chemical Co	More data required	34°42'N 135°26'E	536
1202	Amagasaki Chemical Industrial Works	Same	34°42'N 135°26'E	536
598	Nippon Dyestuffs (Osaka)	Large intermediates mfg. - converted to explosives	34°40'N 125°27'E	N A
	OKAYAMA (90.27)			
1280	Nissan Chemical Co	Large capacity chemicalplant	34°36'N 134°02'E	1280
1281	Dai Nippon Celluloid (Aboshi)	Primary; celluloid, explosives, plastics, glass	34°47'N 134°36'E	1290
1282	Kimura Chemical Co (Sakoshi)	Large unit of one of largest drug companies	34°45'N 134°26'E	1296
1298	Nippon Sulphur (Innushimo Refinery)	Important solvent production	34°34'N 134°07'E	1298
1305	Himeji Poison Gas Factory	Rptd one of largest in Japan	34°50'N 134°42'E	1291
	KOCHI (90.28)			
1525	Nankai Chemical Plant (Kochi)	Small; sulphuric acid & caustic soda	33°32'N 133°33'E	1524

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	NIIHAMA (90.29)			
923	Sumitomo Chemical Co	Large; nitrates, ammonia, explosives	33°58'N 133°16'E	923
	TOKUYAMA (90.32)			
675	Toyo Soda Co (Corrected name)	Rptd largest caustic soda producer	34°03'N 131°48'E	673
818	Ube Nitrogen Fertilizer Co	Large plant	33°55'N 131°16'E	818
819	Dai Nihon Artificial Fertilizer Co(Onoda)	Large plant	34°00'N 131°11'E	819
1537	*Tokuyama Soda Co	Very large soda ash production	34°03'N 131°48'E	N A
	KYUSHU EAST (90.33)			
1313	Ohgi Fertilizer Co	Minor producer fertilizers	33°16'N 131°30'E	-
1314	Asahi Bemberg, Cuprammonium plant	Center of very important chemical works	32°34'N 131°40'E	1311
1315	Asahi Bemberg, Viscose plant	Large rayon plant	32°34'N 131°40'E	1311
1316	Hiji Plant, Hodogaya Industrial Co	Secondary producer industrial chemicals	33°22'N 131°32'E	1316
1317	Nippon Dye Works	Secondary production of poison gas materials	33°14'N 131°42'E	1317
1318	Katakura Cereal Fertilizer Co	Secondary production fertilizers	33°14'N 131°36'E	1329
	SHIMONOSEKI (90.34)			
100	Nihon Fertilizer, Hiko I Plant	Minor	33°55'N 130°55'E	43a
177	Osaka Soda Works (Kokura)	Secondary	33°53'N 130°52'E	168
180	Kyushu Chemical Wks, Kokura Plant	No details	33°53'N 130°52'E	168
567	Asahi Glass Co (Tobata)	Very large glass and soda plant	33°53'N 130°49'E	28
569	Kyushu Chemical Wks, Yawata Plant	No details	33°53'N 130°49'E	28
1113	Nihon Fertilizer, Kurosaki Plant	Important; fertilizer & war chemicals	33°52'N 130°46'E	1113
1115	Kyushu Soda Co (Kokura)	Secondary	33°53'N 130°52'E	168
1122	Japan Industrial Co	Secondary producer welding equipment, chemicals	33°53'N 130°53'E	168

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURUME (90.35)			
1243	Miike Dyestuffs (Omuta)	Very important chemical works	33°02'N 130°27'E	1243
1244	Oriental High Tension, Plant A	Chemicals for explosives & fertilizers	33°02'N 130°27'E	1243
1245	Oriental High Tension, Plant B	Chemicals for explosives & fertilizers	33°02'N 130°26'E	1243
1246	Electro-Chemical Industry	Large output chemicals, fertilizers	33°02'N 130°26'E	1243
	YATSUSHIRO (90.37)			
	KYUSHU SO (90.38)			
1386	Japan Nitrogen Fertilizer (Minamata)	Important; nitrogen fixation, acids, ammonia	32°12'N 130°24'E	-
1387	Nissan Chemical (Kagami Plant)	Gunpowder, plastics, rptd medium size	32°14'N 130°28'E	-
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
42	Taiwan Hiryo K K	Sulphuric acid, nitrogen	25°08'N 121°43'E	-
43	Sulphuric Acid Plant	Secondary	25°07'N 121°49'E	43
44	Cyanide Plant	Secondary	25°07'N 121°51'E	44
45	Taihoku Camphor Monopoly Plant	Secondary	25°03'N 121°31'E	47
46	Taihoku Plant, Taiwan Sugar Refinery	Alcohol, sugar	25°02'N 121°30'E	28
	TAIWAN WEST (91.4)			
87	Carbon Black Plant (Kinsui)	Important; rptd 25% Jap requirements	24°37'N 120°53'E	86
88	Taiwan Chemical Co (Kinsui)	Reported important	24°37'N 120°53'E	86
89	Tainan Salt Wks	Important	22°56'N 120°08'E	112
102	Kagi Alcohol Plant	Large alcohol & butanol production	23°29'N 120°26'E	102
103	Taichu Alcohol Plant	Large alcohol & butanol production	24°08'N 120°42'E	103
104	Kobi Sugar & Alcohol, Plants #1, #2	Large plants	23°42'N 120°26'E	104
107	Mato Sugar & Alcohol Plant	Secondary	23°11'N 120°16'E	-

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAIWAN EAST (91.5)			
72	Taroko Electro-Chemical Co	Fertilizers	23°59'N 121°36'E	66
	TAKAO (91.6)			
2	Chemical Fertilizer Plant (Takao)	Fertilizers, probably war chemicals	22°38'N 120°17'E	2
6	Industrial Alcohol Plant (Takao)	Rptd one of largest such plants in Taiwan	22°37'N 120°17'E	8a
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
33	No Chosen Paper Mfg & Chemical Ind	Medium sized rayon pulp mill	40°58'N 129°20'E	33
34	Japan Magnesite Chemical Ind Co	Manganese, stainless steel, cobalt	40°41'N 129°13'E	-
	KONAN (84.2)			
1	Chosen Nitrogen Fertilizer Co	Rptd largest chemical plant, one of most important industrial targets in Empire; nitrates, explosives, aluminum, magnesium	39°50'N 127°38'E	1
2	Chosen Nitrogen Gunpowder Factory	Large, branch of #1	39°49'N 127°35'E	1
3	Motomiya Fertilizer Factory	Large, branch of #1	39°50'N 127°35'E	1
	HEIJO (84.3)			
59	Chosen Chemical Industry Co	Large, new, nitrogen fixation	39°25'N 125°57'E	59

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
59	Manchu Mine Explosives Co	Black powder, nitro-cellulose, etc	40°10'N 124°20'E	72
60	Manchuria Electro-Chemical Co, Kirin	Important; acetic acid, carbide, etc	43°50'N 126°35'E	58
	MUKDEN (93.3)			
62	S.M.R. Sulphuric Acid Plant	More data required	41°51'N 123°54'E	32
	DAIREN (93.5)			
18	South Manchuria Gas Wks	More data required	38°56'N 121°38'E	1
19	Manchuria Chemical Industry Co	Rptd most important chemical plant in Manchukuo	38°58'N 121°37'E	1
20	Manchuria Soda Co	Important	38°58'N 121°37'E	1
	CHINA (83)			
	TIENTSIN (83.12)			
8	Yung Li Alkali Plant (Tangku)	Soda ash, ammonia; important for area	39°01'N 117°40'E	4
	FRENCH INDO-CHINA (85)			
	FRENCH INDO-CHINA NO (85.1)			
17	Haiphong Chemical Plant	Believed small	20°52'N 106°40'E	N A

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JAPAN - CHEMICALS

TARGET NO.	TARGET	COMMENTS	APPROXIMATE COORDINATES	TARGET CHART NO.
	FRENCH INDO-CHINA NO (85.1)(Continued)			
18	Haiphong Phosphate Plant	Produces for export and local fertilizer needs	20°52'N 106°40'E	N A
19	Hanoi Alcohol Distillery	Converts rice into motor fuel used in Indo-China	21°01'N 105°52'E	"
20	Haiduong Alcohol Distillery	Same	20°57'N 106°20'E	"
21	Namdinh Alcohol Distillery	Same	20°25'N 106°10'E	"
22	Thanh Hoa Alcohol Distillery	Under construction 1941; believed large	19°55'N 105°47'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
5	Thai Industries (Bangkok)	Rptd manufacturing industrial chemicals	13°41'N 100°30'E	26
	NETHERLANDS EAST INDIES (94)			
	JAVA (94.3)			
159	Bandung Quinine Factory	Important; 3,500,000 ounces per month	06°54'S 107°36'E	159
160	Tjibodas Sulphur Factory	Rptd important, no details	07°07'S 107°26'E	160
161	Kalianget Salt Factory	Secondary	07°03'S 113°56'E	156
162	Krampon Salt Factory	Secondary	07°10'S 113°15'E	162

* New Target to be included in Folder revision
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March 1943

COMMUNICATIONS

KEY TARGETS

	TARGET No.	TARGET Name	Importance	Obj. Area
1	497	Plant #1 of Nippon Elec Co	One of 5 most imp comm fctys. in Japan	Tokyo (90.17)
2	326	Plant #2 of Nippon Elec Co	"	Tokyo (90.17)
3	496	Plant #1 of Tokyo-Shibaura Electric	"	Tokyo (90.17)
4	488	Plant #2 of Tokyo-Shibaura Electric	"	Tokyo (90.17)
5	888	Plant #1 of Oki Electric Co	"	Tokyo (90.17)
6	826	Fujikura Elec. Cable Works	One of largest cable producers	Tokyo (90.17)
7	75	Furukawa Elec.	One of largest cable producers	Tokyo (90.17)
8	1418	Marunouchi Telephone Exchange	Vital telephone, telegraph JC.	Tokyo (90.17)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943

COMMUNICATIONS

Japanese communications (telephone, telegraph, radio, etc.) have been badly strained by war. Without them coordination and direction of the military effort would be impossible. For this reason all were classified as vital to national defense and "Secret". Since 1940 the Ministry of Communications has restricted new telephone installations to companies and factories engaged in work of value to the Army or Navy. There was a 20 percent increase in the number of telegraph messages sent during the three years before 1940 which made Japan second only to the United States in number of messages handled, although the nation's telegraph facilities are far less adequate or extensive than those of England, France or Germany. This increase lowered efficiency of operations considerably.

Great stress has been placed on the development of radio communications to supplement other types and to link the telegraph networks of Japan proper, China, Chosen (Korea) and other occupied territories. Radio broadcasting stations have been located throughout Japan so that every region is served by at least one. All major stations are connected by permanent relay lines to make possible synchronized broadcasting of a single program simultaneously, or alternate broadcasting (shifting a program from station to station to confuse enemy monitors).

Dispersal and multiplicity of Japan's communications installations (like those of other nations) makes them poor bombardment targets. Destruction of key central offices, transmitters and other equipment of one type of communications still leaves other channels open, particularly radio. All towns of Japan having any strategic value or industrial significance possess one or more wireless stations; telegraph and telephone connections with other centers.

However, sources of equipment, supply and replacement are restricted and vulnerable. This is because Japan depended on foreign sources to a large extent for communications equipment until the past decade. Loading coils, telephone cable and other equipment used in building the main Tokyo-Kobe telephone line (finished 1928) were imported from the United States. Much of the facilities of Japanese radio broadcasting stations came from Germany and the United States.

Approximately 95 percent of Japan's finished radio equipment and 75-85 percent of all finished telephone equipment came from the five factories of three companies; Nippon Electric, Tokyo Electric and Oki Electric, in or near Tokyo, where the greatest concentration of telephone and telegraph lines in Japan is found in the Marunouchi Exchange. Japan's maximum production capacity of copper, 145,000 metric tons annually, is 45,000 tons below the estimated minimum needs, and 55 percent of the total output is concentrated in four plants, a further vulnerability. (See Non-Ferrous Metals). Demands of the Army and Navy for technicians and communications specialists is reported to have taken large numbers from industry for work in the field. Efforts have been made to train Japanese soldiers blinded in the China war as communications operators. Because of this, the chances appear to be against Japan's having been able to carry out a decentralization of the communications supply industry to safer and more widely separated areas since Pearl Harbor.

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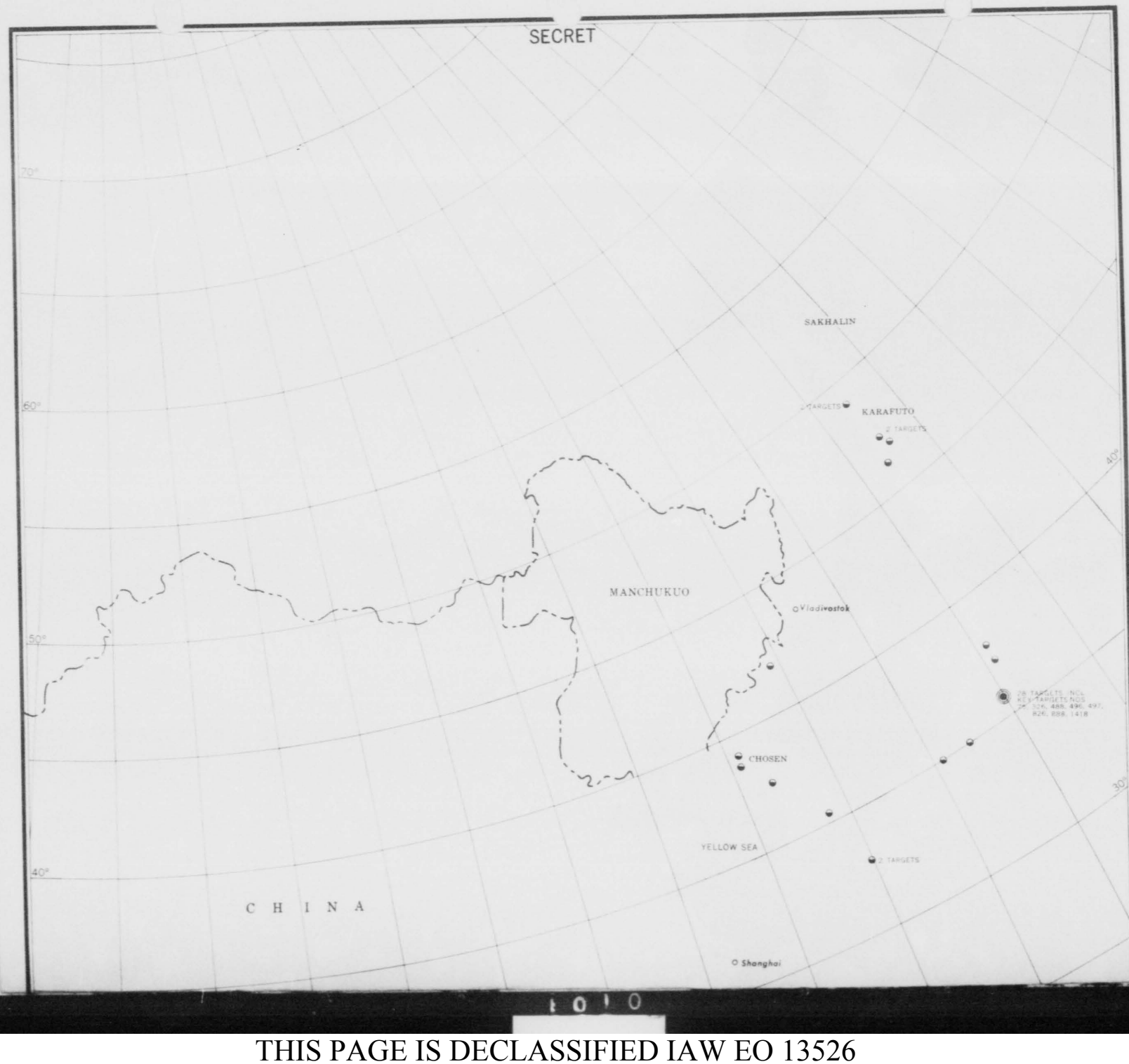

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
944	Toyohara Radio Station	Fixed Station	46°58'N 142°44'E	967
945	Radio Sta Nishi Notoro Point	Direction Finder Station	45°54'N 142°05'E	945
946	Esutoru Radio Station	Ship Station Service	49°04'N 142°03'E	973
947	Radio Station at Esutoru	Fixed Station	49°04'N 142°03'E	973
948	Radio Broadcasting Sta (Toyohara)	Local importance	-	967
949	Otomari Radio Station	Fixed station	46°37'N 142°47'E	966
950	Radio Station at Otomari	Ship Station Service	46°37'N 142°47'E	966
	FUKUSHIMA (90.10)			
1086	Haranomachi Transmitting Station	No details	37°41'N 140°59'E	1086
1087	Tomioka Short Wave Transmitting Sta	No details	37°20'N 141°01'E	1087
	TOKYO (90.17)			
75	Furukawa Electric Co Plant #1	Important production telephone-telegraph wire,accessories	35°27'N 139°37'E	N A
109	Oki Electric Plant #2	Former main plant	35°30'N 139°42'E	"
132	Kawasaki Naval Wireless Station	No details	35°34'N 139°38'E	"
136	Fuji Electric Works (Kawasaki)	High Tension power equipment	35°30'N 139°42'E	"
326	Nippon Electric Co, Factory #2	With #497 largest communications equipment mfr	35°39'N 139°45'E	"
363	Radio Station JOAK (Tokyo)	Japan's main broadcasting station	35°40'N 139°45'E	"
484	Showa Wire & Cable (Kawasaki)	More data required	35°32'N 139°43'E	"

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JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART No
488	Tokyo Shibaura Elec Co, Fcty #2	Major radio-telephone equipment plant	35°32'N 139°42'E	N A
489	Nippon Elec W & C (Yokohama)	Important wire & cable plant	35°32'N 139°42'E	"
494	Tokyo Elec Wire & Mfg Co	Important manufacturer copper & brass wire	35°31'N 139°42'E	"
496	Tokyo Shibaura Elec Co, Fcty #1	Major radio-telephone equipment plant	35°32'N 139°42'E	"
497	Nippon Elec Co, Fcty #1	With #326 largest communications equipment mfr	35°34'N 139°40'E	"
523	Japan Radio & Phonograph(Yokohama)	Converted to war communications	35°29'N 139°39'E	"
551	Meidensha Elec Equipmt Co,Plant #1	Special importance; rptd making aircraft detection equipment	35°37'N 139°44'E	"
826	Fujikura Electric Cable Wks	Large & important production communications equipment	35°40'N 139°48'E	"
888	Oki Electric Co, Plant #1	Large electrical & communications equipment firm	35°38'N 139°45'E	"
889	Nippon Elec Co, Plant #3	Specializes in Navy work	35°38'N 139°45'E	"
1418	Marunouchi Telephone Exch (Tokyo)	Principal Tokyo exchange, jc all domestic & cable telegraph	35°41'N 139°46'E	"
1419	Navy Dept Wireless Towers (Tokyo)	Receives messages from ships at sea	35°40'N 139°45'E	"
1420	Funabashi Naval Transmitting Sta	Transmitter to ships at sea	35°41'N 140°00'E	"
1421	Meidensha Elec.Equipmt,Plant #2	Transformers, electrical machinery	35°33'N 139°46'E	"
1422	Komuro Radio T'phone Sta (Tokyo)	Important receiving station	35°58'N 139°38'E	"
1423	Fukuoka Wireless Sta (Tokyo)	Important station	35°53'N 139°31'E	"
1424	Central Meterolg.Observatory(Tokyo)	Important; military weather information	35°39'N 139°45'E	"
1425	Iwatsuki Wireless Sta (Tokyo)	Important to shipping	35°57'N 139°41'E	"
1428	Yokohama Telephone Exchange #1	Largest in Yokohama	35°27'N 139°39'E	"
1429	Odawara Telephone Repeater Sta	Vulnerable point on Tokyo-Kobe telephone cable	35°15'N 139°20'E	"
1430	Nippon Elec Wire & Cable (Tokyo)	Important copper wire manufacturer	35°43'N 139°49'E	"
	NAGOYA (90,20)			
1151	Yosami Transmitting Station	Short-wave to Europe	34°58'N 137°01'E	1137
1152	Yokkaichi Receiving Station	Short-wave receiving from Europe	34°59'N 136°38'E	1152

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JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SASEBO (90.36)			
857	Radio JOAG (Nagasaki)	Minor importance	32°44'N 129°53'E	542
858	Nagasaki Post & Telegraph Of.(Nagasaki)	Minor importance	32°44'N 129°53'E	542
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
19	Keelung Wireless Station	Substantial station	25°08'N 121°45'E	15a
49	Tansui Wireless Station	Major receiving station for area	25°11'N 121°25'E	49
50	Itahashi Wireless Station	Rptd most important station in area	25°01'N 121°27'E	50
	TAIWAN WEST (91.4)			
116	Shinchiku Radio Station	No details	24°47'N 120°52'E	-
117	Kagi Radio Station	No details	23°28'N 120°12'E	-
118	Tainan Radio Station	No details	23°00'N 120°12'E	-
	TAIWAN EAST (91.5)			
79	Garambi Wireless Station	Key Station	21°56'N 120°49'E	79
80	Karenko Wireless Station	Secondary	23°59'N 121°36'E	66
	TAKAO (91.6)			
60	Hozan Wireless Telegraph Sta	Rptd one of most powerful in Empire	22°52'N 120°29'E	58

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JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
27	Seishin Wireless Station	Large	41°47'N 129°49'E	13
	HEIJO (84.2)			
83	Heijo Radio Station	Important in area	38°59'N 125°45'E	71
84	Chinnampo Radio Station	Important in area	38°43'N 125°24'E	76
	KEIJO (84.6)			
47	Getsubi Radio Station	At Jinsen Harbor	37°28'N 126°37'E	44
	FUSAN (84.7)			
96	Chinkai Radio Station	Links Chinkai, Sasebo & Kure naval bases	35°09'N 128°38'E	101
	THAILAND (98)			
	THAILAND (98.1, 98.2, 98.3)			
33	General Post Office (Bangkok)	Main wire communications center Thailand	13°44'N 100°31'E	26
34	Saladeng Radio Station	Rptd most powerful station Thailand	13°43'N 100°33'E	26
35	Phya Thai Radio Station	Important	13°46'N 100°32'E	37
36	Lak Sri Short Wave Radio Station	Used by Don Muang Airfield	13°53'N 100°35'E	6

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JAPAN - COMMUNICATIONS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NETHERLANDS EAST INDIES (94)			
	SUMATRA SOUTH (94.2)			
71	Muntok Telephone Station	-	2°04'S 105°10'E	57
74	Palembang Radio Station	-	3°01'S 104°45'E	53a
75	Palembang Telephone Exchange	-	2°59'S 104°46'E	75
	JAVA (94.3)			
165	Malabar Radio Station	Powerful overseas transmitter	7°07'S 107°37'E	165
166	Batavia Telephone Exchange	-	6°10'S 106°50'E	166
167	Tandjong Priok Radio Station	More data required	6°06'8 106°53'E	177
168	Surabaya Telephone Exchange	-	7°14'S 112°45'E	174
169	Bandung Telephone Exchange	-	6°55'S 107°37'E	159
170	Bandung Radio Station	More data required	6°55'S 107°38'E	159
	CELEBES-TIMOR (94.5)			
202	Macassar Radio Station	-	5°08'S 119°24'E	202
203	Macassar Telephone Exchange	-	5°08'S 119°24'E	202

* New Target to be included in Folder revision

NA No number yet assigned when this list prepared

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March 1943

ELECTRIC POWER

KEY TARGETS

	TARGET No.	TARGET Name	Importance	Obj. Area
1	110	Tokyo Elec Pr Gen Station, Tsurumi Plant	178,000* Kw	Tokyo (90.17)
2	230	Senju Steam Pr Station	77,000 Kw	Tokyo (90.17)
3	493	Tokyo Steam Pr Plant	70,000* Kw	Tokyo (90.17)
4	111	Kawasaki Elec Pr Pl for Govt Railways	60,000* Kw	Tokyo (90.17)
5	213	Kinugawa Steam Pr Station	35,000 Kw	Tokyo (90.17)
6	1345	Tokyo Municipality Steam Pr Plant	30,000 Kw	Tokyo (90.17)
7	228	Govt Steam Pr Station	25,000 Kw	Tokyo (90.17)
8	63	Kanagawa Steam Power Plant	21,500 Kw	Tokyo (90.17)
9	540	Kansai Kyodo Steam Pr Plant	318,000 Kw	Osaka (90.25)
10	536	Amagasaki Steam Power Plant	300,000 Kw	Osaka (90.25)
11	195	Nagoya Steam Pr Plant	109,000 Kw	Nagoya (90.20)
12	325	Kizugawa Steam Power Power Plant	100,000 Kw	Osaka (90.25)
13	323	Kasugade #2 Steam Plant	65,000 Kw	Osaka (90.25)
14	1283	Sanyo Pr Plant Shikama	55,000 Kw	Okayama (20.27)
15	322	Kasugade #1 Steam Plant	50,000 Kw	Osaka (90.25)
16	1158	Kyoto Steam Pl	50,000 Kw	Kyoto (90.23)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

*Probably much larger; principal plants in 1,000,000 KW capacity on Harbor Front.

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March 1943

ELECTRIC POWER

	KEY TARGETS			
	TARGET			
	No.	Name	Importance	Obj. Area
17	324	Fususaki Steam Power Plant	40,000 Kw	Osaka (90.35)
18	4	Minatogawa Steam Pr Plant	38,160 Kw	Osaka (90.25)
19	55	Hydro Elec Pr Plant, Kirin	360,000 Kw	Manchukuo East (93.2)
20	35	Taikanton Steam Pr Pl #2	150,000 Kw	Mukden (93.3)
21	37	Steam Pr Plant, Showa Steel Works	80,000 Kw	Mukden (93.3)
22	36	Taikanton Steam Pr Pl #1	50,000 Kw	Mukden (93.3)
23	38	Pensihu Steam Power Plant	50,000 Kw	Mukden (93.3)
24	56	Hydro Elec Pr Pl, Suihodo	100,000 Kw**	Manchukuo East (93.2)
25	8	Fusan Hydro Elec Plant #1	129,000 Kw	Dairen (93.5)
26	35	Hatto Harbor Steam Plant	38,000 Kw	Taihoku (91.3)
27	159	Large Steam Pl, Takao	35,000 Kw	Takao (91.6)
28	82	Jitsugetsutan Pr Plant, #1	100,000 Kw	Taiwan West (91.4)
29	83	Jitsugetsutan Pr Plant, #2	60,000 Kw	Taiwan West (91.4)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

**Capacity of Plant--300,000 Kw(1/3 for Manchukuo - 2/3 for Chosen

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March 1943

E L E C T R I C P O W E R

The Japanese war effort is dependent upon the availability of electric power. No other industrial factor is so basic. The manufacture of end products such as planes, tanks, guns, ships, etc. all depend on electric power. The basic industries — iron and steel, aluminum and other non-ferrous metals, fixed nitrogen and considerable transportation -- are likewise dependent on electric power. Without this essential commodity the Japanese war economy would collapse.

The total installed generating capacity in Japan proper, Manchukuo, Chosen (Korea), and Taiwan (Formosa) is approximately 17 million kilowatts. This capacity is comprised of 9,300,000 Kw hydro and 7,700,000 Kw steam. Of the total capacity, Japan proper has 13,200,000 Kw, Manchukuo has 1,400,000 Kw, Chosen has 2,000,000 Kw, and Taiwan has 400,000 Kw. Appreximately 65 billion kilowatt hours will be produced. On the basis of estimated requirements of the basic industries, this amount of electric energy will be sufficient to meet the needs of war production and rationed civilian uses.

Japanese electric power, as outlined in the above paragraph, is divided into four distinct groups on the basis of geographical location. (1) Taiwan, (2) Manchukuo, (3) Chosen, (4) Japan proper. Each of these four groups must be analyzed as a separate and distinct entity in order to indicate the scope of air attack required, and the effects of such bombings on the total war effort.

(Note: The generating capacity percentage figures used in the following paragraphs are based on installed capacity.)

1. TAIWAN.—Four power plants account for approximately 60% of the total electric generating capacity of Taiwan. These plants are: Jitsugetsutan Power Plant #1 (Target 82), Jitsugetsutan Power Plant #2 (Target 83), Hatto Harbor Steam Plant (Target 35), and the large steam plant at Takao (Target 159). The two Jitsugetsutan plants constitute the principal source of electric energy in Taiwan, supplying power to the northern, southern and western areas. The two steam plants are auxiliary stations. The destruction of the two Jitsugetsutan plants would reduce considerably Taiwan's economic contribution to the Japanese war effort and the destruction of all four plants would practically stop Taiwan industrial production.

2. MANCHUKUO.—Seven power plants account for approximately 63% of the total electric generating capacity of Manchukuo. These plants are Hydro Electric Power Plant, Kirin (Target 55); Hydro Electric Power Plant, Suihodo (Target 56)←1/3 of capacity goes to Manchukuo and 2/3 to Chosen; Taikanton Steam Power Plant #1 (Target 36); Taikanton Steam Power Plant #2 (Target 35); Steam Power Plant Showa Steel Works (Target 37); Penhsihu Steam Power Plant (Target 38); Steam Power Plant, Kanseishi (Target 8). These plants are located in the key industrial areas of southern Manchukuo and the destruction of any one of them would result in a loss of war production. The cumulative effect of destroying all seven of these plants would reduce Manchukuo's industrial contribution to the Japanese war effort by at least 80%.

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3 CHOSEN.—Nine of ten hydro power plants account for 60% of the total hydro generating capacity and 45% of all the electric generating capacity of Chosen. These plants are Chosin Hydro-Electric Plant #1 (Target 4), Chosin Hydro-Electric Plant #2 (Target 5), Chosin Hydro-Electric Plant #3 (Target 6), Chosin Hydro-Electric Plant #4 (Target 7), Fusen Hydro-Electric Plant #1 (Target 8), Fusen Hydro-Electric Plant #2 (Target 9), Hydro-Electric Power Plant, Suihodo (Target 56) -- 2/3 of capacity goes to Chosen and 1/3 to Manchukuo. The other two or three plants are located on the Kyosen River about 35 miles airline ENE from Fusen Reservoir dam and aggregate 220,000 Kw These plants have not been assigned target numbers or described in the Objective Folders. With the exception of the plant at Suihodo on the Yalu River, these plants are located in the mountainous region north of Konan. The power plants outlined above form the basic source of electric energy in Chosen. The destruction of these plants would reduce war production in Chosen by 65% to 75%.

4. JAPAN PROPER.--Japan proper includes the islands of Hokkaido, Honshu, Shikoku, Kyushu, and Karafuto (the southern part of Saghalien Island). Approximately 75% of the war production in Japan proper is concentrated in Central Honshu, the industrial triangle which includes the Tokyo, Osaka and Nagoya industrial areas. Approximately 20% of the war production in Japan proper is concentrated in northern Kyushu and southwestern Honshu. The remaining 5% is accounted for by Karafuto, Hokkaido, Northern Honshu and Shikoku. Therefore, this survey of the electric power industry of Japan proper is confined to the two principal areas: (A) Central Honshu, (B) Northern Kyushu and Southwestern Honshu.

A. Central Honshu.--9,401,000 Kw or 71% of the generating capacity of Japan proper is located in Central Honshu. Hydro plants account for 5,301,000 Kw and Steam plants account for 4,100,000 Kw. Central Honshu is divided into two power supply areas: Tokyo Supply area and Osaka-Nagoya Supply area. The Tokyo area operates on a frequency of 50 cycles. The Osaka-Nagoya area operates on a frequency of 60 cycles. This difference in frequency is a barrier to the complete integration of the power facilities of Central Honshu. Under these conditions the power supply of one area could be completely disrupted without affecting the power available to the other area.

