

Hi All;

I thought you might find the attached document of interest. It essentially gives a summary of the Nike R & D program efforts by the Bell Telephone Lab's White Sands Laboratory from 1946 to 1970.

Only one comment I have about the document, and that is on page 10 where it says "JUN 1959 - First firing from underground cell." We believe this refers to a launch from a launcher at the Under Ground Magazine, and not from a cell. We can find no underground cell and those that were around then do not remember there ever being one. I have serious doubts that the launch was from underground in the magazine. If so, that would have the last one. ;-))

This document was prepared by Richard W. Benfer, who was the head of the White Sands Lab, except for a three year period, from 1953 to 1970 when the lab closed.

Understand that the numbers of firings in the Bell document represents those conducted by the contractors. They do not include those fired by government organizations, such as the "Board Four" site operated by Fort Bliss troops. Nor, do they include those fired at Red Canyon Range Camp.

Unfortunately, he doesn't mention what I call the "Quantity-Distance" tests that was conducted. There were three magazines constructed, and we suspect a full load of missiles were blown up inside of one of the magazines and some missile topside and others below in the other magazine.

There were houses built equal distance (about 100 yards) from the magazines on all four sides. It appears they detonated the missiles in the magazines to determine the damage to the houses.

There may have been some radio active material involved, because they apparently removed about a foot of topsoil after the tests. One magazine remains at that location.

I suspect that the Quantity-Distance test was done while Benfer was in Kwajalein in the 60 to 63 time frame.

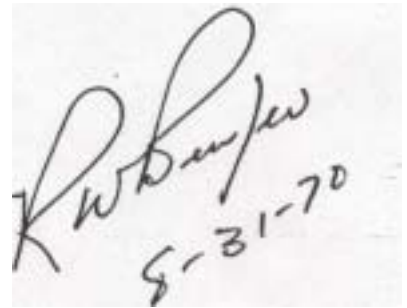
Doyle Piland

HISTORICAL INFORMATION

NIKE R&D PROGRAMS

WHITE SANDS MISSILE RANGE

1946 - 1970



K. W. Sawyer
5-31-70

MILESTONES - Early NIKE R&D SECTION II

- NIKE I - AJAX

FIRINGS - NIKE I - AJAX

MILESTONES - NIKE B - HERCULES SECTION III

MILESTONES - ZEUS - NIKE-X SECTION IV

MILESTONES - Multi-function Array Radar (MAR) SECTION V

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- Personnel Changes

- Personnel Transfers

RESIDENT CONTRACTOR ADMINISTRATORS SECTION VIII

WHITE SANDS MISSILE RANGE COMMANDING OFFICERS

SECTION I

SECTION II

EARLY NIKE R&D

- JUL 1945 - Publication of AAGM Report.
- SEP 1946 - First flight with cluster booster and dummy missile.
- OCT 1946 - First full powered flight with liquid sustainer motor.
- 1947 - Series of free flight firings for structure, booster, and aerodynamic data.
- 1948 - Series of free flight firings for propulsion and separation data. Single JATO booster replaces cluster.
- 1949 - Series of steerable flight tests with on-board programmer and telemetry for steering and roll control data.
- JAN 1950 - First controlled flight test with radar command guidance.
- 1950 - Series of guided flight tests by programmed and manual radar commands for control response and stability data.
- 1951 - Series of guided flight tests (closed loop) with first complete ground system including missile and target radars and computer.
- NOV 1951 - First full system test against QB-17 drone with token burst (spotting charge).
- DEC 1951 - Series of 3 system tests at ground targets and 15 system
MAR 1952 tests at drones to evaluate performance.
- APR 1952 - Series of 5 system tests with fragmentation warheads against QB-17 drones completing this phase of R&D program.

