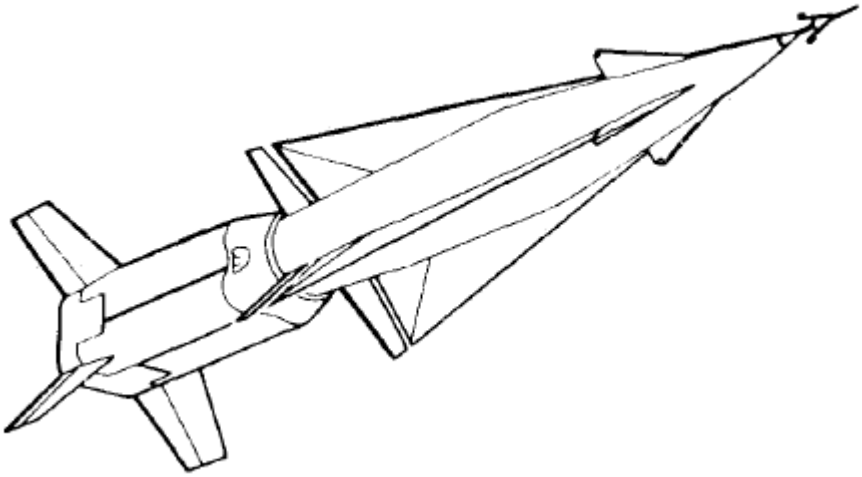
Nike Ajax and Hercules Plans and Records Collection, 1943 - 1978

GOGA 35344



Nike Hercules missile graphic from "Lesson 1. Introduction to the Improved Nike Herculese [sic] Missile System;" see appendix

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Table of Contents

Introduction

Acknowledgements

This collection's further arrangement would not have been possible without the dedicated work of John Martini, who performed initial description of this series from the Army Engineering Plans Collection: Forts Baker, Barry, Cronkhite, Funston, & Miley. I would also like to gratefully acknowledge Park Archivist Susan Ewing Haley and Assistant Archivist Amanda Williford; their guidance and advice have made this an excellent processing experience.

Golden Gate National Recreation Area

The Golden Gate National Recreation Area (GGNRA) was created in 1972 as the largest urban recreation area in the United States. The history and culture contained within span an extraordinary timeframe with a rich layering of themes and subject matter. There are five individual National Historic Landmarks and over 10 National Register properties in the park.

The park's holdings are diverse. Dramatic views of rural and urban environments lead to historic landscapes ranging from dairy ranches and seaside recreation sites. Golden Gate has been part of the homelands of Coastal Miwok and Ohlone people for thousands of years and still contains archeological sites and landscapes influenced by native land management. The park includes the most complete collection of military installations and fortifications in the country, dating from Spanish settlement in 1776 though the Nike missiles of the Cold War. Golden Gate contains eleven former Army posts whose military architecture and historic landscapes comprise the heart of the park.

Park Archives and Records Center

The National Park Service Archives and Records Center is located in a historic Army cavalry stable in the Presidio and has occupied this facility since 1995. The Center contains over 1,000,000 documents, photographic images, oral histories, and maps that document all areas and facets of the history associated with Golden Gate NRA from Spanish establishment of the Presidio in 1776 to the Indian occupation of Alcatraz Island in 1969, as well as the current activities of the park.

The Park Archives and Records Center houses a large collection of transferred Army records pertaining to the Presidio of San Francisco and surrounding military sites. NPS management of these Army records means that stewards have access to a continual line of information about the natural and cultural resources of lands formerly managed by the Department of Defense. The primary contents of this collection include over 50,000 engineering drawings and maps of military sites, individual buildings, and coastal defenses. The archives also holds many park historical collections and privately donated special collections, as well as managing the non-current records of the Golden Gate National Recreation Area. All archives are available for research use by the public.

Nike Ajax and Hercules Plans and Records Collection

Scope and Content

Title

Nike Ajax and Hercules Plans and Records Collection
Alternative title: Nike Plans and Records Collection

Dates

1943-1978

Collection Number

GOGA 35344

Creator

Most of the maps and plans were created for the Sixth Army, mainly by the U.S. Army Corp of Engineers for the Air Defense Artillery Division under the auspices of the Sixth Army Department of Public Works -- Engineering Branch. Real Property records were produced and collected by Sixth Army Real Estate Office/Master Planning Branch. Material subsequently described by the Presidio Archives and Records Center.

Volume

45 oversize folders (14 map drawers, about 2200 plans) and 6 linear feet (11 half record boxes and 2 small photo boxes)

Provenance

All materials were transferred from the Sixth Army Department of Public Works -- Engineering Branch to the National Park Service during the 1994 deactivation of the Presidio. The GOGA accession number was GOGA-2347, Army accession number ADPWE-006. Other non-GGNRA Nike site records were transferred to the US Army Corp of Engineers in Sacramento in 1997 and 2003.