(1) Tokyo Supply Area. There is 5,304,000 Kw generating capacity in the Tokyo area, 3,104,000 hydro and 2,200,000 steam. Twenty-six plants account for 42.2% of the hydro generating capacity in the area and 24.7% of the total generating capacity in the area. Nine steam plants account for 69.4% of the steam power generating capacity in the area and 28.8% of the total generating capacity. Therefore, 35 plants account for 53.5% of the total generating capacity in the Tokyo Supply area. See Table "Principal Targets, Electric Power Industry" for the listing of these plants. If only the 9 steam plants were destroyed, production would be reduced by 40% during the dry months of January-February and August and by 20% during the other months of the year. If only the 26 hydro plants were destroyed, production would be reduced by 30% during the dry season and by 60% during the remainder of the year. The destruction of all 35 plants would reduce Tokyo Supply area power for war production from 75% to 80%.

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(2) Osaka-Nagoya Supply Area. There is 4,097,000 Kw generating capacity in the Osaka-Nagoya area, 2,197,000 hydro and 1,900,000 steam. Twenty-five plants account for 47.9% of the hydro generating capacity in the area and 25.7% of the total generating capacity in the area. Fifteen plants account for 74.0% of the steam power generating capacity in the area and 34.3% of the total generating capacity. Therefore, 40 plants account for 60.0% of the total generating capacity in the Osaka Supply area. See Table "Principal Targets, Electric Power Industry" for the listing of these plants. If only the 15 steam plants were destroyed, production would be reduced by 60% during the dry months of January-February and August and by 25% during the other months of the year. If only the 25 hydro plants were destroyed, production would be reduced by 20% during the dry season and by 60% during the remainder of the year. The destruction of all 40 plants would reduce Osaka Supply area power for war production from 80% to 85%.

By destroying 24 steam plants the production of Central Honshu would be reduced by 50% during the dry months, January-February and August, and by 23% during the other months of the year. The destruction of 51 hydro plants would reduce war production by 25% during the dry season and by 60% during the remainder of the year. If all 75 selected plants were destroyed, power available for war production in Central Honshu would be reduced from 75% to 83%.

B. Northern Kyushu and Southwestern Honshu.--2,601,000 or 20% of the generating capacity of Japan proper is located in this area. Steam plants account for 1,801,000 Kw and hydro plants account for 800,000 Kw. 52.2% of the steam generating capacity is accounted for by 17 steam plants and 34.6% of the hydro capacity is accounted for by 9 hydro plants. These 26 plants account for 46.7% of the total generating capacity in the area. See Table "Principal Targets, Electric Power Industry" for the listing of these plants. The destruction of the 17 steam plants would reduce production in the area by 45%. The destruction of the 9 hydro plants would reduce production in the area from 15% to 20%. Power for war production would be reduced from 60% to 65% if all 26 selected plants were destroyed.

There are over 2,000 steam and hydro plants in Japan proper of 1,000 Kw capacity or more. Out of this number 101 power plants have been selected as Principal Targets in Japan proper — 60 hydro and 41 steam. The destruction of these 101 plants would reduce power available for war production in Japan proper by about 75%.

SUMMARY--121 power plants have been selected as principal targets in the Japanese electric power industry: 4 in Taiwan; 7 in Manchukuo; 9 in Chosen; 101 in Japan Proper. The destruction of all of these plants would drastically reduce war production and the collapse of the Japanese war effort would be imminent. Sustained and large scale operation would be required to accomplish this result. Out of the 121 principal plants, 29 have been selected as key targets or targets which should be given first priority. The destruction of these 29 plants would seriously affect Taiwan, Manchukuo and Central Honshu of Japan Proper.

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PRINCIPAL TARGETS
ELECTRIC POWER INDUSTRY

Target No.	Target Name	Capacity Kw Steam	Capacity Kw Hydro
	JAPAN PROPER		
	CENTRAL HONSHU Tokyo Supply Area		
110	Tokyo Elec Pr Generating Sta, Tsurumi Pl	178,000*	
230	Senju Steam Power Station	77,000	
493	Tokyo Steam Power Plant	70,000*	
111	Kawasaki Elec Pr Pl for Govt Railways	60,000*	
213	Kinugawa Steam Power Station	35,000	
1345	Tokyo Municipality Steam Pr Plant	30,000	
228	Government Steam Power Station	25,000	
63	Kanagawa Steam Power Plant	21,500	
1059	Saku Plant, Kanto Hydro Plant		73,400
1515	Yatsuzawa Power Plant		43,200
881	Inawashiro #1 Hydro Plant		42,000
1502	Yomikaki Power Plant		40,800
1226	Takihara Power Plant		34,000
900	Inawashiro #2 Hydro Plant		30,000
902	Inawashiro #4 Hydro Plant		27,000
901	Inawashiro #3 Hydro Plant		18,000
	Other principal plants, for which target numbers have not been assigned, include:		
	1 Steam Plant	30,000	
	18 Hydro Plants (capacities range from 18,000 Kw to 170,000 Kw per plant)		1,001,980
	*1,000,000 Kw additional capacity on Harbor Front.	1,000,000	
		1,526,500	1,310,380
	Total 2,836,880		
	CENTRAL HONSHU Osaka Supply Area		
540	Kansai Kyodo Steam Power Plant	318,000	
536	Amagasaki Steam Power Plant	300,000	
195	Nagoya Steam Power Plant	109,000	
325	Kizugawa Steam Power Plant	100,000	
323	Kasugade #2 Steam Plant	65,000	
1283	Sanyo Power Plant, Shikama	55,000	
322	Kasugade #1 Steam Plant	50,000	
1158	Kyoto Steam Plant	50,000	
324	Fukusaki Steam Power Plant	40,000	
4	Minetogawa Steam Power Plant	38,160	
877	Kurobegawa #2 Hydro Power Plant		75,000
873	Komaki Hydro Power Plant		72,000
876	Yanagawara Hydro Power Plant		54,000
874	Kanidera Hydro Power Plant		50,000
875	Soyamo Hydro Power Plant		46,000
1505	Oi Power Plant		43,200
1155	Uji Hydro Electric Plant		35,000
1156	Shizugawa Hydro Electric Plant		33,600
	Other principal plants, for which target numbers have not been assigned, include:		
	5 Steam Plants (capacities range from 28,000 Kw to 150,000 Kw per plant).	281,500	
	17 Hydro Plants (capacities range from 23,200 Kw to 77,500 Kw per plant)		644,400
		1,406,660	1,053,200
	Total 2,459,860		
	C. H. TOTAL 5,296,740	2,933,160	2,363,580

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PRINCIPAL TARGETS
ELECTRIC POWER INDUSTRY

Target No.	Target Name	Capacity Kw Steam	Capacity Kw Hydro
	NORTHERN KYUSHU AND SOUTHWESTERN HONSHU		
1249	Omuta Plant, Kyushu Power Company	100,000	
827	Ube Power Company	75,000	
1127	Kokura Steam Plant	72,200	
664	Najima Steam Station	60,000	
796	Saka Power Plant	51,200	
1284	Chukoku Power Plant	26,500	
99	Shimonoseki Maeda Power Plant	23,750	
1320	Gokasekawa Power Plant		31,000
1250	Onagohata Power Station		27,000
1321	Morisaki Power Plant		16,000
	Other principal plants, for which target numbers have not been assigned, include:		
	10 Steam Plants (capacities range from 20,000 Kw to 150,000 Kw per plant)	530,722	
	6 Hydro Plants (capacities range from 19,347 Kw to 54,811 Kw per plant)		202,694
		939,372	276,694
	Total 1,216,066		
	TOTAL JAPAN PROPER 6,512,806	3,872,532	2,640,274
	MANCHUKUO		
35	Taikanton Steam Power Plant #2	150,000	
8	Steam Power Plant (Kanseishi)	85,000	
37	Steam Power Plant, Showa Steel Works	80,000	
36	Taikanton Steam Power Plant #1	50,000	
38	Pensihu Steam Power Plant	50,000	
55	Hydro Electric Power Plant, Kirin		360,000
56	Hydro Electric Power Plant, Suihodo		100,000**
	**Capacity of Plant 300,000 Kw (1/3 for Manchukuo - 2/3 for Chosen)		
		415,000	460,000
	TOTAL MANCHUKUO 875,000		
	CHOSEN		
56	Hydro Electric Power Plant, Suihoda		200,000**
4	Chosin Hydro Electric Plant #1		140,000
8	Fusan Hydro Electric Plant #1		129,000
5	Chosin Hydro Electric Plant #2		112,000
9	Fusan Hydro Electric Plant #2		41,000
6	Chosin Hydro Electric Plant #3		40,000
7	Chosin Hydro Electric Plant #4		28,000
	Two or three Hydro Pl's on Kyosen R. agrigate		220,000
	**Capacity of Plant 300,000 Kw (1/3 for Manchukuo - 2/3 for Chosen)		
			910,000
	TOTAL CHOSEN 910,000		
	TAIWAN		
35	Hatto Harbor Steam Plant	38,000	
159	Large Steam Plant, Takao	35,000	
82	Jitsugetsutan Power Plant #1		100,000
83	Jitsugetsutan Power Plant #2		60,000
		73,000	160,000
	TOTAL TAIWAN 233,000		
	GRAND TOTAL 8,530,806	4,360,532	4,170,274

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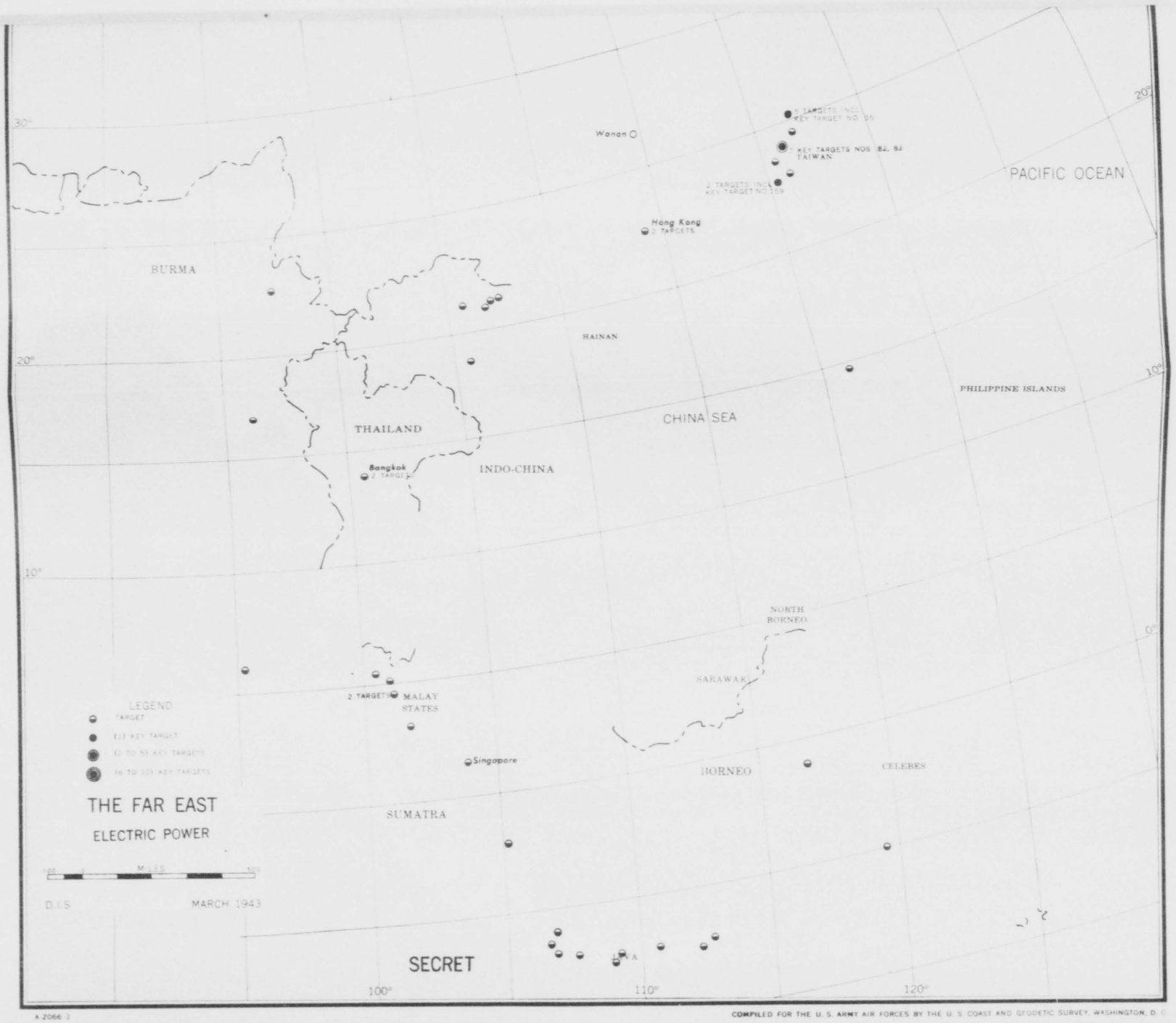

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
959	Hydro-Electric Power Plant	More Data Required	47°03'N 142°44'E	967
961	Hydro-Electric Power Plant	More Data Required	46°56'N 142°39'E	961
	MURORAN (90.3)			
397	Electric Light Co.	Minor	42°20'N 140°58'E	378
398	Power Station	Minor	42°20'N 141°00'E	378
985	Dai Nippon Denryoku Plant	Believed secondary	43°07'N 141°33'E	-
986	Sappore Hydro-Electric Plant	Believed important	43°04'N 141°22'E	-
987	Otaru Electric Power Plant	More Data Required	43°12'N 141°00'E	-
	HAKODATE (90.4)			
981	Kameda Power Plant & Gas Wks	Minor	41°47'N 140°44'E	977
982	Onuma Power Plant	Minor	41°59'N 140°40'E	-
	AKITA (90.6)			
1070 a&b	Hydro Electric Power Stations	Supply nearby copper operations	40°18'N 140°50'E	1070a
	MORIOKA (90.7)			
1073	Morioka Electric Power Plant	Small	39°40'N 141°12'E	1074

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	FUKUSHIMA (90.10)			
881	Inawashiro Hydro Plant #1	Important, serves Tokyo - 42,000 Kw	37°33'N 140°00'E	881
900	Inawashiro Hydro Plant #2	Important, serves Tokyo - 30,000 Kw	37°33'N 139°59'E	881
901	Inawashiro Hydro Plant #3	Important, serves Tokyo - 18,000 Kw	38°33'N 139°57'E	881
902	Inawashiro Hydro Plant #4	Important, serves Tokyo - 27,000 Kw	37°34'N 139°55'E	902
	TOYAMA (90.11)			
873	Komaki Hydro Power Plant	72,000 Kw	36°34'N 137°00'E	873
874	Kanidera Hydro Power Plant	50,000 Kw	36°27'N 137°15'E	874
875	Soyama Hydro Power Plant	46,000 Kw	36°28'N 136°59'E	875
876	Yanagawara Hydro Power Plant	54,000 Kw	36°48'N 137°35'E	876
877	Kurobe #2 Hydro Power Plant	75,000 Kw	36°45'N 137°39'E	877
	TAKASAKI (90.13)			
1059	Saku Plant, Kanto Hydro Power	Key to Kanto System - 73,000 Kw	36°29'N 139°02'E	1059
1060	Hosoo Hydro Development, Daiya River	3 small stations	36°42'N 139°31'E	-
	TAKAYAMA (90.15)			
1495	Kosaka Power Plant	Hydro, 17,000 Kw, secondary source for Nagoya	35°55'N 137°12'E	1495

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JAPAN - ELECTRIC POWER

TARGET NO	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KOFU (90.16)			
1498	Otaki Power Plant #1	28,000 Kw; targets thru #1505 hydro system supplying Osaka	35°49'N 137°41'E	1498
1499	Momoyama Power Plant & Sub-Station	23,100 Kw	35°44'N 137°43'E	1500
1500	Suchara Power Plant	9,200 Kw	35°42'N 137°41'E	1500
1501	Okuwa Power Plant	11,000 Kw	35°40'N 137°38'E	1500
1502	Yomikaki Power Plant	40,700 Kw	35°35'N 137°36'E	1502
1503	Shizumo Power Plant	14,700 Kw	35°35'N 137°32'E	1502
1504	Ochiai Power Plant	13,700 Kw	35°30'N 137°30'E	1504
1505	Oi Power Plant	42,900 Kw	35°29'N 137°24'E	1505
1506	Minamukai Power Plant	21,300 Kw	35°25'N 137°49'E	1506
1507	Tashirogawa Power Plant #1	16,700 Kw;targets thru #1511 important hydro development	35°28'N 138°19'E	1510
1508	Tashirogawa Power Plant #2	20,800 Kw	35°28'N 138°20'E	1510
1509	Hayakawa Power Plant #1	20,000 Kw	35°25'N 138°23'E	1510
1510	Hayakawa Power Plant #2	10,000 Kw	35°25'N 138°22'E	1510
1511	Hayakawa Power Plant #3	6,600 Kw	35°28'N 138°21'E	1510
1512	Shisidone Power Plant	16,800 Kw, unit in Tokyo power supply	35°31'N 138°51'E	1512
1513	Yamura Power Plant	24,000 Kw, unit in Toyko power supply	35°34'N 138°55'E	1513
1514	Komahashi Power Plant	23,400 Kw, unit in Tokyo power supply	35°37'N 138°57'E	1514
1515	Yatsuzawa Power Plant	43,200 Kw, unit in Tokyo power supply	35°37'N 139°06'E	1515
	TOKYO (90.17)			
62	Hodogaya Substation (Yokohama)	Important	35°27'N 139°37'E	NA
63	Kanagawa Steam Plant (Yokohama)	One of 5 largest in area - 21,500 Kw	35°28'N 139°38'E	NA
102	Asahi Substation (Yokohama)	Important; transmits hydroelectric power to factories	35°32'N 139°39'E	NA

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
104	Nippon Electric Trans.Sta (Kawasaki)	Secondary Substation	35°32'N 139°40'E	N A
105	Kawasaki Substation #1 (Kawasaki)	Important switching & transforming station	35°32'N 139°41'E	"
106	RR transformer station (Kawasaki)	Government railway station	35°32'N 139°42'E	"
110	Tokyo Electric, Tsurumi Plant	One of area's 5 largest - 178,000 Kw (1936)	35°29'N 139°43'E	"
111	Kawasaki Electric Plant, Gov't. Rwys.	Large, chief power source for Gov't. railways of area	35°30'N 139°43'E	"
211	Inawashiro Transforming Sta (Tokyo)	Handles power from Key L Inawashiro hydro system	35°44'N 139°46'E	"
213	Kinugawa Steam Station (Tokyo)	Reserve plant for Tokyo tramways - 35,000 Kw	35°45'N 139°47'E	"
228	Government Steam Station (Tokyo)	Important, supplies railways - 25,000 Kw	35°46'N 139°44'E	"
230	Senju Steam Power Sta (Tokyo)	One of area's 5 largest - 77,000 Kw	35°45'N 139°48'E	"
470	Tokyo Electric Station (Kawasaki)	Medium size	35°31'N 139°44'E	"
493	Tokyo Steam Power (Kawasaki)	One of area's 5 largest - 70,000 Kw	35°30'N 139°43'E	"
1345	Tokyo Municipality Steam Plant	Supplementary for tramways - 30,000 Kw	35°39'N 139°45'E	"
1346	Yokohama Electric Light (Yokohama)	Serves Yokohama residential section	35°26'N 139°39'E	"
	NAGOYA (90.20)			
195	Nagoya Steam Power Plant	Main power source for Nagoya - 109,000 Kw	35°05'N 136°54'E	194
1142	Atsuta Steam Power Plant	Standby, 10,000 Kw	35°06'N 136°54'E	197
1143	Iwakura Substation (Kachikawa)	Important distributing station	35°13'N 136°57'E	196
1144	Seto Hydro Electric Station	Secondary	35°13'N 137°06'E	1144
	HAMAMATSU (90.21)			
1226	Takihara Power Plant	Hydro 34,000 Kw	35°09'N 137°49'E	1226

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JAPAN - ELECTRIC - POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KYOTO (90.23)			
1155	Uji Hydro Electric Plant	Supplies Osaka & Kyoto area - 35,000 Kw	34°53'N 135°49'E	1155
1156	Shizugawa Hydro Electric Plant	Supplies Osaka-Kyoto area - 34,000 Kw	34°52'N 135°50'E	1155
1157	Ohmine Hydro Electric Plant	Supplies Osaka-Kyoto area - 16,000 Kw	34°52'N 135°51'E	1155
1158	Kyoto Steam Plant	Important in dry season - 50,000 Kw	35°01'N 135°52'E	1163
	OSAKA (90.25)			
4	Minatogawa Steam Power Plant	Secondary - 38,000 Kw	34°39'N 135°09'E	10
322	Kasugade #1 Steam Plant	Important - 50,000 Kw	34°40'N 135°28'E	263
323	Kasugade #2 Steam Plant	Important - 65,000 Kw	34°40'N 135°28'E	263
324	Fukuzaki Steam Power Plant	Important - 40,000 Kw	34°39'N 135°28'E	325
325	Kizugawa Steam Power Plant	Important -100,000 Kw	34°37'N 135°29'E	263
536	Amagasaki Steam Power Plant	Very important - 300,000 Kw	34°42'N 135°24'E	18
540	Kansai Kyodo Steam Power Plant	Rptd largest steam plant in Japan - 318,000 Kw	34°42'N 135°24'E	18
	OKAYAMA (90.27)			
1283	Sanyo Power Plant, Shikama #3	Steam, main source of power for Himeji	34°47'N 134°40'E	1290
1284	Chukoku Power Plant	26,500 Kw	34°36'N 133°59'E	1280
1285	Horie Power Plant	Largest on Shikoku Island	34°16'N 133°45'E	1303
1286	Sanyo Power Plant, Shikama #2	20,000 Kw	34°48'N 134°42'E	1290
1287	Uno Power Plant	Steam, serves Okayama City	34°29'N 133°57'E	1295
1288	Aboshi Power Plant	Steam, serves Aboshi, probably Target 1281	34°47'N 133°36'E	1290
	KOCHI (90.28)			
1526	Ichiu Power Plant, Ichiumura	Small, supplies Tokushima city	33°53'N 133°49'E	1526

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KOCHI (90,28) (Continued)			
1527	Toho Power Plant, Iya	Small, supplies Tokushima city	33°51'N 133°55'E	1527
1528	Kochi Steam Power Plant, Kochi	Small, supplies Kochi city	33°33'N 133°31'E	1524
	NIIHAMA (90,29)			
926a	Hadeba Power Plant	Power for Sumitomo Besshi Mine, Target 926	33°58'N 133°19'E	926
931	Niihama Steam Power Plant	40,000 Kw	33°58'N 133°17'E	923
	KURE (90,30)			
742	Electric Railways Power Station	Steam, in Hiroshima City	34°23'N 132°27'E	738
743	Electric Power Generator	In Hiroshima City, no details	34°23'N 132°27'E	737
744	Electric Generator	Same	34°23'N 132°27'E	738
796	Saka Power Plant	51,000 Kw	34°21'N 132°32'E	733
	TOKUYAMA (90,32)			
823	Toyo Electric Power (Asa Sta)	Large, hydro electric	34°03'N 131°10'E	819
824	Electric Power Station	Capacity unknown	34°22'N 131°30'E	-
827	Ube Power Co	75,000 Kw	33°57'N 131°14'E	818
	KYUSHU EAST (90.33)			
1320	Gokasekawa Power Plant	Important - 31,000 Kw; supplies Target 1314	32°39'N 131°22'E	1320
1321	Morisaki Power Plant	Important - 16,000 Kw	32°37'N 131°26'E	1320
1322	Sansuhara Power Plant	Secondary - 13,000 Kw; supplies Oita area	32°29'N 131°23'E	1322
1323	Takachiho Power Plant	Secondary - 13,000 Kw	32°42'N 131°17'E	1323
1324	Shin Chinda Power Plant	Minor - 7,000 Kw	32°59'N 131°31'E	1324
1325	Jikumaru Power Plant	Minor - 7,000 Kw	32°59'N 131°27'E	1325
1326	Unoshima Steam Power Plant	Secondary - 10,000 Kw; supplies Nakatsu City	33°37'N 131°08'E	1326

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIMONOSEKI (90.34)			
99	Shimonoseki-Maeda Power Plant	23,750 Kw	33°58'N 130°58'E	44a
188	Kyushu Electric Tramway Power Plant	Important	33°53'N 130°52'E	168
1127	Kokura Steam Plant	Important; 72,200 Kw	33°53'N 130°52'E	168
1128	Kokura Power Plant #1	Rptd new, secondary	33°53'N 130°52'E	168
	KURUME (90.35)			
664	Najima Steam Station	Important - 60,000 Kw	33°39'N 130°25'E	664
1249	Omuta Plant, Kyushu Power Co	Important - 100,000 Kw	33°00'N 130°26'E	1246
1250	Onagohata Power Sta (4 mi SE of Hida)	Important - 27,000 Kw	33°17'N 130°59'E	1250
1251	Kurokawa Hydro Electric Station #1	Minor - 15,000 Kw	32°52'N 130°58'E	1252
1252	Kurokawa Hydro Electric Station #2	Minor - 15,000 Kw	32°52'N 130°58'E	1252
1253	Kurokawa Hydro Electric Station #3	Minor - 10,000 Kw	32°52'N 130°59'E	1252
	SASEBO (90.36)			
847	Nagasaki Steam Power Plant	Minor - 10,000 Kw	32°45'N 129°52'E	542
848	Sasebo Power Plant	Supplies or controls power for Naval Base	33°10'N 129°42'E	755
878	Nagasaki Substation #1 - #2	Minor	32°44'N 129°51'E	542
	YATSUSHIRO (90.37) - KYUSHU SOUTH (90.38)			
1388	Umeto Power Plant	Steam, supplies Minamata chemical plant	32°12'N 130°23'E	
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
35	Hatto Harbor Steam Plant	Main source for Keelung - 38,000 Kw	25°09'N 121°47'E	35
36	Transformer Station	Secondary	25°01'N 121°32'E	47

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JAPAN - ELECTRIC POWER

TARGET NO	TARGET	COMMENT	APPROXIMATE	TARGET CHART NO
	TAIHOKU (91.3) (Continued)			
37	Shosoko Hydro-Electric Substation	Auxiliary station	24°56'N 121°32'E	38
38	Kizan Hydro-Electric Substation	Minor	24°54'N 121°34'E	38
39	Shin-Kizan Hydro-Electric Plant	Secondary	24°53'N 121°34'E	38
	TAIWAN WEST (91.4)			
82	Jitsugetsutan Power Plant #1	Very important - 100,000 Kw	23°51'N 120°52'E	82
83	Jitsugetsutan Power Plant #2	Important; with Target 82 rptd 60% Taiwan power	23°48'N 120°52'E	83
84	Kagi Substation	Secondary	23°29'N 120°26'E	102
	TAIWAN EAST (91.5)			
70	Maruyama Power Plant	Important; supplies Karenko light-metals plants	24°39'N 121°40'E	70
71	Taito Sub-station	Secondary	22°45'N 121°09'E	67
	TAKAO (91.6)			
1	Steam Power Plant	Secondary	22°38'N 120°16'E	1
159	Large Steam Plant, Takao	35,000 Kw	22°38'N 120°16'E	N A
	CHOSEN (84)			
	KONAN (84.2)			
4	Chosin Hydro-Electric Plant #1	140,000 Kw, with targets thru #11 one of largest power developments	40°11'N 127°16'E	4
5	Chosin Hydro-Electric Plant #2	112,000 Kw	40°07'N 127°16'E	5
6	Chosin Hydro-Electric Plant #3	40,000 Kw	40°04'N 127°22'E	5

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KONAN (84.2) Continued			
7	Chosin Hydro-Electric Plant #4	28,000 Kw	40°03'N 127°25'E	7
8	Fusen Hydro-Electric Plant #1	129,000 Kw	40°21'N 127°34'E	9
9	Fusen Hydro-Electric Plant #2	41,400 Kw	40°18'N 127°36'E	9
10	Fusen Hydro-Electric Plant #3	18,000 Kw	40°14'N 127°36'E	11
11	Fusen Hydro-Electric Plant #4	12,000 Kw	40°12'N 127°33'E	11
12	Steam Power Plant	Capacity unknown	39°50'N 127°36'E	1
	HEIJO (84.3)			
85	Heijo Steam Power Plant	Small, 7,000 Kw	39°00'N 125°46'E	71
	MANCHUKUO (Manchuria) (93)			
	MANCHUKUO EAST (93.2)			
55	Hydro-Electric Power Plant, Kirin	Largest Hydro Plant in Manchukuo - 360,000 Kw	44°05'N 126°25'E	55
56	Hydro-Electric Power Plant, Suihodo	Very important, serves both Korea and Manchukuo	40°25'N 125°00'E	56
73	Electric Generating Station, Antung	More Data Required	40°10'N 124°20'E	72
78	Kokai Hydro-Electric Power Plant	More Data Required	40°55'N 126°30'E	78
79	Gishu Hydro-Electric Power Plant	Projected	40°15'N 124°30'E	79
80	Igen Hydro-Electric Power Plant	Projected	40°50'N 126°00'E	80
81	Manpochin Hydro-Electric Power Plant	Projected	41°10'N 126°15'E	81
82	Jijo Hydro-Electric Power Plant	Projected	41°30'N 126°30'E	82
83	Chuko Hydro-Electric Power Plant	Projected	41°40'N 126°55'E	83
84	Kosho Hydro-Electric Power Plant	Projected	41°30'N 127°05'E	84

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MUKDEN (93.3)			
35	Taikanton Steam Power Plant #2	Largest & most important in Manchukuo - 150,000 Kw	41°51'N 123°54'E	32
36	Taikanton Steam Power Plant #1	2nd largest plant in Fushun - 50,000 Kw	41°51'N 123°54'E	32
37	Steam Power Plant, Showa Steel Wks	Supplies Steel Wks - 80,000 Kw	41°05'N 122°58'E	29
38	Pensihu Steam Power Plant	Supplies mines & blast furnaces of Steel Wks - 50,000 Kw	41°18'N 123°45'E	30
39	Fuhsin Steam Power Plant	Supplies industry in Fuhsin	42°05'N 121°35'E	42
64	Electric Power Station	Supplies industry in Mukden	41°47'N 123°23'E	50
	DAIREN (93.5)			
8	Steam Power Plant (Kanseishi)	Largest supplier in Darien - 85,000 Kw	38°58'N 121°37'E	1
9	Electric Power Station	Minor	38°56'N 121°38'E	1
27	Amanagawa Electric Power Plant	Supplies 20% power in Darien	38°55'N 121°35'E	10
	CHINA (83)			
	CANTON (83.4)			
48	Hong Kong Electric, North Point	Only known power plant on Hong Kong Island	22°18'N 114°11'E	55
49	China Light & Power (Kowloon)	Only known power plant in Kowloon	22°19'N 114°11'E	55
	TSINGTAO (83.11)			
68	New Power Plant (Tsingtao)	Largest in area	36°07'N 120°20'E	78
69	Old Power Plant (Tsingtao)	Second largest in area	36°04'N 120°18'E	78
70	Power Plant (Laoyao)	Only plant in port	34°44'N 119°27'E	79

