May 2012

ED: These papers are from the old WECO/ATT Field Engineering "Blue Book" that I had for many years. This data will not be found in general publications, for the most part. The Germans copied most of the book which I retained as classified then, so this stuff, though old data, is still applicable to some extent.

KEN

CHRONOLOGY OF THE NIKE-HERCULES RESEARCH AND DEVELOPMENT PROGRAM

- - - - - 1951 - - - - -

July (5) — Office Chief of Ordnance (OCO) requested feasibility study on the defense against formations of aircraft by use of Corporal in conjunction with T33 or Nike-Ajax system.

July (30) — Conclusions were reached by Bell Telephone Laboratories (BTL) that neither T33 nor Nike-Ajax were feasible to mate with Corporal.

- - - - - 1952 - - - - -

October (9) — Feasibility study requested by OCO for integration of an atomic warhead into the Nike-Ajax missile system. This proposal was considered feasible, with reservations, both for the Nike-Ajax missile and for a larger-diameter missile that would make more efficient use of fissionable materials.

- - - - - 1953 - - - - -

February — Nike-Hercules missile study begun under Nike-Ajax Research and Development (R & D) contract.

March (16) — BTL-OCO conference held to discuss Nike-Hercules Development Program. R & D Board and the Joint Chiefs of Staff had approved the Army requirements for Nike-Hercules.

June (19) — Nike-Hercules program reviewed by Army General Staff G-3 and G-4, Office Chief of Army Field Forces, OCO, Western Electric Co., and Bell Telephone Laboratories at Washington, D. C. Objectives of the Nike-Hercules program were defined as:

1. Development of a new missile to carry a large warhead for use with Nike-Ajax ground guidance and control equipment essentially unmodified.
2. Study of the possibilities of extended range of the Nike-Ajax ground guidance and control equipment to utilize fully the range capabilities of the new missile (including a possible secondary role as a surface-to-surface system).

July (16) — The Nike-Hercules project was authorized by OCO.

October (20 and 21) — Contractor representatives made an oral presentation of the results of Nike-Hercules system studies. Principle topics discussed were:

1. Possible configurations for the Nike-Hercules missile.
2. Ground equipment changes for the 25-mile version of the missile. It was estimated that these changes would cost about 9-1/2 per cent of the original Nike-Ajax ground equipment investment.
3. A long-range (50-mile) version of Nike-Hercules. A cost estimate for the program was given as 21 per cent of the original Nike-Ajax investment.
4. Possibilities of incorporating surface-to-surface capabilities.

- - - - - 1954 - - - - -

First Quarter — Authorization given to:
1. Develop a Nike-Hercules missile capable of carrying a 30-inch diameter, 1200-pound payload.
2. Modify a production Nike-Ajax system for testing the 25-mile Nike-Hercules missile at White Sands Missile Range.
3. Continue study on a long-range version of the Nike-Hercules missile.

February (26) — Oral survey of the Nike-Hercules system given by the contractor at the Pentagon Building, Washington, D. C. at the request of the Committee on Guided Missiles of the Department of Defense.

March (23) — A meeting was held at Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland, for the purpose of coordinating the efforts and fixing the responsibilities of the various agencies concerned with the development of the Nike-Hercules cluster warhead.

April (23) — Oral report on surface-to-surface role of Nike-Hercules given to Sergeant Steering Committee.

Second Quarter — Authorization given to:
1. Develop ground equipment models for extended-range (50-mile) version of Nike-Hercules.
2. Continue study of a single-stage solid propellant missile.
3. Investigate the problem of increased accuracy against ground targets.

August (17-20) — Second Nike-Hercules planning conference was held at White Sands Missile Range.

Third Quarter — Authorization given to contractor to construct a second experimental model of the Nike-Hercules ground guidance and control equipment for development use at Bell Telephone Laboratories, Whippany, N.J.

- - - - - 1955 - - - - -

January — First R & D firing test.

April (29) — Authorization for five prototype systems.

April (29) — Authorization for Charlotte missile production.

November (30) — Authorization for production of Nike-Hercules ground equipment.

December — Completed preparation of manufacturing information.

White Sands Missile Range Firing Summary

Twenty Nike-Hercules rounds fired with modified Nike-Ajax ground guidance equipment using Bathtub guidance sections.

- - - - - 1956 - - - - -

January — First Nike-Hercules missile fired from modified Nike-Ajax R & D system at White Sands Missile Range.