Scope and Content Note

The Nike Ajax and Hercules Plans and Records Collection consists of architectural and infrastructural plans, mechanical and electrical diagrams, and real estate/property maps and records from Sixth Army Air Defense Artillery Division. While Nike was a national system, this collection mostly addresses sites now encompassed by the Golden Gate National Recreation Area: SF-51 (Milagra/Sweeney Ridge), SF-59 (Fort Funston), SF-87 (Fort Cronkhite), SF-88 (Fort Barry), SF-89 (Fort Scott), and SF-91 (Angel Island). The Real Property records contain textual property information on both GOGA and non-GOGA sites SF/T-10H, SF-25, SF-31, SF-51, SF-59C, SF/T-86, SF-87, SF-88, SF-90 and SF-93.

Significance

Today, Fort Barry's Nike site remains the only open and partially restored example of America's most widespread and expensive domestic missile defense system. This makes these plans and records all the more meaningful as support for the continued maintenance and rehabilitation of the Fort Barry site, the study of the cultural landscape of the Cold War, and the examination of 20th century missile development. The plans are also part of the larger documentation of the history of coastal defenses, including the Spanish and Mexican period Presidio, Civil War-era Fort Point and World War I and II artillery batteries all over the GGNRA.

Related Items and Collections

Please note that this list is not comprehensive. It is intended as an aid to researchers. For more complete information, contact the reference archivist. These items can be found on-site at PARC:

-*Nike Quick Look III* historical report: GOGA 10350
-Nike binder with maintenance list: GOGA 11122
-*San Francisco Chronicle* microfiche, "Our Nike Defenses," 1953-1974: GOGA 12429
-Bell Laboratories Nike Collection: GOGA 18441
-Nike Missile Manuals: GOGA 35386
-EMR -- Army Real Estate Records (in processing; please consult reference archivist)
-See photo binder by specific site for images of the Nike system
-Engineering Plans Collection: Forts Baker, Barry, Cronkhite, Funston, & Miley. *Note*: This is the source collection for which the Nike site plans were taken. While the finding aid notes that the Nike plans were a specific series and staff have reviewed all folders that might hold associated maps or plans (with reference to area name and building number) it is still possible that some related items remain. Please check this collection if you are having difficulty locating particular views of surrounding areas.

Websites (current as of September 2008):

- *www.archives.gov* -- The National Archives and Records Administration hold many records, photographs, and moving images (some available digitally and on-demand) pertaining to Nike sites around the country. You can find additional material through an ARC Archival Description Search or a Records Search on NARA's homepage.
- *http://www.nps.gov/goga/nike-missile-site.htm* -- The National Park Service's GOGA Nike website is a comprehensive collection of information on the Park's Nike sites.
- *http://www.nikemissile.org/* -- This Nike-enthusiast site maintained by the Nike Historical Society contains a wealth of technical information concerning Nike functioning. While only a small portion of the site is GGNRA-specific (mostly

SF-88), this resource is too in-depth to pass over. This is the source of the document in the appendix (found in the "Field Maintenance Shops" link); the site contains similar documents taken from technical training manuals and courses on the launching area, physical site set-up, tactical control, missile test equipment, and more.
- *http://ed-thelen.org/MMS-150.html* -- The U.S. Army's Missile and Munitions School (MMS) *Subcourse 150: Nike Radars and Computers* (1971). This page contains the full manual in pdf form, beginning with the chapter 1 which is included in the appendix.

Condition

The plans' conditions vary greatly from good to poor, ranging from rips and tearing along crease lines to being completely unreadable in areas due to poor replication. Some plans are sticky because they are composite pieces taped together and the adhesive is decaying. Also, some plans have been noticeably exposed to smoke and dirt, possibly from use in the field.

Index/Added Entries

Ballistic missile defenses--Bay Area (Calif.)
Nike rocket--Bay Area (Calif.)
Nike Site SF-88L (Calif.)
San Francisco Bay Area (Calif.)--History, Military

Preferred Citation

[Item description], drawer or box and folder number, GOGA 35344

Processing Information

These materials were described as series by John Martini in 1999-2000 during the initial processing of the Engineering Plans Collection: Forts Baker, Barry, Cronkhite, Funston, & Miley. They were fully processed by Erin Hawkins and completed in September 2008.

Real Property Records came fully inventoried by the Army; the only changes made to the existing database were the addition of some information written on the folders as well as noting at the beginning of the record the site to which it refers. The records were rehoused but remain in original order.

History

Nike-Ajax Air Defense Guided Missile System, which included a command-guidance surface-to-air high-explosive warhead, was first nationally deployed in 1953 and locally constructed in 1954. Sites were identified by a one or two letter code related to the closest city or metropolitan area and a number related to the general compass reading for the area. A final letter designating the area type -- "C" for control, "L" for launch, and "A" for administrative -- was added. Nearly 300 Nike sites were established in 30 states to strategically defend large cities,

industrial centers, and coastline. They were on regional rotating alert 24 hours a day with the highly-trained crew performing constant maintenance.

The 20-foot-long Nike-Ajax missiles could travel at an altitude of 70,000 feet at Mach 2.25 with a range 38 miles.[1] However, it quickly became obvious to the military that the increasing speed of aircraft would necessitate an upgrade to stay relevant. Therefore, the Army debuted the Nike-Hercules Air Defense Guided Missile System in1958 as the next stage in ballistic missile development. Nike-Hercules was a surface-to-surface system with the ability to carry a nuclear warhead at an altitude of 100,000 feet with a range of 78 miles and a speed of Mach 3.65. The missiles stood 41.5 feet high[2]. Most Nike-Ajax sites were simply improved to the Nike-Hercules level, adding additional auxiliary acquisition radar (AAR), high-powered acquisition radar (HIPAR), low-powered acquisition radar (LOPAR), and extensive missile redesign. However, a few sites were not modified, like the Angel Island site, which remained at the Ajax level.