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TSINGTAO (83.11) (Continued)			
71	New Power Plant (Tsinan)	Supplies local industries, RR Shops	36°40'N 117°01'E	71
72	Old Power Plant (Tsinan)	Small	36°40'N 117°01'E	71
	TIENTSIN (83.12)			
15	Belgian Tramway & Light (Tientsin)	Largest Tientsin City, not important industrially	39°08'N 117°11'E	11
16	British Electric Co (Tientsin)	Not important industrially	39°07'N 117°11'E	11
26	Port Power House (Chinwangtao)	Important port power	39°56'N 119°37'E	26
34	Linsi Power House	Primary target in area, power for Kailan mine	39°42'N 118°26'E	34
35	Tangshan Power House (Tangshan)	Auxiliary power for Kailan mine operation	39°38'N 118°14'E	35
	FRENCH INDO-CHINA (85)			
	FRENCH INDO-CHINA NORTH (85.1)			
23	Hanoi Power Plant	Chief source of power Tonkin Delta - 22,500 Kw	21°02'N 105°51'E	N A
24	Haiphong Power Plant	Standby plant for Hanoi Power Plant - 5,500 Kw	20°52'N 106°41'E	"
25	Hongay Power Plant	Very important, supplies anthracite coal mines	20°57'N 107°05'E	"
26	Huong Bi Power Plant	Very important; supplies anthracite coal mines	21°00'N 106°45'E	"
27	Vinh Power Plant	Supplies town and important RR shops	18°40'N 105°40'E	"

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
26	Thai Electric Power Plant	Steam, rptd largest in Thailand - 40,000 Kw	13°44'N 100°30'E	26
27	Samsen Steam Power Plant	Supplies Bangkok & Royal Ordnance Fcty - 30,000 Kw	13°47'N 100°31'E	26
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
65	Perak Hydro Power Plant	27,000 Kw; supplies tin mining industry	4°57'N 100°58'E	65
66	Penang Power Plant	Steam - 15,000 Kw; supplies Georgetown, Buttenworth, Prai	5°23'N 100°23'E	27
67	Bungsar Power Plant	Steam - 31,500 Kw; supplies Kuala Lumpur & RR Shops	3°07'N 101°40'E	60
68	Malin Nawar Power Plant	Steam - 30,000 Kw; supplies tin mining industry	4°21'N 101°07'E	68
69	Batu Gajah Power Plant	Steam - 21,000 Kw; supplies tin mining industry	4°28'N 101°03'E	69
	SINGAPORE (92.2)			
64	St. James Power Plant, Singapore	Steam - 17,000 Kw; supplies city	1°16'N 103°50'E	52
	BURMA (82)			
	BURMA NORTH (82.1)			
41	Namsahm Power Plant	Hydro, serves Burma Corp smelters, refinery	22°45'N 97°30'E	41

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BURMA SOUTH (82.2)			
10	Rangoon El.T & S Plant	Only central plant, supplies 90% Rangoon's power	16°46'N 96°8'E	14
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
29	Sabang Electric Power Station	Supplies harbor and town	5°53'N 95°19'E	1
	SUMATRA SOUTH (94.2)			
70	Muntok Power Plant	Small Diesel, at tin smelter	2°04'S 105°10'E	70
	JAVA (94.3)			
186	Oebroeg Hydro Power Station	17,300 Kw; supplies Batavia, Buitenzorg	6°55'S 106°46'E	186
187	Kratjak Hydro Power Station	11,000 Kw; supplies Buitenzorg	6°37'S 106°34'E	187
188	Batavia Power Station	Steam - 7,900 Kw	6°13'S 106°51'E	166
189	Lamadjan Hydro Power Station	19,200 Kw; supplies Bandung	7°10'S 107°33'E	189
190	Semampir Power Station	Steam - 13,000 Kw; supplies Surabaya	7°12'S 112°46'E	174
191	Cheribon Power Station	Diesel - 1,700 Kw; supplies, town, harbor	6°42'S 108°33'E	147
192	Tjilatjap Power Station	Small Diesel - 800 Kw	7°44'S 109°00'E	149
193	Ketenger Hydro Power Station	10,500 Kw	7°24'S 109°13'E	193
194	Djelok Hydro Power Station	14,400 Kw; supplies Semarang	7°12'S 110°30'E	194
195	Mandalan Hydro Power Station	22,000 Kw; supplies Surabaya, Kediri, Malang	7°50'S 112°17'E	195

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JAPAN - ELECTRIC POWER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BORNEO SOUTH (94.4)			
219	Balikpapan Power Plant	Supplies town and harbor	1°16'S 116°49'E	219
	CELEBES TIMOR (94.5)			
204	Macassar Power Station	Supplies Macassar and harbor	5°08'S 119°24'E	202
	PHILIPPINE ISLANDS (96)			
	(PHILIPPINES; NORTH 96.1, SOUTH 96.2)			
35	Manila Electric Co, Steam Plant	Principal source of supply of Manila	14°35'N 120°59'E	NA
47	Manila Electric Co, Hydro Plant	Supplies Manila	14°04'N 121°29'E	NA
48	Philippine Govt., Hydro Plant	Largest hydro plant in Philippines	14°18'N 121°28'E	NA

* New Target to be included in Folder revision

N A - No number yet assigned when this list prepared

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I R O N & S T E E L

	KEY TARGETS			
	TARGET		Importance	Obj. Area
	No.	Name		
1	28, 29	Imp. I. & S., Yawata-Tobata	Largest steel mills in Far East	Shim'seki (90.34)
2	29	Showa Steel Wks	Ranks second in pig iron and steel	Mukden (93.3)
3	1290	Nippon Steel Co., Hirohata	Modern plant; largest plate mill	Okayama (90.27)
4	378, 379	Nippon Steel Co., Wanishi	Tanks, ordnance; huge iron output	Muroran (90.3)
5	5, 6	Kobe Steel Wks	Big integrated mill; also machinery	Osaka (90.25)
6	713	Nakayama Steel Wks	Integrated mill; large rolling cap	Osaka (90.25)
7	7	Kawasaki Dkyd Steel Wks	Ship's plate	Osaka (90.25)
8	189	Imp. Iron & Steel, Kamaishi	Large integrated mill	Kamaishi (90.8)
9	66	Japan Iron Co., Kenjiho	Biggest in Korea	Heijo (84.3)
10	51	Asano Iron Wks	Important in ship's plate	Tokyo (90.17)
11	165	Kokura Steel Wks	Supplies Kokura Arsenal	Shim'seki (90.34)
12	264	Sumitomo Steel Wks	Rptd largest forging & casting shop	Osaka (90.25)
13	52	Japan Steel Tube	Pipe products; large steel capacity	Tokyo (90.17)
14	28, 29	Japan Iron Mfg Co Seishin	Iron, steel, rolled products	Seishin (84.1)
15	546	Mitsubishi Steel & Arms Wks	Plate for big affiliated shipyard	Sasebo (90.36)
16	30	Pensihu Iron Wks	Pig iron	Mukden (93.3)
17	247	Daido Electric Steel Co.	Elec. furnaces; spec. high-grade steels	Nagoya (90.20)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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I R O N A N D S T E E L

There is a wide variation in estimates of Japanese requirements for iron and steel. The quantity of steel used depends upon the scale of military operations on land, the extent of Allied Nations sinkings of Naval and merchant ships and their cargoes, upon the extent of damage inflicted upon industrial targets by aerial action and numerous other circumstances. Nevertheless, it is possible to make some sort of estimate of Japanese steel requirements by considering reports coming out of Japan concerning the situation in industries which are important consumers of steel. Activity in the shipbuilding industry, the machine tool industry, and in many other branches of the machinery and industrial equipment industries has been considerably less than capacity, and it appears that at least part of the explanation for this state of affairs lies in the shortage of steel materials of which the Japanese sources complain. As a rough approximation, it might be estimated that operation of the various munitions, armament, shipbuilding and other consuming industries on the level of which they are capable and which would seem to be required by a full-scale military effort would call for a steel output of 9-10,000,000 tons in 1943.

The Japanese steel industry appears to have a conceivable capacity equal to this required figure. Nevertheless, the problem of utilizing plant facilities to full capacity is not likely to be fully mastered, due to difficulties in assuring a continuous and adequate supply of iron ore and coking coal, of replacing and training skilled workers, etc. It seems probable, on balance, that output of the industry in Japan and Japanese-controlled territory in 1943 is not likely to exceed 7,500,000 tons of crude steel and 1,500,000 tons of cast and wrought iron products. This output appears insufficient to assure adequate steel for both the military production program and the maintenance of industrial equipment, and allocations of steel will probably force some curtailment in both programs.

The accompanying table, which shows the plants selected as key targets, demonstrates that a significant portion of the iron and steel output is concentrated in comparatively few plants. The six mills listed first in the table are estimated to account for roughly 68% of the pig-iron capacity, 61% of the crude steel-making capacity and 50% of the rolling mill capacity available to the Japanese.

Rolling mill capacity is more specialized and differentiated than the equipment for producing crude steel. It is, therefore, a matter of special importance to ascertain the amount of capacity suited to rolling particular types of products and to examine the possibilities of converting

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equipment to the rolling of more essential types. One of the most crucial types of finished steel products for military purposes is steel plate of thicknesses suitable for ships and tanks. Estimates have been made of the amount of plate-rolling equipment available in Japan. Indicated total plate capacity is at least 1,200,000 tons per year and may be as much as 1,400,000 (These estimates are based upon the supposition that suitable sheet-mills will be converted to the manufacture of plate.) This capacity would amply cover plate requirements but allocations are likely to cut the figure.

Major iron and steel works are integrated plants having blast furnaces, open hearth steel furnaces, and some rolling mill equipment, ordinarily at water's edge in order that iron ore and coking coal (most of which must be imported from overseas) may be easily delivered. Japanese blast furnaces are of normal type. Open hearth steel furnaces are used almost exclusively in the Far East, although there is some electric furnace capacity for special steels.

The major plants, especially the Yawata-Tobata plants, are believed heavily defended against air attacks. There is the further fact that a large steel mill occupies a considerable area. Nevertheless, iron and steel output in Japanese-controlled territory is highly concentrated in a few key mills, as indicated in the attached table, and destruction of this capacity would be of critical importance.

As brought out above, the expected output of steel products during 1943 is likely, even in the best of conditions, to fall considerably short of requirements. It is believed that consumption of steel for non-essential uses has already been curtailed to the limit. It is known, furthermore, that there is virtually no stockpile of iron and steel in Japan. It is indicated that bombing operations which result in curtailing the output of either pig iron or crude steel by as much as 35% would necessitate a drastic retrenchment in Japanese military operations.

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	MURORAN (90.3)			
378	Nippon Steel Co	Important steel & ordnance production	42°19'N 141°00'E	378
379	Wanishi Steel Wks	Very important	42°20'N 141°01'E	378
	MORIOKA (90.7)			
1072	Kuji Sponge-Iron plant	Believed secondary	40°11'N 141°46'E	1072
	KAMAISHI (90.8)			
189	Imperial Iron & Steel Wks	Important government plant	39°16'N 141°53'E	189
	NIIGATA (90.9)			
1011	Kuayama Steel Wks	Small; high-grade steel tubes, bars and rails	37°57'N 139°05'E	1005
	TOYAMA (90.11)			
869	Kawasaki Iron Wks, Fushiki plant	Secondary	36°47'N 137°05'E	867
940	Nippon Steel Tubing Co	Steel tubes, electrolytic metal work, etc	36°47'N 137°05'E	867
941	Fuji Special Steel Co	Precision tools, bearings, airplane parts, etc	36°41'N 137°14'E	941
942	Japan High Frequency Steel Co	Electric furnaces	36°47'N 137°05'E	867
943	Japan Electric Forging Co	Alloys	36°44'N 137°03'E	943

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAYAMA (90.15)			
1481	Daido Industrial Co	Important; chains, marine machine parts	36°18'N 136°17'E	1481
1482	Kaga Rim Mfg Wks (Komatsu)	Rims for all types vehicles	36°24'N 136°28'E	1483
1483	Komatsu Engineering Wks	Major; electric alloy steel, machinery, etc	36°24'N 136°28'E	1483
	TOKYO (90.17)			
51	Asano Iron Wks (Kawasaki)	Iron, steel; supplies Tsurumi Steel & Shipbuilding	35°29'N 139°42'E	N A
52	Japan Steel Tube Co (Kawasaki)	Rated most important steel plant in area	35°30'N 139°43'E	"
56	Imperial Iron & Steel, Fuji Wks (Kawasaki)	One of large plants	35°32'N 139°44'E	"
57	Oriental Steel Products Co (Kawasaki)	Specializes in structural steel	35°30'N 139°43'E	"
58	Tokyo Special Steel & Chrome Wks	Special steels, aircraft and auto parts	35°32'N 139°42'E	"
328	Watanabe Steel Wks (Tokyo)	Group of small plants	35°34'N 139°45'E	"
334	Nisso Steel Mfg Co (Tokyo)	Absorbed 1938 by Nippon Soda KK	35°41'N 139°50'E	"
336	Japan Special Steel Co (Tokyo)	One of leading alloy-steel producers	35°35'N 139°45'E	"
904	Sakurada Engineering Wks (Tokyo)	Girders, pipes, boilers, chemical & RR equipment	35°41'N 139°51'E	"
1347	Japan Service Co (Kawasaki)	Stainless steel, rolling & forging	35°32'N 139°44'E	"
1348	Toho Steel Foundry Co (Tokyo)	Produces alloy steels; electric furnaces, mills, foundries	35°46'N 139°41'E	"
1349	Japan Special Steel Wks (Tokyo)	Electric furnaces for special steels; location not certain	35°40'N 139°50'E	"
1350	Tokyo Kosai Co (Tokyo)	Medium size; electric furnaces	35°41'N 139°50'E	"
1351	Tokyo Nakayama Iron Wks (Kawasaki)	Zinc & iron products	35°30'N 139°42'E	"
1352	Steel Plants in NE Joto Ward (Tokyo)	Four small steel plants	35°41'N 139°51'E	"
	NAGOYA (90.20)			
247 a,b,c	Daido Electric Steel Co	Munitions, tools, aircraft parts; 3 units	35°05'N 136°54'E	194

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
5	Kobe Steel Wks Unit #1	Important, rptd 10% Japan output	34°42'N 135°13'E	5
6	Kobe Steel Wks Unit #2	Operates in conjunction with #5	34°42'N 135°13'E	5
7	Kawasaki Dockyard Co Steel Wks	Important, steel for Dockyard shipbuilding	34°42'N 135°13'E	5
8	Uyenoshita Steel Wks Unit #2	More data required	34°41'N 135°12'E	5
9	Uyenoshita Steel Wks Unit #1	More data required	34°42'N 135°13'E	5
264	Sumitomo Steel Wks #1	Important; castings, forgings, special steel	34°40'N 135°27'E	263
266	Sumitomo Steel Wks #2	More data required	34°40'N 135°28'E	263
267	Asai Iron Works	More data required	34°40'N 135°28'E	263
268	Osaka Steel Works	Important, open hearth furnaces	34°42'N 135°27'E	263
269	Aikoku Steel Works	More data required	34°42'N 135°27'E	695
270	Lto Steel Works	More data required	34°42'N 135°27'E	695
271	Nakagawa Iron Works	More data required	34°43'N 135°27'E	695
684	Umebachi Iron Works	More data required	34°36'N 135°29'E	325
685	Kurimoto Iron Works	More data required	34°39'N 135°29'E	325
686	Osaka Metal Wks Co	More data required	34°39'N 135°30'E	325
688	Kuboda Iron Works	More data required	34°39'N 135°30'E	661
691	Osaka Kozai Co	More data required	34°40'N 135°29'E	661
694	Gamamori Steel Works	More data required	34°43'N 135°29'E	695
695	Kaka Foundry Works	More data required	34°43'N 135°29'E	695
696	Sambei Metal Works	More data required	34°43'N 135°31'E	382
698	Iron Works	More data required	34°42'N 135°33'E	382
700	Nihon Steel Pipe	More data required	34°38'N 135°28'E	325
701	Kuboda Iron Works	More data required	34°38'N 135°28'E	325
702	Wakayama Iron Works	More data required	34°38'N 135°28'E	325
703	Mibara Iron Works	More data required	34°38'N 135°29'E	325
713	Nakayama Steel Works	Important, blast furnace products	34°38'N 135°28'E	325
1196	Kanedmo Steel Manufacturing	More data required	34°43'N 135°25'E	536
1197	Kubota Iron Works	More data required	34°43'N 135°25'E	536

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OKAYAMA (90.27)			
1290	Nippon Steel Co (Hirohata)	Rptd to rank 4th in Japanese steel production	34°47'N 134°38'E	1290
	KOCHI (90.28)			
1530	Kochi Steel Plant	Minor	33°33'N 133°33'E	1524
	SHIMONOSEKI (90.34)			
24	Minsukasa Coke Plant (Tobata)	Supplies #28, #29	33°54'N 130°50'E	25
28	Imperial Iron & Steel Wks, Yawata plant	Rated largest steel works Empire	33°52'N 130°49'E	28
29	Imperial Iron & Steel Wks, Tobata plant	Important steel & tinplate plant	33°54'N 130°50'E	29
30	Tobata Foundry Co	Important, munitions	33°54'N 130°49'E	29
165	Kokura Steel Works	Important steel wks	33°53'N 130°53'E	168
166	Tokyo Steel Co (Kokura)	Secondary, cable & wire	33°53'N 130°54'E	168
554	Imperial Foundry (Wakamatsu)	Secondary	33°55'N 130°49'E	29
555	Tokai Steel Wks (Wakamatsu)	Secondary bars and plate production	34°54'N 130°49'E	29
556	Mitsubishi Steel Mfg Co	No details	32°52'N 130°45'E	1113
557	Nihon Steel Works	No details	33°52'N 130°44'E	1113
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
40	Taiwan Electro-Chemical Co	Carbide, ferro-alloys, magnesium	25°08'N 121°43'E	-
41	Maruyama Special Alloys Plant	No details	25°05'N 121°31'E	30

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAIWAN EAST (91.5)			
62	Nickel Smelter (Karenko)	Important	24°00'N 121°37'E	61
63	Manganese Smelter (Rato)	Secondary	24°40'N 121°46'E	68
	CHOSEN (KOREA) (84)			
	SEISHIN (84.1)			
28	Japan Iron Mfg Co	Iron & steel, exact location unknown	41°47'N 129°50'E	-
29	Mitsubishi Iron Co	Small, iron & steel, exact location unknown	41°47'N 129°50'E	-
31	Japan High Frequency Heavy Industry Co	Small, steel, exact location in Joshin unknown	40°41'N 129°13'E	-
32	Mosan Iron Mine	Major mine, rptd largest Far East deposit	42°12'N 129°12'E	32
	HEIJO (84.3)			
66	Japan Iron Co(Kenjiho)	Most important iron & steel plant in Chosen	38°44'N 125°38'E	66
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
57	Steel Works, Tunghua	Rptd still under construction, small production	41°40'N 125°55'E	57
	MUKDEN (93.3)			
29	Showa Steel Works	Most important steel plant in Manchukuo	41°05'N 122°58'E	29
30	Pensihu Iron Works	2nd most important steel plant Manchukuo	41°18'N 123°45'E	30

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JAPAN - IRON AND STEEL

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	DAIREN (93.5)			
7	Special Steel Plant	Important	38°58'N 121°37'E	-
28	Cast Iron Pipe Co	More data required	38°55'N 121°35'E	10
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
44	Bukit Besi Iron Mine	Very important; 1,000,000 tons ore yearly, open cut	4°45'N 103°10'E	44
46	Temangan Iron Mine	250,000 tons ore yearly, open cut	5°43'N 102°07'E	46
	SINGAPORE (92.2)			
43	Hume Pipe Co (Singapore)	Makes steel boilers, pipes, drums	1°20'N 103°48'E	43
45	Sri Medan Iron Mine	Important; 500,000 tons ore yearly, open cut	1°59'N 102°58'E	45

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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March 1943

MACHINE TOOLS

	KEY TARGETS			
	TARGET		Importance	Obj. Area
	No.	Name		
1	899	Dai Nippon Ordnance Co. (Arms)	Swiss type machine tools. Gun-making machinery	Tokyo (90.17)
2	254	Mitsubishi Electric Mfg. Co.	Precision and heavy machine tools. Westinghouse Patents	Nagoya (90.20)
3	998	Niigata Iron Wks Plant #1	One of Big 5	Niigata (90.9)
4	882	Ikegai Machine Foundry Shiba-Ku	One of Big 5	Tokyo (90.17)
5	916	Hitachi Engineering Wks. Kameido Plant	Machine tools to replace American exports, turbines	Tokyo (90.17)
6	331	Tokyo Gas & Electric Co. Omoriko	One of Big 5	Tokyo (90.17)
7	1191	Osaka Kikai KK	Milling machines, planers	Osaka (90.25)
8	1146	Okuma Tekkosho Hagino Plant	One of Big 5	Nagoya (90.20)
9	133	Shibaura Engineering Wks. Ltd.	Grinders, lathes, General Electric patents	Tokyo (90.17)
10	1522	Shinohara Kikai Seisa Kusho	Milling machines	Tokyo (90.17)
11	1357	Tokyo Special Machinery Co. Kamata-Ku (Japan Physico-Chem. Co.)	Kawasaki precision instruments, Zeiss patents	Tokyo (90.17)
12	687	Osaka Wakayama Tekkusho	Machine tools, gauges	Osaka (90.25)
13	833	Karatsu Iron Wks.	One of Big 5	Sasebo (90.36)
14	919	Tokyo Keiki Seisakusho K K	Largest aircraft instruments wks. in East	Tokyo (90.17)
15	1361	Kokusan Mchy Co. Shibuyaku	Turret lathes signal apparatus, centerless grinders	Tokyo (90.17)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943

MACHINES AND MACHINE TOOLS

The Japanese machine tool industry is of prime importance but is so dispersed and the products of individual plants so diversified that effect of attack on individual units would be relatively limited.

Machine tools are employed in making practically every product of the manufacturing arts and are essential to mass production of every mechanical device used in the war effort.

Machine tool production is largely concentrated in sixteen firms licensed and subsidized by the Japanese government. The main plants of these firms include 9 plants in the Tokyo-Yokohama area, one plant in the Niigata area, two each in the Nagoya and Osaka areas, and one in the Karatsu area. About 60% of these plants are concentrated in the Tokyo-Yokohama area.

Japan's 1942 tool production is estimated to have been about $30,000,000 as against $1,400,000,000 in this country. Japan has, however, since 1937 imported large quantities of machine tools while we have exported such tools, so that the Japanese machine tool inventory in the period 1933-1942 increased about $285,000,000 while, during the same period the United States machine tool inventory increased about $1,800,000,000 or more than 6 times that of Japan. Japan is forced to utilize completely every available machine tool, moving small lathes and tools otherwise obsolete to homes or street shops (Machi Koba) to provide parts production or roughing operations, with finishing and assembly affected by sub-contractors and the licensed firms. This early Japanese version of mass production should not be underestimated.

With practically all machine tool producing countries now involved in war, Japan has no source of machine tools other than her own production. Japan's machine tool war production depends on the accumulated inventory together with current production of such equipment. As result of this inventory, Japan has been able to maintain a high rate of war production. However, any cutting into machine tool capacity will directly reduce ability to turn out war materials and there are no substitutes for machine tools.

Machine tool production equipment (machine tools) is fragile as to accuracy but many tools are heavy and rugged enough to withstand moderate concussion without breakage.

Since machine tools are essential to Japan's war effort and the machine tool inventory limits manufacturing, any reduction of machine tools, either in the machine tool production plants or in the general manufacturing plants, would directly reduce Japan's output of all types of war equipment.

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	NIIGATA (90.9)			
998	Niigata Iron Wks, plant #1	Rated one of first 5 Japan machine tool producers	37°56'N 139°04'E	998
999	Niigata Iron Wks, plant #2	Large, newer than plant #1	37°56'N 139°04'E	998
	MITO (90.14)			
1476	Hitachi Engineering Wks, Kaigan plant	Very important; heavy, electrical machinery, munitions	36°35'N 140°39'E	1476
1522	Shinohara Machinery Wks	Important production machine tools	35°43'N 140°04'E	1519
	TOKYO (90.17)			
133	Shibaura Engineering Wks (Yokohama)	Vital importance; electrical equipment, navy turbines, munitions	35°29'N 139°42'E	N A
354	Shibaura Machine Tool Co (Tokyo)	Lathes, grinders & abrasives, "jeeps"	35°39'N 139°46'E	N A
350	Tsugishima Machinery Co (Tokyo)	One of many tool plants near Ishikawajima dockyard	35°39'N 139°47'E	N A
882	Ikegai Machine Foundry (Tokyo)	Industrial machines, machine tools	35°39'N 139°45'E	N A
913	Hattori Co (Tokyo)	Precision instruments, fuses, etc	35°42'N 139°49'E	N A
916	Hitachi Engineering, Kameido Pl (Tokyo)	Important prod heavy industry goods, conversion to war goods	35°42'N 139°50'E	N A
918	Niigata Iron Works (Tokyo)	Machine tools, submarine motors, Diesel trucks	35°34'N 135°43'E	N A
1353	Niigata Iron Works (Urawa)	Highly important, recent expansion	35°52'N 139°39'E	N A
1354	Oriental Babcock Co (Yokohama)	Important; boilers, other heavy industry goods	35°25'N 139°38'E	N A
1355	Japan Steel Bearing Co (Tokyo)	Very important; with #1356 rated leading Japan bearing production	35°37'N 139°44'E	N A
1356	Japan Steel Bearing Co (Fujisawa)	Very important; with #1355 rated leading Japan bearing production	35°20'N 139°29'E	N A

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JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
1357	Tokyo Special Machine Mfg Co-Japan Physico-Chemical Co (Tokyo)	Army and Navy precision tools	35°34'N 139°41'E	N A
1358	Riken Heavy Industry Co (Tokyo)	Produces "Riken" car; probable war conversion	Location uncertain	-
1359	Nippon Piston Ring Co (Kawaguchi)	Important; produces piston rings, rings for airplanes	35°47'N 139°45'E	N A
1360	Ishii Iron Works (Tokyo)	Chemical equipment plant, also produces machine tools	Location uncertain	-
1361	Kokusan Machinery Co (Tokyo)	One of most important producers machine tools	35°39'N 139°43'E	N A
1362	Kitashin Electric Engineering Co(Tokyo)	Electrical and precision instruments	35°34'N 139°42'E	N A
1363	Shoun Engineering Co (Ofuna)	Rptd new ball & roller bearing capacity	35°21'N 139°32'E	N A
1364	Physico-Chemical Industries (Tokyo)	Abrasives, precision machinery	35°43'N 139°45'E	N A
	NAGOYA (90.20)			
254	Mitsubishi Electric Mfg Co	Important; power plant equipment	35°11'N 136°57'E	196
461	Ozone Plant, Okuma Iron Works	Tools & munitions	35°11'N 136°56'E	196
1146	Hagino Plant, Okuma Iron Works	Important tools & munitions production	35°11'N 136°56'E	196
1147	Nunoike Plant, Okuma Iron Works	Tools & munitions	35°11'N 136°56'E	196
1148	Takaoka Engineering Works	Minor; aircraft & automotive parts	35°11'N 136°56'E	250a
1149	Yamada Engineering Works	Minor; tools, hydraulic pumps	35°11'N 136°56'E	196
	HAMAMATSU (90.21)			
1227	Suzuki Automatic Loom Works	Large, rptd converted to war production	34°42'N 137°45'E	1219
1228	Enshu Loom Works	Important loom factory	34°41'N 137°41'E	1219
1229	Nishikawa Tool Co	Minor; polishing tools	34°42'N 137°45'E	1219
	KUMANO (90.24)			
1215	Kobe Steel Co (Toba)	Heavy electrical equipment, cranes, etc	34°28'N 136°51'E	1215

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JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
631	Kansei Electric Machinery Co	More data required	34°42'N 135°29'E	695
648	Dainippon Crane Mfg Co	More data required	34°41'N 135°29'E	661
661	Amatsuji Steel Ball Bearing Co	Rptd only Japan production bearing balls	34°40'N 135°30'E	661
687	Osaka Wakayama Iron Works	Machine tools, gauges, aeroplane engines & parts	34°39'N 135°30'E	325
774	Imperial Precision Machinery Works	More data required	34°39'N 135°08'E	10
779	Precision Machinery Works	More data required	34°39'N 135°09'E	10
782	Kobe Machinery Works	More data required	34°40'N 135°10'E	10
784	Kobe Engines Factory	More data required	34°40'N 135°10'E	10
786	Electric Machinery Works	More data required	34°40'N 135°11'E	10
1191	Hatsudori Seizo	Deisel engines, locomotive parts & machinery	34°42'N 135°29'E	695
1198	Toyo Bearing Seizo KK	Very important production ball bearings	34°47'N 135°22'E	1198
	NIIHAMA (90.29)			
932	Sumitomo Machinery Works	Mining, smelter, misc machinery	33°58'N 133°16'E	923
	KURE (90.30)			
730	Hiro Naval Turbine & Engine Factory	Turbines, engines	34°13'N 132°36'E	656
	TOKUYAMA (90.32)			
825	Hitachi Mfg (Kasado fcty)	One of largest locomotive & tank works	33°59'N 131°53'E	672
	KYUSHU EAST (90.33)			
1327	Usuki Iron Works	Minor producer marine engines	33°07'N 131°48'E	1327

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JAPAN-MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIMONOSEKI (90.34)			
1126	Yasukawa Electric Machine Wks	Large plant, electric equipment	33°52'N 130° 44' E	1113
	KURUME (90.35)			
1256	Miike Machinery Wks (Omuta)	Very large producer mining machinery	33°02'N 130° 27' E	1243
1257	Kobukuro Machinery Wks (Iizuka)	Large; Navy & marine equipment	33°39'N 130° 41' E	1257
1258	Nogata City Industries	Grouped colliery machinery factories	33°45'N 130° 44' E	1258
1259	Togami Electric Wks (Saga)	Large; electrical equipment, Navy supplier	33°16'N 130° 18' E	1259
	SASEBO (90.36)			
829	Mitsubishi Elec Mfg Co	Important, power plant equipment	32°45'N 129°52'E	542
830	Instrument Workshop, Sasebo	New, rptd important	33°10'N 129°42'E	--
833	Karatsu Steel Works	One of most important machine tool plants	33°28'N 129°58'E	833
	MANCHUKUO (MANCHURIA) (93)			
	MUKDEN (93.3)			
50	Sumitomo Metal Works	More data required	41°47'N 123°23'E	50
51	Machine Shop	More data required	41°47'N 123°23'E	50
52	Electric Wire Co	More data required	41°47'N 123°23'E	50
61	Machine Shop	More data required	41°52'N 123°58'E	32
63	Railway Repair Shop.	More data required	41°51'N 123°54'E	32
68	Locomotive & Railway Car Mfg Co	Rptd large	41°47'N 123°23'E	50
	DAIREN (93.5)			
16	South Manchurian Railway Shops	Largest RR shops in Manchukuo	38°56'N 121°35'E	10

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JAPAN-MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	DAIREN (93.5) (Cont'd)			
17	Dairen Machine Works	Important	38°54'N 121°34'E	16
	MALAY STATES (92)			
	MALAY STATES N (92.1)			
53	Machine Shop Area, Ipoh	Machine shops serving Kinta Valley tin industry	4°35'N 101°04'E	53
54	Federated Engineering Co	Machine shop, foundry, dredge building	3°08'N 101°42'E	60
55	United Engineers Ltd, Georgetown	Machine shop, foundry	5°24'N 100°20'E	27
	SINGAPORE (92.2)			
52	United Engineers, Ltd, Singapore	Largest metal working, machine shops, foundries in Malaya	1°18'N 103°51'E	52
	NETHERLANDS EAST INDIES (94)			
	SUMATRA SOUTH (94.2)			
72	Muntok Machine Shop	For Muntok tin smelter	2°04'S 105°10'E	57
73	Muntok Auto Repair Shop	Small machine shop	2°04'S 105°10'E	57
	JAVA (94.3)			
182	Lindetevis-Stokvis Co	Large machine shop	6°58'S 110°25'E	148
183	Braat Machine Shops	Large shops	7°17'S 112°45'E	174
184	Ned Indische Industrie	Large shops, Surabaya	7°14'S 112°44'E	174

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JAPAN - MACHINES AND MACHINE TOOLS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAVA (94.3) (Continued)			
185	Lindetevis-Stokvis, Batavia	Large machine shops	6°09'S 106°49'E	166

* New Target to be included in Folder revision
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March 1943 NON - FERROUS METALS

	KEY TARGETS			
	TARGET			
	No.	Name	Importance	Obj. Area
1	42	Bawdwin Mine & Mill	80% of lead capacity 40% of zinc capacity	Burma N (82.1)
2	1176	Japan Light Metals	40% of alumina capacity	Shizuoka (90.18)
3	811	Ashio Copper Refin'y	22% of copper capacity	Takasaki (90.13)
4	1108	Japan Aluminum Co.	20% of alumina capacity	Shim'ki (90.34)
5	815	Sumitomo Copper Ref'y	19% of copper capacity	Niihama (90.29)
6	1177	Japan Light Metals	16% of aluminum capacity	Shizuoka (90.18)
7	1260	Mitsui Zinc Smelter	30% of zinc capacity	Kurume (90.35)
8	810	Ashio Copper Plants	10% of copper capacity	Takasaki (90.13)
9	1535	Kokusan Light Metals	15% of aluminum capacity	Toyama (90.11)
10	1100	Japan Electro-Chemical Co.	9% of aluminum capacity	Nagano (90.12)
11	814	Shisakijima Copper Sml'tr	15% of copper capacity	Niihama (90.29)
12	925	Niihama Conc. Mill	15% of copper capacity	Niihama (90.29)
13	926	Sumitomo Copper Conc. Mill	15% of copper capacity	Niihama (90.29)
14	1261	Mitsui Zinc Ref'y	30% of zinc capacity	Kurume (90.35)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943 SECRET

NON - FERROUS METALS

Japan's position in non-ferrous metals is generally comfortable but vulnerable in several respects. An estimated 1,000,000 tons of ores and metals per year must be moved into Japan Proper; there are vulnerable points in this movement, (see Shipping). In some cases production or processing is concentrated in relatively small areas and there are also individual processing units, the destruction of which would cut off critical proportions of certain metals.

