~~SECRET~~

~~RESTRICTED DATA~~

AR 380-5

Reviewed per ... on 5 Jan 81 by AJP

Reviewed on 17 Dec 79 By AJP

Inventoried on ______ By ______

Reviewed on 4 Jan 79 By AJP

Inventoried on ~~JAN 8 1979~~ By JP

Reviewed on 12/16/77 MDA

Inventoried on DEC 16 1977 JP

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW

1ST REVIEW DATE: 5/17/95 | DETERMINATION (CIRCLE NUMBER)
AUTHORITY: ☐ ADC ☒ ADC ☐ ADD | 1. CLASSIFICATION RETAINED
NAME: | 2. CLASSIFICATION CHANGED TO:
2ND REVIEW DATE: 8-30-95 | 4. COORDINATE WITH:
AUTHORITY: ADD | 5. CLASSIFICATION CANCELLED
NAME: | 6. CLASSIFIED INFO BRACKETED
| 7. OTHER (SPECIFY): Coordinated

with US Army (CSSD-HC 25-5...) dtd 4-12-94

CHRONOLOGY OF THE DEVELOPMENT OF BALLISTIC MISSILE DEFENSE

(1955 to Current FY)

14 JUL 1970

Reviewed on 18 Dec 75 By MDA

Inventoried on 18 Dec 75 By JP

Reviewed on 8 Jan 75 By MDA

Inventoried on 8 Jan 75 By SP

15 Jan 82 ban

~~RESTRICTED DATA~~ ~~This ... contains Restricted Data as defined in the Atomic Energy Act ...~~

~~72-189~~

Reviewed 10 Jan 74 MDA

Reviewed per AR 380-5 by ... on 27 MAY 1987

AI-79-4

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~~RESTRICTED DATA~~

~~Atomic Energy Act of 1954~~

~~EXCLUDED FROM AUTOMATIC REGRADING; DOD DIR 5200.10 DOES NOT APPLY~~

WPS-13-74

Copy No. 1, Series A

BMD PROGRAM MANAGERS

LTG Austin W Betts 28 Sep 66 - 15 Nov 67	Was appointed as NIKE-X System Manager in addition to his primary assignment as Army Chief of R&D (DA CofS Memo No. 66-436) Remained in position as DA R&D Chief after 15 Nov 67.
LTG Alfred D. Starbird 15 Nov 67 -	Names as SENTINEL System Manager. The SENTINEL System Office (DA GO-48) was established within DA Ofc of Chief of Staff as principal assistant and staff advisor to the Chief of Staff ar the Secretary of Army for all matters pertaining to SENTINEL.

Commanders, BMDSCOM

BG I. O. Drewry	Nov 67 - Jul 69
MG Robert Creel Marshall	Jul 69 -

DEPARTMENT OF THE ARMY
BALLISTIC MISSILE DEFENSE SYSTEMS COMMAND
HUNTSVILLE, ALABAMA

CHRONOLOGY OF THE DEVELOPMENT OF BALLISTIC MISSILE DEFENSE

1955

Mar — (U) Western Electric Company (WECo) and Bell Telephone Laboratories (BTL) began an 18-month study of a "new forward looking ground-to-air guided-missile system capable of effectively engaging the target threats within the Continental United States (CONUS) during the period 1960 - 1970."* Primary emphasis in the NIKE-II study was to be on defense against the intercontinental ballistic missile (ICBM). The 18-month study was under Contract DA-30-069-ORD-1082, with funding of $1.65 M.

15 Nov — (U) An Air Force contract for a 12-month anti-ICBM weapon study was awarded to WECo. Two other defense contractors, Boeing and Lockheed, were selected for the Air Force competitive study.

2 Dec — (U) A full status report of the Nike II system study was presented to Army Ordnance at Redstone Arsenal, AL. A common data gathering system was proposed using a defensive missile with interchangeable noses, one for intercepting air-breathing targets and the other for engaging ballistic targets.

*"NIKE-ZEUS Guided Missile System", Volume I, System Study Report prepared by BTL and Douglas Aircraft Company on behalf of Western Electric Co., Inc., 1 Mar 57, Page vii, Foreword.

1956

21 Mar (U) Limited exploratory development and experimental studies of component hardware for the NIKE-II System were provided in a further extension of the existing Contract DA-30-069-ORD-1082. $1.8 M was added to expedite exploratory hardware work.

Jun (U) Chief of Ordnance determined that tests of NIKE-II should be planned at White Sands Missile Range (WSMR) with the possible exception that radars might be placed on Ascension Island to acquire and track targets of opportunity fired from Cape Canaveral.

1 Oct (U) The NIKE-II feasibility study was completed, and the results were presented to the Army General Staff by WECo. The study defined the threat expected to confront the air defenses of the U.S. between 1960 - 1970 and described the proposed weapon system for confronting it. The study included a discussion of the guidance problem, the equipment that is recommended for its solution, a summary of exploratory development work performed, and a proposed schedule for a development program.

(U) The study concluded that it is feasible to provide an anti-ICBM defense with the NIKE-II System. If development of the system were funded at maximum rate, the first operational capability could be obtained in late calendar year 1962 under a normal production program.

2 Oct (U) The Special Assistant for Guided Missiles to the Secretary of Defense informed the Secretaries of the Army and the Air Force that in the antimissile field, the Air Force would have responsibility for developing the early warning system and the Army would have responsibility for the active defense system. The assignment to the Army was justified on the grounds that major targets were already defended by NIKE sites; NIKE-II appeared to be the only project beyond the study stage capable of accomplishing the mission, and there was a basic similarity between the anti-ICBM problem and the anti-missile-missile for field army use.

25 Oct (U) The Department of Defense Anti-ICBM Committee was notified of the following possible schedules for NIKE-II.

Operational Availability Date	Maximum Rate Funding	Budget Limited Funding
1. Early anti-ICBM capability (75-mile range, 130,000 ft altitude).	4th Qtr CY 62	3rd Qtr CY 65
2. Full high-altitude anti-ICBM capability (75-mile range, 500,000 ft altitude).	4th Qtr CY 63	2nd Qtr CY 67
3. Extended range antiaircraft (manned and unmanned) capability.	4th Qtr CY 64	1st Qtr CY 69

Nov (U) The Army Chief of Research and Development formally directed the Chief of Ordnance to initiate phased development of the NIKE-II System. Funds were made available in the amount of nine million dollars. The phased program had the following three objectives:

1. To develop an early anti-ICBM capability to 30,000 feet altitude and 75 nautical miles range.

2. To develop a full anti-ICBM capability to 500,000 feet altitude and 75 nautical miles range.

3. To develop an extended range capability against aircraft, manned or unmanned, to 200 nautical miles range.

15 Nov (U) Per DA Cir 700-22, the following popular names were assigned to the NIKE family of missiles:

NIKE-AJAX - NIKE-I
NIKE-HERCULES - NIKE-B
NIKE-ZEUS - NIKE-II

1 Dec (U) Contract DA-30-069-ORD-1082 was supplemented to include active development of the NIKE-II System by WECo. This marks the beginning of actual development work.

1957

Jan — (U) U. S. Continental Army Command (CONARC) was presented a draft of military characteristics of the NIKE-II System. CONARC recommended to the Joint Chiefs of Staff (JCS) that NIKE-II be implemented in two phases: Early Capability Anti-missile-missile and the Antiaircraft Missile.

Feb — (U) The Army awarded Western Electric/Bell Telephone Laboratories prime contractor system responsibility for development of an anti-ICBM defense system and changed its name from NIKE-II to NIKE-ZEUS. The research and development effort was under Army Ordnance Contract DA-30-069-ORD-1955, and was administered through the New York Ordnance District. With the growing concern for the ICBM threat, BTL effort would now concentrate solely on the ICBM defensive missile, terminating work on defense against air-breathing targets.

1 Mar — (U) The final written report on the NIKE-II (NIKE-ZEUS) study was published: "System Study, NIKE-ZEUS Guided Missile System, Bell Laboratories Report, Vol I Requirements, and Vol II Appendices."

Apr — (U) Secretary of Defense (Charles E. Wilson) detailed areas of responsibility for the major services regarding missile and system development. He approved recommendations that the Air Force develop the early warning system and communications; that the Army carry out research and development on Local Acquisition Radar (LAR), Target Track Radar (TTR), and the missile for ICBM defense; and that a joint Army-Air Force Committee be established (Skifter Committee) to monitor missile development.

Sep — (U) A joint Atomic Energy Commission - Department of Defense study concluded that it was feasible to develop a warhead for NIKE-Zeus which would be capable of destroying an ICBM warhead and that such a warhead could become available by 1961.

Oct — (U) Cost and schedule data were developed by army studies, to indicate an operational, on-site defense of Continental United States (CONUS). Assuming an accelerated program wherein production of tactical NIKE-ZEUS equipment would be undertaken concurrently with manufacture and test of the prototype, and assuming availability of funds by 1 Jan 58, the following schedule was provided:

1957

Early Capability	Estimated Cumulative Cost
3 batteries* by end-CY 61 30 batteries by end-CY 62	$2.0 billion
Full Capability	
100 batteries by end-CY 65	$4.0 billion
Extended Range Capability	
100 batteries by mid-CY 66	$6.0 billion

3 Oct (U) The Redstone Anti-Missile Missile Systems Office (RAMMSO) was established, per General Order No. 55, U. S. Army Ordnance Corps, Redstone Arsenal, to direct and control the NIKE-ZEUS Project. RAMMSO was under the command of the Acting Deputy Commander for Anti-Missile Missile Systems.

17 Oct (C) The NIKE-ZEUS program was reoriented to provide a system capability according to the following phased programs: Phase I - development of the local control system and an anti-missile missile limited to approximately 100,000 feet altitude and approximately 70 nautical miles range. Phase II - development of an anti-missile missile with jet-head, thereby extending capabilities to 500,000 feet altitude. Phase III - development of an anti-missile missile with a fully active seeker, thereby extending range capabilities against aerodynamically supported aircraft to approximately 200 nautical miles.

*A battery comprised all the elements required for carrying out the engagement of an assigned target: radars for tracking and discrimination, defensive missiles, and related computer equipment. The organizational concept envisioned at this time (1958) for deployment of the NIKE-ZEUS System consisted of two major elements beside the weapons batteries: the Local Defense Center (LDC), consisting of the Local Acquisition Radar (LAR) and tactical control equipment for the one to five batteries associated with the LDC; the Forward Acquisition Radar (to be deployed forward of the defended area in the direction of possible ICBM attack) which was to acquire target data to be transmitted to the LDC's.

Jan

(U) A study was completed on sites considered for jet-head tests: (RSA Report No. AM-ZB-1-58) "Determination of the Test Locations for Certain NIKE-ZEUS Tests", dated 29 Jan 58. Recommendation from study was that jet-head development tests be performed at Point Mugu.

(U) By National Security Council action, the highest national priority ("S - Priority") was established for the development of NIKE-ZEUS.

16 Jan

(U) The Secretary of Defense (Neil McElroy) directed that development effort of a missile system against the ICBM be under the direction of the Advanced Research Projects Agency (ARPA). Until ARPA could be established, the Secretary directed maximum coordination of the effort between the Army and the Air Force. The Army was directed to "continue its development effort in the NIKE-ZEUS program as a matter of urgency, concentrating on system development that will demonstrate the feasibility of achieving an effective, active anti-ICBM system in an electronic counter measure and decoy environment."* The work was to be limited to the missile and launch system, and the acquisition, tracking and computer components required for an integrated missile system. In a separate memorandum, the Secretary of Defense directed the Air Force to continue that portion of its NIKE-ZEUS program pertaining to early warning and acquisition and tracking radars, discontinuing its effort on the missile system proper.

28 Jan

(U) The Office of the Chief of Research and Development, forwarded to the Director of Guided Missiles, Army, the following recommendations with regard to attaining an early defense against ballistic missiles:

1. Drop from further consideration for accelerated development and deployment for defense, all active ballistic missile defense systems except NIKE-ZEUS and the land-based TALOS.

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*Memorandum for the Secretary of the Army from the Secretary of Defense, subj: Program for Defense Against the Intercontinental Ballistic Missile, dtd 16 Jan 58.

b. As first priority, fund the NIKE-ZEUS program.*

30 Jan (U) Chief of Ordnance requested that Redstone Arsenal organize reconnaissance for facilities for downrange Atlantic Missile Range testing.

Mar (U) Funds as specified in studies of AM-1-58 were not available by 1 Jan 58. New guidelines were established for revising AM-1-58, the most significant being the limitation of funds to be made available for this program during FY 59. The lack of FY 58 industrial funds plus the limitation of funds during FY 59 resulted in a slippage of the planned operational date.

1 Apr (U) The Army Rocket and Guided Missile Agency (ARGMA) was organized as a subordinate element of the U. S. Army Ordnance Missile Command (USAOMC) at Redstone Arsenal, Alabama, by USAOMC General Orders No. 6.

Apr (U) Ascension, Antigua, and Barbuda Islands were reconnoitered as possible downrange sites for NIKE-ZEUS testing. Detailed results of the reconnaissance were included in ARGMA Report Nr. AM-ZB-2-58, "Test Site Reconnaissance of Antigua, Ascension, and Barbuda Islands for Project NIKE-ZEUS", dated 28 May 58.

14 Apr (U) Redstone Anti-Missile-Missile Systems Office (RAMMSO) was abolished, per General Order No. 5, U. S. Army Ordnance Missile Command. The mission of RAMMSO was assumed by various segments of ARGMA.

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*On 30 Sep 58, representatives of WECo and the New York Ordnance District (NYOD) signed Supplemental Agreement No. 9 to Contract DA-069-ORD-1955, covering the research and development effort for the NIKE-ZEUS program from 1 Oct 58 to 30 Sep 59. The contract amounted to $135 million and was the largest single contract ever negotiated by the NYOD. A production planning contract with WECo was initiated in FY 59 in the amount of $19.9 million.

1958

1 Jun (U) ARGMA was established as a Class II activity under jurisdiction of the Chief of Ordnance, by DA General Order No. 22.

Nov (U) State Department informed DOD that the NIKE-ZEUS Project would not obtain permission from United Kingdom for use of Barbuda as a ZEUS test site. The Chief of Ordnance directed that a new test site for downrange tests be selected and new test plans be prepared. Though it was originally planned to conduct the ZEUS downrange program in the Atlantic Missile Range, the directive did not restrict the test site selection to existing or proposed impact areas in either the Atlantic or Pacific Missile Range (the Kwajalein - Johnston Island complex was subsequently chosen).

Nov (U) Award of contract and start of construction of NIKE-ZEUS experimental facilities at WSMR. (This was the first specific ZEUS structure, but work was actually started on roads, utilities, etc., as early as Feb 58.)

Dec (U) ARGMA received from Office, Chief of Ordnance, a teletype which stated that the FY 60 PEMA "shopping list" did not mention the NIKE-ZEUS program. If no FY 60 industrial funds were provided, the planned initial operational capability date would be delayed to Jun 64. This teletype also stated that the Department of Defense had not approved an operational date for the NIKE-ZEUS.

1959

2 Jan — (U) U. S. Army Air Defense Command was assigned responsibility for preliminary selection of sites for the NIKE-ZEUS System.

12 Feb — (U) The Ballistic Missile Committee of the Department of Defense approved a test plan for conducting NIKE-ZEUS tests in the Kwajalein-Johnston Island complex utilizing intermediate range ballistic missile (IRBM) targets. Steps were immediately begun to prepare agreements with the Department of the Navy and the Department of the Air Force to establish responsibilities and methods of operation. This plan was also approved by the Director of Guided Missiles on 2 Mar 59.

1 Mar — (U) The Army Ballistic Missile Agency (ABMA) was delegated responsibility for development of ballistic targets for the NIKE-ZEUS test program. ABMA developed the criteria for the facilities at Johnston Island.