With the mid-1970s development of Intercontinental Ballistic Missiles (ICBM), as well as the signing of the Strategic Arms Limitation Treaty in 1972, the majority of installations were disarmed and dismantled by 1974. Only Florida and Alaska maintained their Nike sites until 1979. The Army gave some Nike sites to federal agencies, while others were offered to organizations at the state and local levels. Finally, sites were offered to private individuals or corporations. Therefore, the current uses for decommissioned Nike site are extremely varied: restored natural land (the peak of Mt. Livermore on Angel Island, SF-91), parks (Nike Park in Naperville, Illinois, C-70), communication tower sites (a microwave radio relay station in San Bruno, SF-59L), schools (Nike Intermediate School in Gardener, Kansas, KC-60), research (astronomical observatory for the University of North Texas in Denton, Texas, DF-01), private businesses (Granny's Attic, a thrift store on Vashon Island, Washington, S-61), subdivisions (the Briarwood development in Marlton, New Jersey, PH-32), or simply destroyed.

While the story goes that the Fort Barry site was only saved because of a museum allowance in the Strategic Arms Limitation Treaty, it was more likely that the formation of the Golden Gate National Recreation Area during the period of disarmament facilitated the land's transfer between the Army and the National Park Service. By preserving it as an interpretive and educational site, SF-88 became an excellent compliment to the other historical seacoast fortifications within GGNRA.

[1] Note: the range, speed, and altitude of all missiles vary quite a bit depending on the source due to official suppression and experiential discrepancies.
[2] For an extremely detailed explanation of how Nike works, please see "MMS-150" document in appendix.

Series Description

This collection consists of six series of Nike plans (one for each GGNRA site) and one series of real property records. For plans, each series consists of identical topical subseries. Subseries have been omitted when there were not any appropriate plans to fill them.

All plans subseries are superseded by sets of plans, being placed in the folder that is most applicable to the majority of the plans in the set. Therefore, some sets will undoubtedly contain information that relates to other subseries. Structures and Infrastructure contains the greatest number of sets, so check there for additional information on property issues and broad views. The finding aid will note major sets and cross-reference their content if needed.

Series I. SF-51: Sweeney/Milagra Ridge

Drawer: 246-249
Volume: 12 oversize folders
Bulk dates: 1953-1962
Arrangement: By map subject
Formats: Building plans, polyethylene sheets, blueprints (reprographic copies)
Condition: Good
Subseries:

- *Basic Information Maps and General Site Maps*: General topography, launching area, barracks area; general site maps/BIM (2 folders)

- *Real Estate, Property, and Landscape Management*: Includes separately foldered blueprint, landscape plans, "Soil Sterilization of Fire Breaks" (poor condition) Project No. 2000-59-578, set of 13, soil and erosion control; real estate and easements, widening and improvements to Sharp Park Road (2 folders)

- *Structures and Infrastructure*: "Launcher Area," District File No. 71-16-03, 1-51; "Improved Nike-Hercules with HIPAR," District File No. 71-16-29/29.2/29.3/Pre, set of 1-21, 1-32 (gaps); "Permanent Family Housing-Prefabricated Type Enlisted Men's Two-Bedroom Single House I-III," District File No. 17-16-13, 10-55; "Permanent Family Housing-Prefabricated Type Enlisted Men's Two-Bedroom Single House I-III," cont., 56-111; Buildings, fencing, topography for built items, missile related diagrams; roads and grading; Ready buildings; blueprints: cantonment and launcher area (8 folders)

- *Related Areas*: Pacifica and Oceana High School (combined with last *Structures and Infrastructure* folder)

Series II. SF-59: Fort Funston

Drawer: 250
Volume: 3 oversize folders
Bulk dates: 1943-1963
Arrangement: By map subject
Formats: Building plans, polyethylene sheets
Condition: Fair
Subseries:

- *Basic Information Maps and General Site Maps*: General topography (1 folder)

- *Real Estate, Property, and Landscape Management*: Erosion control, road construction, easements, real estate (combined with *Basic Information* folder)

- *Structures and Infrastructure*: Capehart housing (includes landscape information) and missile diagrams; "Special AAA SF-59-C & L" District File No. 119-16-2, 1-45 (poor condition, soiled); "Special AAA SF-59-C & L" cont., 46-98 (2 folders)

Series III. SF-87: Fort Cronkhite

Drawer: 251-253
Volume: 7 oversize folders
Bulk Dates: 1954-1964
Arrangement: By map subject
Formats: Building plans, polyethylene sheets, blueprints (reprographic copies)
Condition: Poor. Extremely soiled and torn. Take care in handling, especially in Structures and Infrastructure.
Subseries:

- *Basic Information Maps and General Site Maps*: See also Series IV: Fort Barry, subseries 1, Basic Information Maps and General Site Maps for views in "Harbor Defenses of San Francisco" set; topography and general site maps (1 folder)