APPROXIMATE POSITION
(tons of equivalent metal)

Metal	Requirements	Total Production	Japan Proper	
			Imported Production	Stockpile
Copper	190,000	145,000	45,000	200,000
Aluminum	150,000	150,000	120,000	100,000-150,000
Lead	100,000	113,000	100,000	80,000
Zinc	80,000	100,000	80,000	25,000-40,000
Magnesium	15,000	15,000	7,500	15,000
Tin	10,000	150,000	10,000	100,000
Antimony	3,000	300	3,000	3,000-4,000
Mercury	500	- - -	500	1,000-1,500

Eighty percent of Japan's aluminum supply is dependent on bauxite ore shipped from the Singapore area amounting to some 450,000 tons per year. Denial of these shipments would make Japan dependent on the 20% of aluminum which is derived from alunite and shale ores mined and processed into metal in Korea and Manchuria. Conversion of not only future shipments, but also of ore stockpiles into metal depends upon the operation of treatment plants in Japan Proper. Two plants produce the alumina from which about 60% of Japan's aluminum is derived.

The bulk of Japan's copper supply is mined and processed in Japan Proper. It is doubtful if the mines are capable of increased production but the large stockpile, together with the fact that, to some extent aluminum can be substituted for copper, makes Japan's position relatively secure. However, destruction of copper refineries, smelters, and concentrating mills would probably be reflected in the munitions industry as well as presenting a problem to maintenance of Japan's electrical facilities.

Japan's position relative to lead is most precarious in that 80% of the supply comes from one source, the Bawdwin Mine in Burma; destruction of the two shafts, concentrating mill and smelter would make it extremely difficult, if not impossible, for Japan to meet its requirements. No other metal is a satisfactory substitute for lead in small arms ammunition, batteries, cable sheathing etc. This mine also produces about 40% of Japan's zinc supply.

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Magnesium plants in Japan Proper are believed capable of furnishing an ample supply of this metal. Electrolitic plants using sea water could probably be expanded sufficiently to care for any shortages which might occur.

Zinc production in Japan is negligible. Forty percent of the requirements originate in the Bawdwin Mine in Burma. As this product is in zinc concentrates, which must be reduced to metal in smelters and refineries, the large zinc smelter and refinery at Kurume are important.

Stockpiles of tin are believed to be sufficient for several years. Large stocks of the metal were obtained after the occupation of Malaya and as Japan's requirements are small, no shortage should be felt in this metal.

Antimony requirements are met by smuggling and otherwise from Occupied and Unoccupied China. The supply is ample and the requirements are small.

Mercury stockpiles are believed to be sufficient for two to three years. The supply comes from Italy and Spain and stocks could be replenished by blockade running.

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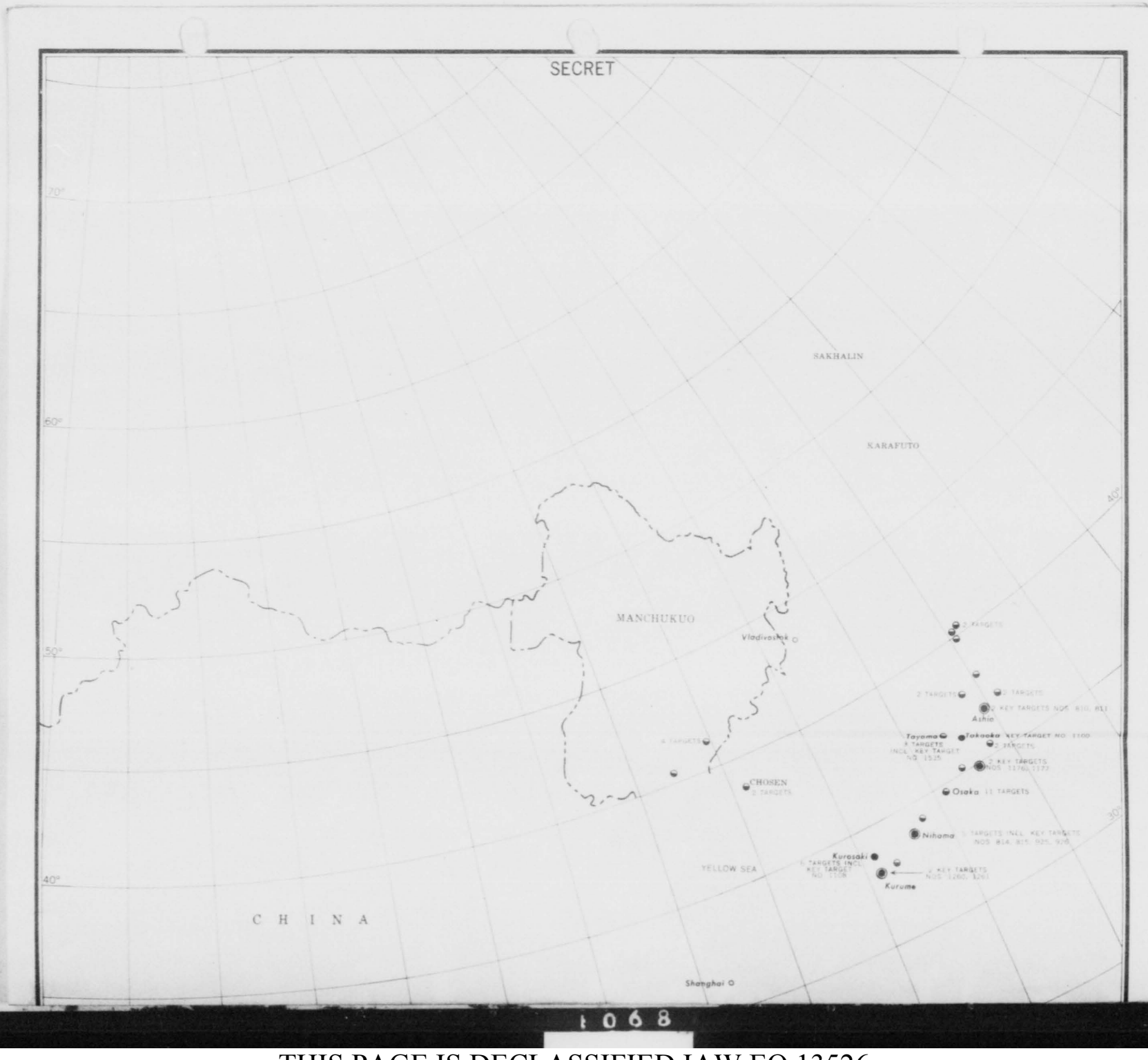

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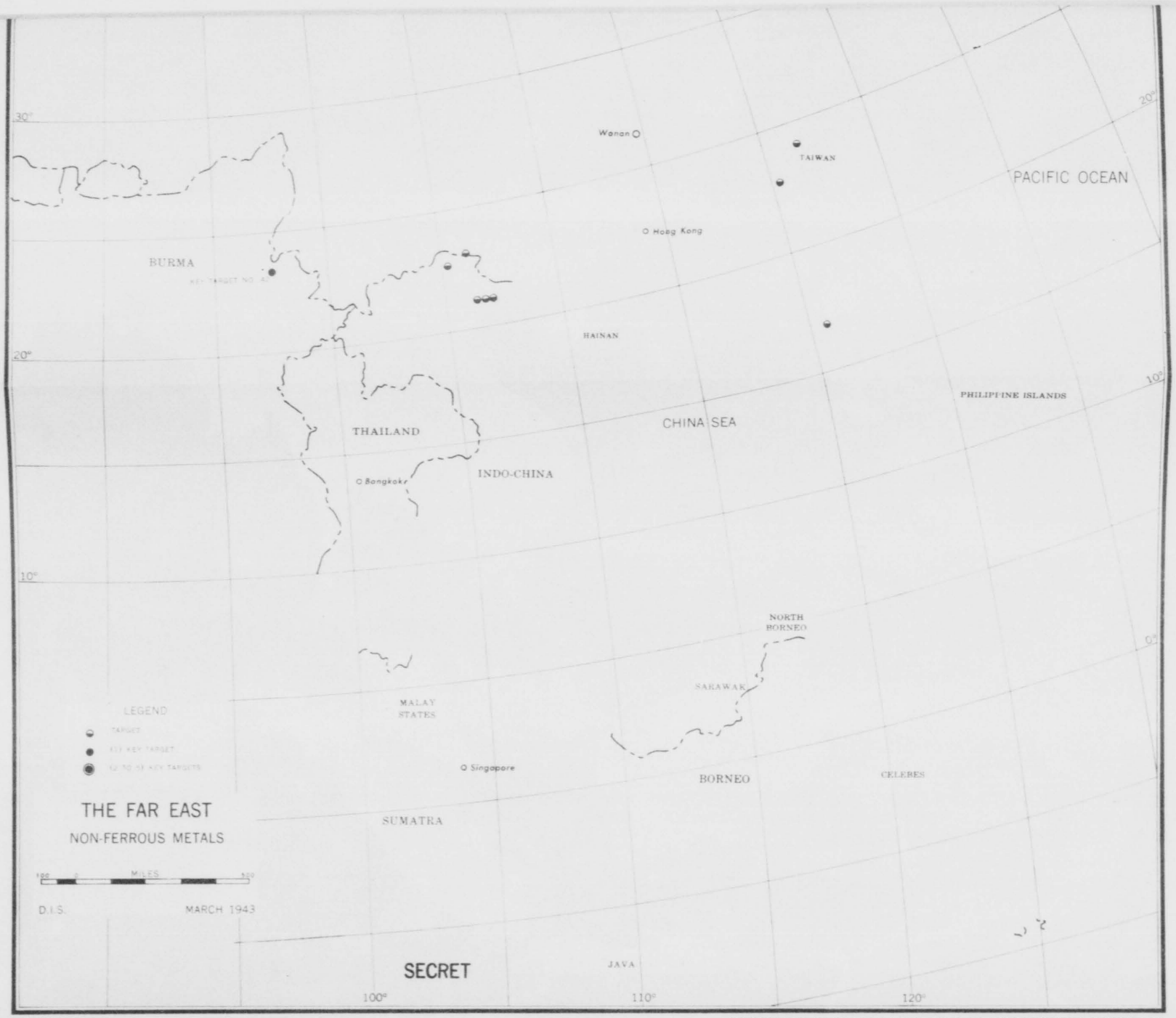

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	AKITA (90.6)			
808	Osarizawa Copper Smelter	Secondary	40°13'N 140°42'E	808
809	Kosaka Copper Smelter & Refinery	Rptd 10% Japan copper	40°15'N 140°44'E	809
1064	Arakawa Copper Smelter	Small	39°38'N 140°24'E	1064
1065	Ani Copper Smelter	Small	39°59'N 140°25'E	1065
	NIIGATA (90.9)			
1003	Japan Light Metals, Plant #1	Among 5 largest aluminum plants in Japan	37°54'N 139°02'E	998
1004	Japan Light Metals, Plant #2	Rolling mill, reduction works	37°55'N 139°04'E	998
	FUKUSHIMA (90.10)			
1081	Tetsuko Alloy Wks, Yamagata Fcty	No details	38°15'N 140°20'E	1082
	TOYAMA (90.11)			
861	Nichiman Aluminum Co	Important, aluminum & alumina	36°45'N 137°14'E	862
866	Nippon Soda Co (Takaoka)	Important, aluminum, alumina & other chemicals	36°46'N 137°01'E	943
1535	Kokusan Light Metals (Sasazu)	Rptd 15% total of aluminum; also alumina	36°26'N 137°58'E	N A
	NAGANO (90.12)			
1100	Showa Electrical Industry, Aluminum Plant	Major aluminum production	36°29'N 137°52'E	1100

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKASAKI (90.13)			
810	Ashio Copper Works	Rated largest in Empire	36°40'N 139°26'E	810
a,b,&c 811	Furukawa Copper Refinery	Rptd Japan's leading producer non-ferrous metals	36°44'N 139°33'E	811
	MITO (90.14)			
812	Hitachi Copper Refinery	With #1492, 4th largest Japan production	36°36'N 140°39'E	1476
1492	Hitachi Copper Smelter	With #812, 4th largest copper production	36°37'N 140°38'E	1476
	TOKYO (90.17)			
212	Asahi Electro Chemical Co (Tokyo)	One of most important magnesium plants in Japan	35°44'N 139°47'E	N A
521	Japan (Showa) Electro Chemical Co (Yokohama)	One of most important alumina plants in Japan	35°29'N 139°40'E	N A
	SHIZUOKA (90.18)			
1176	Japan Light Metals Co (Shimizu,	Rptd largest alumina plant in Japan	35°00'N 138°31'E	1176
1177	Japan Light Metals Co (Kambara)	Rptd largest aluminum plant in Japan	35°07'N 138°37'E	1177
	NAGOYA (90.20)			
1145	Ogaki Aluminum Plant	Rptd important, but no details	35°21'N 136°37'E	1135b

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
262	Sumitomo Electric Wire & Cable Wks	Important	34°40'N 135°27'E	263
263	Sumitomo Copper & Steel Tubing Co	Very important; copper, aluminum products, etc	34°40'N 135°27'E	263
265	Tai Nippon Tungsten Co	More data required	34°40'N 135°28'E	263
689	Osaka Aluminum Co	More data required	34°40'N 135°29'E	661
690	Asano Copper Wks	Important, bars & rods	34°40'N 135°29'E	661
692	Sumitomo Copper Wks & Warehouses	More data required	34°41'N 135°29'E	661
693	Taido Aluminum Co	More data required	34°43'N 135°28'E	695
697	Mitsubishi Copper Refinery	Rptd one of four largest in Japan	34°42'N 135°31'E	382
1193	Toyosaki Copper Works	Important, sheets and plates	34°43'N 135°31'E	382
1194	Amagasaki Copper Works	More data required	34°42'N 135°25'E	536
1195	Sumitomo Copper Works	More data required	34°43'N 135°25'E	536
	OKAYAMA (90.27)			
1297	Mitsubishi Copper Smelter & Zinc Refinery	Major installation	34°28'N 133°58'E	1295
	NIIHAMA (90.29)			
814	Sumitomo Copper Smelter	Large	34°06'N 133°11'E	814
815	Sumitomo Copper Refinery	One of most important copper refineries	33°58'N 133°16'E	923
924	Sumitomo Aluminum Reduction Plant	Rptd 4% Japanese aluminum	33°58'N 133°17'E	923
925	Niihama Ore Dressing Plant	Important, linked with #926	33°58'N 133°16'E	923
926	Sumitomo Besshi Copper Mine & Hadeba Ore Dressing Plant	One of largest; target is ore dressing plant	33°53'N 133°19'E	926
	TOKUYAMA (90.32)			
922	Riken Metal Co	One of few known magnesium plants in Japan	33°57'N 131°14'E	818

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KYUSHU EAST (90.33)			
1328	Saganoseki Copper Wks	Important smelter & refinery	33°15'N 131°53'E	1328
	SHIMONOSEKI (90.34)			
45	Hiko Island Smelting Wks	Believed important zinc smelter	33°56'N 130°53'E	43a
46	Kobe Steel Co (Komoriye)	Rptd tungsten, molybdenum refinery	33°55'N 130°57'E	43a
1108	Japan Aluminum Co (Kurosaki)	Very important alumina plant, rptd nearly 20% Empire capacity	33°52'N 130°46'E	1113
1116	Japan Tube Co (Shimonoseki)	Rptd important aluminum rolling mill	33°58'N 130°58'E	44a
	KURUME (90.35)			
1260	Mitsui Zinc Distilling Plant	Rptd largest zinc distilling plant in Japan	33°02'N 130°27'E	1243
1261	Mitsui Electrolytic Zinc Refinery	Important zinc refinery	33°02'N 130°26'E	1243
	JAPANESE ISLANDS (91)			
	TAIWAN EAST (91.5)			
61	Japan Aluminum Co	Important; aluminum & magnesium	24°00'N 121°37'E	61
	TAKAO (91.6)			
3	Nippon Aluminum Co (Takao)	Important alumina & aluminum production; rptd several other important plants adjacent	22°37'N 120°17'E	3

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (KOREA) (84)			
	HEIJO (84.3)			
67	Chosen Riken Metals Co (Chinnampo)	Large, new, aluminum & magnesium	38°43'N 125°23'E	76
68	Japan Mining Co Smelter (Chinnampo)	Small lead smelter	38°44'N 125°26'E	76
	MANCHUKUO (MANCHURIA) (93)			
	MUKDEN (93.3)			
31	Japan-Manchukuo Light Metals Mfg	Very important; aluminum	41°51'N 123°54'E	-
32	Manchuria Light Metals Mfg	Most important such plant in Manchukuo	41°51'N 123°54'E	32
33	Aluminum Plant of Manchuria RR	Important	41°51'N 123°54'E	-
34	Manchuria Magnesium Industry Co	Important	40°35'N 122°30'E	34
	FRENCH INDO-CHINA (85)			
	INDO CHINA NORTH (85.1)			
34	Cho Dien Zinc Mine	Largest zinc mine Indo China	22°20'N 105°35'E	N A
35	Quang Yen Zinc Smelter	Only zinc smelter in country	20°57'N 106°48'E	N A
36	Hongay Coal Treating Plant	Secondary	20°58'N 107°04'E	N A
37	Campha Coal Treating Plant	Secondary	21°01'N 107°21'E	N A
38	Cao Bang Tin Smelter	Largest tin smelter in country	22°39'N 106°15'E	N A

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES NORTH (92.1)			
47	Penang Tin Smelter	60,000 tons yearly	5°25'N 100°20'E	27
49	Butterworth Tin Smelter	40,000 tons yearly	5°24'N 100°22'E	27
	SINGAPORE (92.2)			
48	Pulo Brani Tin Smelter	45,000 tons yearly	1°15'N 103°50'E	52
	BURMA (82)			
	BURMA NORTH (82.1)			
42	Burma Corp Wks, Namtu	Treats ore of largest lead-zinc mine in Far East	23°05'N 97° 27'E	42
	BURMA SOUTH (82.2)			
17	Concentrating Mill, Mawchi Mines	Treats ore from world's largest tungsten mine	18°49'N 97°11'E	17
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
30	Bintan Island Bauxite Plant	Supplies 60% of Jap bauxite ore	0°50'N 104°36'E	30

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JAPAN - NON-FERROUS METALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SUMATRA SOUTH (94.2)			
68	Muntok Tin Smelter	Approx 7,500 tons per year	2°09'S 105°10'E	57
69	Pangkal Pinang Tin Smelter	Approx 15,000 tons per year	2°08'S 106°09'E	58
	PHILIPPINES (96)			
	PHILIPPINES NORTH (96.1)			
	PHILIPPINES SOUTH (96.2)			
8	Lepanto Smelter	Smelters 90% Philippine copper ore	16°51'N 120°47'E	

* New Target to be included in Folder revision
N A No number yet assigned when this list prepared

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March 1943

P E T R O L E U M

	KEY TARGETS					
	TARGET		IMPORTANCE			
	No.	Name	% Crude Cap.	% Synth. Cap.	% Comb. Cap.	Obj. Area
1	* 61	Pladjoe Ref'y.	29.0	-	25.4	Sumatra S.(94.2)
2	8	Lutong Ref'y.	11.6	-	10.2	Borneo N. (81.1)
3	*116	Mitsubishi Oil Kawasaki Ref.	6.1	-	5.3	Tokyo (90.17)
4	* 87	Ogura Oil Yokohama Ref.	5.8	-	5.1	Tokyo (90.17)
5	672	Nihon Oil Co. Kudamatsu	4.4	-	3.8	Tokuyama (90.32)
6	58	Kirin Artificial Oil Co.	-	25.2	3.1	Manch. E. (93.2)
7	43	Manchuria Coal Liquefaction, Ssupingkai	-	21.0	2.6	Mukden (93.3)
8	29	Showa Steel Wks. (Synth. Plant)	-	15.0	1.9	Mukden (93.3)
9	225	Shell Oil Co. Balikpapan	4.8	-	4.2	Borneo S. (81.1)
10	*128	Petroleum Center Tsurumi	3.5	-	3.0	Tokyo (90.17)
11	*673	Tokuyama Naval Fueling Station	2.9	-	2.5	Tokuyama (90.32)
12	1	Manchukuo Petro. Co. Dairen	2.9	-	2.5	Dairen (93.5)
13	* 88	Chosen Oil Co. Ref'y	2.9	-	2.5	Genzan (84.4)
14	1203	Nippon Oil Ref. Amagasaki	2.9	-	2.5	Osaka (90.25)
15	41	S.M.R. Coal Liquefaction Plt. (Fushun)	-	8.4	1.0	Mukden (93.3)
16	110	Mitsui Mining Co. Chinchow	-	7.5	0.9	Mukden (93.3)
			76.8	77.1	76.5	
	*	Produces Aviation Gasoline				

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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P E T R O L E U M

JAPANESE PETROLEUM POSITION
1943

(000 bbls)

Product	Require-ments	SUPPLY					Storage Jan. 1, 1943.
		Total Supply	Produced in Japan from			Produced in Indies	
			Domestic Crude	Indies Crude	Syn-thetic		
Aviation Gasoline	3,735	15,683	300	1,173	600	1,887	11,723
Motor Gasoline	6,413	25,277	1,508	3,057	7,495	7,181	6,036
Kerosene	1,020	1,455	426	-	-	-	1,029
Lube Oil	2,300	4,431	731	250	250	250	2,950
Diesel & Fuel Oil	39,853	64,627	3,457	3,793	5,307	26,320	25,750
TOTAL	53,321	111,473	6,422	8,273	13,652	35,638	47,488

It is noteworthy that while domestic output (synthetic and crude) of petroleum products is equivalent to almost 40% of total requirements, it supplies only 24% of aviation gasoline requirements and only 22% of fuel oil requirements. The importance of the 12,036,000 barrels of natural fuel oil obtained from the Indies, plus the 14,284,000 barrels of refined fuel oil processed largely at Pladjoe (at Palembang, South Sumatra) and Lutong (Borneo), and the 1,887,000 barrels of aviation gas from Pladjoe, is evident.

Annual crude oil refining capacity in the Japanese Empire is approximately 35,000,000 bbls., only 15,000,000 of which will be used during 1943. The Indies refineries, however, particularly Pladjoe and Lutong, will be run to capacity. Their destruction would force Japan to ship over 22,000,000 bbls. of crude home for refining and then to ship the refined products down to the South Pacific combat zones, a process which would impose a severe strain on the tanker fleet.

The Pladjoe and Lutong refineries lead the list of 8 priority targets in the preceding table, and unquestionably are the most important to Japan at the present time. Destruction of this capacity would greatly increase the importance of refinery and synthetic capacity in the north; the synthetic plants would become still more important if sea-borne transport of crude from the south were seriously restricted.

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The accompanying two tables list all crude oil refineries now under Japanese control and all the principal synthetic oil plants on which there is information.

There are four concentrations of crude oil refining capacity:

(1) Pladjoe, with 29.0% of the total;

(2) Lutong, with 11.6% of the total;

(3) Tokyo Area (9 refineries), with 20.5% of the total;

(4) Kudumatsu-Tokuyama (2 refineries), with 9.7% of the total.

In the case of synthetic oil, 27.3% of the capacity is represented by the two plants at Kirin, (Manchukuo), while the Manchu plant at Szepingkai (north of Mukden) produces 21.0% of the total, and the Showa plant at Anshan 15.0%.

A final table, on the principal known oil storage points in Japanese territory, is included in the report. Although a considerable amount of oil is stored at each of these tank farms, they are, of course, not self-replenishing, and are thus assigned secondary values as targets.

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PETROLEUM REFINERIES IN JAPAN & OCCUPIED TERRITORY

NAME	LOCATION	CAPACITY Bbls. Per Day	CAPACITY % of Total
Pladjoe Refinery*	Palembang, Sumatra	50,000	29.00
Lutong Refinery	Lutong (Miri) British Borneo	20,000	11.6
Mitsubishi Oil Co.*	Kawasaki	10,500	6.1
Ogura Oil Co.*	Yokohama	10,000	5.8
Shell Oil Co.	Balikpapan, Dutch Borneo	8,200	4.8
Nippon Oil Co.	Kudamatsu	7,500	4.4
Nippon Oil Co.*	Tsurumi	6,000	3.5
Nippon Oil Co.	Amagasaki	5,000	2.9
Imperial Navy*	Tokuyama	5,000	2.9
Manchurian Oil Co.*	Dairen	5,000	2.9
Chosen Oil Co.*	Genzan	5,000	2.9
Nippon Oil Co.	Akita	4,000	2.3
Nippon Oil Co.	Kashiwazaki	4,000	2.3
Ogura Oil Co.	Tokyo	3,500	2.0
Nippon Oil Co.	Akita	3,000	1.7
Imperial Navy	Kudamatsu	3,000	1.7
Maruzen Oil Co.*	Shimotsu	3,000	1.7
South Manchurian RR Co.	Fushun	3,000	1.7
Aikoku Oil Co.	Kawasaki	2,000	1.2
Hayama Oil Co.*	Kawasaki	2,000	1.2
South Manchurian RR Co.	Dairen	1,200	0.7
Nihon Seiro Oil Co.	Tokuyama	1,200	0.7
Maruzen Oil Co.	Osaka	1,000	0.6
Thai Navy	Bangkok	1,000	0.6
Toyo Oil Co.	Osaka	700	0.4
Niitsu Oil Co.	Nakadori	700	0.4
Asahi Oil Co.	Tokyo	500	0.3
Toho Oil Co.*	Yokohama	500	0.3
Niitsu (Marushin) Oil Co.	Niigata	500	0.3
Niitsu Oil Co.*	Niigata	500	0.3
Nihon Oil Co.	Funakawa	500	0.3
Asahi	Hikoshima	500	0.3
Nippon Oil Co.	Garugawa	400	0.2
Nippon Oil Co.	Byoritsu, Taiwan	250	0.2
Niitsu (Marushin) Oil Co.	Akita	200	0.1
Hayama Oil Co.	Niigata	200	0.1
Toyo Shoko Oil Co.	Yokohama	200	0.1
Total		169,750	
All Other Refineries		2,690	1.5
Grand Total		172,440	100.0

*Produces Aviation Gasoline.