Apr — (U) Design release of the first 15 research and development missiles was completed and six were fabricated. Missiles were early capability type without jet reaction nose.

May — (U) DOD approved a 40 x 40 mile extension to WSMR for use in connection with the NIKE-ZEUS test program.

30 Jun — (U) Award of a contract for the first package of construction at Kwajalein Island was opened by the Honolulu District Engineers. Included in this bid was one Target Track Radar (TTR) building, Acquisition Radar Receiver, Receiver Antenna, and transmitter buildings.

Jul — (U) A new missile configuration was approved. The missile airframe was simplified and strengthened by removing the large wings from the sustainer section (small wings later had to be added for stability). This design increased range and maneuverability and simplified handling, maintenance, and launching. Initial flights of this design were to begin in mid-1960.

1959

Jul — (U) Bids for facilities at Ascension Island, test site for the TTR, were opened. Facilities covered include BOQ, generator sets, water tanks, utilities, and TTR building.

(U) DOD directed a dual development approach of a warhead for the NIKE-ZEUS System.

Aug — (U) ARGMA published a NIKE-ZEUS test plan. Test sites and their utilization were as follows:

WSMR for the development portion of the radar tests and for missile tests in the 80 - 120 nautical mile category.

Point Mugu, California (Pacific Missile Range) for initial testing in the 560 nautical mile category.

Kwajalein-Johnston Island Complex for performance of the downrange test program, and for final radar performance and system tests in the 250 and 560 nautical mile category.

Ascension Island was chosen as the site for TTR tests because it afforded an opportunity to test radar effectiveness against ICBM targets fired from Cape Canaveral.

26 Aug — (U) The first NIKE-ZEUS missile (Nr. 101) was fired at WSMR. Overall results of the test were partially successful. The missile broke up shortly before sustainer-booster separation. This missile, and the other two rounds fired in 1959, were designed for uncontrolled flights, constructed with fixed-fins and a dummy nose instead of the thrust vectoring nose.

22 Sep — (U) A Memorandum of Understanding was executed between the Army and the Navy to provide peacetime coordination of the NIKE-ZEUS test program in the Kwajalein-Johnston Island complex.

Oct — (U) The WSMR Acquisition Radar Receiver building and the Acquisition Radar Transmitter building were completed, with equipment ready for installation.

1959

14 Oct (U) The second NIKE-ZEUS missile (Nr. 102) was fired at WSMR. Lift-off, boost phase, separation, sustainer ignition and sustainer operation were successful. Missile failsafe and loss of telemetry occurred at 35.3 seconds; insufficient altitude was attained to acquire warhead component data, but other test objectives were met successfully.

Nov (U) The Deputy Secretary of Defense approved use of 30 JUPITERS for IRBM-type targets to be fired from Johnston Island in the NIKE-ZEUS test program. A contract was let by ABMA for fabrication of 15 of these targets. (This decision was later reversed; see page 12, entry for 25 - 26 May 60.)

4 Dec (U) A revised launching and handling concept was approved which provided for subsurface launching of the NIKE-ZEUS missiles. A subsurface cell was approved for installation at WSMR for checking the design prior to acceptance for the Kwajalein Test Site. Contract award for the construction of this cell was 22 Dec 59.

16 Dec (U) The third fixed-fin, winged NIKE-ZEUS missile (Nr. 104) was fired at WSMR. Complete success was not achieved in that the sustainer did not ignite.

1960

3 Feb — (U) The fourth NIKE-ZEUS fixed-fin, winged missile (Nr. 105) was fired at WSMR. The firing was a complete success, with all test objectives met.

28 Apr — (U) This was the initial test of a NIKE-ZEUS missile launched from an underground prototype cell at WSMR. Objectives of obtaining design criteria for the underground type cell and investigating the effect of exhaust gases on missile performance were achieved.

May — (U) Design was completed for all facilities at WSMR, Point Mugu, and Ascension Island except for certain minor changes.

25-26 May — (U) An ad hoc panel was appointed by the Special Assistant to the President for Science and Technology to resolve the controversy over which target missiles should be used to test the NIKE-ZEUS System. The Army proposed use of JUPITER intermediate range ballistic missile (IRBM) targets launched from Johnston Island for intercept by NIKE-ZEUS missiles launched from Kwajalein Atoll. The Director of Defense Research & Engineering (DDR&E) advocated the substitution of ATLAS intercontinental ballistic missiles (ICBMs) to be launched from Vandenberg Air Force Base (VAFB). After two days of hearings, the panel ruled in favor of the latter.

29 Jun — (U) A memorandum from the Secretary of Defense to the Secretaries of the Army, Navy, and Air Force directed that all NIKE-ZEUS ICBM targets would be delivered by ATLAS missiles launched from VAFB. Plans for development of launch facilities at Johnston Island, and the production of all JUPITER missiles for use in NIKE-ZEUS testing were cancelled.

20 Jul — (U) The Army Rocket and Guided Missile Agency (ARGMA) received the first increment ($18 million) of the $25 million previously authorized for prove-out of manufacturing techniques for certain critical ZEUS System components.

10 Aug — (U) The ninth ZEUS missile (20009) was successfully fired at WSMR. This was the first firing of the advanced design ("wingless") missile.

1960

Oct — (U) The NIKE-ZEUS Field Office was formally established at WECo, Burlington, N. C. This location was to provide the government a rapid response to needs of contract or program changes.

28 Oct — (U) Memorandum of Agreement between the Army-Air Force on the ICBM target program was signed.

Nov — (U) Installation of the Missile Track Radar (MTR) at WSMR was completed.

21 Nov — (U) The NIKE-ZEUS Ad Hoc Advisory Committee, chaired by Mr. Richard S. Morse, transmitted to the Chief of Staff the report of the Committee relating to early production and deployment of the NIKE-ZEUS System. Recommendations were:

1. That a program for the production of NIKE-ZEUS batteries at the rate of four per year be immediately initiated.

2. That the units produced be deployed in the defense of the North American Continent in consonance with antimissile defense plans of the North American Air Defense Command (NORAD).

3. That the present NIKE-ZEUS research and development program be continued with the primary objectives of determining the system effectiveness against various types of threats and of improving this effectiveness consistent with the state of the art.

Dec — (U) Installation of the Target Track Radar (TTR) on Ascension Island was completed and power turned on.

1 Dec — (U) The 12th NIKE-ZEUS missile (20013) was successfully launched at WSMR from open pit launcher 207 at a quadrant elevation of 70 degrees, marking the first guided missile firing. Thrust separation and simultaneous control were for the first time successfully employed in a missile of this type.

1960

4 Dec (U) Secretary of the Army recommended to the Secretary of Defense that:

1. An interim program for production and deployment of NIKE-ZEUS at the rate of four batteries, two defense centers, and 200 missiles per year be initiated without delay.

2. FY61 funds in the amount of $73.3 million be provided to permit initiation of a production contract by 31 Mar 61.

3. Units produced be deployed as recommended by Commander-in-Chief, NORAD.

UNCLASSIFIED

1961

Jan — (U) The Army Rocket and Guided Missile Agency (ARGMA) submitted the "NIKE-ZEUS Defense Production Plan" to the Chief of Ordnance. The plan provided for the production and deployment, over a period of eight years, of 29 defense centers, 70 batteries and supporting equipment, and 3,610 missiles. Total cost was estimated at $8 billion. The Secretary of the Army approved the plan and it was forwarded to the Secretary of Defense for approval.

25 Jan — (U) The NIKE-ZEUS Test Unit, U. S. Army Air Defense Command (ARADCOM), was organized at the Army Air Defense Center, Ft. Bliss, Texas, with the mission of assisting the Army Air Defense Board in conducting and evaluating a "valid user test of the NIKE-ZEUS System."

Mar — (U) Two Target Intercept Computers, one at WSMR and one at Point Mugu, were successfully operated for over 40 million transistor hours and nine million transistor hours respectively.

29 Mar — (U) The first attempt of the Target Track Radar (TTR) on Ascension Island to track an ICBM fired from Cape Canaveral failed because the TTR computer did not properly translate trajectory data.

28 May — (U) The TTR on Ascension Island successfully tracked an ATLAS missile fired from Cape Canaveral.

6 May — (U) The TTRs at BTL and Ascension Island tracked the ECHO I satellite to a distance of 2,000 miles.

25 May — (S) After several partial failures of the advanced missile design, the firing of ZEUS missile ZW16 (20021) at WSMR was a complete success. The missile remained on trajectory for the 88-seconds flight duration, in a severe thermodynamic environment, and proved that the heating problem could be overcome.

SRW

Jun — (U) Authorization to proceed with the design of a prototype model of a phased array radar, based on an earlier BTL study, was added to the ZEUS prime contract with WECo (BTL retained responsibility for supervision of the design). Sylvania was selected as the major subcontractor for detailed design of the prototype model and fabrication of the model to be installed at WSMR. Sperry Rand Univac was subcontractor for the digital computer as well as programming for the prototype radar.

(U) The prototype ZEUS Multifunction Array Radar (ZMAR) (later referred to as MAR-I) was an exploratory system which would perform the functions of acquisition, discrimination and tracking of ICBMs by electronic scanning. The phased array would have no mechanical moving parts and no necessity for a rotating antenna. Four installations at 90 degree intervals would be required to cover 360 degrees in azimuth.

Jul

(U) The ZEUS Acquisition Radar (ZAR) at WSMR operated as a system for the first time. A track on a target aircraft was successfully initiated by ZAR data processing equipment.

(U) Successful tracking of a NIKE-ZEUS missile by the Missile Track Radar (MTR) was maintained during firing from the underground launch cell at WSMR.

Aug

(U) The ZEUS missile research and development firing schedule was revised with the principal change being a reduction of 28 missile firings at Point Mugu and a corresponding increase in tests at WSMR. The shift in location stemmed from a decision to test fire more ZEUS missiles without separation of the 2nd and 3rd stages. This mode would lessen range safety problems associated with higher altitude flights and permit firings at White Sands where missile parts could be recovered for analysis and study.

Sep

(U) The first successful jet-head, single blast tube, elbow and nozzle test firing was conducted at Sacramento, California.

9 Sep

(U) NIKE-ZEUS missile ZM-1 (20025) was launched at Point Mugu, California. This was the first NIKE-ZEUS missile tested at Point Mugu. Test objectives were partially achieved.

22 Sep

(U) The Secretary of Defense approved the first two phases of a three phase plan for production and deployment of NIKE-ZEUS defense of twelve metropolitan areas. This decision was to be reversed in January 1962, when the Secretary of Defense informed Congress that only those funds required to keep the NIKE-ZEUS development program at "top priority level" would be spent in FY 63.

1961

15 Nov (U) NIKE-ZEUS missile ZW-28 (20030) was launched at WSMR against a HIGHBALL II missile, the first firing of a ZEUS missile against a real target. Test objectives were partially achieved.

22 Nov (U) The Ascension Island TTR, participating in an ATLAS test, acquired the target at 680 kilometers and tracked continuously for 96 seconds until splash.

14 Dec (U) Three ZEUS firings were successfully conducted at different locations:

1. NIKE-ZEUS ZM-6 (20043) was successfully test fired at Point Mugu, in the longest and highest test flight made to date.

2. At WSMR, the ZEUS ZW-34 (20041) successfully acquired, tracked and intercepted a high altitide, maneuvering supersonic NIKE-HERCULES missile. This was the first intercept of a HERCULES guided missile, and also the first successful integrated system test.

3. NIKE-ZEUS ZK-1 (20047) was test fired from Kwajalein against a space point, the first firing from this test facility.

Dec (U) Unofficial reports circulated in the press implied that President John F. Kennedy and Secretary of Defense McNamara had decided to ask for ZEUS production funds in the new military budget. In presenting his FY 63 budget to Congress in Jan 62, however, President Kennedy indicated his decision to delay the production decision pending final ZEUS firings against ATLAS targets later in 1962.

1962

24 Jan (U) The Kwajalein ZEUS Acquisition Radar (ZAR) received its first signal returns from an intercontinental ballistic missile (ICBM), the initial test of the ZAR against a real target.

17 Feb (U) The ZAR at Kwajalein successfully acquired and transmitted the position of an ATLAS missile to the Target Track Radar (TTR). This marked the first transfer of an ICBM target from the ZAR to the TTR.

Mar (U) The data processing equipment at Kwajalein was integrated into the ZAR subsystem. Tracks were initiated on an ATLAS ICBM fired from VAFB and target position data were successfully transferred to the battery, the first time that a track has been initiated on an ICBM by the Acquisition Radar data processing equipment.

30 Mar (U) A feasibility study was completed on a fast-reaction, surface-to-air missile which by its rapid acceleration, would maximize the time available to a defense for discriminating between warheads and possible decoys. This missile, designated SPRINT, would become a subsystem of the NIKE-X System.

18 Apr (U) The ZAR at Kwajalein participated in a satellite-tracking exercise. Track was initiated and maintained on two objects designated as SPUTNIK 12. On 19 Apr 62, the ZAR again tracked the SPUTNIK 12 booster and successfully transferred the target to the TTR.

27 Apr (U) The Secretary of Defense placed a requirement on the NIKE-ZEUS program to provide the capability, by 1 May 63, for a satellite interception demonstration at Kwajalein. The project was assigned the code name MUDFLAP.

Jun (U) The Deputy Commanding General, Guided Missiles, of the Army Ordnance Missile Command (AOMC), approved a staff study utilizing WECo/BTL as prime contractor for the

ZEUS and Hardsite Defense Systems* with the government directing the selection of major subcontractors. A pre-award survey of possible subcontractors would begin 11 Jun 62, for the development and production of the SPRINT missile.

Jun — (U) The NIKE-ZEUS research and development contract was modified to provide FY 62 authority to develop a satellite intercept system.

26 Jun — (U) The entire NIKE-ZEUS system was installed at KMR, consisting of a hemispheric Acquisition Radar (ZAR); two Target Track Radars (TTRs); one Discrimination Radar (DR); three Missile Track Radars (MTRs); battery control equipment and target interceptor computer; four ZEUS launch cells. The first test of the entire system with an interceptor ICBM fired from Vandenburg AFB was attempted on this date. Tracking of the RV was lost and the test was unsuccessful.

Jul — (U) WECo was informed that the NIKE-ZEUS production planning contract (ORD-2612) would be terminated when the funds already in the contract were used up.

19 Jul — (U) NIKE-ZEUS ZK-7 (20071) made the first successful interception of an ICBM ballistic target nose cone, flown at true ICBM range, speed and trajectory, over Kwajalein. The miss-distance was estimated to be within the lethal blast radius of the ZEUS warhead. Target was boosted into trajectory by an ATLAS missile launched from VAFB.

1 Aug — (U) The NIKE-ZEUS Project Office was established at Redstone Arsenal, Alabama, becoming a separate organizational entity. Prior to this date, NIKE-ZEUS work was performed by functional directorates of the Army Missile Command; personnel were transferred from these directorates to form the NIKE-ZEUS Project Office.

1 Sep — (U) Higher authority told AOMC not to plan against the basic ZEUS System after this date, and that future planning would cover the phase-in of the ZEUS Multiple Array Radar (ZMAR) and the SPRINT missile within the basic ZEUS System and the Hardsite Defense System.

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*The Hardsite Defense System was defined at this time as, "a hardened system consisting of a Multiple Array Radar Subsystem, a Data Processing and Control Subsystem, a SPRINT Missile Subsystem, and associated support equipment." Experimental models of the Multiple Array Radar (MAR) (or ZMAR, as it was known until Jan 63) were to supply the basic technology for a multi-function radar to replace the current ZEUS radars.