- *Real Estate, Property, and Landscape Management*: Planting plan, erosion control, site plan and profiles (combined with *Basic Information* folder)

- *Structures and Infrastructure*: Blueprints, assembly and launchers ("Launchers" District File No. 60-16-8, 1-36, gaps), includes missile diagrams including RADOME facilities, "Missile Assembly" District File No. 160-16-8.2, 13-36; Utilities; Ready building, ready rooms, and fences; Battery plans, associated utilities; "Battery Facilities" District File No. 188-25-94, 1-53; Blueprints: stairwells, helipad, "Nike Hercules Improvement Without HIPAR"; Athletic court, mess hall, site improvements (6 folders)

Series IV. SF-88: Fort Barry

Drawer: 253-257
Volume: 14 oversize folders
Bulk Dates: 1954-1970
Arrangement: By map subject
Formats: Building plans, polyethylene sheets, blueprints (reprographic copies)
Condition: Good
Subseries:

- Basic Information Maps and General Site Maps: "Forts Baker, Barry, Cronkhite & Mendell Area: Roads, Contours & Principal Buildings" good overview map of title areas with building numbers. Also includes good general Bay Area views of all installations with additional focus on SF-31 and SF-51. "Harbor Defenses of San Francisco" set includes information Fort Cronkhite (1 folder)

- Real Estate, Property, and Landscape Management: Erosion control and planting plans (1 folder)

- Structures and Infrastructure: "SF-88 C&L" District File No. 3-16-20, set of 1-31 (gaps), "SF-88 C&L" Def 3-16-20, 1-7, 3-16-20.C, set of 1-31 (gaps). Assorted 3-16-20.1, 20.2, 20.3, 20.4, 1-31 (gaps): launching, assembly areas, underground missile storage construction, building plans; blueprints, "SF-88 C&L" District File No. 3-16-20/20.1, set of 1-31 (gaps): launching, assembly area roads and underground missile storage construction; access road improvements; "Ready Buildings" District File No. 3-16-31, 3-15 and 1-15, general improvements to Ready Buildings (includes landscape info), mess hall plans, missile-related construction including antennas and missile storage; District File No. 3-16-35 set 1-28, "Modifications & Improvements to Launcher Area"; Missile-related diagrams, Small transparencies, File No. 188-25-58 building plans, 5- 51 (gaps; includes building info for Fort Cronkhite); topography for construction, lighting control, generator plans, modification to revised control area; "Improved Nike-Hercules with HIPAR," District File No. 60-16-28 and Pre 60-16-28; "Improved Nike-Hercules with HIPAR," District File No. 60-16-28.1; "Improved Nike-Hercules with HIPAR," District File No. 60-16-28.2/28.4, HIPAR foundation details, alterations of HIPAR facilities, RADOME facilities, general radar plans; road improvements (including Fort Cronkhite), latrine, Warheading Building, fences, canine buildings, District File No. 188-25-72 "Battery Facilities" and barracks rehab; utilities, sewage; generator buildings, radar tower, stairways (12 folders)

Series V. SF-89: Fort Scott

Drawer: 258
Volume: 3 oversize folders
Bulk Dates: 1954-1975
Arrangement: By map subject
Formats: Building plans, polyethylene sheets, blueprints (reprographic copies)
Condition: Good
Subseries:

- Basic Information Maps and General Site Maps: Topography, regional base map, launching area (1 folder)

- Real Estate, Property, and Landscape Management: Topography of tracts of land (1 folder)

- Structures and Infrastructures: Utilities, "Field Maintenance Shop," District File No. 52-16-162.1, 1-22 combined with other versions, generator, gasoline dispersing; blueprints: "Control and Launcher Areas" District File No. 115-16-02, 1-52 (includes landscape info) (2 folders)

Series VI. SF-91: Angel Island

Drawer: 259-260
Volume: 6 oversize folders
Bulk Dates: 1953-1968
Arrangement: By map subject
Formats: Building plans, polyethylene sheets, blueprints (reprographic copies)
Condition: Good
Subseries:

- Basic Information Maps and General Site Maps: General topography (1 folder)

- Real Estate, Property, and Landscape Management: Blueprints: erosion control; tree removal, slide/erosion control, property use (1 folder)

- Structures and Infrastructure: Control and launcher area structures, latrines, launching ramp, lighting control; blueprints "Control and Launchers" District File No. 5-16-13.1, 2 (gaps); "S.F.-91-C&L" District File No. 5-16-22.1, revised area details and missile diagrams; blueprints: "Control and Launchers" District File No. 5-16-13, 1-34; blueprints: cont. "Control and Launchers," 35-62 (4 folders)

Series VII. Real Property Records

Volume: Eleven document boxes, 2 small photo boxes (6 linear feet)
Bulk Dates: 1962-1978
Arrangement: Existing order; by site number further ordered by building/structure number or by permit/case number.
Formats: Paper
Condition: Good
Subseries:

- *Requests, Easements and Maintenance*: Inactivation of sites, as well as the retention/disposal, care and custody, easements, ingrants, outgrants, and permissions. Contains SF/T-10, SF-25, SF-51, SF-59, SF/T-86, SF-87, SF-88, SF-89, SF-91, SF-93 (boxes 1-11)