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PRINCIPAL KNOWN SYNTHETIC OIL PLANTS IN THE JAPANESE EMPIRE

NAME	LOCATION	ESTIMATED CAPACITY	
		Bbls. Per Day	% of Total
Kirin Artificial Oil Co.	Kirin	6160	25.2
Manshu Coal Liquefaction Co.	Ssupingkai	5140	21.0
Showa Steel Co.	Anshan	3670	15.0
South Manchurian RR Co.	Fushun	2055	8.4
Mitsui Mining Co.	Chinchow (Manchuria)	1840	7.5
Mitsui Mining Co.	Miike	1030	4.2
Hokkaido Jinjo Oil Co. #2	Rumoe	940	3.8
Hokkaido Jinjo Oil Co. #1	Takikawa	925	3.8
Chosen Denryoku	Mokpo	900	3.7
Chosen Chisso	Agochi	880	3.6
Manchurian Synthetic Fuel Co.	Kirin	520	2.1
Nissan Liquid Fuel Co.	Wakamatsu	410	1.7
TOTAL		24,470	100.0

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MAJOR KNOWN OIL STORAGE IN JAPAN & OCCUPIED TERRITORY

NAME	LOCATION	CAPACITY (Bbls.)
Tokuyama Naval Fueling Station	Tokuyama	3,000,000
Alexandra Tank Farm	Singapore	2,900,000
Kranji Tank Farm	Singapore	2,900,000
Maizuru Naval Station Tanks	Maizuru	1,505,000
Bukum Island Tank Farm	Singapore	1,500,000
Sasebo Oil Storages	Sasebo	600,000 - 1,000,000
Hanano Waki Oil Tanks	Tokuyama	588,000
Rising Sun Petroleum Co.	Osaka	500,000
Hitonose Oil Storage	Kure	400,000
Kozaki Point Oil Storages	Nagasaki	385,000

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All targets in folders to 3/1/43, grouped by Areas

JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
962	Synthetic Oil Plant at Naihoro	Minor plant	46°40'N 141°50'E	954
963	Ambetsu Oil Field	More data required	49°59'N 142°11'E	963
964	Standard Vacuum Oil Storage	More data required	46°38'N 142°46'E	966
	HOKKAIDO NORTH (90.2)			
1049	Synthetic Fuel Plant, (Kushiro)	Minor importance	43°00'N 144°22'E	-
1050	Synthetic Fuel Plant, (Takigawa)	Minor importance	43°33'N 141°52'E	-
	MURORAN (90.2)			
988	Mitsubishi Coal Liquefaction Plant	Secondary synthetic petroleum plant	42°20'N 141°01'E	378
1027	Kerugawa Refinery	Small refinery	43°04'N 141°22'E	-
	HAKODATE (90.4)			
980	Fuel Oil Storage	Minor bunkering storage	41°47'N 140°44'E	977
	AOMORI (90.5)			
995	Nonai Oil Storage	Secondary but rptd largest in N Japan	40°52'N 140°50'E	995

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	AKITA (90.6)			
1066	Nippon Oil Co Refinery	Secondary	39°46'N 140°04'E	1066
1067	Funakawa Oil Refineries	Small	39°53'N 139°52'E	-
	KAMAISHI (90.8)			
376	Northern Pier Oil Storage	Small	39°16'N 141°54'E	189
377	Radio Towers Oil Storage	Small	39°16'N 141°54'E	189
	NIIGATA (90.9)			
1000	Nippon Oil Co Refinery	One of largest refineries in Japan	37°55'N 139°04'E	998
1010	Sekiyu Oil Refinery	No details	37°57'N 139°50'E	998
1012	Oil Storage #1	Large storage tanks	37°51'N 139°05'E	998
1013	Oil Storage #2	Large storage tanks	37°56'N 139°04'E	1005
	FUKUSHIMA (90.10)			
1084	Standard Vacuum Oil Co	Secondary storage	37°45'N 140°28'E	1077
1085	Rising Sun Petroleum Co	No details	37°45'N 140°28'E	1077
1090	Standard Vacuum Oil Co	No details	38°14'N 140°54'E	1104
1091	Standard Vacuum Oil Co	Small storage	38°15'N 140°20'E	1082
1092	Rising Sun Petroleum Co	No details	38°15'N 140°20'E	1082
	TAKASAKI (90.13)			
1061	Standard Vacuum Oil, Takasaki	Small storage	36°19'N 139°01'E	1051

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JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17)			
87	Ogura Oil Co (Yokohama)	Large refinery & tanks	35°29'N 139°40'E	NA
88	Japan-American Oil (Yokohama)	Fuel oil, gasoline, kerosene; small	35°29'N 139°39'E	"
89	Eastern Petroleum Refinery (Yokohama)	Oil & asphalt	35°29'N 139°41'E	"
90	Oriental Oil Co (Yokohama)	Oil & gasoline	35°29'N 139°40'E	"
92	Lighthouse Bureau & Kanagawa Tanks	Petroleum stores & military supplies	35°26'N 139°40'E	"
94	Matsukata Oil Storage (Yokohama)	Petroleum & gasoline storage	35°29'N 139°40'E	"
116	Mitsubishi Oil Refinery (Kawasaki)	Japan's largest; produces aviation gasoline, lubricants	35°30'N 139°44'E	"
117	Mitsubishi Oil & Chiyoda Tanks	Production & storage	35°29'N 139°41'E	"
127	Hayama Refinery (Kawasaki)	One of area's largest refineries	35°30'N 139°44'E	"
128	Petroleum Center (Kawasaki)	4 refineries & storage; aviation gasoline etc	35°29'N 139°42'E	"
129	Nippon Super Fuel Co (Yokohama)	Small output gasoline by coal liquefaction	35°30'N 139°41'E	"
130	Asaishi Petroleum Co (Kawasaki)	Oil & gasoline	35°30'N 139°43'E	"
147	Aikoku Refinery (Kawasaki)	Fairly large	35°30'N 139°43'E	"
359	Uibar Oil Co (Tokyo)	More data required	35°41'N 139°50'E	"
360	Edogawa Petroleum Refinery (Tokyo)	More data required	35°40'N 139°53'E	"
910	Rising Sun Petroleum Terminal (Tokyo)	Secondary storage tank farm	35°42'N 139°49'E	"
911	Ogura Oil Co (Tokyo)	Large	35°41'N 139°49'E	"
1366	Nippon Oil Co (Tokyo)	Warehouses & storage	35°44'N 139°49'E	"
	SHIZUOKA (90.18)			
1186	Oil Refinery (Shimizu)	No details	35°01'N 138°30'E	1176
	NAGOYA (90.20)			
243	Rising Sun Oil Storage	Minor fueling depot for harbor shipping	35°04'N 136°52'E	194

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NAGOYA (90.20) (continued)			
244	Hatta Oil Storage	Small	35°09'N 136°51'E	250a
456	Toho Gas Works Synthetic Oil Plant	Synthetic oil, large gas works	35°08'N 136°55'E	197
1150	Naval Oil Storage	Fueling depot navy supply ships	34°51'N 136°56'E	1138
	OSAKA (90.25)			
17	Rising Sun Petroleum Co	Important storage terminal	34°39'N 135°09'E	10
164	Standard Vacuum Oil Co	Minor storage	34°42'N 135°17'E	164
257	Maruzen Toyo Petroleum Refinery	Secondary, 1,000 barrels per day	34°38'N 135°28'E	325
258	Mitsubishi Oil Co	Important storage	34°38'N 135°28'E	325
259	Osaka Oil Refinery	More data required	34°38'N 135°28'E	325
260	Rising Sun Petroleum Tanks	More data required	34°38'N 135°29'E	325
261	Standard Vacuum Oil Co	Minor storage	34°40'N 135°27'E	263
1203	Nippon Oil Refinery	Important, 4,000 barrels per day	34°42'N 135°24'E	536
	KOCHI (90.28)			
1529	Kochi Oil Storage	Small	33°33'N 133°33'E	1524
	NIIHAMA (90.29)			
934	Itozaki Oil Storage	Small	34°23'N 133°07'E	933
	KURE (90.30)			
659	Hitonose Oil Storage	Large	34°12'N 132°28'E	659

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JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKUYAMA (90.32)			
669	Hanano Waki Oil Tanks	Large storage capacity	33°58'N 131°47'E	669
670	Japan Paraffin Mfg Co	Large synthetic oil refinery	33°58'N 131°47'E	669
672	Nihon Oil Co	Large refinery & storage	33°59'N 131°52'E	668
673	Tokuyama Naval Fueling Station	Largest of Japanese Navy	34°02'N 131°49'E	673
	SHIMONOSEKI (90.34)			
40	Asahi Sekiyu Oil Refinery	Secondary production	33°55'N 130°56'E	43a
41	Rising Sun Petroleum Co	Secondary storage	33°55'N 130°55'E	43a
1107	Tanokubi Oil Storage	Secondary storage	33°55'N 130°55'E	43a
1123	Nissan Liquid Fuel Co	Secondary synthetic petroleum plant	33°54'N 130°48'E	29
	KURUME (90.35)			
665	Saitozaki Petroleum Storage	Secondary	33°39'N 130°21'E	665
1262	Mitsui Coal Liquefaction Plant	Rptd 2nd largest synthetic oil plant in Empire	33°02'N 130°27'E	1243
	SASEBO (90.36)			
545	Kozaki Point Oil Storages	Important	32°43'N 129°51'E	545
755	Sasebo Oil Storages	Very large naval storage	33°08'N 129°42'E	755
831	O Shima Oil Storage	Rptd Secondary	33°05'N 129°37'E	-
832	Megami Point Oil Storage (Nagasaki)	Small	32°43'N 129°51'E	544

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	YATSUSHIRO (90.37) KYUSHU SOUTH (90.38)			
1382	Sakura Island Oil Storage	Substantial oil storage	31°36'N 130°37'E	
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
14	Underground Oil Storage	Believed secondary	25°09'N 121°44'E	15a
33	Kyushi Zan Oil Storage	Largest storage Taihoku area	25°09'N 121°44'E	15a
34	Rising Sun Petroleum Storage	Secondary	25°10'N 121°27'E	49
	TAIWAN WEST (91.4)			
85	Byoritsu Refinery	Believed secondary	24°34'N 120°49'E	-
86	Kinsui Casing Head Plant	Rptd important	24°37'N 120°53'E	86
119	Shukkoko Oil Wells & Refinery	Secondary	24°25'N 120°51'E	119
	TAIWAN EAST (91.5)			
81	Suo Oil Storage	Rptd largest storage E coast Taiwan	24°36'N 121°53'E	81
	TAKAO (91.6)			
4	Mitsubishi Oil Storage	Storage, bunkering wharf	20°37'N 120°17'E	3
5	Oil Storage (Takao)	Minor	22°37'N 120°16'E	8a

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN (84)			
	GENZAN (84.4)			
88	Chosen Oil Co Refinery	Very large, important refinery	39°09'N 127°28'E	88
90	Rising Sun Oil Co Storage	Rptd large Oil Storage	39°11'N 127°24'E	88
	KEIJO (84.6)			
46	Getsubi Petroleum Storage	Jinsen harbor storage	37°28'N 126°37'E	44
	FUSAN (84.7)			
104	Chinkai Oil Storage	8 large tanks, fueling facilities	35°09'N 128°38'E	101
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
58	Kirin Artificial Oil Co	One of largest oil producing plants in Manchukuo	43°50'N 126°35'E	58
	MUKDEN (93.3)			
40	S.M.R. Shale Oil Refinery	Most important oil producing unit in Manchukuo	41°51'N 123°54'E	32

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MUKDEN(93.3) (continued)			
41	S.M.R. Coal Liquefaction Plant	One of major plants in Manchukuo	41°51'N 123°54'E	32
42	Manchuria Synthetic Fuel Co	Important	42°05'N 121°35'E	42
43	Manchuria Coal Liquefaction Co	Important	43°10'N 124°25'E	43
71	Standard Oil Co	More data required	41°47'N 123°23'E	50
	DAIREN (93.5)			
1	Manchukuo Petroleum Co	Largest refinery in Manchukuo	38°58'N 121°39'E	1
2	Standard Vacuum Oil Co	Largest oil storage in Dairen	38°55'N 121°41'E	2
3	Texas Co Oil Storage	Important	38°55'N 121°41'E	2
4	Asiatic Petroleum Co	More data required	38°55'N 121°41'E	2
5	Manchuria Oil Co Storage	More data required	38°55'N 121°41'E	2
6	Naval Oil Storage	More data required	38°48'N 121°16'E	11
	CHINA (83)			
	CANTON (83.4)			
58	Standard Oil Storage	Rptd medium sized	22°20'N 114°08'E	55
	TSINGTAO (83.11)			
76	Oil Storage Area (Tsingtao)	Capacity more than 50,000 tons	36°05'N 120°20'E	78
77	Oil Storage (Tsinan)	Small	36°40'N 117°01'E	71

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TIENTSIN (83,12)			
4	Asiatic Petroleum Co (Taku)	Storage, no details	38°59'N 117°40'E	4
5	Japanese Oil Storage (Taku)	Storage, no details	38°59'N 117°40'E	4
9	Standard Vacuum, Ta Hwa, Idemitsu Co	Storage, no details	39°02'N 117°38'E	4
10	Asiatic Petroleum Co (Tientsin)	Storage, no details	39°08'N 117°12'E	11
13	Standard Vacuum Oil (Tientsin)	Storage, no details	39°07'N 117°13'E	11
21	Texas Co (Tientsin)	Storage, no details	39°08'N 117°11'E	11
	FRENCH INDO-CHINA (85)			
	INDO-CHINA NORTH (85,1)			
39	Standard Vacuum Oil Storage (Haiphong)	One of 2 main I. China installations; may be empty	20°52'N 106°39'E	NA
40	Texas Oil Storage (Haiphong)	May be empty	20°52'N 106°39'E	"
41	N American Syndicate (Haiphong)	Storage, may be empty	20°52'N 106°39'E	"
42	Shell Storage (Haiphong)	Important oil installation; may be empty	20°52'N 106°39'E	"
	THAILAND (SIAM) (98)			
	THAILAND (98,1, 98,2, 98,3)			
31	Government Oil Refinery & Tank Farm	Rptd only Thailand refinery & largest storage	13°42'N 100°33'E	31
32	Asiatic Petroleum Storage	Tank storage, wharf	13°41'N 100°30'E	26
64	K Si Chang Island Oil Storage	Deep-water anchorage	13°09'N 100°49'E	64

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES (92)			
	MALAY STATES NORTH (92.1)			
74	Butterworth Oil Storage	Secondary	5°24'N 100°22'E	27
	SINGAPORE (92.2)			
70	Alexandra Tank Farm	Large; rptd 2,900,000 bbls	1°17'N 103°48'E	52
71	Kranji Tank Farm	Large; rptd 2,900,000 bbls	1°28'N 103°45'E	17
72	Bakum Island Tank Farm	Rptd 1,500,000 bbls	1°14'N 103°46'E	72
73	Shell Oil Storage	Minor storage, Singapore harbor	1°16'N 103°50'E	52
	BURMA (82)			
	BURMA SOUTH (82.2)			
18	Syriam Refinery (Rangoon)	Rptd largest Burma refinery, being repaired	16°46'N 96°14'E	18
19	Dunneedaw Plant Burmah Oil Co	Packaging plant for #18, rptd now idle	16°46'N 96°11'E	14
20	Seikgyi Refinery (Rangoon)	Small, rptd now idle	16°43'N 96°14'E	18
21	Thilawa Refinery (Rangoon)	Small, rptd now idle	16°40'N 96°15'E	21

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JAPAN-PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
31	Standard Oil Storage Tanks	Harbor oil storage	3°47'N 98°40'E	23
32	Shell Oil Storage Tanks	Harbor oil storage	3°47'N 98°40'E	23
33	Pankalan Brandon Oil Center	Produces oil, aviation gasoline, storage	4°02'N 98°17'E	15
34	Sabang Harbor Oil Storage	Naval base fuel storage	5°23'N 95°19'E	1
35	Sambo Is Oil Tank Farm	Large tank farm, fueling station	1°09'N 103°54'E	35
	SUMATRA SOUTH (94.2)			
61	Pladjoe Refinery	Largest in Far East, 18,000,000 bbls crude per yr plus 650,000 bbls 100-octane aviation gas	03°00'S 104°50'E	61
61a	Pladjoe Refinery	Three distilling towers	03°00'S 104°50'E	61
61b	Pladjoe Refinery	Distilling, cracking, reforming unit, key unit	03°00'S 104°50'E	61
61c	Pladjoe Refinery	Aviation gasoline plant	03°00'S 104°50'E	61
61d	Pladjoe Refinery	Power plant	03°00'S 104°50'E	61
62	Emma Haven Petrol Tanks	At harbor, capacity unknown	01°00'S 100°22'E	54
	BORNEO SOUTH (94.4)			
224	Tarakan Storage Tanks	Large fuel oil storage	03°18'N 117°36'E	221
225	Shell Oil Refinery Balikpapan	Large oil refinery	1°16'S 116°49'E	
	PHILIPPINES (96)			
	PHILIPPINES (96.1, 96.2)			
40	Manila Oil Storage	Center Manila oil storage; partly destroyed	14°36'N 120°58'E	NA

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JAPAN - PETROLEUM

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	PHILIPPINES (96.1, 96.2)(continued)			
56	RR yds & Asiatic Pet Co Storage (Iloilo)	Large oil storage, RR yards	10°42'N 122°35'E	NA
57	Texas Co Storage (Iloilo)	Large oil storage	10°42'N 122°34'E	"
58	Standard Oil Co Storage (Iloilo)	Large oil storage	10°42'N 122°34'E	"
	BRITISH PACIFIC ISLANDS (81)			
	BORNEO NORTH (81.1)			
8	Lutong Oil Installations	Extremely important; supply 9,000,000 bbls natural fuel oil plus 11,000,000 bbls crude oil annually; storage	04°30'N 114°00'E	8

* New Target to be included in Folder revision
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SECRET

March 1943

RUBBER PRODUCTS

	KEY TARGETS			
	TARGET		Importance	Obj. Area
	No.	Name		
1	14	Dunlop Rubber Co.	Largest tire plant in Far East; about 30% of Jap total tire output	Osaka (90.25)
2	141	Yokohama Rubber Co.	About 20% of tire output; also other rubber products	Tokyo (90.17)
3	1263	Bridgestone Tire Co., Kurume	Third largest tire plant; about 16%	Kurume (90.35)
4	164	Goodyear Rubber Co.	Largest plant outside Japan Proper	Java (94.3)
5	1431	Bridgestone Tire Co., Totsuka	Rptd about 8% of tires	Tokyo (90.17)
6	101	Bridgestone Tire Co., Tsingtao	Exact location unknown	Tsingtao (83.11)
7	109	Yokohama Rubber Co., Mukden	Only tire plant in Manchukuo	Mukden (93.3)
8	102	Kiyowa Rubber Co., Tsingtao	Exact location unknown	Tsingtao (83.11)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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March 1943

R U B B E R P R O D U C T S

The very existence of the modern mechanized, mobile army pre-supposes the liberal use of rubber tires. They are necessary equipment for all types of land-based and carrier-based airplanes, for army scout cars, gun caissons, mobile kitchens, ambulances, etc. The essentiality of tires for important industrial purposes is equally familiar. Not only are tires required for the trucks and buses used in the transportation of goods and workers, but they are needed to equip many kinds of construction, earth-moving, and road-building machinery.

Over two-fifths of the output of the Japanese rubber industry consists of vehicular tires. Since the tire branch of the industry is also the one with most strategic importance and since it is difficult to convert other rubber factories to the production of tires, the present report is confined to the tire branch of the rubber industry.

No highly reliable information is available concerning the total number of tires which are highly essential or "required" for the necessary military and industrial uses, but the number is probably in the neighborhood of 2,000,000-2,500,000 per year. This estimate is below the production in recent years and allows for the elimination of tires for pleasure cars and for export.

The total tire-making capacity in Japan and her occupied territory appears to be at least 2,500,000 tires of all types per year. This is adequate to supply the requirements for essential purposes, as estimated above. The distribution of the total tire-building facilities between the major plants in the industry is indicated in the attached table. It is evident that productive capacity is extremely concentrated, perhaps more so than in any other major Japanese industry. The three leading tire factories account for about 67% of the total, and the first five plants aggregate about 84%.

As stated above, the tire industry in the Far East is so highly concentrated in a few large plants that destructive bombing operations against two or three large factories would cut tire output by about two-thirds. Although Japan has a superabundance of crude rubber, of course, the manufacture of tires requires specialized machinery. Persons familiar with the industry estimate that it would require six months to convert a rubber shoe factory or other rubber-goods plant to the manufacture of tires.

Interruption of the output of new tires would be less serious, of course, if Japan should happen to possess large stockpiles of finished tires in the required sizes and types. On the basis of what information is at hand, it seems highly unlikely that the Japanese have any considerable inventory of such tires, although there may be some stocks of passenger-car tires.

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So far as the individual plants are concerned, they present no peculiar problems of vulnerability or invulnerability. The priority targets in the industry are all steel and concrete buildings two to four stories in height.

Because of the essentiality of rubber tires in conducting the war and because of the lack of adequate substitutes, any successful destruction of major plants in the industry would force a curtailment in the output of new vehicles requiring tires or force existing equipment off the road, or both. This effect would appear within a very short time, since stockpiles are low and the difficulties of compensating for damaged plants through conversion of other facilities are great.

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All targets in folders to 3/1/43, grouped by Areas

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JAPAN - RUBBER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	TOKYO (90.17)			
141	Yokohama Rubber Co (Yokohama)	Rptd 2nd most important rubber target Far East	35°30'N 139°42'E	N A
1431	Bridgestone Tire Co (Totsuka)	-	35°24'N 139°32'E	"
	OSAKA (90.25)			
14	Dunlop Rubber Wks #1	Rptd over 30% tire mfg capacity of Empire	34°42'N 135°13'E	5
788	Asahi Rubber Wks	More data required	34°41'N 135°11'E	5
1204	Hanshin Rubber Co	All kinds rubber products	34°39'N 135°10'E	10
1205	Yokohama Rubber Co	All kinds rubber products	34°39'N 135°09'E	10
	KURUME (90.25)			
1263	Bridgestone Tire Co	Rptd 3rd largest tire output in Empire	33°19'N 130°30'E	1263
1264	Nippon Rubber, Kurume City Plant	Large output rubber products	33°19'N 130°30'E	1263
1265	Nippon Rubber, Fukuoka Plant	Secondary production tin & rubber products	33°35'N 130°25'E	1238
1266	Tsuchiyu Tabi Co	Large output rubber footwear	33°18'N 130°30'E	1263
	MANCHUKUO (MANCHURIA) (93)			
	MUKDEN (93.3)			
109	*Yokohama Rubber Co, Mukden	Small tire plant; about 3-4% of total	41°47'N 123°23'E	N A

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JAPAN - RUBBER

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHINA (83)			
	TSINGTAO (83.11)			
101	*Bridgestone Tire Co,(Tsingtao)	3-4% of tire mfg capacity available to Japs	36°05'N 120°20'E	N A
102	*Kiyowa Rubber Co,(Tsingtao)	3-4% of tire mfg capacity available to Japs	36°05'N 120°20'E	"
	NETHERLANDS EAST INDIES (94)			
	JAVA (94.3)			
164	Goodyear Tire Factory	Only tire factory in N E I	6°35'S 106°47'E	164

* New Target to be included in Folder revision

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March 1943

TRANSPORTATION

	KEY TARGETS			
	TARGET		Importance	Obj. Area
	No.	Name		
1	16	South Manchurian Ry Work Shops, Dairen	Repairs, maintenance construction	Dairen (93.5)
2	36	Tongshan RR Shops Tongshan	"	Tientsin (83.12)
3	88	RR Shops & Roundhouse Tsingtao	"	Tsingtao (83.11)
4	40	RR Shops, Shanhaikwan	"	Tientsin (83.12)
5	43	Ryuzan RR Shops and Yards, Keijo	"	Keijo (84.6)
6	105	Fusan RR Workshops, Fusan	"	Fusan (84.7)
7	184	Kokura RR Shops, Kokura	"	Shim'seki (90.34)
8	538	I.G.R. Shops, Takatori	"	Osaka (90.25)
9	894	Imperial Govt RR Shops Omiya	"	Tokyo (90.17)
10	1230	Govt RR Workshops, Hamamatsu	"	Hamamatsu(90.21)
11	871	Kanazawa RR Stn & Shops, Kanazawa	Repairs & maintenance	Toyama (90.11)
12	990	Sapporo Shops Imperial Govt Rys, Sapporo	"	Muroran (90.3)
13	997	RR Yds, Aomori	Train Ferry	Aomori (90.5)
14	977	Imperial Govt Ry Wharves, Hakodate	Train Ferry	Hakodate (90.4)
15	86	Ry Shops & Yds, Harbin	Repair, maintenance and building	Manchukuo (93.1)
16	89	RR Yds, Tsinan	Repairs and maintenance	Tsingtao (83.11)

Priority Targets are underscored

These and all other targets are on the accompanying map and in the target tabulation with coordinates and brief description.

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TRANSPORTATION - RAIL

The network of railroads in Japan Proper presents a system of alternate transportation routes requiring relatively widespread and sustained attacks on fixed facilities to accomplish paralyzation.

Of the 141 targets included in folders, 8 have been selected as key targets. Six of these are Imperial Government Railway shops and two are the termini of the Aomori-Hakodate train ferry. The remaining 133 targets, which are not considered key targets for the purpose of this study, are smaller shops, marshalling yards, bridges and junctions. Each of the I.G.R. shops selected as key targets is the largest maintenance unit for its respective section of the main line.

These I.G.R. shops have been selected as key targets because it is believed that maintenance is the most vulnerable factor in the effective operation of Japanese railroads. In addition to the normal congestion apparent in Japan previous to the war, the railroads are being further taxed by withdrawal of ships from coastwise service for overseas trades. However, it is estimated that the railroad system will not absorb more than a 10 percent increase for the purpose of releasing coastwise shipping and will not materially change the shipping position from a long-time point of view. For instance, 4,000,000 tons of this transferred movement will be coal, which will not release more than 150,000 gross tons of second rate vessels for overseas trade - one month's sinking at the current rate.

Because of the partial or complete conversion of locomotive and car construction units of private plants to military goods, it is believed that construction in Government shops has been increased. Construction units of private plants have been treated as targets in other industrial classifications. The indications are that construction will not exceed 600 steam and 50 electric locomotives for 1943. Of these steam locomotives, 200 will be standard gauge for export to the mainland. Freight car construction is believed to be approximately 11,000 for this year. This rate of replacement is low compared to the demolition rate in the event of sustained attacks on concentrations.

Among the targets described in the folders but not considered key targets for the purpose of this report are these points of locomotive and rolling stock concentrations (roundhouses and marshalling plants). The freight and passenger car congestion in marshalling and freight yards offer first class targets, especially for incendiary attack.

Aside from the military value of the north mainland railroads, they are necessary for the transport of essential industrial supplies to ports for shipment to Japan. Without such transport to shipside, Japanese home production could not support the war.

These north mainland railroads are estimated to deliver to shipside 43% of the total essential overseas industrial supplies originating in ports outside of the Japanese Islands. In this figure are included ore, coal and pig iron, representing approximately 40% of steel production in Japan Proper. This percentage will rise in proportion to the curtailment of iron ore receipts from Malaya, Philippines and the Yangtze Valley.

Maintenance and repair facilities of North China are especially important to the total system. Curtailment in this region will not only disorganize movement of essential supplies, but will burden the shops of Manchukuo which are situated in the most congested sections of the Manchurian system.

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With growing stringency of the shipping position, the Japanese are shortening their sea hauls and greater industrial dependence is being placed on the ever increasing production of raw and semi-processed materials of the region in question. The shorter sea hauls from the industrial concentration of southern Japan reach the mainland within this radius.

Limitations on the free use of ships and the increasing production of the mainland will tend to create stockpiles in the ports awaiting shipment by ships arriving in convoy rather than singly. The prevention of such stockpiling has an adverse effect on the efficient use of available ships since lengthening the turn-around time in ports immobilizes ship tonnage.

It is indicated that the mainland system is now being operated nearly to capacity, and that the strain on repair and maintenance is increasing. The railroad shops selected as key targets maintain the most heavily burdened sections of the railroads and are relatively distant from replacement centers in Japan. The shops in Woosung and Pukow (not key targets), while important, service a section of the railroad system lying relatively close to our China base of operations. At the present time this section of the railroad has a greater military than industrial value.

The building capacity of the mainland is estimated not to exceed 100 locomotives and 3000 freight cars per annum. Since mainland railroads are standard, and Japanese railroads are narrow gauge, locomotives must be especially built in Japan for export. It is not believed that more than 200 locomotives are being built in Japan this year for mainland railroads. Since the difference in gauge precludes transfer of locomotives and freight cars, the replacement rate is only a fraction of the demolition potential of sustained air attack, on roundhouses, locomotive and rolling stock concentrations.

The railroad from Kowloon to Canton has no industrial importance.

The railroads of French Indo-China as a complete system have no industrial importance. The two branch lines from Hanoi to the Chinese border at Laokai and Chen-Nan-Kwan would have great military importance in support of ground forces in South China. The line from Hanoi to Haiphong may be useful for transhipment purposes.

According to reports, the Japanese have not closed the gap between Mytho and the end of the line into Thailand from Pnom-Penh. Goods from Saigon move by rail to Mytho and are transhipped by river craft to Pnom-Penh.

The Indo-China railroads are narrow gauge and single-tracked with passing switches. The freight cars carry an average of ten tons apiece and the locomotives haul about 200 tons per train at a top speed of 25 miles an hour. Trains normally average 150 miles a day.

The main line from Hanoi to Saigon, although of limited capacity, would assume some utility for the movement of military supplies in the event of adverse shipping conditions on the coast.

The railroads of Java would have only localized military or industrial importance.