(Total of 92 firings)
(Plus 17 dummy rounds)

NIKE I - AJAX

- MAY 1951 - Publication of Surface-to-Air Guided Missile System report (NIKE I).
- APR 1952 - Series of firings to test tactical control system and
JUN 1952 lightweight 3-fin booster.
- JUL 1952 - First firing of production missile.
- NOV 1952 - Start of R&D tests with Prototype Ground Guidance system.
- Start of Engineer/User tests.
- OCT 1953 - Start of Army training firing at Red Canyon with production systems.
- JUL 1953 - Start of Ordnance Proof tests.
- DEC 1953 - First deployment of production system at defense site.
- 1954 - Continued firings in support of production, training
1955 and deployment. Includes cold weather tests at Ft.
1956 Churchill, Canada, and sea level tests at Salton Sea.
Also includes several-demonstrations against special targets.
- 1957 - Now known as NIKE AJAX, the firing program continued 1958 in support of production and in demonstrations of system performance and effectiveness.
- 1959 - Occasional batch firings in support of both AJAX and
and later HERCULES for special exercises and hardware qualification tests.
- OCT 1966 - Last firings of AJAX by contractor to shakedown HERCULES system modified for high "g" maneuver capability.

(Total of 743 firings including 92 early R&D, and 77 with special round numbers for demonstrations and other exercises.)

(Plus 17 dummy rounds.)

NIKE I - AJAX

<u>Year</u>	<u>Round #</u>	<u>Rounds</u>	
1946	1 - 6	6	Plus 3 Dummy
1947	7 - 13	7	Plus 5 Dummy
1948	14 - 30	17	Plus 9 Dummy
1949	31 - 33	3	
1950	34 - 59	26	
1951	60 - 73	14	
1952	74 - 157	84	
1953	158 - 263	106	Plus 49 Prototype
1954	264 - 412	149	
1955	413 - 497	85	Plus 5 Ft. Churchill
1956	498 - 566	69	
1957	567 - 616	50	Plus 21 Prototype & WWW
1958	617 - 643	27	
1959	644 - 659	16	
1960	660 - 666	7	
1961			
1962			
1963			
1964			
1965			
1966			2 special

SECTION III

NIKE B - HERCULES

- 1953 - Start of studies for Surface-to-Air defense against high performance targets.
- JAN 1955 - First firing - missile configuration included liquid fuel sustainer motor used in initial 58 missiles.
- 1955 - Series of firings for aerodynamic control data and
1956 shakedown of first model of ground guidance system.
- OCT 1956 - First system test against drone target.
- MAR 1957 - First firing with solid propellant motor (Round #57).
- APR 1957 - First intercept of drone target with R&D HERCULES system (Round #62).
- JUN 1957 - First delivery of production ground guidance system.
- AUG 1957 - First demonstration of surface-to-surface capability.
- APR 1958 - First delivery of production missiles. Start of full scale training program at McGregor Range.
- JUL 1958 - System demonstrations of weapon capabilities in Florida (Operation Snodgrass) and WSMR (Project AMMO).
 - First deployment at defense site.
- NOV 1958 - First warhead kill of high performance target (Q5 at MACH 3).
 - First warhead kill of high altitude target (POGO HI at 100,000 ft.).
- JUN 1959 - First firing from underground cell.
- SEP 1959 - First warhead kill of low altitude target (QF 80 at 1000 ft.)
- FEB 1960 - First demonstration of extreme range (200,000 yds.) surface-to-air role.
- MAR 1960 - First demonstration of extreme range (200,000 yds.) surface-to-surface role.

NIKE B - HERCULES

- 2 -

- JUN 1960 - First warhead kill of CORPORAL ballistic missile with Improved NIKE HERCULES system (INH).
- JUL 1960 - First warhead kill of Q5 at MACH 3 with INH system.
- AUG 1960 - First warhead kill of NIKE HERCULES as a ballistic target with INH system.
- SEP 1960 - First warhead kill of low altitude target (XM21) with INH system.
- MAR 1961 - First firing from mobile launcher (GOER). (Round #314)
- 1961 - Continued firings for production sampling and
1964 evaluation of added features to INH system.
- 1965 - Continued firings in support of INH system
1967 evaluation, Special Projects (Johnston Island) and high maneuver capabilities (Southeast Asia).
- AUG 1967 - Last firing.

(Total of 440 firings including 24 as targets, APR 1960 to SEP 1963.)