March — Delivery of Nike-Hercules model #1 to White Sands Missile Range.

July (25) — First Nike-Hercules missile fired using a Nike-Hercules missile system.

Third Quarter — First prototype (Santa Monica) missile delivered.

November (30) — First Nike-Hercules prototype system (#1) delivered to BTL.

White Sands Missile Range Firing Summary

Eight firings with modified Nike-Ajax ground equipment.

Four firings with internal programmer.

Fifteen firings with Nike-Hercules ground equipment.

(All firings with Bathtub guidance sections, except two firings with Stovepipe guidance sections. All system test rounds in surface-to-air mode.)

- - - - - 1957 - - - - -

January — First prototype (#2) Nike-Hercules system delivered to the Army.

June — Installation of prototype system at White Sands Missile Range.

June (30) — First production system delivered to the Army.

White Sands Missile Range Firing Summary

QB-17 drone kill, 2/6/57, 9000-foot altitude MSL, 20,000-yard range.

QF-80 drone kill, 4/25/57, 9000-foot altitude MSL, 25,000-yard range.

QB-17 drone kill, 9/11/57, 6300-foot altitude MSL, 50,000-yard range.

First solid propellant missile, 3/13/57.

First production-type missile fired, 7/12/57, with Nike-Hercules prototype system #1.

First successful surface-to-surface round, 8/21/57.

First low altitude round, 9/11/57.
(Drone destroyed by direct contact.)

First article inspection round, 11/27/57.

Four surface-to-surface rounds (three successful).

Four low-altitude rounds (two successful).

Five T45 warhead rounds.

Six cellular launcher tests.

- - - - - 1958 - - - - -

January — Delivery of first production (Charlotte) missile.

June — First tactical deployment.

White Sands Missile Range Firing Summary

Three surface-to-surface rounds (all successful).

First flight test of Charlotte production missile successful (also first article inspection round), 4/30/58.

First T46 warhead round, 4/2/58.

First live T46 warhead round, 6/25/58.

Project Ammo demonstration round successful, 7/1/58.

Series of eight rounds to demonstrate in-flight reliability — five fired from White Sands Missile Range, three fired from McGregor range, (seven successful) 7/58.

First Mushroom guidance section flight, 8/8/58, (successful).

Army Ordnance Association demonstration round, 10/9/58.

First flight against POGO drone successful, 11/6/58, 109,000-foot altitude MSL, 58,000-yard range, T45 warhead (drone killed).

First flight against Q-5 drone successful, 11/19/58, 60,000-foot altitude, 50,000-yard range, T45 warhead (drone killed).

NIKE-HERCULES TECHNICAL DATA

- - - - - 1959 - - - - -

January	HIPAR model at Whippany operational.
	Snowjet cold weather operational tests (Fort Churchill, Manitoba).
February	Experimental Dicke-Fix receivers (ECCM devices) installed in Washington-Baltimore Defense Area. (W-25)
April	Ordnance Design Characteristics Inspection of the Improved NIKE-HERCULES System.
May	Testing of Mobile Launcher model begun at White Sands Missile Range.
June	Quick Reaction Capability Program initiated to introduce electronic counter-countermeasure devices into NIKE systems on an expedited basis.
July	Analysis of Weapons System Evaluation Group Test No. 3 to evaluate NIKE performance in a heavy ECM environment presented to ARGMA.
October	Complete Improved NIKE-HERCULES System model at Whippany operational.
November	Development started as part of the HERCULES program on a multichannel ECCM receiver known as the Anti-Jam Display (AJD).

White Sands Missile Range Firing Summary

Two low-altitude rounds successfully fired at a grounded B-17 aircraft carcass for evaluation of the T-46 warhead, 1/7/59.

First flight against Matador drone successful, 2/6/59, 42,500-foot altitude, 48,000-yard ground range, T-45 warhead (drone killed).

QF-80 drone successfully intercepted at an altitude of less than 1000 feet, 2/18/59, 25,900 yard ground range, T-45 warhead (drone killed).

Flight against POGO-Hi target successful, 3/11/59, 156,000-foot altitude, 19,000-yard ground range, T-45 warhead (target killed).

Four rounds fired to demonstrate T-46 warhead tactical capability, 5/59 to 9/59 (all successful).

First firing from cellular launcher, 6/24/59 (successful).

Series of 16 successful rounds to demonstrate surface-to-surface capability — 9 fired from White Sands Missile Range, 7 fired from McGregor range, 7/59 to 9/59.