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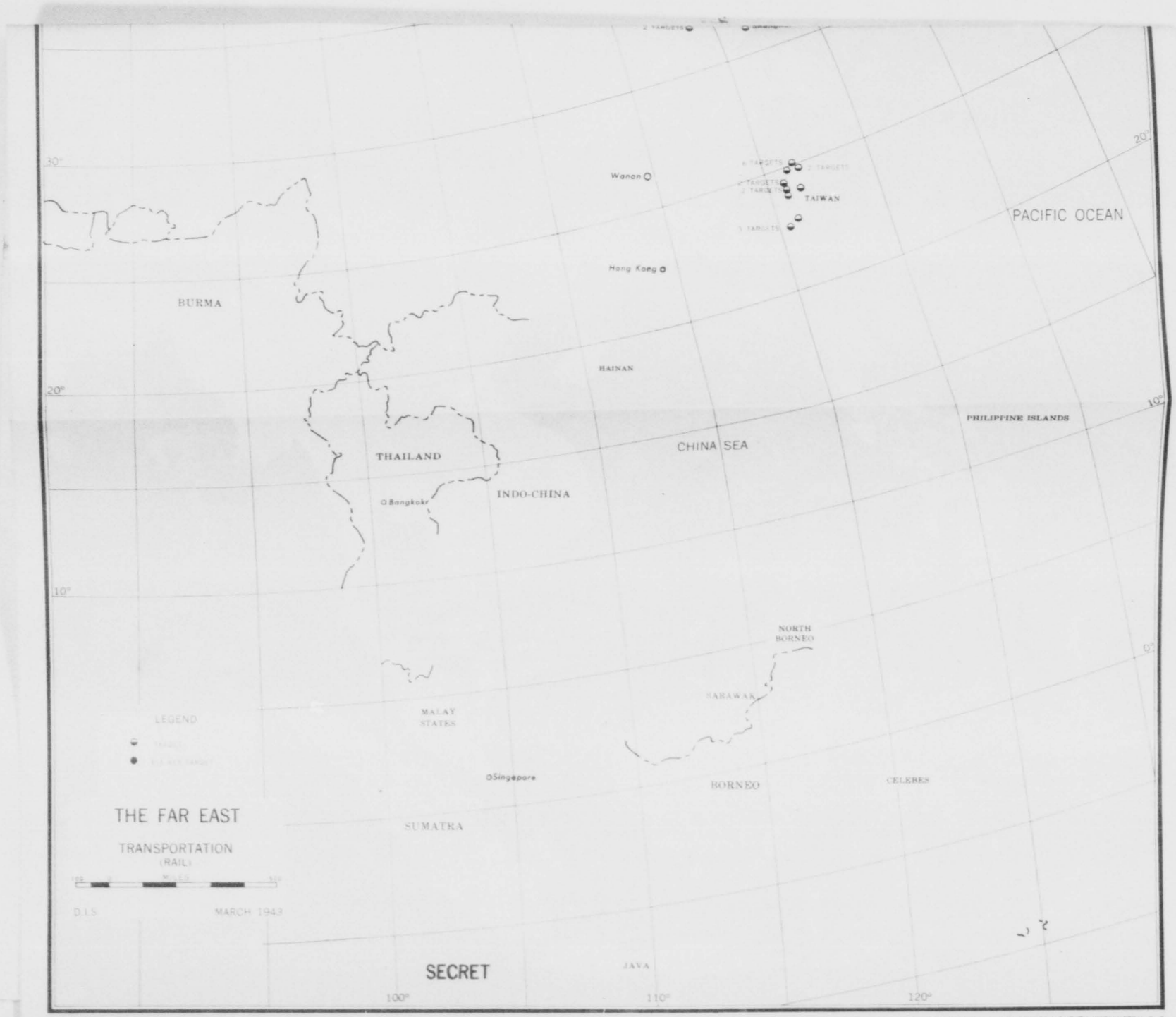

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	MURORAN (90.3)			
380	Muroran RR Terminus	Important coal traffic	42°19'N 140°59'E	378
990	Sapporo Shops Imperial Govt Railways	Important	43°04'N 141°23'E	-
991	Iwamizawa RR Yards & Jc	On main Muroran line	43°12'N 141°46'E	991a
	HAKODATE (90.4)			
977	Imperial Govt Railway Wharves	Terminus for Aomori traffic	41°46'N 140°44'E	977
978a&b	Onuma Causeway & Tunnel	Minor	41°59'N 140°40'E	978
979	Goryokaku RR Shops	Minor	41°48'N 140°44'E	979
	AOMORI (90.5)			
997	RR Yards (Aomori)	Important unit for car-ferry traffic	40°49'N 140°45'E	993
	AKITA (90.6)			
1068	Tsuchizaki RR Shops	Principal repair shops for area	39°45'N 140°05'E	1066

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MORIOKA (90.7)			
1074	Morioka RR Yards & Jc	Secondary	39°42'N 141°18'E	1074
1075	Hanamaki RR Junction	Jc to important Kamaishi steel center	39°23'N 141°08'E	1075
1076	Koma RR Junction	Secondary	39°52'N 141°11'E	1076
	KAMAISHI (90.8)			
1030	Owatari Bridge	Secondary	39°16'N 141°53'E	189
1031	Kamaishi Ry Bridge	Secondary	39°16'N 141°53'E	189
	NIIGATA (90.9)			
1015	Bandai Bridge	Main artery between E-W sections of city	37°55'N 139°03'E	998
1016	Bridge "X"	Main artery between E-W sections of city	37°55'N 139°03'E	1005
1017	RR Bridge "A"	Important, links E & W sections of city	37°55'N 139°02'E	998
1018	RR Bridge "B"	Important, links E & W sections of city	37°56'N 139°05'E	998
1019	RR Bridge "C"	Important, links E & W sections of city	37°55'N 139°05'E	998
1020	Niigata Harbor RR Station	Loading & unloading facilities	37°56'N 139°05'E	1005
1023	RR Shunting Yards & Junction	Extensive yards & junction	37°55'N 139°04'E	998
1024	Freight Yards & Station	Yards, handling facilities, passenger station	37°55'N 139°04'E	998
1029	RR Bridge "D"	Outlet from city of main N-S Shinyetsu line	37°50'N 139°07'E	1029

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	FUKUSHIMA (90.10)			
1077	Fukushima RR Station	Secondary	37°45'N 140°28'E	1077
1082	Yamagata RR Station	Secondary	38°15'N 140°20'E	1082
1089	Sendai RR Station	Principal station Sendai Region	38°16'N 140°53'E	1104
1104	Nagamachi RR Station	Largest yards Sendai Region	38°14'N 140°54'E	1104
1105	Iwanuma RR Junction	Jc 2 important lines north from Tokyo	38°06'N 140°51'E	1105
1106	Koriyama RR Junction	Controls cross-Japan traffic north of Tokyo	37°24'N 140°24'E	1088
	TOYAMA (90.11)			
871	Kanazawa RR Station & Shops	Only shops on W coastline Niigata-Shimonoseki	36°35'N 136°39'E	871
	NAGANO (90.12)			
1093	Chikuma River Bridge	Strategic	36°33'N 138°08'E	1094
1094	Shinonoi RR Junction	Strategic main line junction	36°34'N 138°08'E	1094
1095	Shiojiri RR Junction	Connects 2 main N-S lines	36°06'N 137°57'E	1095
1096	Komoro RR Junction	Controls traffic between Tokyo, Nagoya & north	36°18'N 138°27'E	1096
1097	Toyono RR Junction	Controls traffic on main Shinetsu line	36°43'N 138°17'E	1097
1098	Nagano Government RR Shops	Repairs, maintenance of rolling stock	36°38'N 138°11'E	1098
1099	Sai River Bridge	Controls traffic into Nagano from S	36°37'N 138°09'E	1094

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKASAKI (90.13)			
1051	Takasaki RR Jc Roundhouse & Yard	Key to cross-Japan traffic	36°19'N 139°01'E	1051
1052	Shimizu RR Tunnel	Longest tunnel in Orient	36°50'N 138°55'E	1052
1053	Kiryu RR Junction	Key point on line serving Ashio Mine	36°25'N 139°20'E	1053
1054	Oyama RR Junction	Tokyo-Aomori main line	36°19'N 139°50'E	1054
1055	Shin-Maebashi Jc Yd & Brs	Important in connection #1054	36°23'N 139°03'E	1055
1056	Utsunomiya RR Jc & Br	Rail connection at Furukawa Refinery	36°32'N 139°53'E	1056
	MITO (90.14)			
1478	Mito RR Jc & Station	Secondary	36°22'N 140°28'E	
1479	Toride RR Bridge	Important	35°53'N 140°04'E	
	KOFU (90.16)			
1497	RR Junction	Connects area with southern main line	35°39'N 138°36'E	1497
	TOKYO (90.17)			
66	Takashima Freight Yd (Yokohama)	Area's most important ship-shore transfer point	35°28'N 139°38'E	N A
67	Junctions, Overpass at Yokohama Station	Chief passenger concentration in Yokohama	35°28'N 139°38'E	"
68	Higasahi Yokohama Yd (Yokohama)	Second most important yd in Yokohama	35°27'N 139°38'E	"
112	Tsurumi Shunting Yd (Kawasaki)	Most important yard in Kawasaki	35°32'N 139°40'E	"
224	Tabata-Nippori RR Yards (Tokyo)	Among most important yards in Tokyo vicinity	35°44'N 139°46'E	"

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TOKYO (90.17) (Continued)			
364	Shinagawa RR Yards (Tokyo)	Rptd most important yard in area	35°38'N 139°45'E	N A
365	Shiodome Freight Yards (Tokyo)	Among most important yards in Tokyo vicinity	35°40'N 139°46'E	"
367	Tokyo Central Station (Tokyo)	Most important passenger station in area	35°40'N 139°46'E	"
369	Ueno RR Station (Tokyo)	One of 3 major Tokyo passenger depots	35°42'N 139°47'E	"
370	Oi RR Works (Tokyo)	Second most important shops IGR region	35°37'N 139°44'E	"
894	Imperial Govt RR Shops (Omiya)	Largest shop in IGR region	35°55'N 139°38'E	"
1367	Tama River Bridges (Kawasaki)	Possibly area's most vulnerable RR bottleneck	35°32'N 139°43'E	"
1368	Akabane RR Bridges & Jc (Tokyo)	Control main line outlets N out of Tokyo	35°46'N 139°44'E	"
1369	Tsurumi River Bridges (Kawasaki)	Only outlet S from Tokyo & Kawasaki except #1367	35°31'N 139°41'E	"
1370	Sumida R Br & Yd, Joban Line (Tokyo)	With #1371 controls chief outlet NE out of Tokyo	35°44'N 139°48'E	"
1371	Arakawa River RR Bridges (Tokyo)	With #1370 controls outlet NE out of Tokyo	35°45'N 139°49'E	"
1372	Sumida R Br & Ryogoku Br & RR Yd	Sobu RR E out of Tokyo; alternate for Joban line	35°41'N 139°48'E	"
1373	Sobu RR Br of Arakawa R, & Shinkoiwa Yd	With #1372 Sobu RR E out of Tokyo	35°43'N 139°52'E	"
1374	Shinjuku Sta & RR Jc (Tokyo)	One of three important Tokyo stations	35°41'N 139°43'E	"
1375	Hachioji Junctions & Br	Key outlying traffic points of Tokyo area	35°39'N 139°21'E	"
1376	Ofuna Jc (Yokosuka)	Controls main RR traffic with Yokosuka base	35°21'N 139°32'E	"
1377	Sagami (Banyu) R Br (Hiratsuka)	One of area's important bridges	35°20'N 139°22'E	"
	SHIZUOKA (90.18)			
1173	RR Bridge over Oi River	Tokaido main line & telephone cable	34°49'N 138°09'E	1173

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIZUOKA (90.18) (Continued)			
1174	RR Bridge over Abe River	Tokaido main line	34°57'N 138°22'E	1175
1175	RR Shops & Roundhouse (Shizuoka City)	No details	34°58'N 138°23'E	1175
1180	RR Junction (Fuji)	Controls traffic over alternate route	35°09'N 138°40'E	1177
1181	RR Shops & Roundhouse (Numazu)	Important repair shops & yards	35°06'N 138°52'E	1181
1182	RR Junction (Matsuda)	Controls traffic over Tokaido & Chuo lines	35°20'N 139°09'E	1182
	NAGOYA (90.20)			
250a	Nagoya Freight Yard	Important; largest yards Nagoya area	35°09'N 136°53'E	250a
250b	Nagoya Repair Shops	Important; largest shops Nagoya area	35°09'N 136°52'E	250a
250c	Nagoya Station	Secondary	35°10'N 136°53'E	250a
425	Nada Canal	Intensive artery between port & freight yards		
425a	Nada Canal Tramway Bridge	See #425	35°05'N 136°53'E	194
425b	Nada Canal Control House	See #425	35°05'N 136°53'E	194
425c	Nada Canal Elevated Crane	See #425	35°05'N 136°53'E	194
425d	Nada Canal Barge Basin	See #425	35°05'N 136°53'E	194
1132a&b	NW Shonai River Bridges	On main line	35°12'N 136°52'E	250a
1133	Inazawa Shunting Yard	Principal shunting yard of area	35°15'N 136°50'E	1133
1134a&b	Kuwana RR Bridges	Important	35°05'N 136°42'E	1134a
1135a&b	Gifu-Ogaki RR Bridges	Important	35°24'N 136°40'E	1135b
1136a&b	NE Shonai River Bridges	On alternate route to Tokyo	35°12'N 136°57'E	196
1137	Kariya RR Bridge	Important	35°00'N 136°59'E	1137

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HAMAMATSU (90.21)			
1230	Government RR Workshops (Hamamatsu)	Important, rptd 3rd largest in Japan	34°42'N 137°43'E	1219
1231	Station, Yards, Roundhouse (Hamamatsu)	Secondary	34°42'N 137°44'E	1219
1232	Tenryu River Bridge	Long, steel, on Tokaido main line	34°43'N 137°48'E	1219
1233	Bentenjima Bridge	Major, carries Tokyo-Nagoya traffic	34°40'N 137°35'E	1233
1234	Toyo River Bridge	Carries Tokaido main line, telephone cable	34°46'N 137°22'E	1222
	MAIZURU (90.22)			
1035	RR Junction	Connects Tsuruga with main line	35°39'N 136°05'E	1033
1036	Tsuruga Junction	Vital, connects Tsuruga with rest of Japan	35°37'N 136°04'E	1036
1045	Maizuru Junction	Connects Tsuruga with Kobe, Osaka, Shimonoseki	35°20'N 135°20'E	1045
	KYOTO (90.23)			
1159	Kyoto RR Sta Jc & Yds	Controls 4-way traffic out of Kyoto	34°59'N 135°46'E	1170
1160	Maibara RR Junction	Important Jc Tokaido & Hokuriku Lines	35°19'N 136°18'E	1160
1161	RR Bridge	Important bridge on Tokaido main line	34°59'N 135°55'E	1163
1162	Ayabe RR Junction	Important junction	35°18'N 135°16'E	1162
	KUMANO (90.24)			
1217	Kameyama Jc	Important junction of RR line between Nagoya & Osaka	34°51'N 136°27'E	1217
1218	Matsuzaka Jc & Roundhouse	Minor	34°34'N 136°32'E	1218

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	OSAKA (90.25)			
154	Kobe RR Station	Central passenger station	34°41'N 135°11'E	10
156	Onohama RR Station	Important freight station	34°41'N 135°12'E	5
157	Sannomiya RR Station	Passenger station	34°41'N 135°12'E	5
158	Wadamisaki RR Station	Important freight station	34°39'N 135°11'E	10
159	Takatori RR Station	More data required	34°39'N 135°08'E	10
538	I.G.R. Shops, Takatori	Very important repair & maintenance	34°39'N 135°08'E	10
1206	Osaka RR Station	Most important station in Osaka	34°42'N 135°30'E	695
1207	Shinyodo RR Br #1	Key bridge Tokaido Line entering Osaka	34°43'N 135°30'E	695
1208	Shinyodo RR Br #2	On Osaka-Kobe main line	34°42'N 135°29'E	695
1209	Suita RR Yard & Shops	Important railroad yards and shops	34°46'N 135°32'E	1209
	OKAYAMA (90.27)			
1299	Okayama Yards	Extensive RR yds, large whses, roundhouse	34°40'N 133°55'E	1294
1300	Takamatsu Terminal	Extensive RR yards	34°21'N 134°03'E	1300
1301	Yoshino River RR Bridge	Coastal route from Tokushima to Takamatsu	34°06'N 134°32'E	1302
1302	Tokushima Yards & Repair Shops	Shipping point agricultural products, Shikoku Island	34°04'N 134°33'E	1302
1303	Tadotsu Yards & Repair Shops	Yards of 3 RR lines	34°16'N 133°45'E	1303
1304	Yoshino River Highway Bridge	Largest vehicular bridge in Orient	34°05'N 134°33'E	1302
	KOCHI (90.28)			
1532	RR Tunnel (Totano)	Secondary; northern outlet for Kochi	33°40'N 133°41'E	1532

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NIIHAMA (90.29)			
933	Mihara Railroad Junction	For coastal line serving Kure Naval Base	34°23'N 133°05'E	933
	KURE (90.30)			
733	Kaitaichi RR Junction	Important coastal line	34°22'N 132°33'E	733
740	East Hiroshima Station	Jc main line and Ujina military branch	34°23'N 132°27'E	740
798	Kure RR Station	Large, cranes, storage, serves Naval Base	34°14'N 132°33'E	657
	KYUSHU EAST (90.33)			
1329	Oita RR Yard	Secondary RR terminal	33°13'N 131°37'E	1329
	SHIMONOSEKI (90.34)			
184	Kokura RR Shops	Most important shops Kyushu Island	33°53'N 130°52'E	168
561	Wakamatsu RR Shops	Rptd important repairs	33°54'N 130°49'E	29
772	Kwannon RR Tunnel & Viaduct	Important	33°57'N 130°55'E	43a
1110	Moji RR Sta & Yds	Important	33°56'N 130°58'E	44a
1111	Shimonoseki RR Shops & Yds	Important; includes terminus Korea ferry	33°57'N 130°56'E	43a
1118	Kokura RR Jc	Secondary	33°53'N 130°52'E	168
1119	Hatabu RR Jc	Secondary	33°59'N 130°56'E	99
	KURUME (90.35)			
838	Isahaya RR Junctions	Junction Nagasaki main line & Sasebo branch	32°51'N 130°03'E	838

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	KURUME (90.35) (Continued)			
1267	Miike Coal Yard (Mikawa)	Important	33°00'N 130°25'E	1243
1268	Mitsui RR Workshops	Secondary	33°00'N 130°25'E	1243
1269a&b	Chikugo River Bridges	On main line between Kurume area & north	33°18'N 130°30'E	1263
1270	Hakata RR Station	Principal station Kurume area	33°36'N 130°25'E	664
	SASEBO (90.36)			
759	Sasebo RR Station	Minor	33°10'N 129°43'E	757
839	Haiki RR Terminal	Secondary	33°08'N 129°48'E	839
840	RR Tunnels (Okusa)	Minor	SW Tunnel: 32°51'N 129°58'E SE Tunnel: 32°50'N 129°54'E	840
	YATSUSHIRO (90.37) KYUSHU SOUTH (90.38)			
1384	Oyodo River Railway Bridge at Miyasaki	On only east coast RR in S Kyushu	31°54'N 131°27'E	N A
1385	Kuma River Railway Bridge at Yatsushiro	On only west coast RR in S Kyushu	32°30'N 130°38'E	"
1517	Kagoshima RR Repair Shops	Only known RR repair shop in S Kyushu	31°34'N 130°32'E	"
1518	Kagoshima Station & Freight Yards	Large, in most important RR city in S Kyushu	31°36'N 130°34'E	"

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPANESE PACIFIC ISLANDS (91)			
	TAIHOKU (91.3)			
27	Bridges & Tunnels near Hatto	Carry all heavy Keelung traffic	25°07'N 121°44'E	27
28	Shinten River RR Bridge	Only RR between Taihoku & S Taiwan	25°02'N 121°29'E	28
29	Taihoku Highway Bridge	Secondary	25°04'N 121°30'E	29
30	Meiji Highway & RR Bridges	Secondary	25°05'N 121°31'E	30
31	Taihoku RR Terminal	Important	25°03'N 121°31'E	31
32	Matsuyama RR Shops	Important	25°03'N 121°35'E	32
	TAIWAN WEST (91.4)			
90	Nisui Junction & Bridge	Secondary	23°47'N 120°38'E	90
91	Taito River Bridges	Important	24°07'N 120°34'E	91
92	Shoka RR Terminal	Important	24°06'N 120°33'E	92
93	Toyohara Tunnel & Bridge	Secondary	24°17'N 120°45'E	93
94	Taian River Bridge	Secondary	24°25'N 120°38'E	94
95	Chikunan Terminal & Bridges	Important	24°41'N 120°48'E	95
	TAIWAN EAST (91.5)			
66	Karenko RR Station & Yards	Northern terminal Taito-Karenko line	23°59'N 121°36'E	66
67	Taito RR Station	Southern terminal Taito-Karenko line	22°45'N 121°09'E	67
68	Dakusui River RR Bridge	Suo's only RR connection with Keelung	24°43'N 121°46'E	68
69	Giran River RR Bridge	Only Karenko-Suo RR connection with Keelung	24°46'N 121°45'E	69

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TAKAO (91.6)			
9	RR Yard & Repair Shops (Takao)	Southern terminal Taiwan's only trunk line	22°38'N 120°16'E	9
10	RR Car Sheds (Takao)	Minor	22°37'N 120°17'E	
55	Shimo Tansui RR Bridge (Heito)	Important	20°40'N 120°26'E	55
	CHOSEN (84)			
	SEISHIN (84.1)			
16	Seishin RR Station & Yards	Terminal for goods to NE Chosen	41°47'N 129°48'E	13
17	Seishin Railway Workshops	One of few in NE Chosen	41°47'N 129°48'E	13
18	Rashin RR Yards	Terminal for goods, military supplies	42°14'N 130°18'E	14
19	Tumen River Bridge #1	Targets 19,20,21 control traffic in NE Chosen & Manchukuo	42°59'N 129°48'E	19
20	Tumen River Bridge #2	Targets 19,20,21 control traffic in NE Chosen & Manchukuo	42°42'N 129°45'E	20
21	Nanyo Junction	Targets 19,20,21 control traffic in NE Chosen & Manchukuo	42°48'N 129°50'E	20
22	Ranan RR Yards & Munitions Warehouses	Serve army base	41°42'N 129°41'E	22
	HEIJO (84.3)			
73	Heijo RR Station	Includes yards, workshops, army depot	39°00'N 125°44'E	71
74	Heijo Shunting Yards	Large, still under construction	39°04'N 125°44'E	74
75	Teishu Railroad Workshops	One of important shops in Chosen	39°41'N 125°13'E	-
91	Daido Railroad Bridge	Steel, only crossing Daido River	38°59'N 125°45'E	71
92	Daido Highway Bridge	Steel, only crossing Daido river	39°01'N 125°45'E	71

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	CHOSEN EAST (84.5)			
56	Kakusando RR Terminal	Terminal Korean RR system	36°03'N 129°22'E	55
	KEIJO (84.6)			
42	Han River RR Bridge	All N-S RR traffic in Korea crosses this bridge	37°31'N 126°57'E	42
43	Ryusan RR Shops & Yards	Largest in Korea	37°32'N 126°57'E	42
44	Jinsen RR Station & Yards	Connect with Jinsen Harbor	37°29'N 126°37'E	44
	FUSAN (84.7)			
105	Fusan RR Workshops	One of principal Chosen locomotive repair shops	35°07'N 129°03'E	97
106	Rakuto River RR Bridge	On main RR Fusan-Manchukuo, 2 parallel spans	36°00'N 128°23'E	106
	MANCHUKUO (93)			
	MANCHUKUO NORTH (93.1)			
86	RR Shops & Yards (Harbin)	Important, northernmost maintenance shops	45°47'N 126°40'E	N A
	MANCHUKUO EAST (93.2)			
72	Antung RR Station	Principal station Antung	40°10'N 124°20'E	72
77	RR Bridge over Yalu River	Very important in Korea-Manchukuo traffic	40°10'N 124°20'E	72

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MUKDEN (93.3)			
53	RR Station	Main RR Station in Mukden	41°47'N 123°23'E	50
	DAIREN (93.5)			
26	RR Station	Principal station of Dairen	38°56'N 121°38'E	1
	CHINA (83)			
	SHANGHAI (83.1)			
98	Tientsin-Pukow RR Wkshops	Important	32°05'N 118°43'E	N A
99	Pukow-Nanking Train Ferry	Connects Tientsin-Pukow RR with Nanking-Shanghai RR	32°05'N 118°43'E	"
100	Pukow-Nanking RR Wkshops	Important	31°23'N 121°30'E	"
	CANTON (83.4)			
59	Kowloon RR Terminal	Canton-Kowloon RR terminus, ferry piers	22°17'N 114°10'E	55
60	Canton-Kowloon RR Shops	Only RR shops in area	22°19'N 114°11'E	55
	TSINGTAO (83.11)			
80	Litsun River RR Bridge	On only line Tsingtao to Mukden-Shanghai RR	36°09'N 120°22'E	80
81	Peisha River RR Bridge	On only line Tsingtao to Mukden-Shanghai RR	36°15'N 120°22'E	81
82	Taku River RR Bridge	On only line Tsingtao to Mukden-Shanghai RR	36°21'N 120°07'E	82
83	Haichow River RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34°40'N 119°10'E	83
84	Shu River RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34°26'N 118°19'E	84
85	RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34°26'N 118°27'E	85
86	Grand Canal RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34° 22'N 117°50'E	86

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	TSINGTAO (83.11) (Continued)			
87	I River RR Bridge	On only line Laoyao to Mukden-Shanghai RR	34°23'N 118°02'E	87
88	RR Shops & Roundhouse (Tsingtao)	Construction, maintenance; most important in area	36°06'N 120°20'E	78
89	RR Shops (Tsinan)	Repairs, maintenance; important	36°40'N 117°01'E	71
90	RR Station & Yards (Tsingtao)	Rolling stock primary target	36°04'N 120°18'E	78
91	Yellow River RR Bridge	On only line Mukden-Shanghai RR	36°43'N 117°01'E	91
	TIENTSIN (83.12)			
11	East Station (Tientsin)	Concentration point	39°08'N 117°11'E	11
12	Central Station & Yards	Concentration point	39°10'N 117°11'E	11
17	Hsin Kai River RR Bridge	Important RR crossing	39°10'N 117°11'E	11
18	Hai River RR Bridge (Tientsin)	Important RR crossing	39°09'N 117°10'E	11
19	West Station Yards (Tientsin)	Concentration point	39°09'N 117°09'E	11
25	Kailan Mining RR Yards, Shops	Major concentration point	39°56'N 119°37'E	26
28	Pekin-Mukden RR Station, Yards	Concentration point	39°56'N 119°36'E	26
36	Tangshan RR Shops	Important locomotive & car building	39°40'N 118°12'E	35
38	Lwan River RR Bridge	Very important; coking coal to Anshan & Japan	39°46'N 118°47'E	38
39	Pehtang River RR Bridge	Only line to Manchukuo	39°17'N 117°45'E	39
40	RR Shops (Shanhaikwan)	Most important shop in area	40°01'N 119°45'E	40
44	RR Shops (Tientsin)	Important	39°10'N 117°11'E	11

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	FRENCH INDO-CHINA (85)			
	NORTH INDO-CHINA (85.1)			
43	Gialam RR Repair Shops	2nd largest RR shops IC; all repairs Haiphong-Yunnan RR	21°03'N 105°53'E	N A
44	Vinh RR Repair Shops	Largest RR shops IC; all repairs Hanoi-Saigon RR	18°40'N 105°41'E	"
45	Tourane RR Yards	Small	16°00'N 108°14'E	"
46	Hongai RR Yards & Workshops	Important; maintains RR connecting coal mines & port	20°57'N 107°04'E	"
47	Nam Dinh RR Yards	Fairly large	20°25'N 106°10'E	"
48	Quang Ngai RR Yd	Small	15°06'N 108°51'E	"
49	Hanoi RR Station & Yds	Only RR junction in Indo-China	21°01'N 105°51'E	"
50	Col des Nuages RR Tunnels	Key point Saigon-Hanoi line	16°13'N 108°08'E	"
51	Cap Varella RR Tunnels	Key point Saigon-Hanoi line	12°55'N 109°24'E	"
52	Pont Doumer Bridge (Hanoi)	Controlling point in entire Indo-China RR system	21°02'N 105°00'E	"
53	Phuly RR Highway Bridge	Important bridge Hanoi-Saigon RR line	20°31'N 105°56'E	"
54	Haiphong City RR & Highway Br	Important bridge, in city proper on Haiphong-Hanoi RR	20°51'N 106°40'E	"
55	Ham Rong RR & Highway Br	Important bridge on Hanoi-Saigon RR	19°55'N 105°47'E	"
56	Quang Tri RR Highway Br	Important bridge on Hanoi-Saigon RR	16°45'N 107°12'E	"
57	Clemenceau RR Highway Br (Hue)	Important bridge on Hanoi-Saigon RR	16°28'N 107°35'E	"
58	Tourane RR Bridge	Important bridge on Hanoi-Saigon RR	16°07'N 108°08'E	"
59	Quang Ngai RR Bridge	Important bridge on Hanoi-Saigon RR	15°06'N 108°51'E	"
60	Thanh Hoa RR Highway Br	Important bridge on Hanoi-Saigon RR	22°03'N 114°56'E	"
61	Moncay RR Bridge	On frontier between China and Indo-China	21°32'N 107°57'E	"

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	THAILAND (98)			
	THAILAND (98.1,98.2,98.3)			
37	Makasan Railroad Workshop	Rptd most extensive shops in Thailand	13°45'N 100°33'E	26
38	RR Workshops, Bangsue Station & Yards	Rptd second largest in Thailand	13°49'N 100°33'E	37
39	Bangkok Noi Station & Yards	Important yards, river landing	13°46'N 100°29'E	26
40	Hua Lampang Station & Yards	Main Bangkok passenger sta, roundhouses etc	13°44'N 100°31'E	26
41	Kengkoi Switching Yards & Roundhouse	Important Korat Line & engine change point	14°35'N 101°01'E	41
42	Korat RR Yards, Sta & Jc	Important, jc RR to Ma Keng with RR to Ubon	14°58'N 102°05'E	42
43	Tung Song Junction	Controls important traffic, including to Singapore	08°09'N 99°40'E	43
44	Haad Yai Junction	Rptd most important junction on peninsula	07°01'N 100°28'E	44
45	Rama VI RR Bridge	Controls N & E lines, line to Malaya, Singapore	13°49'N 100°31'E	38
46	Ratburi RR Bridge	Combined highway & RR mainline S	13°32'N 99°50'E	46
47	Pechaburi RR Bridge	Main line	13°07'N 99°57'E	47
48	Prachuab Kirikhan RR Bridge	Main line	11°51'N 99°49'E	11
49	Lampang RR Bridge	Controls traffic to Lampun & Chiengmai	18°17'N 99°29'E	49
50	Ta Roe RR Bridge	Secondary	14°34'N 100°44'E	50
51	Jaisri RR Bridge	Controls EW lines	13°49'N 100°16'E	51
52	Ban Pachi RR Junction	Jc Chieng Mai-Bangkok & Korat Bangkok lines	14°27'N 100°44'E	52
61	Memorial Bridge (Bangkok)	Only vehicular bridge in district across Chao Phraya	13°44'N 100°30'E	26
	BRITISH MALAYA (92)			
	MALAY STATES NORTH (92.1)			
56	Central RR Shops	All repair work Malayan RRs	03°11'N 101°41'E	60

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MALAY STATES NORTH (92.1) (Cont'd.)			
58	Guillemard RR Bridge	Very important; connects Malaya & Thailand	05°46'N 102°08'E	58
59	Victoria RR Bridge	Very important; with #58 Malaya-Thailand connection	04°50'N 100°58'E	59
60	Kuala Lumpur RR Yds, North	Station & small yards	03°09'N 101°42'E	60
61	Kuala Lumpur RR Yds, South	Large yards, engine sheds, warehousing	03°08'N 101°41'E	60
63	Prai RR Yards	Important; yds for all Malaya-Penang Island traffic	05°23'N 100°23'E	27
75	Iskandar Highway Bridge	Highway alternate for #59	04°49'N 100°57'E	59
	SINGAPORE (92.2)			
62	Gemas RR Junction	Jc E & W RR lines	02°35'N 102°37'E	62
	BURMA (82)			
	BURMA NORTH (82.1)			
43	Gokteik Viaduct	2200 ft viaduct on Mandalay-Lashio RR	22°22'N 96°55'E	43
44	Ava Bridge	Near Mandalay; only road & RR br across Irrawaddy	21°52'N 96°00'E	44
45	Shweli Bridge	Controls RR traffic to Bhamo	23°50'N 97°47'E	45
46	RR Shops Myitnge	Main RR shops in Mandalay area	21°52'N 96°05'E	46
47	Myitnge RR Bridge	RR br on main Rangoon-Mandalay line	21°51'N 96°04'E	46
48	RR Yards, Maymyo	Yards & locomotive repair near Mandalay	22°02'N 96°32'E	48
49	Ta-Hapalai Bridge	On Mandalay-Lashio RR	22°40'N 97°20'E	49
50	Warehouses, Old Lashio	Storage dumps & warehouses	23°00'N 97°50'E	31

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JAPAN - TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	BURMA SOUTH (82.2)			
22	Insein Shops	Important RR repair shops	16°53'N 96°07'E	3
23	Mahlwagon Shops (Rangoon)	Roundhouse, minor repairs & storage	16°47'N 96°11'E	14
24	Botataung Freight Yds (Rangoon)	Serve Rangoon dock area	16°46'N 96°10'E	14
25	Martaban Roundhouse & Yds	Serve Moulmein area	16°32'N 97°38'E	4
26	Pegu Bridge	RR bridge on Rangoon-Mandalay main line	17°22'N 96°30'E	26
27	Pazundaung Creek Bridge	Carries Rangoon-Paleik main line	16°51'N 96°13'E	27
28	Twante Canal Toll Sta	Key point on inland waterways system	16°45'N 96°05'E	28
	NETHERLANDS EAST INDIES (94)			
	SUMATRA NORTH (94.1)			
23	Belawan Station & Yards	RR terminal at large harbor	03°47'N 98°41'E	23
24a	Belawan RR Bridges	Connect RR system with Belawan Harbor	03°46'N 98°41'E	23
24b	Belawan RR Bridges	Connect RR system with Belawan Harbor	03°45'N 98°41'E	23
24c	Belawan RR Bridges	Connect RR system with Belawan Harbor	03°46'N 98°41'E	23
	SUMATRA SOUTH (94.2)			
63	Kertapati RR Sta & Yds, Palembang	Terminal of South Sumatran RR	03°01'S 104°45'E	53a
64	Emma Haven RR Station	At harbor, sidings to wharves	01°00'S 100°22'E	54
65	Panjang RR Sta, Oosthaven	Southern terminal South Sumatran RR	05°28'S 105°19'E	55
66	Padang RR Sta & Yds	Important transit point	00°57'S 100°22'E	54

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JAPAN-TRANSPORTATION

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAVA (94.3)			
171	Semarang RR Center	RR junction, yards	06°57'S 110°25'E	148
172	State RR Shops, Manggarai	Large; repair & rebuild all equipment	06°13'S 106°51'E	166
173	State RR Shops, Madiun	Repair, rebuild steam locomotives	07°40'S 111°30'E	173
174	State RR Shops, Goebeng	Repair freight cars	07°16'S 112°45'E	174
175	RR Sta & Shops, Bandung	Large	06°55'S 107°36'E	159
176	RR Sta & Yards, Batavia	Important	06°08'S 106°49'E	166
177	Tandjong Priok RR Station	Harbor terminal	06°06'S 106°53'E	177
178	Surabaya RR Station	City's main station	07°15'S 112°45'E	174
179	Surabaya RR Yards	Large yards at harbor	07°12'S 112°44'E	174
180	Cheribon RR Yards	Yards, jc two important lines	06°42'S 108°33'E	147
181	Tjilatjap RR Sta & Yards	Southern terminus Javan RR system	07°44'S 109°00'E	149
196	Wonokromo RR Sta & Bridge	Important outlet Surabaya	07°18'S 112°45'E	174
	PHILIPPINES (96)			
	PHILIPPINE ISLANDS (96.1, 96.2) NORTH SOUTH			
15	Caloocan RR Shops	Only large RR shops in Philippines	14°40'N 120°58'E	N A
30	Tondo Station RR Yards	Largest RR yards in Philippines	14°37'N 120°58'E	"
41	Santa Messa Bridge	Carries all Manila traffic to south	14 36'N 121 01'E	"
	BRITISH PACIFIC ISLANDS (81)			
	BORNEO NORTH (81.1)			
7	Jesselton RR Repair Shops	Only known RR repair shops in Borneo	05°59'N 116°05'E	4

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MISCELLANEOUS

The targets in this section are in the AAF target folders under the headings Building Materials, Textiles, Water Supply and Miscellaneous. No key targets are listed under this heading but a number of the plants in this section have been included as key targets in the review of specific industries.