1962

1 Oct — (U) The Government awarded four contracts for four-month studies of the program definition phase of the SPRINT missile. Lockheed Aircraft Corporation dropped out, leaving North American Aviation, Douglas Aircraft Company, and the Martin Company as participants. (See entry dated 18 Mar 63.)

12 Dec — (CFRD) NIKE-ZEUS Test K-6 involved two missiles in an attempt at salvo firing. The first missile (20066) successfully intercepted an actual ICBM and achieved all test objectives. The second missile (20077), fired 25 seconds after the first, failed structurally at control fin unlock.

17 Dec — (U) The first ZEUS missile, modified for Project MUDFLAP tests, (DM-15B) was fired at WSMR, successfully intercepting a designated spare point at an altitude of 100 nautical miles.

19 Dec — (U) ZEUS activity at Point Mugu ended, and the system equipment was moved to other ZEUS sites and all buildings were returned to control of the Pacific Missile Range.

22 Dec — (CFRD) NIKE-ZEUS Test K-7 was the second attempt at a salvo firing. The first missile (20068) intercepted an ATLAS ICBM carrying a target vehicle and two decoys. This was the first intercept involving decoys and all test objectives were achieved. The second missile (20100) failed, with loss of one or more control fins.

5 Jan — (U) A memorandum dated 5 Jan from the Secretary of Defense for the Secretary of the Army stated that: (1) there would be no deployment, current or future, of the existing NIKE-ZEUS System and (2) that no decision had been made as to whether or not the NIKE-X System would eventually be deployed. The memorandum directed the Army to reorient the NIKE-ZEUS effort toward a new system approach, to be called NIKE-X. The NIKE-X System now consisted of the following components: the Multifunction Array Radar (MAR), Missile Site Radar (MSR), SPRINT missile, ZEUS missile, and data processing equipment. The NIKE-ZEUS testing program at Kwajalein and Ascension Islands and at the WSMR were to be continued with reorientation to support the NIKE-X System.

13 Feb — (U) The ZEUS Project Office was established as a Class II activity by U. S. Army Materiel Command General Order No. 11, removing the Project from the jurisdiction of the U.S. Army Missile Command and establishing it directly under Headquarters, Army Materiel Command.

(U) Twenty-one officers, four enlisted, and 228 civilians, for an aggregate of 253 were then assigned to the NIKE-ZEUS Project.

15 Feb — (U) Second successful flight of the ZEUS missile modified for Project MUDFLAP, at WSMR.

18 Mar — (U) The subcontract for the development of the SPRINT missile was awarded to Martin-Marietta, Orlando, Florida.

21 Mar — (U) The third DM-15S missile (the ZEUS modified for Project MUDFLAP) and the first to be fired at KMR, attempted intercept of a simulated satellite target at 112 nautical miles. The flight was unsuccessful because the MTR failed to properly track the missile.

30 Mar — U (S) NIKE-ZEUS Test K-17 (20114) was fired against an ICBM target from VAFB, the first successful ICBM intercept in which reaction controlled steering was employed. Intercept occurred at the highest altitude (261,000 ft) to date in the Kwajalein test series. No major equipment malfunction was noted during this test. ERW

Mar — (U) Ground breaking for the MAR I prototype system took place at WSMR.

Apr — (U) The Department of the Army directed the Army Materiel Command to plan for the first NIKE-X site to become operational in the first quarter CY 69.

20 May — (U) Research contracts for the composite propellant development program for the SPRINT were awarded to the Aerojet General Corporation and the Thiokol Chemical Corporation.

1963

23 May — (U) A satellite intercept was successfully accomplished at Kwajalein when NIKE-ZEUS ZK-20 (20138) was launched against an AGENA D satellite. This demonstrated the MUDFLAP capability, as directed by the Secretary of Defense in Apr 62. ZK-20 was the 100th missile to be fired in the Zeus research and development program. From this date through 1964, MUDFLAP missiles were maintained at KMR in a ready state for intercept of a real satellite target. After 1964, this "ready" requirement was terminated, allowing full concentration on the normal R&D test program for the ZEUS missile.

5 Jun — (U) The President of the United States witnessed a successful NIKE-ZEUS missile firing conducted at WSMR. This was a non-jet-head firing from a cell. All test objectives were met.

30 Jun — (U) As of this date, there had been 103 ZEUS firings.

1 Oct — (U) The new system prime contract (DA-30-069-AMC-333(Y)) with WECo became effective. The new research and development contract was based on the reorientation of the NIKE-ZEUS program to the NIKE-X System development.

Nov — (U) The Secretary of Defense directed the Army to assume responsibility for managing the Kwajalein Atoll and to provide all services for missile launches from the Atoll. Subsequently, the mission was assigned to the Commanding General, Army Materiel Command, who in turn designated the ZEUS Project Manager to assume this responsibility.

6 Nov — (U) The first SQUIRT test vehicle was launched at WSMR (the "SQUIRT" program of five missile flights is designed to evaluate heat shield materials for the SPRINT). Structural failure resulted in early termination of the flight.

14 Nov — (U) NIKE-ZEUS test K-24 was a successful intercept of a Titan I boosted ICBM. This was the 13th and final live target test of the NIKE-ZEUS system (of which nine were fully successful). However, further tests under the MUDFLAP Satellite Test Program and system tests against taped live targets or simulated ICBMs continued at KMR until 1966.

Dec — (U) After evaluation of competitive proposals from seven companies, The Raytheon Company, Wayland, MS, was awarded a contract for development of the Missile Site Radar. The design concept was an S-band phased array radar with a single transmitter or receiver sharing a single phased-controlled antenna face. Varian Associates was selected to provide the high power transmitter output tubes.

1964

Jan — (U) ZEUS radars at Kwajalein and WSMR participated in an ECHO II satellite tracking mission on 25, 27, 28, and 29 Jan 64. At both sites the ZEUS Acquisition Radars (ZARs) provided acquisition data enabling the Target Track Radars (TTRs) to acquire and track the satellite.

1 Feb — (U) General Orders No. 4, U. S. Army Materiel Command Headquarters, redesignated the NIKE-ZEUS Project Office the NIKE-X Project Office.

17 Mar — (U) The second SQUIRT I missile was fired at WSMR with all test objectives met. SQUIRT I is a test vehicle for SPRINT development.

Apr — (U) Personnel and functions of the ZEUS branch at New York Procurement District were transferred to the NIKE-X Contract Services Office.

1 Apr — (U) A contract was awarded Aerojet General Corporation in the amount of 1.38 million for SPRINT composite propellant development.

15 May — (U) A memorandum from the Secretary of Defense (Robert McNamara) to the Secretaries of the Army and Navy stated approval of the Army's plan for transfer of the Kwajalein Test Site from the Navy to the Army. Transfer date was set at 1 Jul 64, and the NIKE-X Project Manager was directed to carry out the functions and responsibilities of "National Range Commander."

15 Jun — (U) Installation of the Multifunction Array Radar (MAR) I (formerly termed the ZMAR) was completed at WSMR and power turned on. This was the design evaluation model. A second model, MAR II, was planned for installation as a tactical prototype at Kwajalein. The MAR has the capability of replacing three radars of the NIKE-ZEUS System: the acquisition, target tracking, and discrimination radars.

1964

18 Jun — (U) The ZEUS radars at Kwajalein participated in the advanced ballistic re-entry system, low observable re-entry vehicle (ABRES-LORV-1) test, a part of the Air Force penetration aids program. Good radar and optical data were obtained. The Discrimination Radar accepted ZAR designation, identified the re-entry vehicle, then transferred the target to the TTRs. This sequence of events was a notable first at Kwajalein.

1 Jul — (U) Kwajalein Test Site was officially transferred from the Navy to the Army. The transfer involved nine islands, including Roi Namur, the island which is second to Kwajalein in the amount of technical instrumentation installed.

9 Jul — (C) In Test ZK 42 and 43, a salvo of two NIKE-ZEUS missiles was fired at Kwajalein against a simulated target. Missile 20157 intercepted the target as planned; missile 20158 was destroyed after 66 seconds of flight, about three seconds prior to intercept, by failsafe action. This was the fourth two-missile salvo attempt.

31 Jul — (U) Martin/Orlando demonstrated the first SPRINT Launch Eject System Test. A simulated SPRINT missile mock-up was ejected from an above-ground cell using equipment similar to tactical site type. The system milestone schedule date and all test objectives were successfully met.

11 Sep — (U) MAR I successfully tracked a real target for the first time. A balloon was tracked for 50 minutes with track being intentionally dropped and re-established automatically several times. This balloon was successfully handed over in the automatic mode, which included transfer from search to verification, to acquisition track, and target lock-on.

30 Sep — (U) MAR I continued to demonstrate its multifunction capability by successfully demonstrating "automatic search", "verification track", and "precision track" of real targets. HIGHBALL and SPEEDBALL type targets were automatically acquired on the upward leg and precision tracked on both track channels.

19 Nov (U) The MAR I at WSMR participated in a PERSHING missile firing. Approximately 71 seconds of tracking data were obtained. This was a significant first for the MAR.

23 Nov (U) Construction of the SPRINT site at WSMR was begun.

9 Dec (U) NIKE-ZEUS ZW-72 (20061), a special communication round, was fired at WSMR. This firing concludes the NIKE-ZEUS test firing program at WSMR.

10 Dec (U) Secretary of Defense Robert McNamara was briefed on threat, strategic, and system analyses, and the status of discrimination techniques. Principal attendees were Deputy Secretary of Defense Cyrus Vance; Mr. W. M. Hawkins, Jr., Assistant Secretary of the Army, R&D; Dr. Harold Brown, Director of Defense Research & Engineering; LTG W.W. Dick, Jr., Chief of Research and Development, DA; MG A. W. Betts, Deputy Chief of Research and Development, DA; and the NIKE-X Project Manager, Col I. O. Drewry. It was later learned from documentation signed by Secretary McNamara that the deployment decision was to be postponed for another year, and the Initial Operating Capability extended for an additional year, to Oct 70. The FY66 RDT&E program was recommended at $390 million, which included $20 million for the follow-on re-entry measurement program and $10 million for production planning/engineering.

30 Jan — (C) NIKE-ZEUS missiles ZK-50 and 51 (20155 and 20162) were launched on Kwajalein in a salvo-of-two mode against a simulated submarine launched ballistic missile. The test was the first completely successful salvo firing, with miss-distances of both missiles well within the blast radius.

1 Feb — (U) A Director of Defense Research and Engineering (DDR&E) memo of this date, subject, "NIKE-X Development" indicated that no change of plans was contemplated for the Missile Site Radar (MSR) and SPRINT missile installations at Kwajalein. The Multifunction Array Radar (MAR) II plans, however, might require modification. Large procurement funds for the MAR II w[illegible] to be delayed pending completion of a study to determine possible alternatives to the MAR and possible augmentation of the MSR capabilities and growth potential.

10 Feb — (U) A contract in the amount of $17,334,517 was awarded Global Associates to provide logistic support at Kwajalein for a 12-month extension. Effective date of contract was 1 Mar 65.

18 Feb — (U) The NIKE-ZEUS Test Unit, ARADCOM, was redesigned NIKE-X Test Unit and relocated at WSMR.

Feb — (U) An intensive investigation was started on possible modification of the NIKE-X System and hardware concept to provide a more cost-effective defense against a possible N th country defense in addition to the more sophisticated Soviet-type threats on which past NIKE-X design had been based. The investigation resulted in a NIKE-X reorientation effort (see entry for 23 Apr 65).

26 Mar — (U) The first of two planned firings of the SPRINT Propulsion Test Vehicle (PTV-1) took place at WSMR. The PTV is a two-stage, fixed vane unguided version of the SPRINT. The primary test objective, to verify the performance of the SPRINT 1st and 2nd stage motors in an axial acceleration environment, was successfully met.

13 Apr — (U) Construction of Phase I SPRINT facilities at WSMR was completed on schedule and installation of technical equipment began.

23 Apr — (U) A meeting with Dr. Harold Brown, DDR&E, resulted in several decisions affecting the NIKE-X reorientation effort. The Army was directed to: (1) install a tactical MAR* on

*The tactical multifunction array radar (TACMAR) was a reduced performance revision of the MAR, designed to perform the multifunction sensor role in the "light attack defense."

April 65 – Target Track Radar at Ascension Island, Eastern Test Range, 26 was transferred to The Air Force.

Kwajalein; (2) proceed with the development of an augmented MSR; (3) conduct cost and schedule studies on installing the originally planned MSR and then the augmented MSR, or only the augmented MSR on Kwajalein; (4) proceed with a new long-range interceptor missile; and (5) continue design studies of a Very High Frequency radar.

10 Jun — (U) The ZEUS radars at Kwajalein participated in a dual ICBM launch and the planned observation objectives were largely achieved. The first missile was KX-29, a Re-entry Measurement-Vehicle (RMV) boosted by an ATLAS D; the second target, a MINUTEMAN, was destroyed by Range Safety.

15 Jun — (U) A Secretary of Defense briefing was given to Dr. Harold Brown, DDR&E. Dr. Brown requested that the Army prepare a paper on sole source justification for the modified ZEUS missile to be utilized in the barrage defense role. He stated that it was permissible to call the modified ZEUS missile a DM 15X-2 with the understanding that a new name would be chosen later.

8 Jul — (U) NIKE-ZEUS Missile 20173, the second DM 15-S2 qualification round, was fired at Kwajalein. The missile successfully intercepted a simulated satellite target at the highest intercept altitude ever achieved by a NIKE-ZEUS missile.

29 Jul — U (S) A third NIKE-ZEUS DM 15-S2 (20174) qualification round was successfully fired at Kwajalein. These rounds (20170, 20173, and 20174) demonstrated the effectiveness of this specially modified missile in intercept of satellites with extremely small miss-distances.

8 Oct — (U) Results of the Army's Deployment of NIKE-X Exercise (DEPEX) were presented to the Secretary of the Army and the Secretary of Defense. The DEPEX study consisted of an evaluation of the future Chinese Communist ballistic missile threat and possible deployments against it. The DEPEX II, a "25-city defense", was recommended.

1965

17 Nov (U) The first guided SPRINT flight (FLA-1) was successfully conducted at WSMR. The test verified compatibility of the eject and flight systems, missile in-flight communications, and the ability of the guidance and control systems, structure, heat shield, and motors to perform in actual flight environment.*

Dec (U) The Secretary of Defense decided to defer production activities for at least a year. The NIKE-X Project Office issued new production/deployment planning guidance to all agencies concerned.

15 Dec (U) The Discrimination Radars and the Target Track Radars at Kwajalein and WSMR supported the GEMINI 6 manned space mission. A good track was accomplished at WSMR on the first revolution. Kwajalein did not track on first pass as the vehicle was outside radar range.

*Subsequent SPRINT tests are listed at Inclosure 1, "Test Firings of SPRINT Missile."

1966

Jan — (U) Authorization was given to start development work at McDonnell Douglas (formerly, Douglas Aircraft) on a modified ZEUS-15C missile which would have increased payload, velocity, and range.

Feb — (U) Two UH-19D helicopters were obtained from army excess stocks to support the impact scoring sites at Kwajalein and were scheduled to be operational in May 66.

Feb — (U) The Assistant Secretary of the Army for Research and Development was asked to favorably reconsider procurement or lease of CV-2B Caribou aircraft for Meck Island support.

Mar — (U) During this month, a total of 43,452 Integrated Circuit Packages were produced for the system digital equipment. This is the first time that the requirement of 40,000 per month has been exceeded.

8 Apr — (U) In a memorandum for the Assistant Secretary of Defense, the Assistant Secretary of the Army requested authorization to purchase or lease three Caribou aircraft for Kwajalein.

6 May — (U) This NIKE-ZEUS test, ZK-61 (20139) at Kwajalein completed the developmental flight testing of the ZEUS missile.