Targets engaged by HERCULES:

QF80
Q2 (Firebee)
Q5
POGO HI
XM21 (ECM)
QTM61 (Matador)
CORPORAL
HERCULES
REDSTONE
SERGEANT
HONEST JOHN

SECTION IV

ZEUS - NIKE-X

- OCT 1956 - Released results of study of defense against ICBM.
- FEB 1957 - Project ZEUS authorized.
- OCT 1958 - Start of site preparation for Acquisition Radar(ZAR).
- JUL 1959 - Start of site preparation for Target Track Radar(TTR).
- AUG 1959 - First firing (winged configuration).
- APR 1960 - First firing from underground cell.
- JUN 1960 - Only firing from unported cell.
- AUG 1960 - First firing (canard configuration).
- DEC 1960 - First firing with radar control (EMIR).
- JAN 1961 - Start of site preparation for Discrimination Radar (DR).
- JUL 1961 - First firing with ZEUS missile track radar control.
- SEP 1961 - First firing at Pt. Mugu.
- DEC 1961 - First system test against ballistic target (HERCULES).
- APR 1962 - First system test with warhead kit against simulated ICBM.
- NOV 1962 - First system test with 3rd stage jet-head control against simulated ICBM.
- DEC 1962 - Last firing at Pt. Mugu.
- JAN 1963 - Now known as NIKE-X.
- DEC 1963 - Last firing at WSMR.

(Total of 72 firings at WSMR and 19 firings at Pt. Mugu.)

- 1964 - Continued operation of TTR and DR for subsystem
- 1965 tests and re-entry measurements.

ZEUS - NIKE-X

- 2 -

- OCT 1965 - TTR and DR operations continue with ARPA funding in support of RONDO, HAPDAR, and the ATHENA re-entry measurements program.
- OCT 1966 - TTR and DR operations continue under direct ARPA contract.
- OCT 1968 - TTR and DR operations transferred from ARPA to ABMDA. Program funded and authorized through March 1970.
- SEP 1969 - Terminate TTR and DR operations.

SECTION V

MULTI-FUNCTION ARRAY RADAR
MAR

- 1962 - Development authorized on phased array radar.
- MAR 1963 - Start of site preparation at White Sands Missile Range.
- JUN 1964 - First "power on" and start of test program.
- SEP 1964 - First automatic track of missile target.
- MAR 1965 - Shutdown of transmitter for design changes. Receiver tests continue.
- OCT 1965 - First full power radiation from full array with rebuilt transmitter.
- DEC 1965 - Completed beam width measurements, radar range capability, and absolute track accuracy evaluation.
- OCT 1966 - First demonstration of autonomous multi-function operation tracking a satellite target.
- JUN 1967 - First demonstration of multiplex-frequency tracking of multiple targets (PERSHING).
- SEP 1967 - Completed demonstrations of continuous operation, CHAFF cloud survey, and fine frequency techniques. Terminated test program 9/30/67.

(SENTINEL Evaluation Agency continued operations at reduced level as a training facility through May 1969.)

SECTION VI

SPRINT

- 1963 - High acceleration missile proposed for close-in defense against ICBM.
- NOV 1963 - First firing of 4 slant launched vehicles for materials test-(MTV).
- 1964 - Modification of ZEUS ground control equipment and construction of launch cells for SPRINT.
- MAR 1965 - First firing of 2 slant launched vehicles for propulsion test (PTV).
- NOV 1965 - First firing of SPRINT.
- MAY 1966 - First test of dual plane pitchover.
- AUG 1967 - First demonstration of control system with 2nd stage maneuvers.
- OCT 1967 - First demonstrations of flight to primary and secondary design points.
- NOV 1967 - First demonstration of maximum maneuver.
- FEB 1968 - First firing with tactical cell closure.
- JUL 1968 - First demonstration of control response and endurance with maximum lateral acceleration.
- FEB 1969 - First firing of 3 rounds instrumented for staging data.
- 1969 - Firings scheduled to complete the staging experiments,
1970 flight tests of MOD III autopilot and MGS, demonstrate extended range, and flight tests of warhead sections.
- JUL 1969 - First firing MOD III extended range.
- NOV 1969 - First firing warhead kit.
- MAY 1970 - First firing MOD IV configuration.
- AUG 1970 - Last firing.