The large textile mills have not been considered key targets largely because the Japanese ability to produce cloth of all kinds has been drastically cut by shortage of raw materials, leaving great excess plant capacity which would have to be destroyed before a shortage could be produced by bombing. Large cellulose plants, most of which are in Karafuto, likewise have been excluded from the key list because Japan's ability to produce cellulose probably far exceeds its war requirements.

Many of the targets in this section may have local significance although, they are not important to Japanese overall economy. As examples, many of the cement plants are the only local sources of cement, and their destruction might hamper fortification of the areas in which they are located or require the use of shipping space to import cement. The alcohol plants may be the principal source of local motor fuel. Other targets in the miscellaneous category may be important if bases are moved.

Since no key targets are listed no table of distances from the operational base at is given.

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KARAFUTO (90.1)			
965	Shikuku Pulp Factory	Large & important plant	49°14'N 143°07'E	965
966	Otomari Pulp Factory	Pulp & paper cellulose	46°38'N 142°47'E	966
967	Toyohara Pulp Factory	Pulp & paper cellulose	46°58'N 142°44'E	967
968	Maoka Pulp Factory	Pulp & paper cellulose	47°02'N 142°02'E	968
969	Noda Pulp Factory	Important plant	47°27'N 141°59'E	969
970	Ochiai Pulp Factory	Important plant	47°21'N 142°47'E	970
971	Shiritori Pulp Factory	Probably most important in Karafuto	48°38'N 142°47'E	971
972	Tomariorū Pulp Factory	Important plant	47°46'N 142°04'E	972
973	Esutoru Pulp Factory	One of largest plants in Karafuto	49°08'N 142°05'E	973
	MURORAN (90.3)			
402	Toyo Whale Co	Small whale oil plant	42°20'N 140°57'E	378
403	Harbor Construction Office	Minor	42°21'N 140°57'E	378
404	Iron Works	Minor	42°20'N 140°58'E	378
405	Carpenter Shop	Minor	42°20'N 140°58'E	378
406	Kurihayashi Commercial Lines	Minor	42°20'N 140°58'E	378
407	Civil Engineering Branch	Minor	42°19'N 140°58'E	378
989	Fuji Paper Co	Minor	43°07'N 141°33'E	-
	HAKODATE (90.4)			
983	Hokkai Cement Plant	Important as region's source of supply	41°49'N 140°38'E	983
984	Sulphur Plant	Secondary	41°49'N 140°40'E	983

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NIIGATA (90.9)			
1005	Hokuetsu Paper Mill	Pulp & all types paper	37°55'N 139°05'E	1005
1008	Unidentified Pulp Mill	No details	37°56'N 139°04'E	998
	MITO (90.14)			
1520	Riken Vacuum Tubes Plant	Believed minor	35°26'N 140°18'E	-
	TAKAYAMA (90.15)			
1484	Kamioka Mine & Smelter	Important, lead & zinc	36°24'N 137°12'E	1484
	TOKYO (90.17)			
475	Asano Cement Co (Kawasaki)	Secondary	35°31'N 139°43'E	N A
485	Fuji Spinning Mills (Kawasaki)	Indeterminate importance	35°32'N 139°43'E	"
487	Meiji Sugar Factory (Kawasaki)	Beet sugar plant; rptd large alcohol expansion	35°32'N 139°42'E	"
880	Konishi Photo Works (Tokyo)	Leading photo equip mfr'r	35°41'N 139°42'E	"
912	Nisshin Spinning Mill (Tokyo)	Cotton thread and fabrics	35°42'N 139°49'E	"
914 & 915	Oriental Weaving Co Plants (Tokyo)	Yarn, serge & muslin; probable war conversion	35°41'N 139°50'E	"
1365	Japan Bakelite Co (Tokyo).	Leading & one of few important plants in Orient	35°43'N 139°49'E	"
	NAGOYA (90.20)			
1153	Japan Porcelain Co	Major industrial porcelain & fire-brick plant	35°10'N 136°53'E	250a
1171	Nippon Insulator Co	Minor industrial ceramics, sparkplugs, etc	35°08'N 136°55'E	197

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	HAMAMATSU (90.21)			
1235	Kune Copper Mines	Secondary, pyrites mines with dressing mill	35°05'N 137°50'E	1235
	OSAKA (90.25)			
1211	Osaka Central Market	Largest in Osaka	34°41'N 135°29'E	661
	KOCHI (90.28)			
1533	Kochi Woodworking Cooperative		33°33'N 133°33'E	1524
	NIIHAMA (90.29)			
935	Sumitomo Rayon Plant	Rptd converted to munitions	33°58'N 133°16'E	923
	KURE (90.30)			
729	Naval Academy	Imperial naval academy	34°15'N 132°28'E	658
741	Gas Works	Gas for Hiroshima City	34°23'N 132°27'E	738
745	Weather Observation Station	For Hiroshima area	34°23'N 132°27'E	738
746	Telephone Station	Central Hiroshima exchange	34°23'N 132°27'E	738
748	Division Headquarters	Army barracks, minor depots	34°23'N 132°27'E	740
	TOKUYAMA (90.32)			
674	Tokuyama Naval Coal Yard & Briquette Fcty	Largest of Japanese Navy	34°02'N 131°49'E	673
817	Okinoyama Collieries	Under-sea coal mines	(33°57'N 131°14'E) (33°58'N 131°11'E)	821

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIMONOSEKI (90,34)			
174	Kokura Paper Factory	Minor	33°52'N 130°53'E	168
	KURUME (90,35)			
1274	Dainoura Mine	One of largest mines in Japan (Coal)	33°43'N 130°40'E	1257
1275	Tagawa Mines	Large operation (Coal)	33°38'N 130°49'E	1275
1276	Futase Mines	Large operation (Coal)	33°39'N 130°40'E	1257
1277	Kineshima Mine	Smaller mine (Coal)	33°14'N 130°05'E	1277
1278	Manda Mine	Large operation (Coal)	33°00'N 130°27'E	1243
1279	Yotsuyama Mine	Important operation (Coal)	33°00'N 130°25'E	1243
	SASEBO (90,36)			
842	Takashima Colliery	Secondary	32°39'N 129°46'E	842
843	Ha Shima Colliery	Secondary	32°37'N 129°44'E	842
844	Sasebo Coal Yard	Secondary; near shipyards & fuel depots	33°09'N 129°42'E	755
846	Koyagi Shima Coke Ovens	Secondary, supply Nagasaki steel mills	32°41'N 129°49'E	545
	YATSUSHIRO (90,37)			
	KYUSHU SOUTH (90,38)			
1516	Kagoshima City Gas Mfg. Plant	Furnishes gas for Kagoshima (pop 150,000)	31°35'N 131°34'E	N A

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SHIMONOSEKI (90.34)			
174	Kokura Paper Factory	Minor	33°52'N 130°53'E	168
	KURUME (90.35)			
1274	Dainoura Mine	One of largest mines in Japan (Coal)	33°43'N 130°40'E	1257
1275	Tagawa Mines	Large operation (Coal)	33°38'N 130°49'E	1275
1276	Futase Mines	Large operation (Coal)	33°39'N 130°40'E	1257
1277	Kineshima Mine	Smaller mine (Coal)	33°14'N 130°05'E	1277
1278	Manda Mine	Large operation (Coal)	33°00'N 130°27'E	1243
1279	Yotsuyama Mine	Important operation (Coal)	33°00'N 130°25'E	1243
	SASEBO (90.36)			
842	Takashima Colliery	Secondary	32°39'N 129°46'E	842
843	Ha Shima Colliery	Secondary	32°37'N 129°44'E	842
844	Sasebo Coal Yard	Secondary; near shipyards & fuel depots	33°09'N 129°42'E	755
846	Koyagi Shima Coke Ovens	Secondary, supply Nagasaki steel mills	32°41'N 129°49'E	545
	YATSUSHIRO (90.37)			
	KYUSHU SOUTH (90.38)			
1516	Kagoshima City Gas Mfg. Plant	Furnishes gas for Kagoshima (pop 150,000)	31°35'N 131°34'E	N A

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
47	Jonai District of Taihoku	Grouped public buildings	25°03'N 121°31'E	47
	TAIWAN WEST (91.4)			
105	Hokko Sugar Refinery	No details	23°34'N 120°17'E	105
106	Shinei Sugar Refinery	Minor	23°18'N 120°19'E	106
108	Sharoken Sugar Refinery	No details	23°55'N 120°14'E	-
109	Shoka Sugar Refinery	No details	24°05'N 120°32'E	-
110	Tainan Magnesium Plant	Believed important for war chemicals, magnesium	23°00'N 120°09'E	89
111	Kagi Lumber Mill	Secondary	23°29'N 120°26'E	102
	TAKAO (91.6)			
11	Water reservoir & Filtering Plant	Supplies Takao City	22°38'N 120°16'E	9
12	Prefectural Office	Takao City Administration	22°37'N 120°17'E	3
	MANCHUKUO (93)			
	MANCHUKUO EAST (93.2)			
76	Coal Yard, Antung	-	40°10'N 124°20'E	72

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	MUKDEN (93.3)			
44	Fushun Colliery	Most important in Manchukuo, coal & oil shale	41°50'N 123°54'E	32
47	Mond Gas Plant	More data required	41°51'N 123°54'E	32
65	Electric Company	More data required	41°47'N 123°23'E	50
66	Electric Company	More data required	41°47'N 123°23'E	50
70	Coal Yard	-	41°47'N 123°23'E	50
	DAIREN (93.5)			
23	Army Barracks	-	38°56'N 121°39'E	1
25	Army Barracks	-	38°56'N 121°39'E	1
54	Onoda Cement Works	Probably largest cement wks in Manchukuo	38°58'N 121°31'E	12
	CHINA (83)			
	TSINGTAO (83.11)			
63	Tzechwan Mines	Production small but good smokeless navy bunker coal	36°39'N 117°57'E	63
64	Fangtze Mines	Production small but good smokeless navy bunker coal	36°37'N 119°08'E	64
65	Tsapchwang Mines	Second largest mines North China - 2,000,000 tons yearly	34°52'N 117°26'E	65
66	Peanut Oil Tanks (Tsingtao)	Possible oil storage	36°05'N 120°20'E	78
67	Peanut Oil Tanks (Tsingtao)	Possible oil storage	36°05'N 120°20'E	78
73	Jap Gens-d'Armes Hq (Tsingtao)	Important in area	36°04'N 120°19'E	78
74	Jap Naval Eq (Tsingtao)	Important in area	36°04'N 120°19'E	78
75	Asia Affairs Board (Tsingtao)	Administrative Hq	36°04'N 120°19'E	78

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TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO
	TIENTSIN (83.12)			
27	Yao Hua Glass Wks	Secondary	39°56'N 119°36'E	26
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
59	Thai Cement Co (Bangkok)	Rptd largest in S E Asia	13°48'N 100°33'E	37
60	Government Distillery (Bangkok)	Rptd main Government alcohol plant	13°46'N 100°30'E	26
	MALAY STATES (92)			
	MALAY STATES NORTH (92.1)			
50	Malayan Collieries	Sole Malayan source; 500,000 tons per year	3°19'N 101°28'E	50
	BURMA (82)			
	BURMA SOUTH (82.2)			
29	Burma Cement Co	Modern, only known cement mill in Burma	19°20'N 95°7'E	29
	PHILIPPINES (96)			
	PHILIPPINES (96.1, 96.2)			
22	Philippine Ref Co	Largest coconut oil refinery in Philippines	14°35'N 121°59'E	-

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JAPAN - MISCELLANEOUS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	PHILIPPINES (96.1, 96.2) (Continued)			
23	Spencer-Kellog Co	Large producer coconut oil and meal	14°36'N 121°58'E	-
31	Philippine Mfg Co	Coconut oil and glycerine	14°37'N 120°58'E	-
32	Elizalde Rope Factory	One of three rope factories in Philippines	14°35'N 120°59'E	-
36	Johnson Pickett Rope Co	One of three rope factories in Philippines	14°36'N 120°59'E	-
37	Manila Cordage Co	One of three rope factories in Philippines	14°56'N 120°59'E	-
38	Manila Gas Plant	Supplies all gas to Manila	14°35'N 121°59'E	-
39	Insular Refinery	Coconut oil and derivatives	14°36'N 121°00'E	-

* New Target to be included in Folder revision

N A No number yet assigned when this list prepared

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - BUILDING MATERIALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	KOFU (90,16)			
1496	Chichibu Cement Co	Only cement plant in area	36°00'N 139°05'E	1496
	NAGOYA (90,20)			
454	Tokokuni Cement Co	Large plant	35°05'N 136°54'E	194
455	Onoda Cement Co	Large plant	35°07'N 136°55'E	197
	KOCHI (90,28)			
1524	Tosa Cement Plant (Kochi)	Secondary but area's largest industrial target	33°32'N 133°33'E	1524
	TOKUYAMA (90,32)			
821	Ube Cement Co	Large capacity	33°57'N 131°14'E	818
822	Onoda Cement Co	One of largest in Japan	33°58'N 131°11'E	819
	SHIMONOSEKI (90,34)			
39	Asano Cement Co	Very large, possible conversion to explosives	33°56'N 130°57'E	43a
	KURUME (90,35)			
1242	Sangyo Cement Co (Gotoji)	Minor	33°37'N 130°46'E	1275

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JAPAN - BUILDING MATERIALS

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPANESE ISLANDS (91)			
	TAKAO (91.6)			
13	Asano Cement Plant	More data required	22°39'N 120°16'E	9
	CHOSEN (KOREA) (84)			
	HEIJO (84.3)			
82	Onoda Cement Co	Most important cement plant in Chosen	39°01'N 125°48'E	-
	CHINA (83)			
	CANTON (83.4)			
61	Green Island Cement Co	Important; large & only one in area	22°19'N 114°11'E	55
	TIENTSIN (83.12)			
37	New Cement Wks (Tangshan)	Largest in area	39°40'N 118°12'E	35
	FRENCH INDO-CHINA (85)			
	INDO-CHINA NORTH (85.1)			
16	Haiphong Cement Plant (Haiphong)	Only large cement plant in country, major in Far East	20°52'N 106°40'E	N A

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JAPAN - BUILDING MATERIALS

TARGET NO	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	NETHERLANDS EAST INDIES (94)			
	SUMATRA SOUTH (94.2)			
67	Indarung Cement Plant	Important as local source of supply	00°57'S 100°29'E	67
	PHILIPPINES (96)			
	P. I. (NORTH 96.1, SOUTH 96.2)			
49	Rezal Cement Co	Estimated 25% Philippine capacity	14°28'N 121°10'E	N A
60	Cebu Cement Plant	Estimated 75% Philippine capacity	10°16'N 123°45'E	*

* New Target to be included in Folder revision

N A No number yet assigned when this list prepared

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Tab M-5 Miscellaneous -- Pertinent

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All targets in folders to 3/1/43, grouped by Areas

JAPAN - TEXTILES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART No.
	JAPAN PROPER (90)			
	NIIGATA (90.9)			
1007	Miye Spinning Mill	Rayon, possibly converted to munitions	37°56'N 139°05'E	998
1014	Niigata Rayon Co	Rayon, possibly converted to munitions	37°57'N 139°06'E	1005
	FUKUSHIMA (90.10)			
1078	Marutomo Silk Factory	No details	37°46'N 140°28'E	1077
1079	Spinning Mill (Fukushima)	No details	37°46'N 140°28'E	1077
	KOCHI (90.28)			
1531	Tenma Silk Mill (Kochi)	Minor	33°35'N 133°33'E	1524
	KYUSHU EAST (90.33)			
1330	Fuji Gas Spinning Co	Secondary producer textiles & cotton linters	33°14'N 131°35'E	1329
	KURUME (90.35)			
1271	Kanegafuchi Spinning Co, Fukuoka Mill	Large	33°35'N 130°25'E	664
1272	Kanegafuchi Spinning Co, Kurume Mill	Large	33°19'N 130°30'E	1263
1273	Kanegafuchi Spinning Co, Omuta Mill	Very large mill	33°02'N 130°27'E	1243

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JAPAN - TEXTILES

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	SASEBO (90.36)			
851	Nagasaki Spinning & Weaving Mill (Nagasaki)	Minor	32°45'N 129°52'E	542
	FRENCH INDO CHINA (85)			
	INDO CHINA NORTH (85.1)			
62	Cotton Spinning Mill (Haiphong)	Large mill	20°52'N 106°42'E	N A
63	Cotton Spinning Mill (Nam Dinh)	Large mill	20°25'N 106°10'E	"

*New Target to be included in Folder revision

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Tab M-1 Miscellaneous -
Water Supply

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All targets in folders to 3/1/43, grouped by Areas

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JAPAN - WATER SUPPLY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPAN PROPER (90)			
	MURORAN (90.3)			
399	Muroran Reservoir #1	Minor	42°19'N 140°59'E	378
400	Muroran Reservoir #2	Minor	42°20'N 141°01'E	378
401	Wanishi Reservoir	Minor	42°20'N 141°01'E	378
	NIIGATA (90.9)			
1026	Water Works & Reservoir	Supplies Niigata City	37°55'N 139°02'E	998
	NAGOYA (90.20)			
426	Nagoya Filtering Plant	Filter plant Nagoya water supply	35°10'N 136°57'E	196
	OSAKA (90.25)			
152	Uegahara Water Works	Principal water works for Kobe	34°46'N 135°21'E	1198
153	Senkari Reservoir Dam	Principal source of water for Kobe	34°52'N 135°16'E	153
1210	Osaka Water Works	Principal water works for Osaka	34°43'N 135°31'E	695
	SHIMONOSEKI (90.34)			
1172	Kawachi Dam	Yawata City water supply	33°50'N 130°48'E	28
	SASEBO (90.36)			
841	Old Nagasaki Waterworks	Rptd minor	Location uncertain	
859	New Nagasaki Waterworks	Rptd minor	Location uncertain	

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JAPAN - WATER SUPPLY

TARGET NO.	TARGET	COMMENT	APPROXIMATE COORDINATES	TARGET CHART NO.
	JAPANESE ISLANDS (91)			
	TAIHOKU (91.3)			
51	Taihoku Reservoir & Filtering Plant	Water supply for Taihoku City	25°01'N 121°32'E	47
	CHOSEN (KOREA) (84)			
	HEIJO (84.3)			
81	Heijo Water Works	Source all Heijo City water	39°02'N 125°46'E	71
	MANCHUKUO (MANCHURIA) (93)			
	MANCHUKUO EAST (93.2)			
74	Antung Water Works	Rptd principal water works for Antung	40°10'N 124°20'E	72
	THAILAND (SIAM) (98)			
	THAILAND (98.1, 98.2, 98.3)			
62	Main Bangkok Water Works	Reservoir, treatment & pumping station for city	13°46'N 100°32'E	26

* New Target to be included in Folder revision
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FAR EASTERN TARGET SUMMARY

AREA NAME	AREA NUMBER	AIRCRAFT	AIR PORTS SEA PLANE BASES	ARMS MUNITIONS	AUTOMOBILES AND MOTORS	BUILDING MATERIALS	CHEMICALS	COMMUNICATIONS	DEFENSES	ELECTRIC POWER	HARBOR FACILITIES	WAREHOUSES	IRON and STEEL	MACHINES, MACHINE TOOLS	NAVAL BASES — SHIPYARDS	NON FERROUS MATERIALS	PETROLEUM	RUBBER	TRANSPORTATION RAIL	TEXTILES	WATER SUPPLY	MISCELLANEOUS	TOTAL
JAPAN PROPER	90																						
Karafuto	90.1		4					7		2	4						3					9	29
Hokkaido North	90.2										1						2						3
Muroran	90.3									5	2	2					2		3		3	7	24
Hakodate	90.4									2	2				1		1		3			2	11
Aomori	90.5										2				1		1		1				5
Akita	90.6								1	1	1					4	2		1				10
Morioka	90.7									1		1							3				5
Kamaishi	90.8										1	1					2		2				6
Niigata	90.9		1				4				3	1	2			2	4		9	2	1	2	31
Fukushima	90.10						2	2	1	4						1	5		6	2			23
Toyama	90.11	1	2				6			5	3	5				2			1				25
Nagano	90.12		2				1									1			7				11
Takasaki	90.13	1	2						2	2						2	1		6				16
Mito	90.14	1	17				1		1					2	1	2			2			1	28
Takayama	90.15	1								1		3										1	6
Kofu	90.16					1				18									1				20
Tokyo	90.17	17	19	32	10		14	28	1	16	26	15	19	28	2	18	2	22				8	277
Shizuoka	90.18		1								1			1	2	1		6					12
Izu	90.19																						
Nagoya	90.20	9	4	3	4	2	4	2	1	4	1	1	6		1	4		14			1	2	63
Hamamatsu	90.21	2	1	1						1			3					5				1	14
Maizuru	90.22		2								4			7				3					16
Kyoto	90.23	1	1	1			4		1	4								4					16
Kumano	90.24		1	1									1	1				2					6
Osaka	90.25	7	1	14	4		15			7	3	28	11	5	11	8	4	10			3	1	132
Matsue	90.26																						
Okayama	90.27						5		4	6	1	1		2	1			6					26
Kochi	90.28		1			1	1			3		1				1		1	1			1	11
Niihama	90.29						1			2			1	5	5	1		1				1	17
Kure	90.30	1	5	10						4	3		1	1		1		3				5	34
Bungo	90.31																						
Tokuyama	90.32			2		2	3			3			1	1	1	4						2	19
Kyushu East	90.33		4	3			6		1	7			1		1			1	1				25
Shimonoseki	90.34		4	3		1	8		2	4	8	10	1	3	4	4		7			1	1	61
Kurume	90.35	1	3	3	1	1	4		2	6	2		4		2	2	4	5	3			6	49
Sasebo	90.36	2	3	4				2	1	3	4		3	6		4		4	1	2	4		43
Yatsushiro	90.37		1				1			1								1					4
Kyushu South	90.38		2				1		2							1		3				1	10
Tsushima	90.39																						
TOTAL		44	81	77	19	8	81	41	20	112	72	69	56	63	44	72	10	143	10	11	55		1088

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FAR EASTERN TARGET SUMMARY

	Area Number	Aircraft	Air Ports Seaplane Bases	Arms Munitions	Automobiles and Motors	Building Materials	Chemicals	Communications	Defenses	Electric Power	Harbor Facilities Warehouses	Iron and Steel	Machines, Machine Tools	Naval Bases — Shipyards	Non-Ferrous Metals	Petroleum	Rubber	Transportation Rail	Textiles	Water Supply	Miscellaneous	Total
CHOSEN (KOREA)	84																					
Seishin	84.1		2				2	1	2		3	4						7				21
Konan	84.2						3			9												12
Heijo	84.3	1	2	5		1	1	2	2	1	5	1			2			5		1		29
Genzan	84.4		1								1			1		2						5
Chosen East	84.5		1								9							1				11
Keijo	84.6		6					1			1					1		3				12
Fusan	84.7		3	1				1			1			2		1		2				11
Koshu	84.8										3											3
TOTAL		1	15	6		1	6	5	4	10	23	5		3	2	4		18		1		104
MANCHUKUO (MANCHURIA)	93																					
Manchukuo North	93.1																					
Manchukuo East	93.2						2		1	10	1	1				1		2		1	1	20
Mukden	93.3	1	2	2			1		1	6		2	6		4	5		1			5	36
Manchukuo West	93.4																					
Dairen	93.5		1	3			3			3	3	2	2	2		6		1			3	29
TOTAL		1	3	5			6		2	19	4	5	8	2	4	12		4		1	9	85
JAPANESE ISLANDS	91																					
Kurile	91.1		2								23											25
Ryukyu	91.2																					
Taihoku	91.3		3				5	3	2	5	3	2		3		3		6		1	1	37
Taiwan West	91.4		4				7	3	4	3	2					3		6			6	38
Taiwan East	91.5		5				1	2	1	2	2	2			1	1		4				21
Takao	91.6		3		1		2	1		1	2			2	1	2		3			2	20
Pescadores	91.7		2											2								4
Bonin	91.8																					
Mariana	91.9																					
Marshall	91.10																					
Caroline	91.11																					
Palao	91.12																					
TOTAL			19			1	15	9	7	11	32	4		7	2	9		19		1	9	145
NETHERLANDS EAST INDIES	94																					
Sumatra North	94.1		11							1	10				1	5		2				30
Sumatra South	94.2		5		1			3		1	17		2		2	6		4				41
Java	94.3		10	1			4	6		10	15		4				1	12				63
Borneo South	94.4									1	4					1						6
Celebes Timor	94.5		5					2		1	14											22
New Guinea West	94.6																					
TOTAL			31	1	1		4	11		14	60		6		3	12	1	18				162

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FAR EASTERN TARGET SUMMARY

	Area Number	Aircraft	Air Ports Sea Plane Bases	Arms Munitions Automobile and Motors	Building Materials	Chemicals	Communications	Defenses	Electric Power	Harbor Facilities Warehouses	Iron and Steel	Machines, Machine Tools	Naval Bases Shipyards	Non-Ferrous Metals	Petroleum	Rubber	Transportation Rail	Textiles	Water Supply	Miscellaneous	Total
CHINA	83																				
Shanghai	83.1																				
Wenchow	83.2																				
Fukien	83.3																				
Canton	83.4		4		1				2	3			5		1		2				18
Nanning	83.5																				
Hainan	83.6		3										1								4
Kweiyang	83.7																				
Hankow	83.8																				
Chungking	83.9																				
Kaifeng	83.10																				
Tsingtao	83.11								5	2			2		2		12			8	31
Tientsin	83.12				1	1			5	6			4		6		12			1	36
Kalgan	83.13																				
Hsining	83.14																				
Kunming	83.15																				
TOTAL			7		2	1			12	11			12		9		26			9	89
FRENCH INDO-CHINA	85																				
Indo-China North	85.1	1	6		1	6			5	6				5	4		19	2			55
Indo-China South	85.2																				
TOTAL		1	6		1	6			5	6				5	4		19	2			55
THAILAND (SIAM)	98																				
Thailand North	98.1		3														1				4
Bangkok	98.2	1	5	3		1	4	5	2	3			5		3		13		1	2	48
Thailand South	98.3		2														3				5
TOTAL		1	10	3		1	4	5	2	3			5		3		17		1	2	57
MALAY STATES	92																				
Malay States North	92.1		4						5	18	2	3		2	1		7			1	43
Singapore	92.2		5						1	7	2	1	10	1	4		1				32
TOTAL			9						6	25	4	4	10	3	5		8			1	75
BURMA	82																				
Burma North	82.1		11						1					1			8				21
Burma South	82.2		8				1	1	3				3	1	4		7			1	29
TOTAL			19				1	2	3				3	2	4		15			1	50
PHILIPPINES	96																				
Philippines North	96.1		4		1		5	3	7				3	1	1		3			8	36
Philippines South	96.2		3		1				3						3						10
TOTAL			7		2		5	3	10				3	1	4		3			8	46

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FAR EASTERN TARGET SUMMARY

	AREA NUMBER	AIRCRAFT	AIR PORTS SEAPLANE BASES	ARMS MUNITIONS	AUTOMOBILES and MOTORS	BUILDING MATERIALS	CHEMICALS	COMMUNICATIONS	DEFENSES	ELECTRIC POWER	HARBOR FACILITIES WAREHOUSES	IRON and STEEL	MACHINES MACHINE TOOLS	NAVAL BASES SHIPYARDS	NON-FERROUS METALS	PETROLEUM	RUBBER	TRANSPORTATION RAIL	TEXTILES	WATER SUPPLY	MISCELLANEOUS	TOTAL
BRITISH PACIFIC ISLANDS	81																					
Borneo North	81.1										6					1		1				8
(Other B.P.I. not schedld)																						
TOTAL											6					1		1				8
TOTAL ALL TARGETS		48	207	91	20	16	120	70	44	196	255	87	74	108	66	139	11	291	12	15	94	1964

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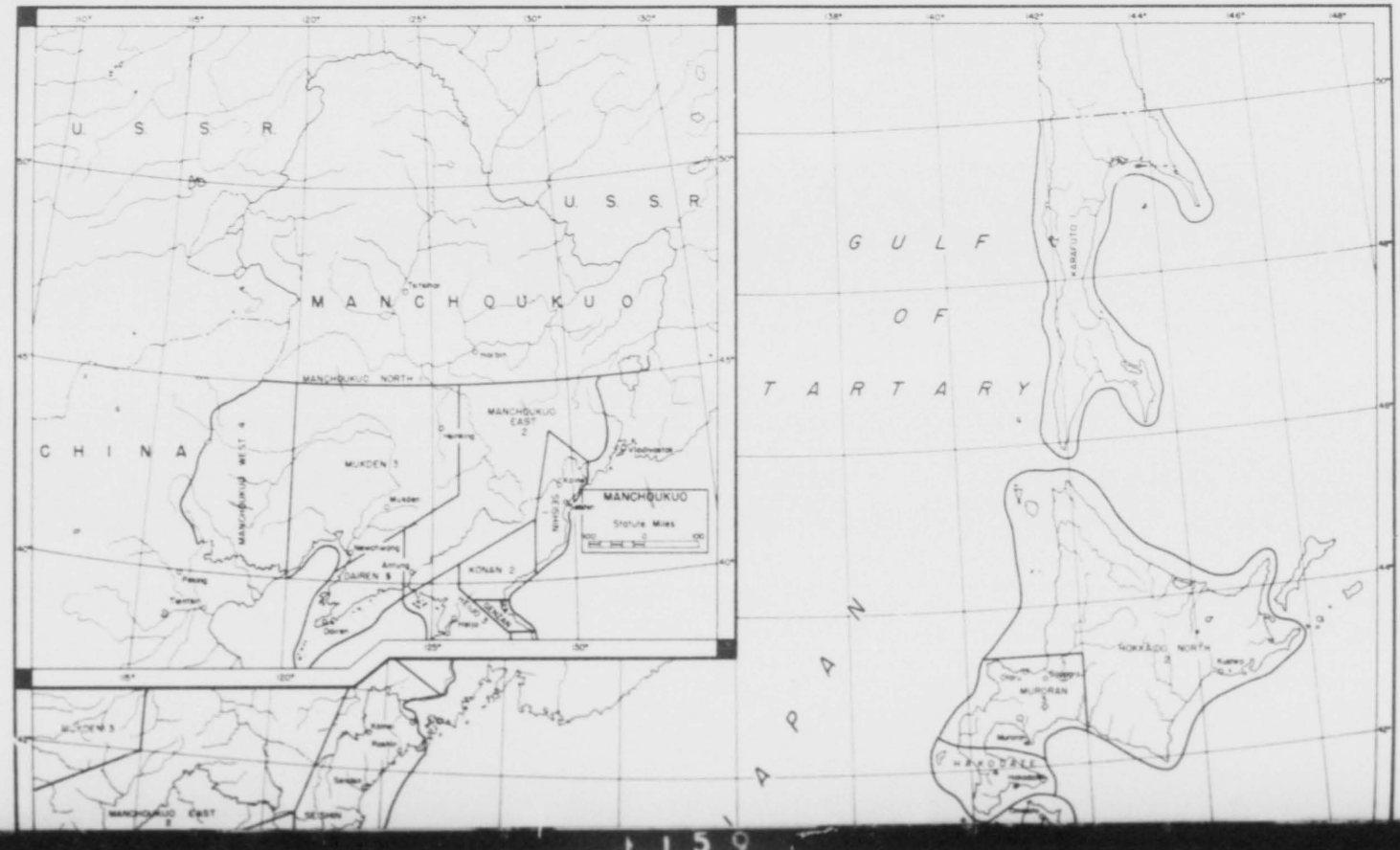
JAPANESE OBJECTIVE FOLDER AREAS AAF A-2