First round fired to test Transponder Control Group parachute recovery system, 8/28/59 (successful).

Q-5 drone flying at Mach 2.2 successfully intercepted, 10/16/59, 38,000-foot altitude, 47,000-yard ground range.

NIKE-HERCULES TECHNICAL DATA

- - - - - 1960 - - - - -

February	Whippany Improved NIKE-HERCULES Model participated in SIOUX ARROW I.
March	Proposed concept of mobility for the High Power Acquisition Radar (HIPAR) of the Improved NIKE-HERCULES System was prepared.
March	Anti-Jam Display (AJD) equipment installed in the S-band Acquisition Radar (LOPAR) at Whippany and tested in an ECM environment.
March	Whippany Improved NIKE-HERCULES Model operated as a Basic NIKE-HERCULES System participated in SIOUX ARROW II.
March	Prototype HIPAR accepted with the Improved NIKE-HERCULES Ground Guidance System by Army Ordnance (3/31/60).
April	Study on Cross-Country NIKE-HERCULES indicated feasibility to mount the Improved NIKE-HERCULES System on self-propelled, Goer-type vehicles.
April	Whippany Improved NIKE-HERCULES Model participated in SIOUX ARROW III.
April	Study completed which investigated the capabilities of the Basic and Improved NIKE-HERCULES System with certain modifications against attack by certain short-range ballistic missiles. (4/8/60).
→ April	First firings made from the prototype Improved NIKE-HERCULES System at White Sands Missile Range (4/14/60).
May	Whippany Improved NIKE-HERCULES Model participated in SIOUX ARROW IV.
→ June	Study made of an abbreviated NIKE-HERCULES System limited only to the surface-to-surface mode of operation.
June	Whippany Improved NIKE-HERCULES Model participated in SIOUX ARROW V.
July	Installation and checkout of the Manual Anti-Jam Display (AJD) for the Whippany Improved NIKE-HERCULES Model and the White Sands Missile Range Prototype HIPAR concluded.
November	Study concerning the feasibility of using a single HIPAR to supply acquisition data to a dual NIKE-HERCULES site completed.
December	Model kit for experimental installation of the MARK XII. IFF Interrogation System to selected NIKE-AJAX and NIKE-HERCULES Systems completed.

TWO MISSION MODES

White Sands Missile Range Firing Summary NIKE "B" = HERCULES (NIKE ONE I = AJAX)

HERCULES Missile (B-281) cold condition to -40°F. successfully intercepted a POGO Target. (2/5/60).

Four rounds (B-284, 285, 286, 293) fired in evaluation tests of the new low-altitude functions which were installed in the C-Station Computer. Three rounds were successful. One unsuccessful. (2/26/60, 2/26/60, 3/2/60, 4/26/60).

First firings from ZURF occurred; one AJAX Missile (660) fired in a successful system test of ZURF. (3/8/60). One HERCULES round (ZURF) also fired. (4/8/60)

Two firings (B-294, ZURF-6) made using cold-conditioned missiles. One successful intercept of a simulated target was made at 130,000 yards range, 64,000 feet altitude MSL. The other round unsuccessful. (5/17/60, 7/15/60).

AJAX missile successfully fired to evaluate miss distance indicator to be used in the HIGHBALL target program. (5/21/60)

First intercept by HERCULES missile (INH-2), equipped with a conventional T-45 warhead, of a CORPORAL missile at 26,500 feet MSL and a range of 52,000 yards. (6/3/60)

HERCULES (INH-4) intercepted a POGO-HT Target at an altitude of 101,000 feet MSL and a ground range of 52,000 yards. (6/15/60)

Six separate HERCULES missiles (INH-3,6,8,9,11,12) fired against six target HERCULES missiles. (6/15/60, 8/12/60, 8/17/60, 9/14/60, 10/6/60, 11/17/60)

Three HERCULES rounds (B-299, B-303, B-305) fired for the T-46 firing program. (7/6/60, 7/27/60, 10/12/60)

HERCULES missile (INH-5) successfully intercepted a Q-5 drone at 63,000 feet MSL and 72,000 yards ground range. (7/11/60)

HERCULES missile (INH-7) fired at a surface target 115,000 yards up-range. (8/17/60)

HERCULES missile (INH-10) successfully destroyed an XM-21 drone at the low altitude of 4500 feet above ground level. Ground range was 60,000 feet. (9/14/60)

- - - - - 1961 - - - - -

First quarter Strategic Air Command (SAC) developed a Radar Bomb Scoring field kit for use in NIKE Systems.