- *Real Property Documentation*: Information concerning total area of item/object, ownership status, construction type, utilities, and all changes in the life of the structure (original build date to transfer or destruction). Contains SF-51, SF-59, SF-86, SF-89, SF-91 (boxes 12-13)

Drawer/Box and Folder list

Series I. SF-51: Sweeney/Milagra Ridge

D	*F*	*Subseries*	*Contents*
246	1/3	Basic Information Maps and General Site Maps	General topography, launching area, barracks area
246	2/3	Basic Information Maps and General Site Maps	General site maps/BIM
246	3/3	Real Estate, Property, and Landscape Management	Includes separately foldered blueprint, landscape plans, "Soil Sterilization of Fire Breaks" (poor condition) Project No. 2000-59-578, set of 13, soil and erosion control
247	1/3	Real Estate, Property, and Landscape Management	Real estate and easements, widening and improvements to Sharp Park Road
247	2/3	Structures and Infrastructure	"Launcher Area," District File No. 71-16-03, 1-51
247	3/3	Structures and Infrastructure	"Improved Nike-Hercules with HIPAR," District File No. 71-16-29/29.2/29.3/Pre, set of 1-21, 1-32 (gaps)
248	1/3	Structures and Infrastructure	"Permanent Family Housing-Prefabricated Type Enlisted Men's Two-Bedroom Single House I-III," District File No. 17-16-13, 10-55
248	2/3	Structures and Infrastructure	"Permanent Family Housing-

			Prefabricated Type Enlisted Men's Two-Bedroom Single House I-III," cont., 56-111
248	3/3	Structures and Infrastructure	Buildings, fencing, topography for built items, missile related diagrams
249	1/3	Structures and Infrastructure	Roads and grading
249	2/3	Structures and Infrastructure	Ready buildings
249	3/3	Structures and Infrastructure; Related (combined)	Blueprints: cantonment and launcher area; Pacifica and Oceana High School

Series II. SF-59: Fort Funston

D	*F*	*Subseries*	*Contents*
250	1/3	Basic Information Maps and General Site Maps; Real Estate, Property, and Landscape Management; Structures and Infrastructure (combined)	General topography; Erosion control, road construction, easements, real estate; Capehart housing (includes landscape information) and missile diagrams
250	2/3	Structures and Infrastructure	"Special AAA SF-59-C & L" District File No. 119-16-2, 1-45 (poor condition, soiled)
250	3/3	Structures and Infrastructure	"Special AAA SF-59-C & L" cont., 46-98

Series III. SF-87: Fort Cronkhite

D	*F*	*Subseries*	*Contents*
251	1/3	Basic Information Maps and General Site Maps; Real Estate, Property, and Landscape Management	See also Series IV: Fort Barry, subseries 1, Basic Information Maps and General Site Maps for views in "Harbor Defenses of San Francisco"set; topography and general site maps; Planting plan, erosion control, site plan and profiles
251	2/3	Structures and Infrastructure	Blueprints, assembly and launchers ("Launchers" District File No. 60-16-8, 1-36, gaps), includes missile diagrams including RADOME facilities, "Missile Assembly" District File No. 160-16-8.2, 13-36
251	3/3	Structures and Infrastructure	Utilities
252	1/3	Structures and Infrastructure	Ready building, ready rooms, and fences
252	2/3	Structures and Infrastructure	Battery plans, associated utilities
252	3/3	Structures and Infrastructure	"Battery Facilities" District File No. 188-25-94, 1-53
253	1/3	Structures and Infrastructure	Blueprints: stairwells, helipad, "Nike

			Hercules Improvement Without HIPAR;" Athletic court, mess hall, site improvements

Series IV. SF-88: Fort Barry

D	*F*	*Subseries*	*Contents*
253	2/3	Basic Information Maps and General Site Maps	"Forts Baker, Barry, Cronkhite & Mendell Area: Roads, Contours & Principal Buildings" good overview map of title areas with building numbers. Also includes good general Bay Area views of all installations with additional focus on SF-31 and SF-51. "Harbor Defenses of San Francisco" set includes information Fort Cronkhite
253	3/3	Real Estate, Property, and Landscape Management	Erosion control and planting plans
254	1/3	Structures and Infrastructure	"SF-88 C&L" District File No. 3-16-20, set of 1-31 (gaps), "SF-88 C&L" Def 3-16-20, 1-7, 3-16-20.C, set of 1-31 (gaps). Assorted 3-16-20.1, 20.2, 20.3, 20.4, 1-31 (gaps): launching, assembly areas, underground missile storage construction, building plans
254	2/3	Structures and Infrastructure	Blueprints, "SF-88 C&L" District File No. 3-16-20/20.1, set of 1-31 (gaps): launching, assembly area roads and underground missile storage construction; access road improvements
254	3/3	Structures and Infrastructure	"Ready Buildings" District File No. 3-16-31, 3-15 and 1-15, general improvements to Ready Buildings (includes landscape info), mess hall plans, missile-related construction including antennas and missile storage
255	1/3	Structures and Infrastructure	District File No. 3-16-35 set 1-28, "Modifications & Improvements to Launcher Area."
255	2/3	Structures and Infrastructure	Topography for construction, lighting control, generator plans, modification to revised control area
255	3/3	Structures and Infrastructure	"Improved Nike-Hercules with HIPAR," District File No. 60-16-28 and Pre 60-16-28
256	1/3	Structures and Infrastructure	"Improved Nike-Hercules with HIPAR," District File No. 60-16-28.1;