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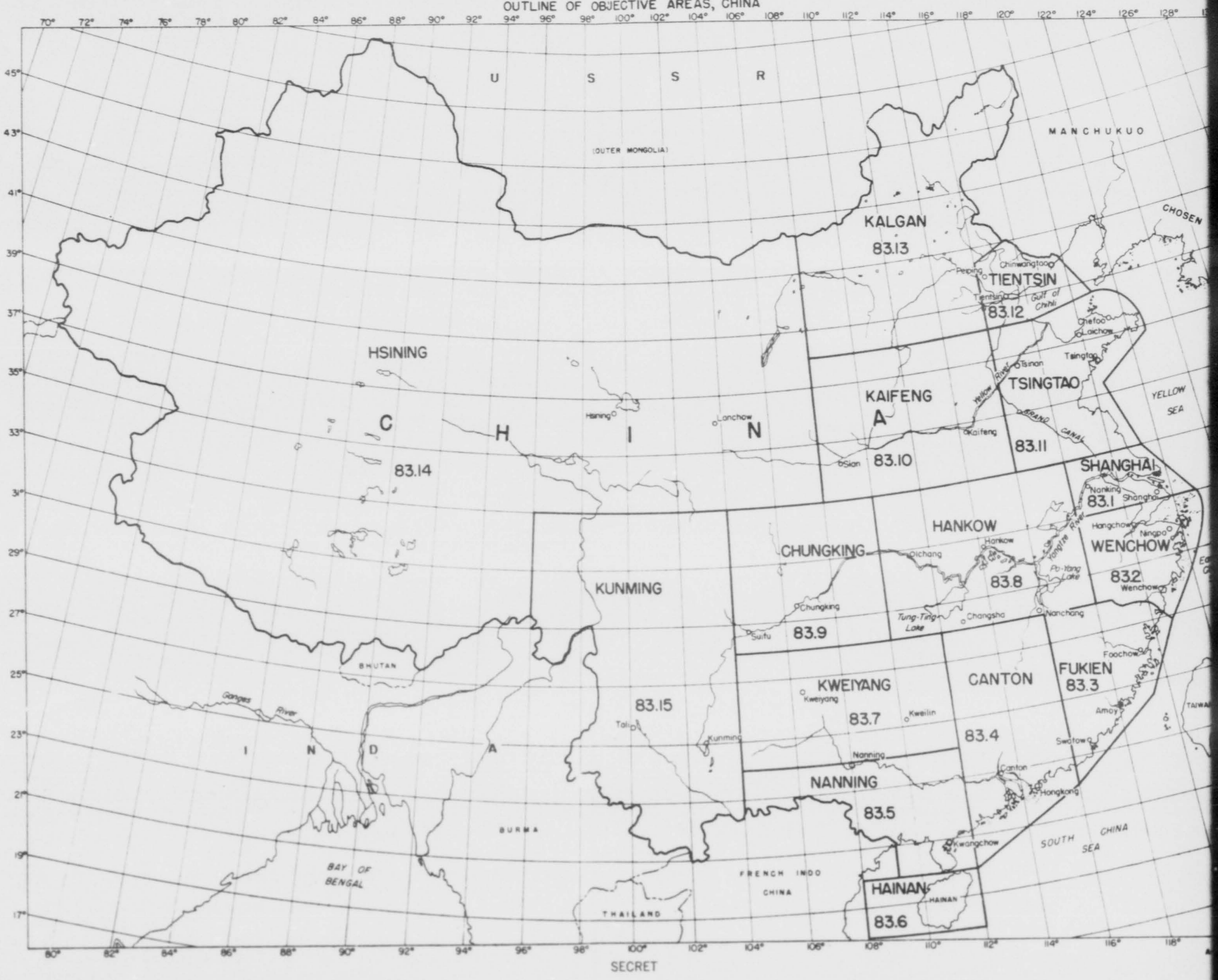
OUTLINE OF OBJECTIVE AREAS, CHINA



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OUTLINE OF OBJECTIVE AREAS, CHINA

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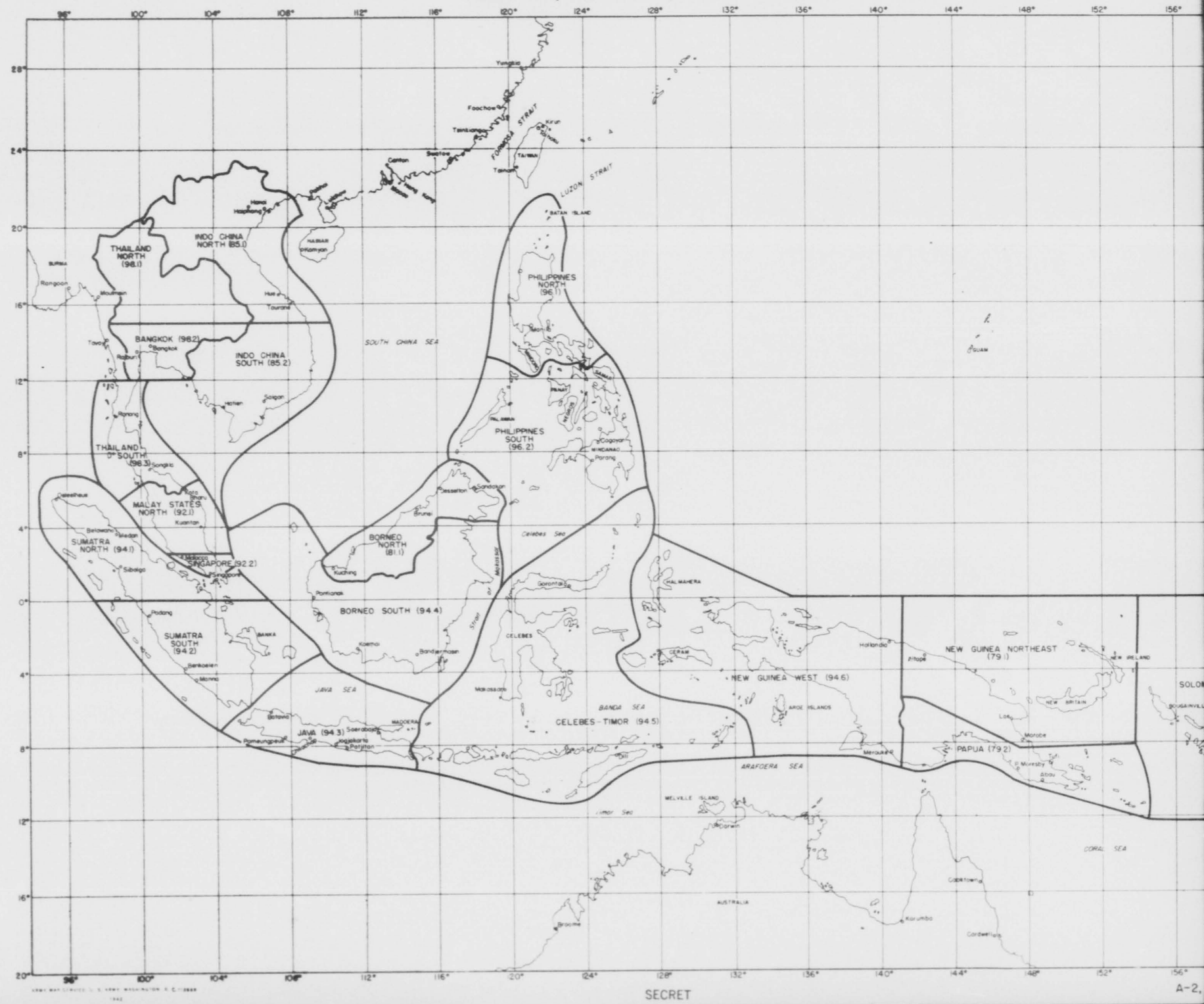
OUTLINE OF OBJECTIVE AREAS
PHILIPPINES, EAST INDIES, AND SOUTHEASTERN ASIA



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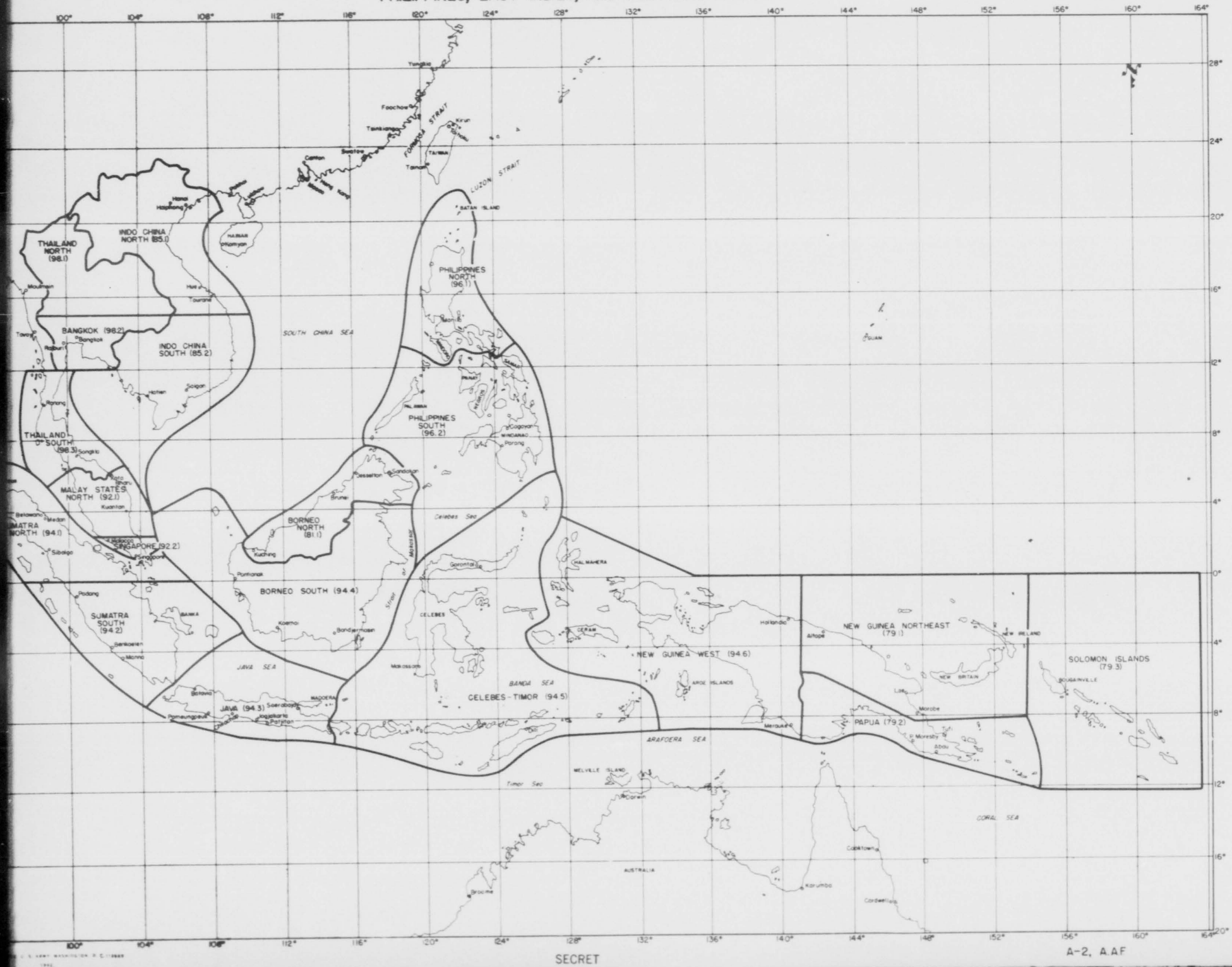
OUTLINE OF OBJECTIVE AREAS
PHILIPPINES, EAST INDIES, AND SOUTHEASTERN ASIA


100° 104° 108° 112° 116° 120° 124° 128° 132° 136° 140° 144° 148° 152° 156° 160° 164°
28° 24° 20° 16° 12° 8° 4° 0° 4° 8° 12° 16° 20°
THAILAND NORTH (98.1)
INDO CHINA NORTH (85.1)
BANGKOK (98.2)
INDO CHINA SOUTH (85.2)
THAILAND SOUTH (98.3)
MALAY STATES NORTH (92.1)
SINGAPORE (92.2)
SUMATRA NORTH (94.1)
SUMATRA SOUTH (94.2)
BORNEO NORTH (81.1)
BORNEO SOUTH (94.4)
JAVA (94.3)
PHILIPPINES NORTH (96.1)
PHILIPPINES SOUTH (96.2)
CELEBES - TIMOR (94.5)
NEW GUINEA WEST (94.6)
NEW GUINEA NORTHEAST (79.1)
PAPUA (79.2)
SOLOMON ISLANDS (79.3)
SOUTH CHINA SEA
JAVA SEA
BANDA SEA
ARAFOERA SEA
CELEBES SEA
TIMOR SEA
CORAL SEA
FORMOSA STRAIT
LUZON STRAIT
AUSTRALIA
Bangkok
Saigon
Singapore
Kuching
Jesselton
Sandakan
Brunei
Makassar
Soerabaja
Djokjakarta
Bandjermasin
Pontianak
Koepang
Broome
Darwin
Karumba
Cobbtown
Port Moresby
Lae
Rabaul
Manila
Cagayan
Davao
Zamboanga
Iloilo
Taihoku
Amoy
Foochow
Swatow
Canton
Hainan
Haiphong
Hanoi
Vientiane
Mouhnan
Tourane
Kratie
Phanrang
Medan
Sibolga
Padang
Palembang
Bankalan
Menado
Ambon
Halmahera
Ceram
Celebes
Timor
Aru Islands
Merauke
Hollandia
Aitape
New Britain
New Ireland
Bougainville
Lae
Morobe
Abau
Babuyan Islands
Batan Island
Bashi Channel
Luzon Strait
Formosa Strait
Taiwan
Kirun
Amoy
Swatow
Foochow
Tsingtao
Tsingtao
Canton
Haiphong
Hanoi
Vientiane
Mouhnan
Tourane
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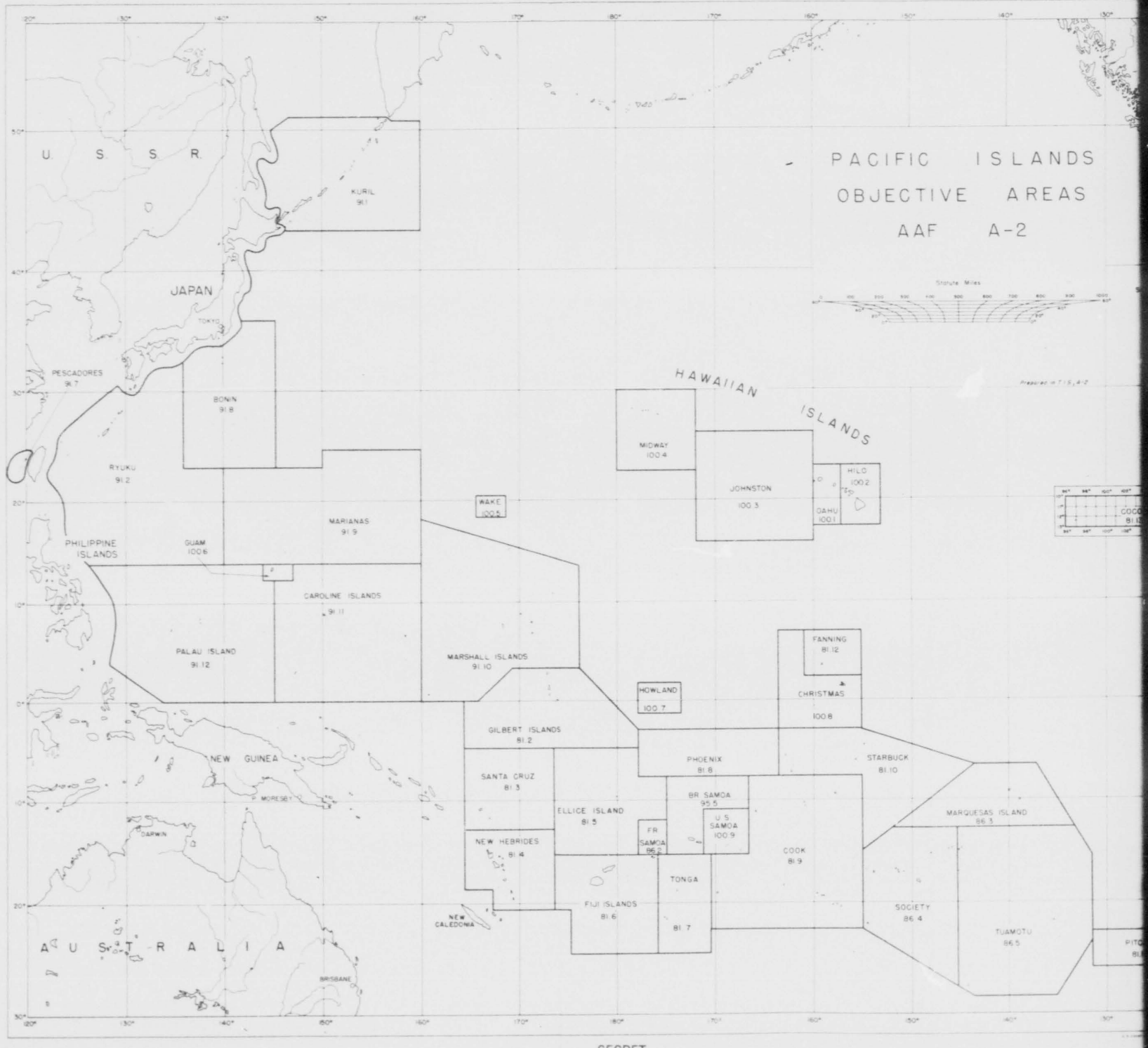

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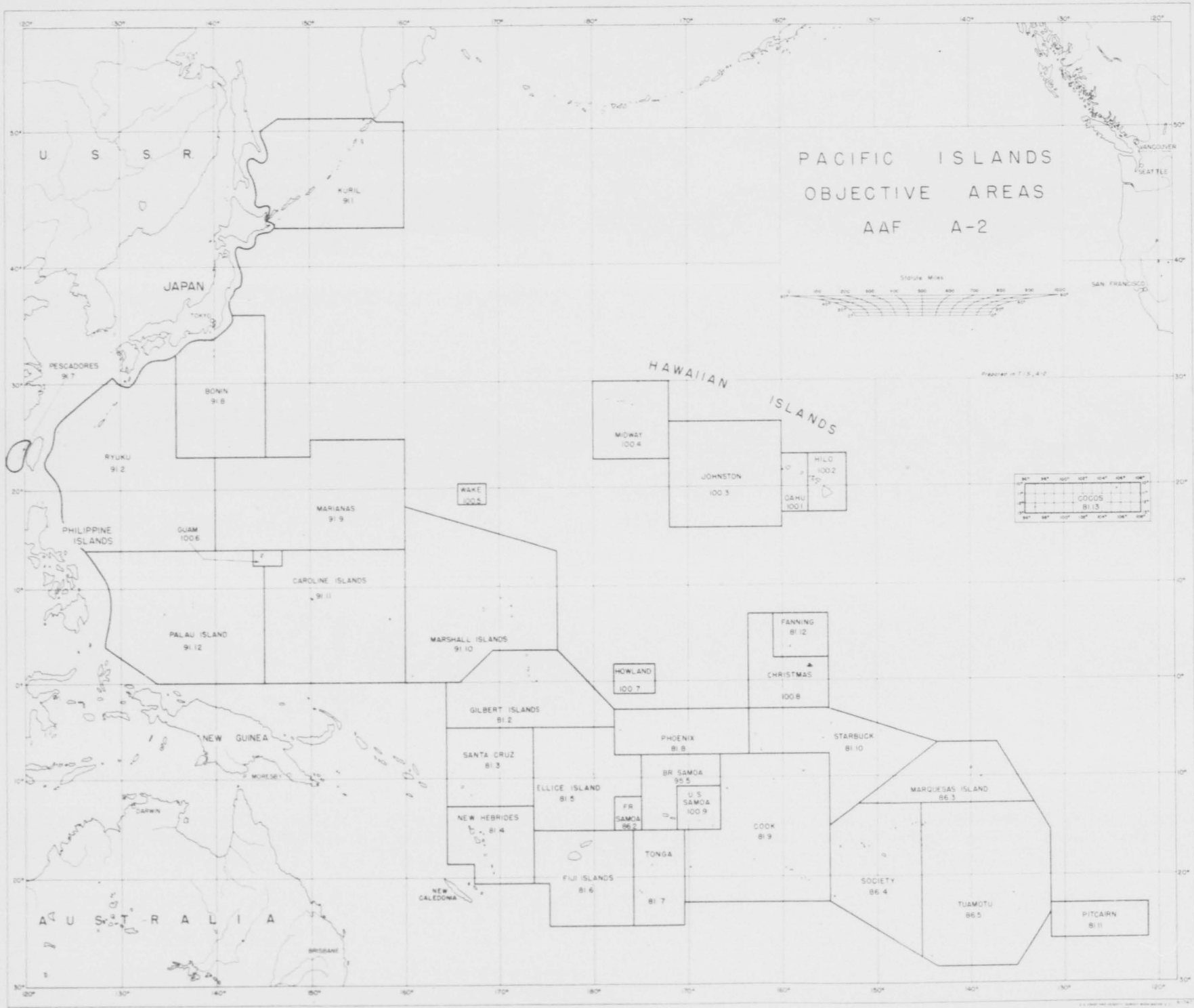

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OBJECTIVE AREAS

INDIA AND BURMA

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OBJECTIVE AREAS

INDIA AND BURMA

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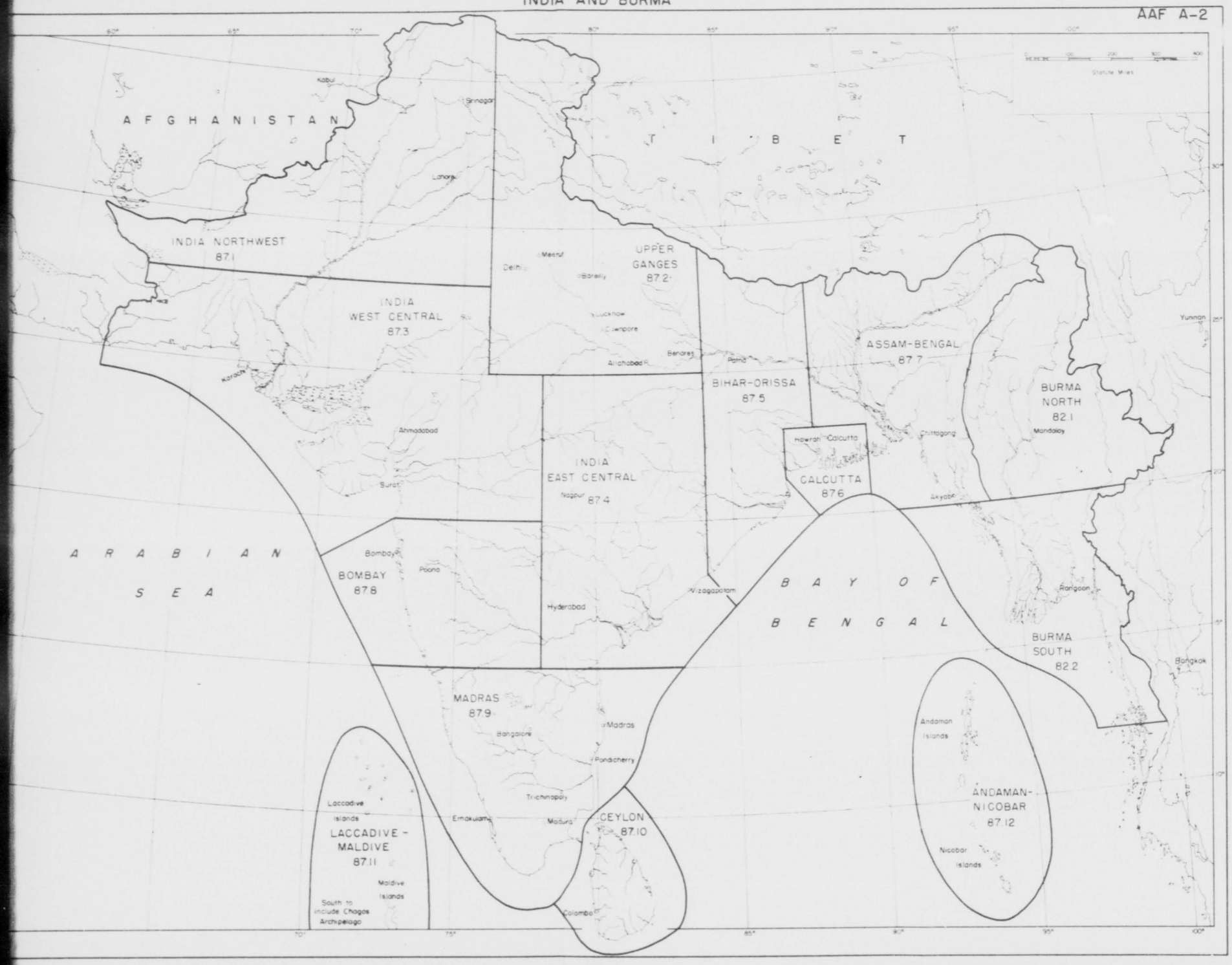

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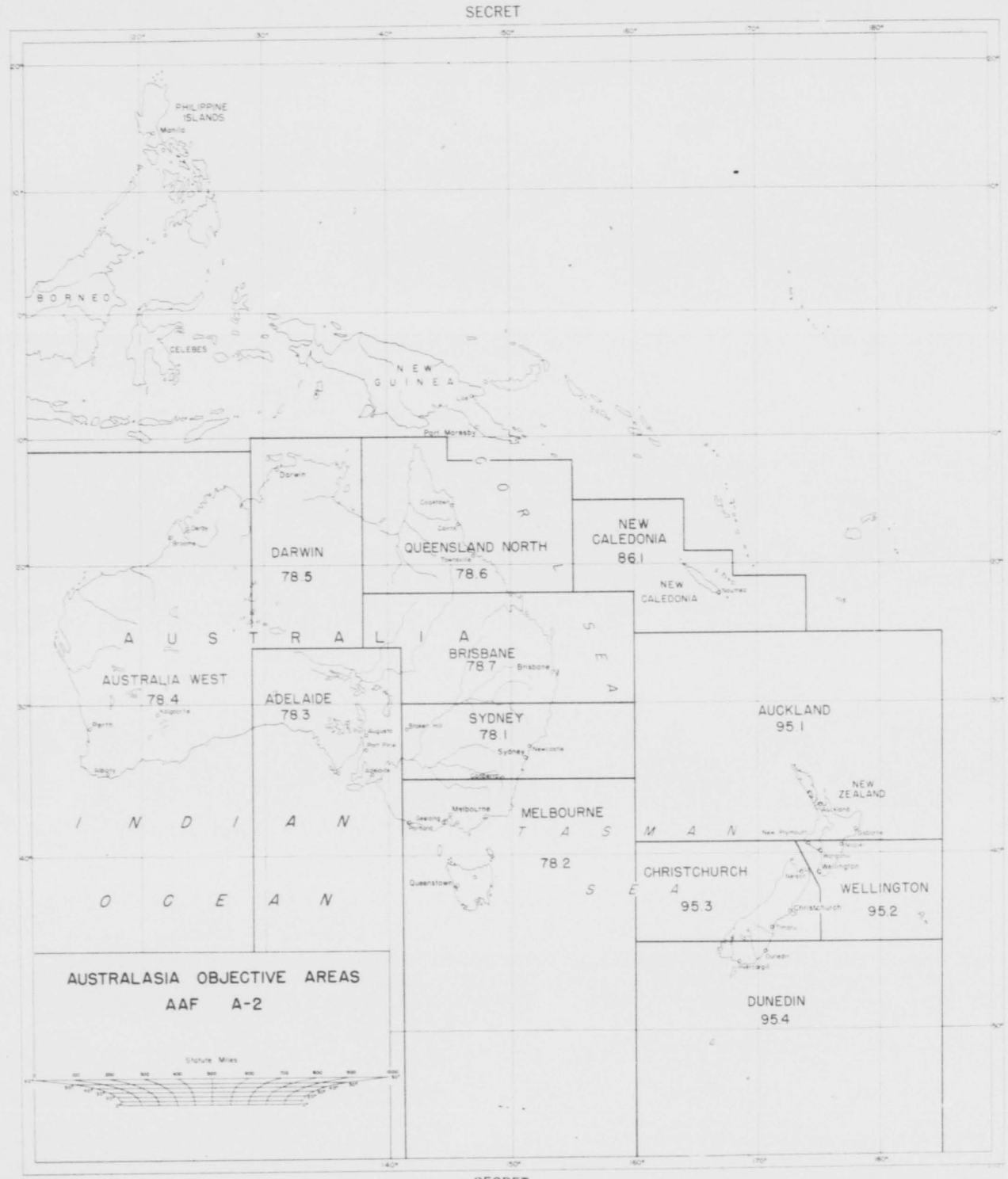

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DOCUMENT TO ROLL INDEX

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Frame Number	Classification Number	Date Period	Vol	Pt	Title	Security Classification	Remarks
4	142.61-1	1943-1945	4		AC/AS Intelligence.	U	
146	142.61-2	1942-1945			Industrial Targets	U	
159	142.61-3	Oct/43			European Axis Target System.	U	
176	142.61-4	Oct/43			Aerial Objectives in Axis Europe.	U	
212	142.61-5	Sep/43			Major Industrial.	U	
224	142.61-6	Oct/43			Airfield of Southern Swedon.	U	
248	142.611-1	Jan/44			Retabatory Gas attacks on Germany.	U	
266	142.611-1	Mar/44			Retabatory Gas Attacks on Germany.	U	
363	142.611-2	Apr-May/45			Targets in Germany.	U	
378	142.611-3	Aug/44			Heavy AA Gun Barries.	U	
506	142.621-1	Mar/43			Japanese Target Data.	U	
829	142.621-2	Apr/43			Japanese Target Data.	U	
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