(Complete program will total 42 SPRINT firings and 6 materials and propulsion test vehicles.)

WHITE SANDS LABORATORY
SPRINT FIRINGS

<u>DATE</u>	<u>FLT</u>	<u>FLA</u>	<u>SECS</u>	<u>OK</u>	
11-17-65	1	1	5.1	X	Eject - ign - staging - FS
1-25-66	2	2	5.8		Breakup - pitch over timer
3-15-66	3	3			Exploded - TVC abort in cell
5-3-66	4	4	1.6		Dive to impact - wiring
8-2-66	5	5	2.0		TIC destruct - pitch gyro
11-3-66	6	6	1.0		1st stage motor rupture
4-18-67	7	9	4.4		Breakup - staging transient
5-23-67	8	10	3.2		Breakup - staging transient
7-18-67	9	8	4.4		2nd stage motor rupture
8-8-67	10	11	39.8	X	Control & response
9-19-67	11	12	2.9		Destruct - MGS fault
10-10-67	12	7	36.9	X	120/20 design point
10-31-67	13	14	32.5	X	60/40 design point
11-20-67	14	15	6.9		Destruct - TIC fault
12-11-67	15	13	32.3	X	Max g during 2nd stage
2-5-68	16	16	2.8		Destruct - TIC error
2-26-68	17	17	32.4	X	Control & response
3-25-68	18	18	2.1		Loop to impact - autopilot
4-22-68	19	19	2.4		Destruct - FS system fault
6-27-68	20	20	25.0_	X	High heat rate data
7-29-68	21	21	30.0	X	Control endurance
8-22-68	22	22	32.7	X	120/20 INCENTIVE
9-9-68	23	23	32.0	X	Control INCENTIVE
10-8-68	24	24	32.0	X	60/40 INCENTIVE
10-28-68	25	25	32.0	X	Control INCENTIVE
12-2-68	26	26	2.2		Destruct - autopilot
2-10-69	27	27	32.8	X	Staging data
3-17-69	28	30	25.9	X	60/40 INCENTIVE (8 secs only)
4-21-69	29	28	32.7	X	Staging data - max pitch over
5-26-69	30	31	32.6	X	Control INCENTIVE
6-23-69	31	29	32.4	X	Control INCENTIVE (staging data)

Total of 16 MOD I and 15 MOD II firings
plus 4 materials and 2 propulsion firings.

WHITE SANDS LABORATORY
SPRINT FIRINGS

<u>DATE</u>	<u>FLT</u>	<u>FLA</u>	<u>SECS</u>	<u>OK</u>	
7-22-69	32	32	59.3	X	1st MOD III extended range
9-15-69	33	35	72.6	X	Control & response
10-6-69	34	36			Broke up at eject
10-23-69	35	38	72.7	X	Control endurance
11-6-69	36	33	5.3		Destruct - controls
12-1-69	37	34			Broke up at eject
3-19-70	38	39	4.4		Destruct - controls
5-23-70	39	40	72.7	X	1st MOD IV configuration
6-8-70	40	44	72.7	X	Block II warhead kit
6-29-70	41	43	72.7	X	Block II warhead kit
8-12-70	42	45	72.0	X	Block I warhead kit

(Flight 42 completes the SPRINT
development firings at White Sands)