January HIPAR operating frequency band shifted from 1435 - 1535 MCS to 1427 - 1527 MCS.

SHOP 1-2 43 MFG-DEPOT AND DSU TEST EQUIP TRAILERIZED

January The design of Electronic Shop 3 (GS-58679) for the Improved NIKE-HERCULES Battery Type IV was placed into production.

February Whippany Model HIPAR modified to incorporate automatic Anti-Jam Display (HAJD) capability.

May Army Rocket and Guided Missile Agency requested that Bell Telephone Laboratories develop an Anti-tactical Ballistic Missile (ATBM) system.

June Feasibility study for operating one HIPAR with two NIKE-HERCULES Systems resulted in a modification kit to provide facilities for integrating a HIPAR into NY-49, a dual Improved NIKE-HERCULES site.

November — The "A" Frame Derick for use with the NIKE-HERCULES Field Army System mounted and tested.

November — Testing of the Improved NIKE-HERCULES HIPAR Anti-Jam Display (HAJD) successfully completed.

White Sands Missile Range Firing Summary

Six HERCULES missiles (SS-1 thru SS-6) fired in support of a surface-to-surface evaluation. (2/28/61 to 4/27/61)

HERCULES (INH-15) successfully intercepted Q2A drone at 4500 feet above terrain, 52,000 yards range. (3/10/61)

HERCULES round (INH-16) fired in the surface-to-surface mode to 100,000 yards ground range (3/21/61).

First GOER launch (B-314) at simulated ASM. (3/30/61)

HERCULES (INH-17) with T-45 successfully intercepted ECM-equipped Q2A drone at 27,000 feet above terrain, 96,000 yards range. (4/31/61)

Simulated radar-seeking missile target successfully intercepted by a HERCULES Missile (B-316) at 52,000 feet MSL and 58,000 yards ground range. (5/20/61)

Round (B-317) fired at a space point, 15,000 feet MSL and 30,000 yards ground range during verification that failsafe switches at station 136 would operate correctly. (6/14/61)

First firings from a GOER launcher in the surface-to-surface mode. Two missiles (B-320, 321) fired to a ground range of 154,000 yards. (9/20/61, 10/6/61).

HERCULES (INH-13) launched and successfully intercepted an ECM-Equipped XM-21 Drone at 22,000 feet MSL and 60,000 yards ground range. (11/17/61)

HERCULES round (INH-18) equipped with a Miss Distance Indicator (MDI) successfully intercepted a ballistic HIGHBALL II Rocket nose section at an altitude of 20,000 feet (MSL) and ground range of 54,000 yards. (11/20/61)

HERCULES round (INH-19) with T45 warhead fired against a Redstone missile under "Operation HARDNOSE." Intercept of the REDSTONE nose cone not accomplished. (12/5/61)

System Test Division (STD) Round 84HE successfully fired at a 66-foot diameter polyethylene balloon. (12/6/61)

Two HERCULES missiles (ZURF-13, 14) fired at space points as high altitude ballistic targets for NIKE-ZEUS System Demonstrations (12/12/61, 12/14/61)

- - - - - 1962 - - - - -

March — AOMC authorized the development of the Cross-Country NIKE-HERCULES HIPAR Program (3/6/62).

March — The HIPAR staggered PRF modification concluded.

April	General Electric began development of mobile HIPAR.
April	Static ECCM tests for the TRR completed and documented. (4/16/62)
June	Prototype Evaluation of the Improved NIKE-HERCULES System completed and documented.
June	Criteria established for an acceptable Cross-Country NIKE-HERCULES power distribution system. (6/26/62)
June	The Improved NIKE-HERCULES System implemented with the "Sync-loop" successfully beacon-tracked ZEUS missiles. (6/28/62, 7/31/62, 8/28/62)
July	The EFS modification installed in the prototype NIKE-HERCULES System at WSMR. — HIPAR ELECTRONIC FREQ SELECTION
August	Two brassboard kits of the lin-log receivers installed in the Prototype Improved NIKE-HERCULES System at WSMR for dynamic testing.
September	Ordnance documentation for ATBM System completed and approved by AMICOM. (9/28/62)
→ September	Production model of the ATBM modification (less HIPAR) installed in the improved NIKE-HERCULES Prototype System at WSMR. (9/22/62)
November	Installation of ATBM HIPAR Antenna into the Improved NIKE-HERCULES Prototype System at WSMR complete.
December	Development effort to provide Cross-Country capability to the NIKE-HERCULES System discontinued. (12/13/62).
December	Interim Mobile HIPAR proposed. (12/15/62)