20 May — (U) The Multifunction Array Radar (MAR)/WSMR was successful in its first attempt to track a satellite. USSR POLYNOT II satellite was detected and verification tracked over the entire sector of expected track. This test was the first of a series of planned tracking missions to gain experience and knowledge with satellite traffic and high performance targets.

26 May — (U) U. S. Continental Air Defense Command (CONAD) established a joint NIKE-X Impact Task Force, with Army Air Defense Command (ARADCOM) representation, to assess the effect of NIKE-X deployment on existing and programmed military systems.

Jun — (U) The Atomic Energy Commission was requested by the Director of Defense Research and Engineering (DDR&E) to proceed with development of a single warhead for the SPRINT missile.

Jun — (U) Construction was begun on the Meck Island Control Building at Kwajalein.

30 Jun — (U) The initial phase of the Re-entry Measurements Program was completed, with the successful accomplishment of the KX-39 mission.

1966

1 Jul — (U) A reorganization of the Project Office was effected. NIKE-X Regulation 10-1, dated 1 Jul 66, was the official directive with respect to concepts of management, assignments of missions, organizational policies and responsibilities, distribution of functions, and the approved organizational structure. This reorganization was considered an interim step toward action necessary should a production decision be forthcoming.

28 Sep — (U) Department of Army Chief of Staff Memo No. 66-436 established the NIKE-X System Office as a DA Class II Activity. LTG A. W. Betts was appointed NIKE-X System Manager (acting) in addition to his primary assignment as Army Chief of Research and Development. The NIKE-X Project Office was designated as an Army Materiel Command Class II Activity, under the operational control of the NIKE-X System Manager.

15 Nov — (U) The U. S. Army NIKE-X Engineering/Service Test Office (ESTO) with station at WSMR, was established as a Class II Activity under the command of the U. S. Army Materiel Command and was concurrently placed under the operational control of the NIKE-X System Manager. This action was directed by DA General Order No. 44, dated 10 Nov 66.

5 Dec — (U) A briefing was given Dr. O'Neal, Assistant Secretary of the Army, on aspects relating to the Low Frequency Radar and how the NIKE-X System would comply with the intent of the DDR&E memo, subject: "VHF/UHF Radar for NIKE-X." The Project Manager requested authority to proceed with the program. Dr. O'Neal gave verbal approval and the system contractor was advised to proceed, with General Electric as the subcontractor for design and development. Design definition of this system which was later termed the Perimeter Acquisition Radar, was scheduled for completion by July 1967.

20 Dec — (U) Department of the Army presented NIKE-X Deployment Model 1-67 (DEMOD 1-67) to meet certain defense objectives specified by the Secretary of Defense. Defense objectives of this

deployment model were directed against the potential threat from both the Chinese People's Republic and the USSR through the 1970's. Major objectives were a defense against a deliberate Chinese Communist (CHICOM) ICBM attack against U. S. industrial and urban centers--a countervalue attack; and a defense against a deliberate attack on U. S. offensive forces--a counterforce attack. An additional objective was the protection of Continental United States against an inadvertent or unauthorized ICBM launching by a foreign nuclear power. Deployment Model 1-67 was approved by the Secretary of Defense for planning purposes and with minor modifications would become the Model 1-68, or SENTINEL, Deployment.

FY 66 (U) The NIKE-X FY 66 program amounted to $390.2 million, of which $388.3 million had been obligated by 30 Jun 66.

1967

Jan — (U) The Advanced Development Group was organized as an integral element of the NIKE-X Project Office. The mission was to fill the gap between the exploratory development program of the Advanced Research Projects Agency and the engineering development of the NIKE-X System as well as to serve as a vehicle for introducing improvements into the NIKE-X System.

1 Jan — (U) The ZEUS DM15X-2 Missile was renamed SPARTAN.

6 Jan — (U) LTG A. W. Betts, NIKE-X System Manager, requested the CG, U. S. Army Air Defense Command (ARADCOM), to conduct preliminary site selection for the Model 1-67 deployment.

27 Jan — (U) The Secretary of Defense in memoranda to the Secretaries of Army, Navy, and Air Force approved the general concept of the NIKE-X Test Program recommended by the Army. The memo directed that all three services cooperate to the maximum extent required for the successful accomplishment of this test program.

Feb — (C) The DRAGON MIST underground nuclear effects experiment was cancelled, recombined with another experiment and rescheduled for late 1967. The name selected for the reconfigured experiment was HUDSON SEAL. Many of the DRAGON MIST experiments were deleted from HUDSON SEAL.

2 Mar — (U) The first full test of the WSMR Multifunction Array Radar (MAR) ATHENA tracking mode was accomplished during the ATHENA mission. This mode provided autonomous target acquisition and handover to precision track to be maintained on the object closest in range through target separation.

27 Apr — (U) In a multiplex tracking demonstration conducted at WSMR, the MAR successfully tracked five objects ejected from a HIGHBALL rocket. The test completed an operational demonstration milestone.

1967

Jun — (U) A task group, outside the Project Office, was formed to review the status of SPRINT development. Chaired by Mr. C. C. Willhite, BTL, the task group included personnel from the Douglas Aircraft Corporation, the Boeing, Martin, and Aerojet General Companies; from Princeton, and Brooklyn Polytechnic Institute; and from the U. S. Army Missile Command.

9 Jun — (S) KX-101, the first flight under the Re-entry Measurements Program "B", was launched with three payloads. All ZEUS sensors, including Discrimination Radar, Target Track Radars, and optical aircraft, collected data on all three targets. This is the first known flight of independently targeted multiple payloads on a single booster. This is probably also the first successful flight of solid propellant start-stop and restart motor.

5 Jul — (U) Secretary of Defense Robert McNamara was briefed on several different deployment concepts. The topics covered were the 1-67 deployment, expanded Hardsite Defense deployments, modifications to the 1-67 deployment to counter the Fractional Orbital Bombardment System threat, and an anti-Soviet defense deployment (2-67). Mr. McNamara directed that a 30-day study be performed of the evolving Chinese People's Republic threat and the modular growth of the 1-67 deployment to counter that threat. This study is to be made by a DOD appointed committee.

11 Jul — (U) The Montgomery Committee, established by the Department of Defense to consider questions concerning the Chinese threat, held its first meeting.

10 Aug — (U) The SPRINT Investigating Committee made its final report to the Project Manager. Significant findings were: (1) SPRINT performance specification represents adequate design and its requirements can be met; (2) the design and performance to date of the SPRINT missile is adequate to meet NIKE-X System requirements.

21 Aug — (U) The first combined SPARTAN/SPRINT Missile Engineering/Service Test Course started at WSMR. Thirty students from NIKE-X Engineering/Service Test Office (ESTO), Continental Army Command (CONARC), Army Air Defense Command (ARADCOM), and the NIKE-X Project Office (NXPO) attended.

18 Sep — (U) In a speech before the United Press International Editors and Publishers, in San Francisco, California, the Secretary of Defense announced the decision to proceed with limited deployment of an antiballistic missile system which would provide a defense against the Chinese Communist ICBM force of the mid-1970s. Such a deployment would also provide some defense of MINUTEMAN sites against Soviet attack.

1 Oct — (U) Construction of the Meck Island Control Building (MICB) at Kwajalein was completed. The MICB would house the Missile Site Radar and the associated data processing system.

15 Oct — (U) The United States Army Corps of Engineers Huntsville Division (USAEDH) was organized effective 15 October 1967, under authority of Department of the Army, Office of the Chief of Engineers General Orders Number 17, dated 9 October 1967, as the United States Army Corps of Engineers NIKE-X Division. The Division was organized as a separate Class II activity under the command of the Chief of Engineers but by agreement under the operational control of the SENTINEL System Manager (SENSM). Brigadier General Robert P. Young was assigned as the first Division Engineer on 17 October 1967. The cadre spaces and personnel were assigned from the NIKE-X Cadre and Planning Group, Directorate of Military Construction, Office of the Chief of Engineers and the NIKE-X Engineering Division, United States Army Engineer District, Mobile. USAEDH as established was to be co-located with the US Army SENTINEL System Command (SENSCOM) in Huntsville, Alabama, with the mission of developing criteria; designing and constructing developmental, training, support, and tactical facilities; and to include the provision of Tactical Support Equipment (TSE) for the SENTINEL program.

1 Nov — (U) The Department of Defense announced the locations of the first ten SENTINEL sites: Boston-Perimeter Acquisition Radar (PAR) and Missile Site Radar (MSR); Chicago-MSR; Grand Forks-PAR and MSR; Salt Lake City-MSR; Detroit-PAR and MSR; Seattle-PAR and MSR; Hawaii-MSR; Dallas-MSR; New York-MSR; and Albany, Georgia-MSR.

3 Nov — (U) The Department of Defense announced that NIKE-X was redesignated the SENTINEL System. The SENTINEL System consisted of the SPRINT and SPARTAN missiles, a long-range detection radar designated the PAR, the MSR, and the data processing equipment.

15 Nov — (U) DA General Order No. 48 was published, creating the SENTINEL System Organization. The SENTINEL System Manager (SENSM) was established within the Office of the Chief of Staff as principal assistant and staff advisor to the Chief of Staff and Secretary of the Army for all matters pertaining to SENTINEL. Under the SENSM were:

The SENTINEL System Office (SENSO) at Washington, D.C.

The SENTINEL System Command (SENSCOM) at Huntsville, Alabama

The SENTINEL System Evaluation Agency (SENSEA) at WSMR, New Mexico

(U) The personnel and resources of the NXPO were transferred to SENSCOM. The jurisdiction of Kwajalein Test Site was transferred from the Army Materiel Command to become a subordinate element of SENSCOM, but the test site was to be operated under the guidance and direction of the Office, Chief of Research and Development, with respect to national range matters.

15 Nov — (U) LTG Alfred D. Starbird was named SENTINEL System Manager.

Nov — (U) On-site effort began on the SENTINEL program. The Corps of Engineers obtained rights of entry for core drilling and radio frequency interference (RFI) testing at Boston, Detroit, Grand Forks, and Chicago.

Dec — (U) BTL was requested to study an extended range SPRINT as a substitute for remote launch and to review other program advantages that would accrue from such a longer-range interceptor.

7 Dec — (U) Electromagnetic compatibility/radio frequency interference (EMC/RFI) testing at Boston deployment sites started, with scheduled completion date of 23 Dec 67. This was the first testing of this type for the SENTINEL System.

14 Dec — (U) A successful static test of a SPARTAN first-stage motor was conducted. This motor was the first quality assurance round and the second SPARTAN first-stage motor static-tested to date. The motor performed as predicted.

FY 67 — (U) DOD budgeted more than $447 million for the fiscal year, for NIKE-X research, development, production planning and engineering, construction of facilities and testing.

1968

Jan — (U) The budget message of the Secretary of Defense to Congress for FY 68 contained the following recommendations in regard to NIKE-X: (1) vigorously pursue the development, test, and evaluation of the system (for which $386 million was included in the 1968 budget) but take no action now to deploy the system; (2) initiate negotiations with the Soviet Union to limit the deployment of the Antiballistic Missile System; and (3) reconsider the deployment decision in the event these discussions proved unsuccessful.

Mar — (U) The Boeing Company, Seattle, was named to carry out a 14-month study of certain antiballistic missile sites.

(U) The Missile Site Radar (MSR) receiver became operational at Meck Island, after being on-site for one week. This put the receiver installation and checkout about two months ahead of schedule.

2 Mar — (U) The first SPARTAN development firing at Kwajalein Test Site was attempted. At "launch order" command, the first stage motor ignition failed to occur. Investigation revealed that the positive side of the missile's battery had failed to activate fully. The missile was removed from the launch cell and returned to the factory on 7 March for further analysis and refurbishment.

30 Mar — (S) The first SPARTAN missile was launched at Kwajalein on 30 Mar 68. The missile performed according to its flight plan with the flight terminating at 277.7 seconds. All test objectives were achieved. *

Apr — (U) The first Lockheed Core Memory (8K-68 bit words) was installed and checked out in the Whippany Data Processing Laboratory. The second Lockheed Core Memory (8K-68 bit words) was shipped to Meck Island.

*Subsequent SPARTAN tests are listed at Inclosure 2, "Test Firings of the SPARTAN Missile".

1968

15 Apr (U) The SENTINEL Logistics Command was organized as a major subordinate command of the U. S. Army Materiel Command (AMC).

16 Apr (U) DA General Order No. 16, changing the name Kwajalein Test Site to Kwajalein Missile Range, was published.

Apr (U) An ad hoc committee, under the chairmanship of Dr. H. W. Augustadt of BTL, was appointed to investigate the SPRINT program and make recommendations for improvements. The committee's recommendations were accepted in late May, and the CG, SAFSCOM, directed the contractor to begin implementation immediately. An estimated three to four week slip in the firing schedule was anticipated.

May (U) The Secretary of the Navy signed the Memorandum of Agreement between the Army and the Navy for the SENTINEL System Test Target Program.

(U) DOD disclosed three additional general areas to be surveyed as possible site locations for the SENTINEL System: San Francisco and Los Angeles, California, and Sedalia, Missouri.

(U) Three contractors (the Boeing Company, Martin-Marietta Corporation, and McDonnell-Douglas Corporation) were selected by the Advanced Ballistic Missile Defense Agency (ABMDA) to conduct analytical studies to establish promising methods for upgrading SENTINEL System performance by modifications to, or a new design of, the third-stage of the SPARTAN missile to meet evolving threats. The selection by ABMDA represented a consensus of the evaluators from both ABMDA and SENSCOM.

6 May (U) BTL authorized General Electric to proceed with Phase II of Perimeter Acquisition Radar (PAR) development. Phase II was the design and manufacture of a prototype PAR to be installed at a tactical site (Boston was scheduled to be the first site).

1968

12 May — (U) The formal agreement of 12 May 1958 between Canada and the United States concerning the establishment of the North American Air Defense Command (NORAD) was renewed for five years. Either party may terminate the agreement upon one year's notice.

14 May — (U) By Memorandum of Agreement between the Corps of Engineers and the Sentinel System Organization, the U.S. Army Engineer Division, Huntsville was placed under operational control of the SENSM.

18 May — (U) "Power on" was completed for the Missile Site Radar (MSR) at Meck Island.

20 May — (U) The IBM 360 Model 65 Computer in the Launch Operations Building at Meck Island was made operational. The scheduled completion date for this milestone was 1 Jul 68.

Jun — (U) UNIVAC completed delivery of all the 200 nanosecond, thin-film memory designed and built for the research and development program. This memory was used in the Missile Site Data Processor, the Whippany Data Processing Laboratory and in the UNIVAC Test Bed. The thin-film memory at Whippany and Meck was supplemented with 500 nanosecond core memory from Lockheed. These were prototypes of tactical memories.

30 Jun — (U) The NIKE-X Development Office (NXDO) was established at Huntsville, Ala., as a Class II activity of the Office of the Chief of Research and Development, under the command jurisdiction of the U. S. Army Advanced Ballistic Missile Defense Agency (ABMDA). NXDO was collocated with SENSCOM to facilitate interfacing of programs. The Advanced Development Directorate of SENSCOM and that portion of the Advanced Research Projects Division of the U. S. Army Missile Command designated as supporting project DEFENDER were transferred to the U. S. Army NXDO.

29 Jul — (U) A major accomplishment was made in the software area with the successful cycling of Support Zero Process (SOP)-4A1 on the Meck Data Procwssing System. SOP-4A1 is a real-time process containing the operating system (NEXOS), utility

programs, and test programs which are used in "debugging" the operating system.

31 Jul — (U) The SENTINEL Data Processing Laboratory at Whippany was made operational as a split data processing system, doubling the computer time available for program development.