			Missile-related diagrams, Small transparencies, File No. 188-25-58 building plans, 5- 51 (gaps; includes building info for Fort Cronkhite)
256	2/3	Structures and Infrastructure	"Improved Nike-Hercules with HIPAR," District File No. 60-16-28.2/28.4, HIPAR foundation details, alterations of HIPAR facilities, RADOME facilities, general radar plans
256	3/3	Structures and Infrastructure	Road improvements (including Fort Cronkhite), latrine, Warheading Building, fences, canine buildings
257	1/3	Structures and Infrastructure	District File No. 188-25-72 "Battery Facilities" and barracks rehab
257	2/3	Structures and Infrastructure	Utilities, sewage
257	3/3	Structures and Infrastructure	Generator buildings, radar tower, stairways

Series V. SF-89: Fort Scott

D	*F*	*Subseries*	*Contents*
258	1/3	Basic Information Maps and General Site Maps; Real Estate, Property, and Landscape Management (combined)	Topography, regional base map, launching area; Topography of tracts of land
258	2/3	Structures and Infrastructures	Utilities, "Field Maintenance Shop," District File No. 52-16-162.1, 1-22 combined with other versions, generator, gasoline dispersing
258	3/3	Structures and Infrastructures	Blueprints: "Control and Launcher Areas" District File No. 115-16-02, 1-52 (includes landscape info)

Series VI. SF-91: Angel Island

D	*F*	*Subseries*	*Contents*
259	1/3	Basic Information Maps and General Site Maps	General topography
259	2/3	Real Estate, Property, and Landscape Management	Blueprints: erosion control; Tree removal, slide/erosion control, property use
259	3/3	Structures and Infrastructure	Control and launcher area structures, latrines, launching ramp, lighting control
260	1/3	Structures and Infrastructure	Blueprints "Control and Launchers" District File No. 5-16-13.1, 2 (gaps); "S.F.-91-C&L" District File No. 5-16-

			22.1, revised area details and missile diagrams
260	2/3	Structures and Infrastructure	Blueprints: “Control and Launchers” District File No. 5-16-13, 1-34
260	3/3	Structures and Infrastructure	Blueprints: cont. “Control and Launchers,” 35-62

Series VII. Real Property Records

Box	*F*	*Folder Name*
001	001	001 Nike Sites: General Information [Air Defense - Safeguard]
001	002	002 Nike Sites: Inactivation, Retention, Disposal, Care, And Custody Of Site (Master Copies)
001	003	003 Nike Sites: Utilization Inspection Report Compliance Report (Outgrants)
001	004	004 Nike Sites: Phase Out Of Nike Sites [Operation Concise/Outline Of Real Estate Acitons]
001	005	038 SF-59/Fort Funston: Feeder Information: Acquisitions: Spring Valley Water Company Fort Funston (150.29 AC) Deed Dated July 9 1917
001	006	039 SF-59/Fort Funston: Feeder Information: Spring Valley Water Company - Fort Funston 941.4 AC Dated May 19 1901 By Condemnation, Civil
001	007	040 SF-59/Fort Funston: Ingrants: City And County Of San Francisco - Reserved By QCD April 24 1950 Reduced To 2.81 AC By QCD August 4 1965 Easement Indefinite
001	008	041 SF-59/Fort Funston: Ingrants: City And County Of San Francisco - Reserved By Quitclaim Deed April 24 1950 25' Wide Utility Easement
001	009	042 SF-59/Fort Funston: Ingrants: City And County Of San Francisco - Right Of Way For Sewer Line Resolution No. 3252 Of June 12 1939
001	010	043 SF-59/Fort Funston: Ingrants: U.S. Veterans Administration Right Of Way For Power And Cable Line Over Tract 2 (0.093AC) Easement
001	011	044 SF-59/Fort Funston: Ingrants: Spring Valley Water Company Joint Use Of Right Of Way And Utility Easement Fort Funston Reservation (N.E. Cor. Sloat Blvd 3.07 AC) Indefinite
001	012	045 SF-59/Fort Funston: Outgrants: State Of California National Guard Easement - Reserved By Quitclaim Deed 4/24/50 Easement Of 7.69AC For C
001	013	046 SF-59/Fort Funston: Disposition: 1502-29-Memo Of Agreement Sfre-749 Fort Funston - Army Use Of Veterans Administration Land September 28 1954 Approx 2.0 AC
001	014	047 SF-59/Fort Funston: Disposition: 1502-29-Memo Of Agreement Use Of Permit GSA To DA-15 February 1960, Fort Funston 4.65AC
001	015	048 SF-59/Fort Funston: Disposition: 1502-02 Disposal Of Family