White Sands Missile Range Firing Summary

Two HERCULES cold rounds (B-324, 325) successfully fired at space points. (1/12/62, 2/9/62)

System Test Division (STD) round 85HE successfully fired in the SS mode. (1/29/62)

STD round (FS-4) successfully fired at a 36-foot metalized parachute. (3/15/62)

HERCULES missile (ZURF-15) fired as high altitude ballistic targets from ZURF for NIKE-ZEUS System demonstrations. (3/28/62)

→ HERCULES missile (B-326) successfully fired in the SS mode at a target 154,000 yards distant. (5/12/62)

For evaluation of a new guidance section two HERCULES rounds (B-327, 328) fired on special "roller coaster" trajectories. The rounds were successfully fired at a test point 20,070 yards in range and zero altitude. (6/28/62, 8/16/62)

→ A HERCULES missile (B-330) and two special missiles successfully fired at a space point. Maximum altitudes attained were 280,000, 228,000, and 320,000 feet MSL respectively. (9/10/62, 8/28/62, 8/29/62)

NIKE-HERCULES TECHNICAL DATA

- - - - - 1963 - - - - -

February	Advanced HERCULES study program begun by BTL at the request of AMICOM.
February	Effort terminated on development of the NIKE-HERCULES GOER solid state power converter. (2/15/63)
March	NIKE-HERCULES participated in Project DOMINIC. ← JOHNSTON ISL.
April	BTL study on the NIKE-HERCULES Proposed Improvement Program was documented. (4/17/63)
April	Design requirements on Interim Mobile HIPAR finalized. (4/19/63)
April-May	Flight Tests conducted to evaluate HIPAR MTI Performance.
May	Design of vans for use with Mobile HIPAR completed.
June	Contractor directed by HERCULES Project Office at RSA to develop specific improvements to TTR, TRR, and HIPAR and conduct feasibility studies on an improved Battery Control Console and use of scan conversion.
July	R and D model of "Random/Program Frequency Selector" installed in the HIPAR at WSMR.
August	HIPAR Electronic Frequency Selection (EFS) modification kit installed in the WSMR HIPAR.
November	Design requirements for the Interim Mobile HIPAR finalized and released.

White Sands Missile Range Firing Summary

Instrumented HERCULES cold round (B-331) successfully fired at two space points 80,000 feet MSL, 130,000 yards ground range and 43,000 feet MSL, 167,000 yards ground range. (1/18/63)

A HERCULES round (B-332) fired at a surface target of 154,000 yards ground range to evaluate new missile guidance section components. Missile fail-safe at 123 seconds. (2/7/63)

The first missile (ATBM-1) of the NIKE-HERCULES ATBM Prototype System fired at a NIKE-HERCULES missile launched from the ZURF site. Event recorder miss distance was 738 feet. (4/3/63)

The nose section of a Pershing missile tracked after being released from a B-47. (5/17/63)

The second missile (ATBM-2) of the Prototype NIKE-HERCULES ATBM System intercepted a POGO target at an altitude of 101,000 feet MSL and a ground range of 30,000 yards. (5/11/63)

Four HERCULES missiles (ATBM-3, -4, -5, -8)fired from the HERCULES ATBM Prototype System against HERCULES target missiles. (5/17/63, 5/28/63, 6/5/63, 6/5/63)

Two HERCULES missiles (ATBM-6, -7) fired from the HERCULES ATBM Prototype System successfully intercepted a space point at a ground range of

80,000 yards and an altitude of 120,000 feet MSL. (6/26/63, 7/19/63)

A HERCULES missile (ATBM-9) with a T-45 warhead fired from the HERCULES ATBM site and successfully intercepted a HERCULES target missile at a ground range of 56,000 yards and an altitude of 65,000 feet. This was an Engineering/Service tactical firing test and was conducted by a military operating crew. (9/5/63)

HERCULES missile (ATBM-11) with a T-45 warhead successfully fired from the ATBM site against a REDSTONE missile. Intercept occurred at 45,000 yards ground range and an altitude of 40,000 feet MSL. (10/5/63)

Two HERCULES missiles (ATBM-12 and 13) successfully fired from a mobile launcher located 1000 yards from the MTR. (10/11/63 and 10/24/63)