26 Aug — (U) The U. S. Army SENTINEL Logistics Command (SENLOG) became operational in Huntsville, Ala., moving from its temporary location in Washington, D. C.

5 Sep — (U) Acquisition of the first SENTINEL sites--Camp Curtis Guild (MSR) and Sharpner's Pond (PAR) at Boston--was approved by the Real Estate Subcommittee of the House Armed Services Committee.

9-13 Sep — (U) First usage of the clear voice channel of the Kwajalein satellite communication link occurred during this week. The link provided high quality voice service between Meck and Whippany for missile site data processing software information. The circuit was over a long-distance toll line between Whippany, N. J., and Camp Roberts, California, and thence over the satellite link to the ground terminal on Kwajalein.

24 Sep — (U) The advanced contract for construction of a portion of the Boston PAR was awarded to George T. Brox, Inc., Dracut, Mass., on 24 Sep. Notice to proceed was issued concurrently, effective 25 Sep. The contractor's bid of $767,242 exceeded the Government estimate by $4,467.

27 Sep — (U) The Western Electric Company was awarded two contracts, effective 1 Oct, for continuation of the SENTINEL System effort; $273,171,000 was for research and development and $202,375,319 for production related activities.

8 Oct — (U) Meck Island Data Processing Center received from Whippany, N. J., the first authentic data via the satellite data link. The turnaround time was 24 hours in contrast to a

previous average of two weeks, when surface/air mail were used for transmission of data.

7 Nov — (U) The award for the fabrication and delivery of the prime movers and generators for the Boston MSR and PAR powe_ plants went to the Cooper-Bessemer Company. This was the first award of a multi-year program, i. e., two sites for the first year, three sites for the second year, and eight sites for the third year.

15 Nov — (U) Meck Zero Process-4, the first real-time process of the M-0 series, was run at the SENTINEL Data Processing Laboratory at Whippany, N. J.

20 Nov — (U) DOD announced the location of two additional SENTINEL sites: Warren Air Force Base, Wyoming, and Malmstrom Air Force Base, Montana.

12 Dec — (U) The first assembly of a SPARTAN warhead section was accomplished at Sierra Army Depot, using the tactical ballistic case and an actual dynamic warhead model furnished by the Atomic Energy Commission (AEC). The warhead section was shipped to McDonnell-Douglas, Santa Monica, where it was to undergo pre-flight qualification.

18 Dec — U (C) An AEC test critical to the SPARTAN warhead development was successfully conducted at the Nevada test site.

FY 68 — (U) The total approved funding program was $577,745,000 of which $569,735,000 was obligated.

22 Jan (U) After evaluation of the bids by the Corps of Engineers, a contract was awarded to Morrison-Knudsen for the construction of a 2-Face PAR at Boston.

6 Feb (U) By order of the Secretary of Defense, all site acquisition and construction were suspended, pending a review of the SENTINEL System ordered by President Nixon.

8 Feb (U) Dedication ceremonies of the new SENTINEL System Command Headquarters were held.

14 Mar (U) The SENTINEL System Manager directed SENSCOM to proceed with preparations to accomplish Phase I of the revised deployment plan, and to modify current contracts as necessary.

17 Mar (U) A Control Data Corporation 6400 Computer was installed for the SENSCOM Data Center.

25 Mar (U) The name of the SENTINEL Ballistic Missile Defense System was officially changed to SAFEGUARD Ballistic Missile Defense System by General Order 18. Brevity codes were changed accordingly from:

1. SENSO to SAFSO (SAFEGUARD System Office)
2. SENSM to SAFSM (SAFEGUARD System Manager)
3. SENSCOM to SAFSCOM (SAFEGUARD System Command)
4. SENSEA to SAFSEA (SAFEGUARD System Evaluation Agency)
5. SENLOG to SAFLOG (SAFEGUARD Logistics Command)

18 Apr (U) A multiprocessor data processing system was successfully demonstrated in the SAFEGUARD Data Processing Laboratory (SDPL) at Whippany, N.J. Two support processes were executed concurrently under the control of the NIKE-X Operating System.

25 Apr (U) The SAFEGUARD System Deployment Description, in accordance with the Design Concept Paper of the Secretary of Defense, was issued.

1 May (U) The NIKE-X Development Office (NXDO) was redesignated the "Advanced Ballistic Missile Defense Agency, Huntsville" (ABMDAH). There was no change in mission or function and the organization remained under control of the Advanced Ballistic Missile Defense Agency (ABMDA) in Washington, D.C.

15 May (U) The April 25 Deployment Description was contractually incorporated with the Western Electric Company by contract change order on 15 May.

24 May (U) The SAFEGUARD Logistics Command completed its move into the SAFEGUARD System Command headquarters building.

29 May (U) A three processor multiprocessor system was successfully operated in the SDPL (SAFEGUARD Data Processing Laboratory) at BTL, Whippany.

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24 Jun — (U) A significant Missile Site Radar demonstration was performed at Meck Island: for the first time, the precision track mode was used to track a 48-inch balloon launched from Roi. Both precision track channels were utilized, and the radar performance was under the control of the test track software program.

26 Jun — (U) The SENTINEL Communications Program Office was reorganized to become the SAFEGUARD Communications Agency (SAFCA). A subcommand of the U. S. Army Strategic Communications Command, SAFCA will be headquartered at Ft. Huachuca, Arizona.

30 Jul — (U) A 3-month "no-cost extension" was negotiated with Western Electric Company for the FY 69 production contract, extending the level of effort through Oct 69.

31 Jul — (U) BG Ivey O. Drewey, CG of the SENTINEL, now the SAFEGUARD System Command, retired and was awarded the DSM. BG Robert C. Marshall was named Acting CG of the Command.

Jul — (SRD) A decision was made by the Secretary of Defense to delete the low yield warhead option for SPARTAN; design agencies would proceed accordingly.

6 Aug — (U) The Senate endorsed President Nixon's proposal to deploy the SAFEGUARD System, by two votes. A bipartisan amendment, sponsored by Senators John Sherman Cooper (R., Ky.) and Philip A. Hart (D., Mich.) to permit continued research and development of the SAFEGUARD System but to bar deployment or site acquisition, was defeated by a 51 - 49 vote. A previous amendment offered by Margaret Chase Smith (R., Maine) that would have forbidden further work on the SAFEGUARD System, but allowed funds for development of "other antiballistic missile systems" was rejected by a 50 - 50 vote.

22 Aug — (U) The investigation of the failure of SPARTAN KT-12 on 13 Aug was completed with cause of missile failure determined and corrective measures taken to prevent recurrence. Flights 13, 14, and 15 would be delayed until Oct or Nov.

29 Aug — (U) Power was turned on at the General Electric (Syracuse) Limited Engineering Development Model of the Perimeter Acquisition Radar (PAR). This is the first major milestone leading to operational tests.

4 Sep	(U) A preliminary plan was presented to the SAFSM on Operational Site System Tests (OSST), containing a program to test SAFEGUARD components on-site, to include interceptor firings. The OSST study was initiated by the SAFSM on 25 Jul, with effort required by ARADCOM, SAFSEA, SAFSCOM, and the Weapon System Contractor.
16 Sep	(U) BTL, at the SAFEGUARD Data Processing Laboratory in Whippany, N.J., demonstrated a 3-processor operation.
8 Oct	(U) A field office was opened at Grand Forks, under the jurisdiction of the SAFEGUARD System Command. On 7 Nov, responsibility for the field office transferred to USAEDH.
14 Oct	(U) Title 10 action was submitted to Congress for acquisition of real estate in the Grand Forks area.
20 Oct	(U) A field office was opened at Great Falls, Montana, under the jurisdiction of the SAFEGUARD System Command. On 15 Jan 70, responsibility for the field office transferred to USAEDH.
23 Oct	(U) Advance notice was sent to prospective bidders for construction of the MSR and PAR facilities at the Grand Forks, North Dakota, SAFEGUARD sites. This notice would be followed by an invitation to bid on 23 Jan 70.
30 Oct	(U) BG Robert C. Marshall was named Commanding General of the SAFEGUARD System Command. BG Marshall had held the position of Acting Commanding General of the command since the retirement of his predecessor, BG Ivey O. Drewry on 31 Jul 69.
30 Oct	(U) A 2-month extension of the FY 69 production contract with WECo was awarded, extending the level of effort through December 1969.
Nov	(U) A community impact study was conducted by representatives of the Omaha District, Corps of Engineers, in the Grand Forks and Malmstrom areas. The survey included all towns within a 50-mile radius of planned SAFEGUARD sites, and all cities of 10,000 or more population within a 100 mile radius. The two objectives of the study were to: evaluate the impact of SAFEGUARD on the local scene; and identify programs available to assist in community planning.
21 & 25 Nov	(U) A significant milestone was reached when satellite "targets of opportunity" were acquired and tracked by the MSR. This is the first automatic acquisition and tracking of high velocity targets by the MSR using the Meck-Zero Test Track software for radar control.

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4 Dec — (C) A SPRINT investigating committee chaired by the Chief Scientist of SAFSCOM, Dr. Oswald Lange, was formed to study the eject failures of SPRINT FLA-36 and FLA-34. SPRINT developmental firings were temporarily suspended to permit determination of failure, and if necessary, changes in design/procedures.

8 Dec — (U) The House of Representatives approved $69.9 billion in appropriation for the Defense Department, which included $359.5 million in deployment funds for the SAFEGUARD System and $400.9 million for research and development. By a 78 to 25 vote, the House rejected an amendment that would have eliminated deployment funding. The Senate, on 16 Dec, approved by a vote of 85 to 4 the $69.9 billion appropriation. A move to delete almost all of the $760 million for the SAFEGUARD System was defeated by a vote of 49 to 36.

11 Dec — (U) The MSR, with its associated data processing equipment under control of the Meck-Zero process software, successfully tracked an ICBM launched from VAFB, California.

15 Dec — KT 15, SPARTAN Missile 800017, was the last SPARTAN development flight at Kwajalein. The flight was successful, achieving all missile and warhead/adaption kit objectives.

16 Dec — (U) Special Test Flight-2 was an ICBM target data collection test; the MSR successfully fulfilled the mission objectives of collecting radar cross-section and position data on the re-entry complex.

31 Dec — (U) Modification (P027) to the production contract was signed, providing for the FY 70 hardware buy and extending the level of effort items through 31 Jul 70.

1970

Jan — (U) The SAFSM directed that a Cost Analysis Group be established at SAFSCOM, in response to Department of Army emphasis on analyzing military procurement costs.

5 Jan — (U) An interim report was issued by the SPRINT Investigation Committee. Recommendations were made for recovery measures, and the remaining four of the WSMR flight tests would be shifted to Apr and May 70.

13 Jan — (U) A 4-processor data processing operation was demonstrated at MECK.

20 Jan — (U) Contracts were let for a Data Processing Feasibility Study to IBM and CDC. The 6-month study effort is to evaluate the capability of integrating commercial data processing equipment into the SAFEGUARD System at some future time, should an advancing threat make such incorporation desirable.

23 Jan — (U) Invitation to bid for the Grand Forms construction was issued by the U. S. Army Engineer District, Huntsville, to 18 prime of "joint venture" contractors and approximately 150 subcontractors - all pre-qualified.

30 Jan — (U) President Nixon announced his decision for further deployment of the SAFEGUARD BMD System beyond the previously approved 2-site, Phase I program. The recommended new deployment would consist of a third-site (Whiteman AFB, Missouri) and advance preparation for five additional sites (in the Northeast, Northwest, Washington, D. C., Warren AFB, Wyoming, and in the Michigan-Ohio area) although with no deployment commitment at these sites.

24 Feb — (U) Secretary of Defense Melvin Laird recommended to Congress the Modified Phase II SAFEGUARD program to include: one additional site at Whiteman AFB; additional SPRINT missiles at the first two sites; advanced preparation work at five more sites.

23 Mar — (U) WECo and BTL began talks with the Army on limiting their future commitment in the nation's ballistic missile defense system.

31 Mar — (U) Morrison-Knudsen Company & Associates were awarded the $137,858,850 contract for construction of the PAR building, the MSR building, the power plants, and certain other support facilities at SAFEGUARD sites in the Grand Forks area.

1970

31 Mar — (U) The Omaha District, Corps of Engineers, opened bids for the furnishing of mobile home facilities for government employees at the Grand Forks sites. The low bid was $1,849,090, by Western States Construction, Inc., Loveland, Colorado.

6 Apr — (U) Ground was broken at the first SAFEGUARD site (the PAR site near Concrete, North Dakota) by Morrison-Knudsen Company.

14 Apr — (U) The first SAFEGUARD System test at MECK, Mission M1-1, was conducted with partial success. The flight was terminated by the flight safety auto destruct action approximately 19 seconds after launch due to a loss of MSR track. Two primary objectives, however, were achieved: (1) verification of the system concept of launch and guidance to the interceptor by the MSR and its data processor; and (2) demonstration of the flight safety function. Guidance to a space point was only partially achieved due to flight termination.

1 May — (U) BTL, at Whippany, N.J., demonstrated the operational capability of the basic Tactical Software Control Site (TSCS).

4 May — (U) The first major contract for construction of facilities in the Malmstrom, Montana, area was awarded to the Watson Construction Company, Minneapolis, Minn. The $3,369,850 contract was principally for excavation and concrete work, and construction of an area office at the MSR site.

19 May — (U) A contract was awarded for $4,773,402 to the joint venture company of H. C. Smith and Amalco Corp. for initial construction at the PAR site near Conrad, Montana. Work to be accomplished included excavation and concrete work, as well as construction of an area office.

21 May — (U) The "Community Impact Study for the Grand Forks Deployment Area" was released. The study was conducted by the Omaha District, Corps of Engineers, to evaluate the impact of SAFEGUARD deployment on local communities.

22 May — (U) Ground-breaking ceremony at Conrad, Mont. (MSR site) marked the beginning of construction at the Malmstrom Complex.

27 May — (U) The Basic Operating System (BOS) was demonstrated on the basic TSCS at Whippany, N.J., verifying the operational capability of the Central Logic and Control II (CLC II) hardware.

1970

17 Jun — (U) The Senate Armed Services Committee voted approval of funds for a SAFEGUARD installation at Whiteman AFB, (Mo) and for advanced preparation at Warren AFB (Wyo.) while deleting funds for advanced preparation at the four other sites requested by DOD.

24 Jun — (U) M1-1A was a completely successful repeat of the 14 April M1-1 SAFEGUARD System test at MECK. The SPARTAN missile, guided by the MSR with its data processing subsystem, intercepted a fixed spacepoint target.

ABMDA - WASHINGTON

P. J. Friel	1968
J. B. Gilstein	1968 -

ATC

P. Phillips	1967 - 1968
J. Davidson	1968 -

Commander, Kwajalein Missile Range

CPT. G. Smith	1959 - 1961
CPT P. Holmberg	1961 - 1963
CDR H. R. Gordinier	1964 - 1964
CPT H. D. Allen	1964 - 1964
COL G. Crane	1964 - 1965
COL M. Clark	1965 - 1967
COL F. C. Healy	1967 - 1969
COL D. B. Millar	1969 -

End of Fiscal Year Strengths

	Civilian	Military
FY67 (NIKE-X Project Office)	398	49
FY68 (SENSCOM)	719	104
FY69 (SAFSCOM)	882	116
FY70 (SAFSCOM)	803	91

NIKE-ZEUS & NIKE-X Development

(U) The United States research on ballistic missile defense began in 1945 when the Army initiated, through the Bell Telephone Laboratories, a feasibility study for developing an anti-aircraft missile. The NIKE-AJAX was the first defensive missile to reach full development, and its performance was impressive enough to warrant its deployment, in the early nineteen-fifties, around U. S. cities and air bases as a bomber defense. The 2nd generation NIKE was the nuclear-tipped HERCULES, emerging as an operational missile in 1958. A total of 3,000 HERCULES missiles were produced and deployed against bomber attacks.