		Quarters At Rigler Fort Funston; Contract DACA05-80-S-0126
001	016	049 SF-59: Disposition: City And County Of San Francisco Quitclaimed For Parcel 1(115.61 AC) Parcel 2(0.78AC)QCD3-1-62, Formed
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001	018	051 SF-59/Fort Funston: Disposition: City And County Of San Francisco Quitclaimed Parcel A(2.07AC)&Parcel B(0.02AC) HSG Area, August 4 1965
001	019	052 SF-59/Fort Funston: Disposition: City And County Of San Francisco Quitclaimed 46.7AC With Exception For Family Housing Area
001	020	053 SF-59/Fort Funston: Pendings: 1501-07 Fort Funston Housing Replacement By City Of; Vol 2
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002	002	055 SF-59/Fort Funston: Pendings: City Of San Francisco-Richmond-Sunset WPCP-Force Main; Inquiry Regarding Army Utilities In Area; Letter Dated 31 January 1972
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002	013	143 SF-51: Consumers Ice Company -Tracts 3 And 5 For Gas And Water Pipe Line (0.44AC) License 11-1390
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013	006	1504-11 Nike Sites Real Property Inventory Changes [Rocky Ridge, San Pablo, Fort Funston]
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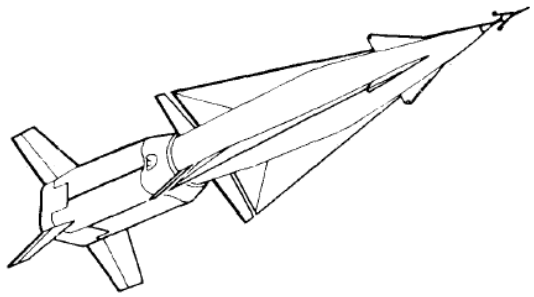
Appendix



LESSON 1. INTRODUCTION TO THE IMPROVED NIKE HERCULESE MISSILE SYSTEM

MMS Subcourse No 150 . . . . . **Nike Radars and Computer**

Lesson Objective . . . . . **To give you a general knowledge of the history, missions, and purpose of the improved Nike Hercules missile system and relationship of its major items.**

Credit Hours . . . . . **Two**

TEXT

1. **GENERAL.** This lesson presents an overall description of the improved Nike Hercules air defense guided missile system. This description is intended to provide information for personnel requiring only a general knowledge of this missile system.

2. **PURPOSE.**

a. The purpose of air defense guided missile systems is to deter or minimize the effects of enemy attacks by detecting and destroying enemy aircraft and missiles approaching a defended area. These systems must be capable of defending strategic areas against attack from high altitude, high speed enemy aircraft capable of taking evasive action while performing precision bombing. Therefore, to intercept targets that can take evasive action, the system must be capable of trajectory corrections after missile launch. In addition, it is desirable that the system be capable of self-defense against tactical surface targets.

b. The improved Nike Hercules system and the Nike Hercules antitactical ballistic missile (ATBM) system can be used in support of other service groups. For example, both systems may contain a bomb scoring system that tracks an aircraft during a simulated bomb run, from the start of the run until the bomb release point. Then, using predetermined data, the theoretical impact point of the bomb can be calculated. Thus, bomb-drop accuracy can be measured without actually expending a bomb.

3. **SEQUENCE OF EVENTS.**

a. The improved Nike Hercules air defense guided missile system and the Nike Hercules ATBM system both use integrated radar systems to detect and track targets approaching their defended areas. Another radar system is used to guide missiles to intercept and destroy the hostile target. Early warning facilities provide information on the approach of hostile targets, and either of two acquisition radar systems provide constant long-range detection and surveillance of the targets. The acquisition radar supplies azimuth and range data to the target tracking radar which then acquires and tracks the target. A missile tracking radar system acquires a missile while it is still on the launcher, tracks the missile in flight, and transmits steering and warhead burst orders to the missile.

b. The target and missile track radars continuously supply target and missile position data to a computer system. From this data, the computer supplies the necessary information to the battery control officer for launching the missile, and it sends steering and warhead burst orders to the missile tracking radar system

for transmission to the missile during flight. Both high explosive (HE) and nuclear warheads can be used with the Nike Hercules system. (Nuclear warheads would be used against large formations of aircraft, tactical ballistic missiles, or selected surface targets.)

4. HISTORY OF DEVELOPMENT.

a. The development of offensive missiles and the increases in the capabilities of modern aircraft have rendered conventional antiaircraft weapons ineffective. The need for a new defense became apparent as fundamental changes in existing defensive weapons seemed unlikely. After an extensive investigation, it was decided that a guided missile system would be the most effective defense.

b. There were three types of missile guidance systems from which to choose: the homing system, the beam rider system, and the command guidance system. These three guidance systems are briefly described in (1) through (3) below.

(1) The homing system guides the missile by locking in or "homing" on energy emission or reflections from the target. This energy may be either light, heat, radio signals, or radar reflections. Since the homing system locks in on energy coming from the target, the amount of received energy increases as the missile approaches the target and accuracy increases.

(2) With the beam rider system, the missile must be launched and then captured by a radar beam pointing at the target. The missile must then follow the beam to the target. Although the narrow radar beam makes it difficult to capture the launched missile, a number of missiles can be controlled at the same time with this system.