First SERGEANT intercept by HERCULES (ATBM-14). (12/9/63)

HERCULES missile (ATBM-15) with a T-45 warhead fired against SERGEANT target missile. (12/18/63)

- - - - - 1964 - - - - -

March	The HIPAR portion of the ATBM Prototype Test Program at WSMR completed.
April	Douglas report prepared which described the technical and economic aspect of converting to a single-stage missile.
May	Development phase of the Mobile HIPAR program completed.
June	HIPAR MTI performance investigation completed and documented.
March	Contractor testing of Interim Mobile HIPAR System completed.
April	Implementation of AJD into WSMR EFS/ATBM HIPAR begun.
April	Modifications begun to increase radiated power of HIPAR transmitter.

White Sands Missile Range Firing Summary

First TECOM tactical SERGEANT intercept by HERCULES (ATBM-17). Intercept occurred at an altitude of 40,600 feet (MSL)and a ground range of 60,000 yards. (1/15/64)

First intercept of HONEST JOHN by HERCULES (ATBM-18)
Intercept at 23,000 yards ground range, altitude 20,700 feet (MSL) (1/21/64)

First TECOM tactical HONEST JOHN intercept by HERCULES (ATBM-19).
Intercept at 21,000 yards ground range, altitude 24,000 feet (MSL). (1/30/64)

HIPAR DESCRIPTIVE DATA (U)

TRANSMITTER SYSTEM	EFS HIPAR	EFS RETROFIT HIPAR	ATBM HIPAR
PRF	400 to 445 pps (fixed with moving target indicator (MTI) trigger)	Same	Same
Frequency range	1350 to 1450 mc (ten preset crystal-controlled frequencies, selected at battery control console or transmitter control cabinet)	Same	Same
Transmitter Tube type	Broadband Klystron Type ~~ZU-6801~~ 6803	Same	Same
Peak power	~~7.5~~ 10.4 megawatts	5.5 megawatts	~~7.5~~ 10.4 megawatts
Average power	~~19~~ 26 kilowatt (.00254 duty cycle)	14 kilowatts (.00254 duty cycle)	~~19~~ 26 kilowatts (.00254 duty cycle)
Pulse width	6 μsec	Same	Same
Transmitter frequency change time	Less than 90 μsec (During dead time before transmitted pulse)	Same	Same
TR tube			
Recovery time	Less than 100 μsec to 3 db down point	Same	Same
Insertion loss	0.7 db maximum	Same	Same
Duplexer tube			
Recovery time	105 μs	Same	Same
Insertion loss	0.3 db maximum (transmitting) 0.1 db maximum (receiving)	Same	Same
RECEIVING SYSTEM			
Receiver type	Low-noise broadband parametric amplifiers of the lower sideband, up-converter type (noise figure limit is 3 db) dual channel (main and auxiliary)	Same	Same
System noise figure (including front-end loss and sky noise)	5.5 db (maximum - either channel) 4.5 db (typical)	Same	Same

RECEIVING SYSTEM	EFS HIPAR	EFS RETROFIT HIPAR	ATBM HIPAR
Receiver bandwidth (Target channel)	200 kc	Same	Same
Receiver bandwidth (Strobe channel)	3 mc	Same	Same
Anti-jam features	Clutter gated noncoherent MTI, Dicke-Fix, Stagger PRF, fast automatic gain control (FAGC) electronic frequency selection	Same	Same
MDS			
Main receiver	-114 dbm	Same	Same
MTI receiver	-112 dbm	Same	Same
Auxiliary receiver	-102 dbm	Same	Same
Parametric amplifier dynamic range			
Main parametric amplifier	80 db	Same	Same
Auxiliary parametric amplifier	80 db	Same	Same
Parametric amplifier gain			
Main amplifier	45 ±3 db	Same	Same
Auxiliary amplifier	45 ±3 db	Same	Same
Image rejection	Spurious signal rejector of 60 db or more at ±10 mc from center frequency	Same	Same
FAGC noise level variation	Less than 2 db at the signal detector for a 60-db variation at the input of the narrowband amplifier with a recovery period of not more than 100 μsec.	Same	Same
STC signal range adjustment	Suppression adjustable from 0 to 80 db (STC time constant adjustable from 100 to 1500 μs) Range adjustable from zero to 40 nautical miles with a reduction of 12 db per octave.	Same	Same