(U) While HERCULES was being developed, a missile specifically to defend against other missiles was under study, and in 1955 the Army initiated a contract for the investigation of the first true antimissile missile. This led to the development and successful testing of the NIKE-ZEUS system. The famous NIKE-ZEUS trial over Kwajalein on 19 July 1962 became a milestone in the evaluation of our strategic defense forces, for it demonstrated what the skeptics had doubted: that "a bullet can hit a bullet." An incoming ICBM, fired from Vandenberg Air Force Base, was actually intercepted and theoretically destroyed by a ZEUS missile.

(U) In early 1963, DoD directed work on an advanced system which would include more versatile and higher capacity radars and computers, and an interceptor missile fast enough to be launched after an enemy object re-entered the atmosphere. The advanced system was designated NIKE-X, and its development was conducted on the highest priority.

(U) Under the NIKE-X project multifunctional radars were developed which could search and track enemy missiles, and guide and track defensively launched missiles. These radars incorporated the phased-array technique, which could generate many beams and steer them electronically across the sky in a matter of microseconds, thus permitting complete coverage of the radar horizon.

(U) An interceptor missile capable of accelerating to a terminal velocity of many thousands of feet per second in a few seconds was another vital development under NIKE-X. The SPRINT missile can be withheld from fire until after enemy objects re-enter the atmosphere; the radar can then accomplish discrimination, filtering out the decoys to designate the real warhead before the SPRINT is launched to intercept it.

(U) Production and deployment of the NIKE-X System had been considered at the highest governmental levels for several years prior to the production decision of September 1967. While the major NIKE-X effort was devoted to development, some deployment planning effort had been undertaken, and in 1965, two major contributions to deployment preparation were completed. The first of these was a maintenance study which provided a basis for manning and logistical support of a deployed NIKE-X System. The second was the organizational plan approved by the Department of the Army (DA) on 5 Jun 65, visualizing a NIKE-X System Manager at DA level. This System Manager would execute a decision to deploy the NIKE-X Weapon System, using the existing Army Staff to the maximum extent to assist him. He would be supported in the field by the major Army commands and agencies and by a sizable NIKE-X field organization which would be under his direct command.

(U) Upon approval of the organizational plan, the Chief of Staff of the Army

directed that a cadre be set up to plan implementation of the concept. An implementation plan was completed in March 1966. The time was now appropriate to designate a System Manager for NIKE-X, and in October 1966, the Chief of Research and Development, Lieutenant General A. W. Betts, was appointed to act as NIKE-X System Manager in addition to his other duties. At the same time, the NIKE-X Project Office and the NIKE-X Engineering/Service Test Office of the Army Materiel Command (AMC) were placed under the operational control of the System Manager to assist him in the field. The NIKE-X System Office was organized and located in the Washington area to assist the System Manager in carrying out his mission.

(U) One of the first actions of the System Manager was to prepare and issue Letters of Instruction to each of the Army major commands and agencies which was to have a NIKE-X role and mission. A second action of major importance by the NIKE-X System Manager was to establish representative deployment models, thereby providing a common basis for planning by all agencies. The first accepted deployment model was termed "DEMOD 1-67", and it defined a mix of weapons for a specified amount of money keyed to a "thin" defense. On 5 Jul 67, Secretary of Defense Robert McNamara was briefed on this deployment model, as well as on alternatives which would provide defense against the more advanced Soviet threat and against the fractional orbital bombardment system (FOBS) threat.

(U) Secretary McNamara asked for a 30-day study of the evolving Chinese Communist threat and of a deployment based on modular growth to counter it. A committee was established by the Director of Defense Research and Engineering (known as the Montgomery Committee) which held its first meeting on 11 Jul 67. The committee presented a generally favorable report on 15 Aug, indicating that the

NIKE-X DEMOD ?-67 constituted an adequate base for proceeding.

(U) In a speech on 18 Sep 67 before the United Press International Editors and Publishers in San Francisco, the Secretary of Defense announced the decision to proceed with production and deployment of an antiballistic missile system.* The defensive system as outlined by Secretary McNamara was a relatively modest "thin" shield, estimated to cost $5 billion, and principally to defend against the growing threat from the Chinese People's Republic.

(U) Secretary McNamara explained his opposition to deploying a large scale, or "thick" ABM system, not primarily because of the estimated $40 billion price tag, but because he felt that it was not possible to build an impenetrable shield which would guarantee protection of our population against a Soviet attack. Should we attempt to build such a system - at whatever price - a corresponding Soviet reaction would be virtually certain, and the U. S. would, in the long run, gain no significant improvement in security. The system approved by Secretary McNamara was therefore not designed to protect against a Soviet attack on U. S. cities, but had other objectives. One was in relation to the emerging nuclear capability of Communist China. Other objectives were to provide protection against an accidental intercontinental ballistic missile launch by any nuclear-capable foreign power, and to preserve an option for protection of certain of our MINUTEMAN sites against attack from any enemy nation, to insure survival of a portion of our offensive retaliatory capability.

(U) The deployed system was to consist of the SPRINT and SPARTAN interceptor missiles, whose development had begun under the NIKE-ZEUS and NIKE-X projects; the perimeter acquisition radar (PAR) and the missile site radar (MSR) utilizing technology from previous phased array radar programs; and a data processing system

*This speech is reproduced in full as Document 1, Supporting Documents.

to fulfill the command and control function. The name "SENTINEL" was given to the system in November 1967, in General Orders 48. These orders designated the U. S. Army Air Defense Command (ARADCOM), with headquarters in Colorado Springs, Colo., the ultimate user of the system. The CG, SENSCOM, as Deputy SENTINEL System Manager, would have command "over tactical SENTINEL sites during the activation phase, until acceptance of the operational site by the CG, ARADCOM."

SUMMARY OF THE SENTINEL PROGRAM
FY 68

(U) With the announcement of plans to deploy the antiballistic missile system, the Army moved rapidly to put the SENTINEL System into being. The NIKE-X Project was discontinued and the SENTINEL System established by general orders issued on 15 Nov 67. The U. S. Army Engineer Division, Huntsville was established in October 1967, and the SENTINEL Logistics Command on 15 Apr 68. Both agencies will be collocated with SENSCOM when the new SENSCOM Headquarters Building is completed early in 1969. The Army Air Defense Command rapidly expanded its site selection activities. Four SENTINEL contact teams, each headed by the commanding general of the region, went into action, presenting briefings to the public and to local officials in each potential site area. Under the SENTINEL System Command, the pace of the pre-production program quickened, as contractor effort stepped up on computer programing, engineering design, and complete documentation of the system - the groundwork for actual deployment. A measured buildup of personnel brought the SENSCOM nearer to its total approved strength of nearly 1,000 civilians and 125 military. Progress in missile and radar development and testing, in training plans, and in site activation planning is briefly summarized below.

(U) Based on cost, schedules, and current technology, it was decided not to build an R&D prototype perimeter acquisition radar (PAR). Phased-array technology had been developed under such previous radar programs as the Multifunction Array Radar I and II, and the Air Force AN/FDS-85. Configuration of the PAR was extensively reviewed in FY 68, with a decision in favor of the single face design, capable of expansion to two or three faces.

Traveling wave tubes would be used to energize the antenna elements. A common aperture would both transmit and receive. With the PAR requirements and configuration defined, Phase I was completed; Phase II, the design and manufacture of the first PAR at a site near Boston, began late in FY 68.

(U) An R&D version of the missile site radar (MSR) has been installed in the Meck Island control building. "Power-on" of the MECK MSR, demonstrated 18 May 68, was a key event of FY 68. Integration of the MSR with its associated data processor began in late May. The MECK MSR will be used to track targets and guide missiles in tests of the SENTINEL System, scheduled to start in November 1969.

(U) Missile development continued, with the first successful test firings of the SPARTAN, launched from Kwajalein Missile Range, occurring in March and May of this year. The SPRINT flight testing program began the fiscal year with a successful flight in August 1967, in which the missile for the first time executed a second stage maneuver on command. Of the twelve FY 68 test firings, six were termed fully successful, achieving all objectives. A SPRINT investigating committee, chaired by Dr. H. W. Augustadt of BTL, studied the SPRINT program and recommended certain design changes to increase the reliability and structural integrity of the missile. Modifications to extend the range/flight time of the SPRINT were developed in FY 68, and it was planned to test the extended range SPRINT in July 1969.

(U) It had been determined under the NIKE-X System that commercially available computers were not adequate to the system's requirements for speed, realtime capability and reliability. Bell Telephone Laboratories, with the help of several subcontractors, is developing data processing hardware specifically for the SENTINEL System, termed Central Logic and Control (CLC). Two

sites are in use for the checkout of CLC hardware, and for software development: the Data Processing Laboratory at Whippany, N. J. and the Missile Site Data Processor at Meck Island.

(U) Software development presented major problems in this FY. The concurrent evolution of hardware and software posed scheduling problems, and the development of an operating system (the NIKE-X Operating System or NEXOS) presented time-consuming and severe difficulties. Some slippages in tactical software development will result. However, the checkout of NEXOS is now nearing completion. The Whippany Data Processing Laboratory was reconfigured in June 1968 to operate as a split system, doubling the time available for software development, and a split system operation for the MECK data processing system was planned for early 1969.

(U) A Central Training Facility (CTF), located at Ft. Bliss, Tex., will be the site for all resident training for the SENTINEL System. Engineer/service test (EST) courses, conducted at White Sands Missile Range by the contractor, were initiated in this fiscal year for the major SENTINEL subsystems (with the exception of the PAR). These courses are designed to qualify personnel to participate in the testing of R&D equipment and provide early technical training. The first combined SPARTAN/SPRINT EST course started in August 1967, and the first MSR course in March 1968.

(U) A Training Devices Working Group was established in December 1967. A training contract was awarded in May 1968 for assistance in developing a task and skill analysis, and for an independent review and evaluation of training plans.

(U) Production of hardware for the SENTINEL System will be initially accomplished through continuation of the [illegible] and development contract

structure inaugurated under the NIKE-X System. A pre-production contract with the Western Electric Co., awarded 1 Apr 67 for a 6-month period, was extended to 1 Apr 68. On this date, the initial SENTINEL production contract, in the amount of $85,480,628, was awarded. The award will be shared by nine firms including the Western Electric Co., which received $28,000,000.

(U) Ten geographic areas were announced in November 1967 by the Department of Defense as possible site locations for the SENTINEL System. In May 1968, three additional locations were identified. Selection of the potential locations was based mainly on tactical and technical considerations, to fulfill the SENTINEL objective of area defense of the entire United States, and to protect the option for point defense of United States strategic forces.

(U) Community relations functions, public meetings and briefings accompanied the site selection and validation efforts. Some opposition has developed locally to installation of a SENTINEL site in a particular area, mainly on the grounds that the SENTINEL installation would adversely affect surrounding communities.

(U) The first site, and the first PAR installation, will be in the Boston area. Initial criteria for the PAR building was approved, and a PAR design contract awarded for the Boston and Detroit PARs, in June 1968. Also in June a contract was awarded for design of the power plants to supply the PARs. Criteria for the MSR building was released in January 1968, and a design and engineering contract awarded. It was planned to begin advanced construction at the PAR site in the Boston area in October 1968, providing the PAR design is sufficiently advanced, and the real estate acquisition completed at this time.

(U) Manpower strength in the SENTINEL System Command at the end of the fiscal year was 823: 719 civilians and 104 military. At the beginning of FY 68, comparable figures for the NIKE-X Project Office were 398 civilians and 49 military. The total approved funding program was $577,745,000 of which $569,735,000 was obligated.

"SUMMARY OF SENTINEL/SAFEGUARD PROGRAM PROGRESS, FY69"

FY 69 was a year of change for the SENTINEL System, with a new designation to "SAFEGUARD System", revised deployment objectives, and reduced deployment plans.

Opposition to the SENTINEL System, and particularly to specific site deployment locations, was at a mounting tempo through 1968 and 1969. Ten potential site areas had been publicly announced by DoD in November 1967, three more in May 1968, and two more on 13 Nov 68. These 15 sites (in addition to two additional areas, Washington, D.C., and Fairbanks, Alaska, which were never publicly announced were to be located in the following general areas:

Boston Massachusetts	Chicago, Illinois
Seattle, Washington	San Francisco, California
Whiteman Air Force Base, Missouri	Detroit, Michigan
Grand Forks Air Force Base, North Dakota	Albany, Georgia
Malmstrom Air Force Base, Montana	Dallas, Texas
Warren Air Force Base, Wyoming	Salt Lake City, Utah
Los Angeles, California	New York City, New York
Oahu, Hawaii	

Briefing teams, composed variously of personnel from the Air Defense Command, the SENTINEL System Command, the SENTINEL System Office and Corps of Engineers, visited many of the above locations. They conducted public meetings and disseminated general information to local and state officials and press media on SAFEGUARD objectives and deployment plans. Increasingly the teams met with hostile questioning, challenges to debate the ABM issue, doubts about the [illegible]ty

and effectiveness of the SENTINEL System, and criticism of planned site locations.

Scientific and environmental groups joined with peace organizations and citizens' groups to voice their adverse reaction to deployment of an ABM system. The objections generally expressed were that such a system would be obsolete when deployed, would be ineffective, would only serve to accelerate the arms race, or would endanger and despoil a particular locale.

Resistance to the SENTINEL System reached peak momentum by early 1969, with especially adverse reaction in Boston, Seattle, and Chicago. Between 10 and 26 Feb 69, over 2300 pieces of correspondence were received in Washington relative to the proposed SENTINEL System, and the ratio of opposition to support was about 20 to 1.

President Nixon, following his inauguration in January 1969, announced that a thorough review of the SENTINEL System would be made. Pending the outcome, all SENTINEL site activities, construction, and site surveys were halted.

On 14 March 69, President Nixon announced his decision to reorient the ABM system, calling the new approach "a safeguard program." The principal defense objective changed from an area defense of the United States to a defense of the U. S. offensive forces. Three objectives were defined:

Safeguard the U. S. deterrent system.

Safeguard against an ICBM attack by the People's Republic of China.

Safeguard against an accidental attack from any source, of less than massive magnitude.

Deployment of the revised ABM system would be at twelve potential sites, with the important proviso that the program would be reviewed annually, and site deployments authorized incrementally in consonance with the National defense

posture and the international strategic situation. Five of the 12 sites were unchanged from the SENTINEL Program: Grand Forks, Malmstrom, Whiteman and Warren Air Force Bases, and Washington, D.C. The other 7 sites were identified regionally as follows:

Upper Northwest	Central California
Southern California	Central Texas
Michigan/Ohio	Florida, Georgia
Southern New England	

The first phase of the revised deployment would authorize only Grand Forks and Malmstrom as ABM sites. The name change to "SAFEGUARD" became official on 25 Mar 69 and all organizational elements were accordingly redesignated. Contracts were modified where necessary, and a new SAFEGUARD System Deployment Description was issued in April 1969.

Site selection activities were in process at many of the proposed SENTINEL sites when the directive to halt all site acquisition/construction came in late January 1969. Actual construction, however, had commenced only in the Boston area, which was to be the first SENTINEL site. A pre-construction and excavation contract had been awarded in September 1968 for the PAR building and power plant and another contract for power generating equipment. A construction contract had been awarded, on 22 Jan 69, to Morrison-Knudsen Company. The contractor had mobilized and accomplished a small amount of drilling and excavation work when the termination order was issued on 6 Feb 69.

Development of SAFEGUARD weapon systems continued in FY 69 and was not significantly affected by the changed deployment objectives. However, considerable revision of tactical operational planning, the command and control of the deployed system, and software weapons programs resulted from the new ballistic missile defense rationale.