SECTION VII

WHITE SANDS LABORATORY
MANPOWER SUMMARY

	<u>Jan.</u> <u>1965</u>	<u>Jan.</u> <u>1966</u>	<u>Jan.</u> <u>1967</u>	<u>Jan.</u> <u>1968</u>	<u>Jan.</u> <u>1969</u>	<u>July</u> <u>1969</u>	<u>Jan.</u> <u>1970</u>	<u>July</u> <u>1970</u>
NIKE-X								
BTL (tech)	63	64	47	36	26	21	15	6
(dftg)	42	33	17	10	6	4	3	-
WECo	182	134	105	56	34	35	34	21
MMCo	8	74	75	61	51	50	37	22
CONTRACT	<u>71</u>	<u>37</u>	<u>27</u>	<u>17</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>
Sub-Total	371	342	271	180	118	112	90	51
HERCULES	66	60	72	24	25	5	3	2
DR/TTR / MILLSTONE		27	44	48	38	46	12	-
PARL				10	-	-	-	-
MAR					8	2	-	-
OTHER/UPSTAGE	<u>78</u>	<u>76</u>	<u>36</u>	<u>28</u>	<u>20</u>	<u>17</u>	<u>18</u>	<u>8</u>
Sub-Total	144	163	152	110	91	70	33	10
SUPPORT SERVICES								
BTL	17	20	18	12	10	7	7	4
WECo (service)	165	158	111	80	49	45	44	35
WECo (inst/shop)	82	61	33	27	13	12	8	4
CONTRACT	<u>110</u>	<u>113</u>	<u>108</u>	<u>66</u>	<u>46</u>	<u>46</u>	<u>44</u>	<u>40</u>
Sub-Total	<u>374</u>	<u>352</u>	<u>270</u>	<u>185</u>	<u>118</u>	<u>110</u>	<u>103</u>	<u>83</u>
GRAND TOTAL	889	857	693	475	327	292	226	144

MAR Full Power Array - Oct 65

DR/TTR to WECo ----- Oct 65

First SPRINT Firing -- Nov 65

Last HERCULES Firing----- Aug 67

Terminate MAR ----- Sep 67

Terminate HERCULES ----- Jun 69

Terminate SPRINT ----- Aug 70

Terminate DR/TTR ----- Sep 69

WHITE SANDS LABORATORY
NIKE-X MANPOWER SUMMARY

	<u>Jan. 1965</u>	<u>Jan. 1969</u>	<u>July 1969</u>	<u>Jan. 1970</u>	<u>July 1970</u>	<u>Est. Close-Out</u>
BTL - DIR	1	1	1	1	1	
HD	3	2	2	2	1	
SUPV	9	2	1	1	-	
MTS	18	6	5	1	-	
AMTS	11	4	3	3	-	
STA	12	10	8	6	3	
TA	5	1	1	1	1	
GSP	2					
PDT	7					
BTL Tech Sub-Total	<u>68</u>	<u>26</u>	<u>21</u>	<u>15</u>	<u>6</u>	(10/70)
BTL - DFTG	42	6	4	3	-	
WECo	182	34	35	34	21	(10/70)
MMCo	8	51	50	37	22	(8/70)
CONTRACT						
NMSU	4	(terminated 6/68)				
GE	10	(terminated 11/68)				
DES. SERV.	13	1	2	1	2	(8/70)
SRU	19	(terminated 9/67)				
LFS	4	(terminated 11/66)				
SYLV	21	(terminated 6/65)				
CONTRACT Sub-Total	<u>71</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	

WHITE SANDS LABORATORY

Depts. 6451-2-3
 Technical Personnel Changes

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
TRANSFER IN	5	2	2	1		
RECLASS IN	<u>1</u>	<u> </u>	<u> </u>	<u> </u>		
TOTAL IN	6	2	2	1		
TRANSFER OUT	4	11	11	9	7	12
RETIRE	2	1			2	3
EDUCATIONAL LEAVE	1	2	1			
RESIGN	3	5	1	1	2	
LAI D OFF	<u> </u>	<u> </u>	<u>1</u>	<u> </u>	<u> </u>	<u> </u>
TOTAL OUT	10	19	13	11	11	15
NET CHANGE	-4	-17	-11	-10	-11	-15
YEAR END COUNT	64	47	36	26	15	0

Dept. 6459
 Drafting Personnel Changes

TEMP. RETURNED	8					
TRANSFER OUT		7	6	3	2	1
RECLASS OUT	1					
RESIGN		9	1	1	1	
LAI D OFF	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>2</u>
TOTAL OUT	9	16	7	4	3	3
NET CHANGE	-9	-16	-7	-4	-3	-3
YEAR END COUNT	33	17	10	6	3	0