NIKE-HERCULES, IMPROVED NIKE-HERCULES, AND NIKE-HERCULES ATBM MISSILE TRACKING RADAR HANDWHEEL CONSTANTS AND MAXIMUM TRACKING RATES (U)

	Type of Operation			
Coordinate	Manual	Aided Manual	Automatic	Slew
ELEVATION	34 mils/turn	0.465 - second time constant; 420 mils/second maximum	700 mils/second maximum	----
AZIMUTH				
A Scope	34 mils/turn	0.313-second time constant; 625 mils/second maximum	700 mils/second maximum	----
RANGE	200 yards/ turn	1.15-second time constant; 1000 yards/second maximum	1600 yards/second maximum	18,000 yards/ second maximum

MISSILE TRACKING RADAR - DESCRIPTIVE DATA (U)

NIKE-HERCULES

Pulse repetition rate	500 pps (HERCULES mode) 1600-2400 pps (AJAX mode)
Frequency range	8500-9600 mc
Power requirements (minimum)	Average power 79.4 watts Peak power 158.9 kw
Pulse width	0.25 μsec
Frequency tuning rate	50 mc/sec
Antenna type	Double dish cassigranian parabolic reflector consisting of feed, subdish, and polarizing filter
Antenna diameter	92 inches
Antenna gain	
Azimuth and elevation	37.5 db (midband) 2.5 db variation over the frequency band
Sum	44.1 db (midband) 0.7 db variation over the frequency band
Increase over NIKE-AJAX	4.8 db (midband, sum)
Antenna polarization	Vertical
Antenna efficiency	54% (measured/ideal, power gain for uniformly illuminated antenna of same size)
Beamwidth	1 degree azimuth and elevation
Receiver noise figure	11.2 db nominal, with input to converter, (includes noise source correction)
System noise figure	12.2 db nominal with input to converter +1 db preconverter losses (includes noise source correction)
IF preamplifier 60Mc	
Gain	24 db
Noise figure	3 db

MISSILE TRACKING RADAR - DESCRIPTIVE DATA (U) (continued)

NIKE-HERCULES

Tracking rates	
Automatic	Azimuth and elevation 700 mils/second maximum range 1600 yards/second maximum
Manual aided	Azimuth and elevation 700 mils/second maximum 1000 yards/second maximum
Slew	Range 18,000 yards/second
Presentation range	200,000 yards

NIKE-HERCULES TECHNICAL DATA

Improved NIKE-HERCULES

Pulse repetition rate	500 pps (HERCULES mode) 1600-2400 pps (AJAX mode)
Frequency range	8500-9600 mc
Power requirements (minimum	Average power 79.4 watts Peak power 158.9 kw
Pulse width	0.25 μsec
Frequency tuning rate	50 mc/sec
Antenna type	Double dish cassigranian parabolic reflector consisting of feed, subdish, and polarizing filter
Antenna diameter	92 inches
Antenna gain	
Azimuth and elevation	37.5 db (midband) 2.5 db variation over the frequency band
Sum	44.1 db (midband) 0.7 db variation over the frequency band
Antenna polarization	Vertical
Beamwidth	1 degree azimuth and elevation
Antenna cross-polarized gain	At least 26 db below nominal sum mode gain over the band
Receiver noise figure	11.2 db nominal with input to converter (includes noise source correction)
System noise figure	12.2 db nominal with input to converter +1 db preconverter losses (includes noise source correction)
ATR recovery time (6163 tube)	8 μsec maximum
IF preamplifier	
Gain	24 db
Noise figure	3 db
Receiver dynamic range (including AGC)	Greater than 95 db
Main IF amplifier, gain control range	Greater than 75 db

Tracking antenna capabilities in high winds (based upon 521 ft-lbs to counterwind torque and 7250 lb antenna weight)

TARGET TRACKING RADAR - DESCRIPTIVE DATA (U)

NIKE-HERCULES

Pulse repetition rate	500 pps
Frequency range	8500-9600 mc
Power requirements, minimum	26.9 watts average, 215.3 kilowatts peak
Power requirements, typical	250 kilowatts peak
Pulse width	0.25 μsec
Frequency tuning rate	50 mc/sec
Antenna type	Double dish Cassigranian parobolic reflector consisting of feed, subdish, and polarizing filter
Antenna diameter	92 inches
Antenna gain	
Azimuth and elevation	37.5 db (midband) 2.5 db variation over the frequency band
Sum	44.1 db (midband) 0.7 db variation over the frequency band
Increase over NIKE-AJAX	4.8 db (midband, sum)
Antenna efficiency	54% (measured/ideal, power gain for uniformly illuminated antenna of same size)
Antenna polarization	Vertical
Beam width	1 degree azimuth and elevation
Receiver noise figure	11.2 db nominal with input to converter (includes noise source correction)
System noise figure	12.2 db nominal with input to converter + 1 db preconverter losses (includes noise source correction)
IF preamplifier	
Gain	24 db
Noise figure	3 db
Tracking rates	
Automatic	Azimuth and elevation 700 mils/second maximum; range 1600 yards/second maximum.