The performance/design specifications for SPARTAN and SPRINT were accepted, with minor changes, by the SENTINEL Configuration Control Board on 20 Sept 68. Development testing of the SPARTAN, at Kwajalein Missile Range (KMR), and the SPRINT, at White Sands Missile Range (WSMR) continued. Fifteen SPARTAN and 42 SPRINT development flights were planned, with the objective of verifying the performance and integrity of missile components, and the ability of the complete missile to function in a tactical weapons system. Following developmental testing, the SPARTAN and SPRINT missiles will be fired from Meck Island in integrated system tests with the Missile Site Radar (MSR) and the missile site data processor (MSDP). The Meck Test Program is scheduled to commence in April 1970. Target requirements for the program have been finalized, using surplus Minuteman and Polaris missiles supplied by the Air Force and Navy for high performance targets. Modifications of nine Intercontinental Ballistic Missiles (ICBM) and 5 Intermediate Range Ballistics Missiles (IRBM) were completed in this fiscal year.

Extensive modifications to KMR facilities to support the Meck Test Program were nearing completion in FY 69. Two SPARTAN launch cells (numbers 21 and 22) were under construction and scheduled for completion this year. The Meck Island Control Building, housing the MSR and missile site data processor, and the test tower for the MSR were completed. The SPRINT complex at Meck Island, consisting of four launch stations, a vertical missile assembly building, and missile holding bay, has been constructed.

Seven SPARTAN missiles were fired in FY 69, with a record of four successful and two partially successful missions, and one failure. Modified Zeus launch facilities at Kwajalein Island, and the Zeus Early Missile Track Radar were used for these missions. The first assembly of the SPARTAN warhead section

was completed 12 Dec 68 at Sierra Army Depot, using the tactical ballistic case, and a dynamic warhead model furnished by the Atomic Energy Commission. SPARTAN warhead section tests flights were scheduled to commence in July 1969.

Eleven SPRINT flights were conducted in FY 69, with nine successful, two partially successful and one failing to achieve any objectives. The Meck Test Program will include testing of SPRINT missiles in the remote launch mode. Six tests (five with actual targets) were planned, in which SPRINT will be launched from an adjacent island but acquired and tracked by the MSR located on Meck Island. Remote launches will be conducted from Illeginni, if land lease negotiations with the Marshallese for that island are successful. A secondary site, Gagan Island, where land use rights are already authorized, will be used if Illeginni is unavailable.

Two R&D configurations of the SAFEGUARD data processing hardware, known as "Central Logic and Control" (CLC)were in operation in FY 69, one at the SAFEGUARD Data Processing Laboratory (SDPL), Whippany, NJ, and the other at the Meck MSR. These are CLC1 design; a tactical design designated CLC2 was planned for installation at the sites and at BTL's Tactical Software Control Site. The SDPL became operational early in FY 69 as a split data processing system, permitting dual, separate software development on each system. Split system operation of the MSDP at Meck Island was also begun in the second quarter, FY 69.

Meck-0 software, a set of real time processes to check out the MSR, MSDP and their interfaces prior to system testing, was developed in FY 69 and shipped to Meck. Meck-0 testing commenced in March 1969. Meck-1 software, which will test the initial weapons system capability, was in the integration stage at the SDPL, and expected to be completed for shipment to Meck by October 1969. The first Meck system test, a SPARTAN firing scheduled for April 1970, will require this software.

Design definition of the PAR was completed in September 1968 and development of long leadtime and critical items was initiated. General Electric, subcontractor for PAR development, began assembly of the PAR Limited Engineering Development Model (LEDM). This brassboard model will consist of a 24-element active array with a full string of PAR sensor equipment. The LEDM will supply the test bed for operational and life testing of PAR equipment groups.

The Meck MSR became operational with power turn-on in May 1968. Full power operation was achieved in January 1969 with full peak and average power radiated through the antenna for several hours without failure. Subsystem tests of the antenna, transmitter and receiver were in process and would continue through the first half of FY 70, to demonstrate the operational capability of the MSR/MSDP to support Meck system testing.

A significant event of this year for the SAFEGUARD System Command was the relocation of the Command from Redstone Arsenal to the new headquarters building in Research Park, Huntsville, AL. The move took place in the first two weeks of January 1969, and dedication ceremonies were held on 8 Feb 69. An open house for friends and families of employees followed. The SAFSCOM Headquarters building, begun in April 1968, was constructed by a private contractor and leased to the General Services Administration. The building has some 300,000 square feet of office space and an annex immediately adjacent to the headquarters which is occupied by the U. S. Army Engineer Division, Huntsville. With the move of U. S. Army SAFEGUARD Logistics Command and Advanced Ballistic Missile Defense Agency into the SAFSCOM headquarters in April and May 1969, all Huntsville-based SAFEGUARD organizations are now consolidated in one location.

SUMMARY OF THE SAFEGUARD PROGRAM, FY 70

BG Robert C. Marshall was named the new Commanding General of the SAFEGUARD System Command following the retirement of BG Ivey O. Drewry on 31 July 69.

During the summer of 1969 the SAFEGUARD System, and antiballistic missile development in general, were subjects of intense interest by Congress, press media, and the general public. Many weeks of Congressional Committee hearings and over a month of heated debate on the Senate floor preceded a vote on the Administration's proposed SAFEGUARD Program for FY 70.

On the date that the SAFEGUARD authorization came before the Senate for voting, 6 Aug 69, an unusual perfect attendance of 100 Senators was recorded. Several amendments which would have terminated SAFEGUARD deployment were narrowly defeated. The final key vote tallied a 50-50 tie, allowing the SAFEGUARD program to continue.

In January 1970 President Nixon, after annual review of the SAFEGUARD System, announced the Administration's program for further SAFEGUARD deployment in FY 71: continue the previously approved sites at Grand Forks, ND, and Malmstrom, MT; an additional third site at Whiteman AFB, MO; and advance preparation at five additional sites. The Senate Armed Services Committee in June 1970, however, approved the additional site at Whiteman AFB, advanced preparation at Warren AFB, WY, and deleted funds for advanced preparation at any other site.

The SAFEGUARD System began to be discussed in a new role: as a "bargaining chip" in the Strategic Arms Limitation Talks between the U. S. and the Soviet Union which were initiated in November 1969. Secretary of Defense Melvin O. Laird declared that a unilateral cut in SAFEGUARD funds, or discontinuance of the ABM deployment would impair the U. S. position [illegible] talks. A limitation of the

ABM defense of both nations was considered a likely area for potential agreements between the U. S. and the Soviet Union.

Technical progress in SAFEGUARD System weapons continued to be good, with initial Meck integrated system testing at the Kwajalein Missile Range (KMR) perhaps the most important technical milestone. The Meck Test Program, projected for a 5-year period, was designed to demonstrate capability of the Missile Site Radar (MSR), Missile Site Data Processor (MSDP), and the SAFEGUARD missiles to function as an integrated system. Space point and live intercepts for both SPARTAN and SPRINT, remote launch tests of SPRINT, and salvo firings of both missiles have been planned. PAR interfaces will be simulated.

The last SPARTAN development flight was successfully conducted at KMR on 15 Dec 69, with all missile and warhead objectives achieved. A total of 14 SPARTAN missiles were flight tested in this development program, the first in March 1968. Eleven full-duration flights were achieved; three tests were terminated early due to in-flight failures and one additional launch attempt failed. The first integrated system test at Meck Island (Mission M1-1), attempted on 14 Apr 70, failed due to loss of MSR track and subsequent auto destruct of the SPARTAN missile. An investigation located the cause of failure in an arithmetic control unit of a processor within the missile site data processing system. A hardware solution was subsequently installed to prevent a repeat of this circumstance. Mission M1-1 was re-run on 24 Jun 70, with the SPARTAN successfully intercepting a fixed spacepoint target under guidance of the MSR/MSDP.

The extended range SPRINT missile was flight-tested at White Sands Missile Range (WSMR) for the first time on 22 Jul 69, and all subsequent flights were conducted with the extended range SPRINT. The first SPRINT warhead section/adaption kit development flight was accomplished in November 1969. Two SPRINT

flights in October and December 1969 resulted in premature ignition of the first stage and structural failure. Development flights were suspended pending investigation of these failures, and modifications were made in the launch eject equipment and first stage aft skirt of the missile. Successful SPRINT flight tests were accomplished in May and June 1970. Forty one of the planned forty-two SPRINT development flights were accomplished by the end of FY 70; six of these demonstrated warhead/adaption kit objectives as well as missile performance. After the last SPRINT mission, scheduled for early FY 71, SAFEGUARD testing at WSMR will be phased out. All system flight testing will then be within the Meck Test Program.

Very significant verification of MSR capability was achieved in FY 70. A major milestone occurred in late November 1969 when satellite "targets of opportunity" were acquired and tracked by the Meck MSR. This was the first automatic tracking of high velocity targets under control of Meck test track software. Further tracking demonstrations followed and in December 1969, the MSR successfully acquired and tracked an ICBM launched from Vandenburg AFB, CA.

The PAR Limited Engineering Development Model (LEDM) was a brassboard model constructed in lieu of a prototype PAR, at the General Electric Syracuse plant. The LEDM was completed in August 1969 for operational testing to commence. All groups of PAR equipment will be tested prior to critical design reviews and release to production. Planned LEDM testing was about 57% complete at the end of FY 70.

Data processing subsystem development, both hardware and software, was approximately on schedule. Operating system and support processes have been checked out and delivered to support test and tactical software development.

SAFEGUARD software was under development at Bell Telephone's Whippany, NJ, SAFEGUARD Data Processing Laboratory. A facility for integration of tactical software, designated the Tactical Software Control Site (TSCS) was begun in 1970. The TSCS will eventually comprise two separate systems of PAR and MSR sensor equipment, data processing hardware for each, and some communications equipment. This will essentially duplicate a tactical site. A "basic TSCS" became operational in May 1970 with a minimum hardware data processor configuration. A new building was under construction in Madison, NJ (scheduled for completion in April 1972) which will house the total PAR and MSR TSCS equipment.

Multiprocessor operation of SAFEGUARD data processing hardware was successfully demonstrated in FY 70, both at the SAFEGUARD Data Processing Laboratory and at the Meck missile site data processor. Four processors were installed at Meck in November 1969, and computer throughput, using one, two, three and four processors was subsequently measured.

Meck-Zero software, providing checkout of the MSR, its data processor, and the SAFEGUARD missiles as an integrated system, was delivered to Meck in early FY 70. Meck-Zero testing was essentially completed by February 1970. All Meck-1 software processes were delivered to Meck by December 1969 in preparation for the commencement of system testing in April 1970.

Turning now to SAFEGUARD site deployment, FY 70 saw the commencement of construction at both the Grand Forks, ND and Malmstrom, MT sites. Selection of the sites in these areas was publicly announced in October 1969 and field offices were opened at both locations.

On 31 Mar 70, Morrison-Knudsen Company and associates were awarded a contract for $137,858,850 for construction of the PAR, the MSR, their associated

power plants and certain other support facilities at the Grand Forks site. Three bids were received for this competitive award, ranging from the winning low bid of $137.8 million to a high of $181.2 million. Ground was broken at the PAR site on 6 Apr 70.

It was decided to award advance construction contracts for the Malmstrom site, rather than a single large contract, in order to match schedule requirements with available funds. Advance work such as excavation, access roads, and base slabs for the tactical buildings commenced in May 1970; follow-on contracts were planned for award in April 1971. The Watson Construction Company was the successful low bidder ($3.4 million) for initial construction at the MSR site. A contract in the amount of $4.7 million was awarded to the joint venture of H. C. Smith Company and Amalco Corp. for initial work at the PAR site. These contracts were awarded on 4 May and 19 May 70, respectively, and ground breaking took place shortly thereafter at the Malmstrom site.

TEST FIRINGS OF THE SPRINT MISSILE
(NOVEMBER 1965 THROUGH MAY 1970) (U)

TYPE & SERIAL NO OF MISSILE	DATE	OBJECTIVES & RESULTS
FLA-1 (Flight 1)	17 Nov 65	The first guided flight of the SPRINT missile. The test verified compatibility of the eject and flight systems, missile in-flight communications, and the ability of the guidance and control systems, structure, heat shield, and motors to perform in actual flight environments. A maximum velocity of 10,223 fps at 10,000 feet altitude was achieved.
FLA-2 (Flight 2)	25 Jan 66	Launch eject and first and second stage burning appeared normal; however, pitch-over angle was greater than predicted. Planned dive commands were transmitted at 5.2 seconds and initiation of dive was visually observed. Malfunction of missile autopilot resulted in self destruct at 5.85 seconds.
FLA-3 (Flight 3)	15 Mar 66	Launch order was given, but the flight was aborted due to a major alarm generated by the failure of thrust vector control (TVC) valve No 3 to close in the allotted time during the launch sequence. An in-cell explosion occurred approximately 23 minutes later as a result of heat generated by the normal firing of the missileborne gas generators. The missile and cell were completely destroyed. The cell was to be rebuilt, with the target date for completion January 1967.
FLA-4 (Flight 4)	3 May 66	The missile impacted 1200 feet north and east from the launch site. Telemetry records indicated that feedback signals from TVC valves 2, 3, and 4 were lost at certain time intervals. The crater caused by the impact was approximately 30 feet wide and 7 feet deep, and the south side of the hole showed evidence of an explosion.

TYPE & SERIAL NO OF MISSILE	DATE	OBJECTIVES & RESULTS
FLA-5 (Flight 5)	2 Aug 66	The missile departed radically from the planned trajectory and the flight safety system automatically destroyed it at 2.035 seconds. However, the test objectives of the eject and first stage propulsion systems were met, and operation of the flight safety system autodestruct mode was demonstrated for the first time. The flight path error was due to a malfunctioning rate gyro.
FLA-6 (Flight 6)	3 Nov 66	The flight was prematurely terminated at 0.960 seconds. When the first stage motor dome ruptured, the missileborne flight safety system operated and segmented the missile. Early failure prevented accomplishment of all but eject, launch phase, and initial pitchover objectives.
FLA-9 (Flight 7)	18 Apr 67	Eject, velocity, and pitchover of the missile appeared normal. However, the flight was terminated at 4.5 seconds. Recovered parts showed evidence of some burning inside the second stage aft skirt.
FLA-10 (Flight 8)	23 May 67	First stage flight, including pitchover, appeared normal. Separation and second stage ignition occurred, but the flight was terminated early in the second stage. A telemetry loss at 3 seconds resulted in the Target Intercept Computer automatically transmitting a destruct signal at about 4 seconds.
FLA-8 (Flight 9) (Planned)	27 Jun 67	The missile was counted down to launch, but did not eject from the cell. The flight was aborted because thrust vector control valve No 2 did not close within its allotted time. Slow thrust vector control valve closure was also the reason FLA-3 was aborted.

TYPE & SERIAL NO OF MISSILE	DATE	OBJECTIVES & RESULTS
FLA-8 (Flight 9)	18 Jul 67	Flight was terminated at 4.433 seconds. Missile performance during eject, first stage flight, and up to second stage tail-off was essentially as predicted. Test objectives achievable within the time frame of missile flight were all met.
FLA-11 (Flight 10)	8 Aug 67	This test was completely successful, with the entire trajectory very close to that predicted. This was the first missile to execute successfully a second stage maneuver command.
FLA-13 (Flight 11) (Planned)	28 Aug 67	Launch was attempted but aborted. The squibs for the gas eject generator mal-functioned.
FLA-12 (Flight 11)	19 Sep 67	The launch sequence through first stage burnout appeared normal; however, flight was prematurely terminated shortly after two seconds. Termination was due to failure in the missile guidance set which triggered fail-safe.
FLA-7 (Flight 12)	10 Oct 67	The first SPRINT flight using the closed loop guidance. The flight was fully successful and accomplished the first intercept of a space point, at an altitude of 20,000 feet.
FLA-14 (Flight 13)	31 Oct 67	The missile in-flight performance was essentially as predicted and all flight objectives achieved.
FLA-15 (Flight 14)	20 Nov 67	After a normal countdown, checkout and launch, the flight was terminated prematurely during second stage burning at roughly 7 seconds after launch order. Investigations indicated that one of the Target Intercept Computers failed to correctly interpret the SEMTR data.