WHITE SANDS LABORATORY
645
PERSONNEL TRANSFERS

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
WHIPPANY	1 MTS	1 HEAD 1 SUPV 3 MTS 3 PDT 2 STA	3 SUPV 1 MTS 5 AMTS 1 DFTG	1 SUPV 3 MTS 1 AMTS		1 HEAD
KWAJALEIN	1 SUPV 1 AMTS		1 MTS		1 SUPV 1 MTS 1 AMTS	
HOLMDEL	1 HEAD		1 DFTG			
INDIAN HILL	1 AMTS 7 DFTG		(MERRIMACK VALLEY)			1 AMTS
AT&T			1 AMTS			1 STA
WINSTON-SALEM			1 DFTG			2 STA
BURLINGTON			3 DFTG	2 SUPV 1 MTS		
GREENSBORO				3 DFTG	3 STA 1 DFTG	
WEC _o				1 TA		1 NTS 1 STA 1 TA
DENVER					1 MTS 1 DFTG	1 SUPV 2 AMTS 1 STA 1 DFTG
TOTAL	<hr/> 4	<hr/> 18	<hr/> 17	<hr/> 12	<hr/> 9	<hr/> 13

SECTION VIII

WHITE SANDS LABORATORY
CONTRACTOR ADMINISTRATION

Bell Telephone Laboratories Technical

R. W. Benfer -----	9/53 - 9/60	
L. H. Kellogg -----	10/60 - 8/63	
R. W. Benfer -----	9/63 - 10/70	(est)

Bell Telephone Laboratories Staff

G. A. Sharpe -----	9/53 - 7/56	
W. D. Elliott -----	8/56 - 2/61	
G. W. Cosgrove -----	3/61 - 6/64	
W. L. Teulings -----	7/64 - 6/66	
H. W. Cosgrove -----	7/66 - 5/69	
G. A. Sharpe -----	6/69 - 3/71	(est)

Douglas Aircraft Company

W. L. Duval -----	/46 - 1/56	
E. L. Sorenson -----	2/56 - 8/58	
J. O. Robinson -----	9/58 - 4/59	
T. W. Stephens -----	5/59 - 12/60	
W. H. Branch -----	1/61 - 5/62	
R. G. MacEwan -----	9/62 - 5/63	
J. L. Cuba -----	6/63 - 12/63	
R. E. Mansfield -----	1/64 - 7/67	

Western Electric Company

C. W. Beard -----	9/53 - 5/54	
N. W. Scott)		
A. A. Miani)		
R. W. Schulte) -----	6/54 - 5/61	
D. F. Littlefield)		
J. E. Browne)		
F. Simon -----	6/61 - 8/64	
W. E. Ratcliff -----	9/64 - 5/67	
J. E. Dancy -----	6/67 - 5/69	
W. E. Ratcliff -----	6/69 - 1/71	(est)

Martin Marietta Company

W. E. Foster -----	5/64 - 4/65	
W. A. Bilott -----	5/65 - 7/67	
D. Meikle -----	8/67 - 7/70	

WHITE SANDS MISSILE RANGE
COMMANDING OFFICERS

COL. HAROLD R. TURNER	9 Jul 45 - 3 Aug 47
BRIG. GENERAL PHILIP G. BLACKMORE	4 Aug 47 - 31 Jan 50
BRIG. GENERAL GEORGE GAGE EDDY	1 Feb 50 - 14 Jun 54
BRIG. GENERAL WILLIAM L. BELL, JR.	1 Aug 54 - 31 Jan 56
MAJ. GENERAL W. E. LAIDLAW	1 Feb 56 - 30 Jun 60
MAJ. GENERAL JOHN G. SHINKLE	21 Jun 60 - 11 Jun 62
MAJ. GENERAL J. FREDERICK THORLIN	9 Jul 62 - 31 Jul 65
MAJ. GENERAL JOHN M. CONE	1 Aug 65 - 30 Mar 66
COL. KARL F. EKLUND (Acting Commander)	31 Mar 66 - 11 Oct 66
MAJ. GENERAL H. G. DAVISSON	12 Oct 66 - 31 Mar 70
MAJ. GENERAL E. H. deSAUSSURE	8 Apr 70 - 31 May 1972