Manual aided	Azimuth and elevation 700 mils/second maximum; range 1000 yards/second maximum
Slew	Azimuth 700 mils/second maximum; elevation 62 mils/second maximum; range 18,000 yards/second maximum
Handwheel constants	
Elevation	Manual 34 mils/turn; manual aided 420 mils/second maximum (0.465 second time constant)
Azimuth	Manual 34 mils/turn; manual aided 625 mils/second maximum (0.313 second time constant)
Range	Manual 200 yards/turn; manual aided 1000 yards/second maximum (1.15 second time constant)
Presentation range	200,000 yards

Improved And ATBM NIKE-HERCULES

Pulse repetition rate	400-445 PPS (HIPAR, long and short pulse) 500 PPS (LOPAR, long and short pulse)
Frequency range	8500-9600 mc (X - Band)
Power requirements, minimum	Short pulse 25.1 watts average power, 201.1 kw peak power Long pulse 177.8 watts average power, 142.3 kw peak power
Power requirements, typical	Short pulse 250 kw peak; long pulse 200 kw peak
Pulse width	0.25 and 2.5 μsec
Frequency tuning rate	50 mc/sec
Antenna type	Double dish Cassigranian parabolic reflector consisting of feed, subdish, and polarizing filter
Antenna diameter	92 inches
Antenna gain	
Azimuth and elevation	37.5 db (midband) 2.5 db variation over the frequency band
Sum	44.1 db (midband) 0.7 db variation over the frequency band
Beamwidth	1 degree azimuth and elevation
Antenna cross-polarization gain	At least 26 db below nominal sum mode gain over the band
Antenna polarization	Vertical
Receiver noise figure	10.2 db nominal with input to converter (includes noise source correction)
System noise figure	11.2 db nominal with input to converter + 1 db preconverter losses (includes noise source correction)
Receiver bandwidth	Long pulse, 0.8 mc (bandpass filter) Short pulse, 9.5 mc (main IF amplifier)
ATR recovery time (6163 tube)	8 μsec maximum
IF preamplifier	
Gain	Greater than 25 db
Noise figure	2.30 db
Receiver dynamic range (including AGC	Greater than 95 db
Main IF amplifier, gain control range	Greater than 75 db

Tracking rates	
Automatic	Azimuth and elevation 700 mils/second maximum; range 2600 yards/second maximum
Manual aided	Azimuth and elevation 700 mils/second maximum; range 2000 yards/second maximum
Slew	Azimuth 700 mils/second maximum; elevation 65 mils/second maximum; range 18,000 yards/second maximum
Handwheel constants	
Elevation	Manual 73 mils/turn; manual aided 420 mils/second maximum (1-second time constant)
Azimuth (B Scope)	Manual 440 mils/turn; manual aided 420 mils/second maximum (6-second time constant)
Azimuth (A Scope)	Manual 73 mils/turn; manual aided 420 mils/second maximum (1-second time constant)
Range (B Scope)	Manual 2100 yards/turn; manual aided 2000 yards/second maximum (6-second time constant)
Range (A Scope - long pulse)	Manual 700 yards/turn; manual aided 2000 yards/second maximum (2-second time constant)
Range (A Scope - short pulse)	Manual 175 yards/turn; manual aided 2000 yards/second maximum (0.5-second time constant)
Presentation range	200,000 yards
Tracking antenna capabilities in high winds (based upon 521 ft-lbs to counterwind torque and 7250-lb antenna weight)	
With an inflated radome the tracking antenna will safely operate without fairings in winds up to	75 mph (approx.)
With an inflated radome the tracking antenna will safely operate with fairings in winds up to	90 mph (approx.)
With uninflated radome the tracking antenna is subject to damage in winds exceeding	70 mph
With the radome inflated no damage is sustained in winds up to	100 mph

Ed
~~FENDER SKIRTS~~
ELEPHANT EARS