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TYPE & SERIAL NO OF MISSILE	DATE	OBJECTIVES & RESULTS
FLA-13 (Flight 15)	11 Dec 67	Eject, first stage ignition, separation and second stage ignition occurred as planned, and full missile flight time was achieved. All planned orders were transmitted with the missile responding as programmed.
FLA-16 (Flight 16)	5 Feb 68	The flight was prematurely terminated just after first stage separation. A computer programming error resulted in erroneous gain commands and subsequent system instability which caused missile breakup.
FLA-17 (Flight 17)	26 Feb 68	Flight through planned destruct, including three planned maneuvers, appeared flawless. This was the first flight to use the tactical cell closure and tactical second stage motor. The flight also demonstrated the ability of the interceptor to respond to maneuver commands within specified time limits.
FLA-18 (Flight 18)	25 Mar 68	The missile ejected and first stage ignited. Pitchover was initiated as planned but not terminated; the missile completed a full loop and impacted the ground nose-first, approximately 500 yards north of the launcher.
FLA-19 (Flight 19)	22 Apr 68	Ejection and first stage ignition, pitchover, and first stage flight appeared normal. Separation did occur but apparently involved a transient and early second stage ignition. The flight terminated at 2.44 seconds when flight safety destruct occurred.
FLA-20 (Flight 20)	27 Jun 68	This was a full duration flight, with all test objectives successfully accomplished. The trajectory was designed to subject the missile to the most severe thermal environment possible at WSMR. As part of the planned

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TYPE & SERIAL NO OF MISSILE	DATE	OBJECTIVES & RESULTS
		experiment, the missile tumbled 2 1/2 times end over end before destruction. The condition of the recovered hardware indicated that this maneuver minimized impact damage.
FLA-21 (Flight 21)	29 Jul 68	A successful flight, achieving all objectives. The S-band telemetry system, in its first flight test, provided data throughout the flight.
FLA-22 (Flight 22)	22 Aug 68	This flight was designed to demonstrate missile structure and control system integrity through the intercept of a space point and to determine missile response to a switch plane maneuver.
FLA-23 (Flight 23)	9 Sep 68	This flight provided a severe test of the missile hydraulic system; pressure readings showed that the system functioned normally and full control capability was maintained.
FLA-24 (Flight 24)	8 Oct 68	The objectives of demonstrating the missile's structural and control system integrity through the intercept of a space point, were fully achieved.
FLA-25 (Flight 25)	28 Oct 68	Designed primarily as a missile control system endurance test, the missile responded as predicted to cyclic commands issued to test the endurance of the hydraulic control system.
FLA-26 (Flight 26)	2 Dec 68	The flight was prematurely terminated at approximately 2.3 seconds. Flight termination resulted from a malfunction in the missile autopilot, causing the pitchover angle to increase to 92.9 degrees from vertical versus 38 degrees predicted. FLA-26 autopilot was recovered in good condition.

TYPE & SERIAL NO OF MISSILE	DATE	OBJECTIVES & RESULTS
FLA-27 (Flight 27)	10 Feb 69	This was the first of three staging experiment flights to verify wind tunnel test data by a controlled staging maneuver which was accomplished by introducing moderate sized vane deflections and staging transients. All flight objectives were successfully achieved.
FLA-30 (Flight 28)	17 Mar 69	Performance of this flight was as predicted from launch until approximately 8 seconds into the flight. A rupture of the second stage gas generator then caused loss of missile control.
FLA-28 (Flight 29)	21 Apr 69	A successful flight designed to obtain aerodynamic and environmental staging data and to determine missile stability at second stage ignition. All objectives were achieved.
FLA-31 (Flight 30)	26 May 69	This flight provided a severe test of the missile hydraulic system. All objectives were achieved.
FLA-29 (Flight 31)	23 Jun 69	The third staging experiment flight designed to acquire environmental data resulting from second stage ignition at minimum separation distance. Missile responded properly to all commands and all flight test objectives were achieved.

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TYPE & SERIAL NR OF MISSILE	DATE OF FIRING	OBJECTIVES OF TEST FIRING & RESULTS
SPRINT FLT-32 (FLA-32)	22 Jul 69	Designed primarily to demonstrate an extended range controlled flight time duration of 51 seconds and to perform an overall evaluation of the MOD III System performance. No missile problems were experienced during the countdown and missile performance was as predicted from launch until end of programed flight. All flight test objectives were achieved.
SPRINT FLT-33 (FLA-35)	15 Sep 69	Designed primarily as a verification round of the MOD III Missile configuration and extended range flight time capability. No missile problems were experienced during the countdown and missile performance was as predicted from launch until end of programed flight. All flight test objectives were achieved.
SPRINT FLT-34 (FLA-36)	6 Oct 69	Designed primarily to obtain intermediate to high angle of attack data during the period of high Mach number environment. No missile problems occurred during the countdown. Missile failure occurred during the eject phase as an apparent result of eject piston dome rupture. The missile was destroyed at 2.436 seconds by RF destruct command. No missile test objectives were achieved.
SPRINT FLT-35 (FLA-38)	23 Oct 69	Designed primarily to obtain intermediate to high angle of attack data during the period of high Mach number environment. This test demonstrated the ability to sequentially countdown two missiles (FLA-38 and FLA-34) and to countdown a missile

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TYPE & SERIAL NR OF MISSILE	DATE OF FIRING	OBJECTIVES OF TEST FIRING & RESULTS
SPRINT FLT-35 (con.)		(FLA-34) after being subjected to the environment of a missile (FLA-38) launched from an adjacent cell. All desired aerodynamic data were obtained as the missile responded satisfactorily to all maneuver commands. All test objectives were achieved.
SPRINT FLT-36 (FLA-33)	6 Nov 69	Designed primarily to subject the warhead/adaption kit (WH/AK) unit to the extremes of the aerodynamic environment effects and to verify the functional integrity of the airborne telemetry system. No missile problems occurred during the countdown. Missile flight was normal until approximately 5 seconds when the missile experienced severe lateral accelerations resulting in missile breakup. Good warhead telemetry data was obtained until missile breakup.
SPRINT FLT-37 (FLA-34)	1 Dec 69	Designed primarily to subject the WH/AK unit to the extremes of the aerodynamic environment effects and to verify the functional integrity of the airborne telemetry system. Missile destruct occurred during launch eject as a result of eject piston dome failure, which was similar to that of FLA-36. The missile was destroyed at 12.3 seconds based on programed 5,000 ft. minimum altitude criterion.
SPRINT FLT-38 (FLA-39)	19 Mar 70	Designed primarily to test the WH/AK configuration consisting of an instrumental warhead and adaption kit with an associated airborne telemetry system. Terminated prematurely at 4.38 seconds when the missile experienced severe lateral accelcrations and subsequent structural breakup. The ability to launch the missile from RF test request was demonstrated.

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TYPE & SERIAL NR OF MISSILE	DATE OF FIRING	OBJECTIVES OF TEST FIRING & RESULTS
SPRINT FLT-39 (FLA-42)	7 May 70	Designed to obtain flight test data on the warhead section development and the evaluation of missile performance. The missile was aborted in the cell during the attempted launch due to noise recorded during the vane null check.
SPRINT FLT-39 (FLA-40)	28 May 70	Diagnostic flight to verify structural modifications of the missile and cell eject system as a result of previous warhead flights. Warhead type trajectories with maximum pitchover and "G" (acceleration) commands was utilized. All objectives were achieved.
SPRINT FLT-40 (FLA-44)	8 Jun 70	Designed to perform flight test of the Block II WH/AK configuration consisting of an instrumented WH and AK with an associated airborne telemetry system. No missile problems occurred during the countdown. All flight test objectives were achieved.
SPRINT FLT-41 (FLA-43)	29 Jun 70	Designed primarily to subject the WH/AK system to a severe inflight environment. No problems occurred during countdown. All flight test objectives were achieved.

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TEST FIRINGS OF THE SPARTAN MISSILE
(MARCH 1968 THROUGH DECEMBER 1969) (U)

TYPE & SERIAL NO OF MISSILE	DATE	OBJECTIVES & RESULTS
KT-01 (800003)	30 Mar 68	The first SPARTAN flight, with all test objectives achieved. The missile response to guidance commands was normal; second stage burnout was completed at 23.8 seconds and the missile left the atmosphere, after which third stage separation and performance were as programmed. At 208 seconds into the flight, the HPU turbine failed structurally. The flight was terminated at 277.7 seconds.
KT-02 (800004)	22 May 68	In the second SPARTAN flight, the missile followed the long range, medium altitude, atmospheric trajectory planned. The flight was terminated at 134.6 seconds as a result of the planned activation of the manual destruct system.
KT-03 (800005)	7 Aug 68	The third full-duration flight of the SPARTAN missile. All objectives were achieved during the endoatmospheric test in a total of 152.5 seconds flight time. The modified ZEUS DM15C hydraulic power unit, flown as an interim measure pending availability of the tactical design, performed satisfactorily.
KT-04 (800007)	16 Sep 68	This flight was unsuccessful due to malfunction in the fin position demodulator, causing uncontrolled oscillations in the yaw control system shortly after second stage motor ignition. Destruct was accomplished by a discrete command from the SPARTAN Guidance Computer at 18.55 seconds.
KT-05 (800006)	21 Nov 68	Only a few of the planned objectives were attained in this flight, due to premature destruct, at 13.8 seconds. Failure occurred in the aft end of the second stage.

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TYPE & SERIAL NO OF MISSILE	DATE	OBJECTIVES & RESULTS
KT-06 (800008)	6 Feb 69	The purpose of the test was to evaluate thermodynamic integrity of the missile, overall missile performance, and subsystem operation during a medium range, low altitude, atmospheric trajectory flight. First and second stage motors performed normally, third stage motor was not ignited. All flight objectives were successfully achieved.
KT-07 (800009)	22 Mar 69	Test was aborted during launch countdown due to a battery failure. This missile will be returned to the contractor for checkout; to avoid delay, Missile No 800010 will be used for KT-07.
(800010)	25 Apr 69	All flight objectives were achieved in this test to evaluate two stage missile thermodynamic integrity and overall inflight missile performance and subsystem operation on a long range, medium altitude atmospheric trajectory.
KT-08 (800009)	18 May 69	A successful flight test to evaluate overall performance on a long range, medium altitude, exoatmospheric trajectory. The end of the planned flight occurred at 403 seconds at a range of 395 nautical miles.
KT-09 (800011)	4 Jun 69	Only a few of the objectives were achieved due to premature termination of this flight at 15.1 seconds. Malfunction of the hydraulic pumping unit gas generator shut-off valve initiated the sequence of events that led to missile destruct.

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TYPE & SERIAL NR OF MISSILE	DATE OF FIRING	OBJECTIVES OF TEST FIRING & RESULTS
SPARTAN KT-10 (Msl 800013)	16 Jul 69	Designed to evaluate the overall inflight missile performance and subsystem operation on a medium altitude, long range, exoatmospheric trajectory. The missile flew on the intended trajectory, and all flight objectives were achieved.
SPARTAN KT-11 (Msl 800014)	31 Jul 69	Designed to evaluate the overall missile performance and subsystem operation on a long range, low altitude, exoatmospheric trajectory and to provide environmental data for application to warhead development. All missile development and warhead system measurement objectives were achieved.
SPARTAN KT-12 (Msl 800012)	13 Aug 69	Test was conducted unsuccessfully. The first stage motor ignition was prevented during the launch countdown sequence. An inspection of the missile hardware revealed that the explosive harness connections had been interchanged between the HPU and the third stage motor. This resulted in the third stage motor being ignited when the HPU ignition signal was sent.
SPARTAN KT-13 (Msl 800016)	17 Oct 69	Designed to all-systems test of the two stage missile configuration in the atmospheric mode and to evaluate the warhead/adaption kit (WH/AK) in a severe atmospheric heating environment. All missile, WH, and AK objectives were achieved.

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TYPE & SERIAL NR OF MISSILE	DATE OF FIRING	OBJECTIVES OF TEST FIRING & RESULTS
SPARTAN KT-14 (Msl 800015)	25 Nov 69	Designed to evaluate the thermodynamic integrity and overall performance of the missile during a long range, medium altitude, atmospheric trajectory. The flight was terminated at 211 seconds after completion of all missile test objectives.
SPARTAN KT-15 (Msl 800017)	15 Dec 69	Designed to evaluate the performance and subsystem missile operation and to obtain flight environment data on WH section dynamic components during a long range, medium altitude, exoatmospheric trajectory. The flight was terminated at 440 seconds after achieving all missile, WH, and AK objectives. This was the last of the programed SPARTAN development flights.
SPARTAN M1-1 (Msl 800018)	14 Apr 70	Designed to verify that the MSR and associated MSDP was capable of guiding a missile through a predetermined space point. Missile launch occurred with system performance approximately as predicted until 19.1 seconds into flight. Although MSR/missile objectives were demonstrated to a certain degree, the mission objectives were reassigned to mission M1-1A.
SPARTAN M1-1A (Msl 800019)	24 Jun 70	Designed to demonstrate the ability of the MSR, MSDP, and SPARTAN subsystem to work together in launching and guiding a SPARTAN missile to a space point. All primary and secondary mission objectives were achieved.

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Key Dates on BMD Designations and Organization

March 1955	NIKE II study contract with the Western Electric Company originated.
February 1957	Army awarded WECo/BTL contract for R&D effort on an anti-ICBM system, changing its name from NIKE II to NIKE-ZEUS. NIKE-ZEUS effort until 1962 under the Army Rocket and Guided Missile Agency (ARGMA), with work performed by functional directorates of the Army Ordnance Missile Command.
1 Aug 62	A separate NIKE-ZEUS Project Office was established under the Army Missile Command.
5 Jan 63	NIKE-ZEUS reoriented to a new approach, to be called NIKE-X.
13 Feb 63	NIKE-ZEUS Project Office made a Class II activity under the Army Material Command, removing the project from MICOM jurisdiction.
1 Feb 64	NIKE-ZEUS Project Office redesignated NIKE-X Project Office.
28 Sep 66	NIKE-X System Manager appointed.
18 Sep 67	SECDEF announced decision to proceed with limited deployment of an ABM system.
15 Oct 67	U.S. Army Corps of Engineers, NIKE-X Division established, with BG Robert P. Young named Division Engineer.
3 Nov 67	DOD redesignated NIKE-X the SENTINEL System.
15 Nov 67	All personnel and resources of the NIKE-X P.O. transfered to the SENTINEL System Command. SENSO established under DA, and the SENSM was named assistant to the Army Chief of Staff for all SENTINEL matters.
15 Apr 68	The SENTINEL Logistics Command (SENLOG) was organized as a major subordinate command of the USAMC.
14 May 68	By Memo of Agreement, the U.S. Army Engineer Division, Huntsville, was placed under operational control of the SENTINEL System Manager.

30 Jun 68	The NIKE-X Development Office (NXDO) was established as a Class I activity of the Office of the Chief, Research and Development, as the field office of the U.S. Army Advanced Ballistic Missile Defense Agency.
25 Mar 69	The SENTINEL BMD System was reoriented to the SAFEGUARD BMD System.
1 May 69	The NIKE-X Development Office was redesignated the Advanced Ballistic Missile Defense Agency, Huntsville (ABMDAH).