(3) The command guidance system guides the missile by steering commands transmitted from ground guidance equipment to the missile while in trajectory. Although complex and precise ground guidance equipment is required for this type of guidance system, the expendable missile guidance equipment is normally less complex than that required for the homing or beam rider systems.

c. After analyses of the three missile guidance systems, it was decided that the command system would provide the best guidance for the needed defense. The command guidance system promised to be the most effective against fast and highly maneuverable aircraft and to have capabilities for greater range. A government research and development program was initiated that resulted in the Nike Ajax air defense guided missile system utilizing a command guidance system.

d. Although the Nike Ajax system was capable of destroying aircraft at ranges up to 50,000 yards, by 1952 the increased speed and maneuverability of modern aircraft made it apparent that the Nike Ajax system would soon cease to be an effective defense. A new guided missile system was needed which could, with a single missile, destroy entire formations of high altitude, high speed aircraft at greater ranges. After extensive studies, it was determined that this new system would require the use of a nuclear warhead in a new missile with a greater range and speed than the Nike Ajax.

e. Studies were made concerning the feasibility of incorporating a nuclear warhead in the Nike Ajax missile to give it the required destructive capabilities. Consideration was also given to modifying the Nike Ajax ground guidance equipment to get the greater range and accuracy required. It became apparent that adaption of the Nike Ajax missile would necessitate extensive missile redesign, but only minor changes in the ground guidance equipment. In addition, it was determined that the ground guidance equipment could be altered so that it would be capable of launching and controlling the new missile as well as the Nike Ajax missile. This would allow the Nike Ajax missile to be retained for use against single aircraft at shorter ranges.

f. Surface to surface capability for the new system was included as a secondary requirement. Engagement of surface targets at long ranges was desired, and the missile used must be capable of delivering nuclear warheads.

g. In 1954, after studies were completed, contractors were authorized to proceed with the new system - designated the Nike Hercules air defense guided missile system. This system would provide the additional capabilities needed, including an intercept range far in excess of the Nike Ajax.

h. By 1956, it was again apparent that further improvement in the Nike Hercules system would be necessary to keep pace with advancements in aircraft, air to surface missiles, and electronic countermeasures (ECM) techniques. Extension of Nike Hercules capabilities was needed to maintain an effective defense against smaller, faster targets operating at higher altitudes and equipped with improved ECM systems. From inception, the Nike system was designed to afford maximum performance flexibility with minimum system modification. Studies showed that the basic Nike

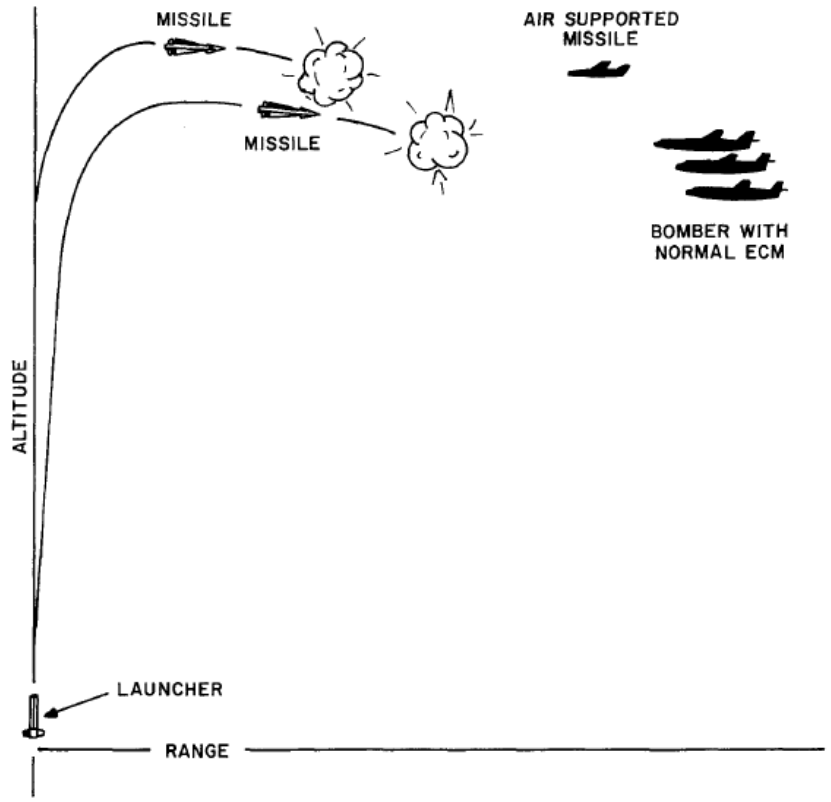


Figure 1. Surface to air mission.

Hercules system could again be improved to meet the anticipated post-1960 threat. With no change in the missile, the effective range could be increased by the addition of a new high power acquisition radar (HIPAR) system. The HIPAR system, plus a new target ranging radar system (TRR), could provide electronic counter countermeasure (ECCM) capabilities to contend with anticipated enemy ECM techniques. In 1958, after studies were completed, contractors were authorized to proceed with development of the new system - designated the improved Nike Hercules air defense guided missile system. The improved systems were to be deployed in two configurations within the continental United States, with or without HIPAR. Sites without HIPAR will have an auxiliary acquisition radar (AAR) which is supplied by modifying existing acquisition systems to improve their ECCM and power capabilities.

i. Later studies were begun on the feasibility of adapting existing guided missile systems for use in countering the threat to the field army by enemy tactical ballistic missiles. The studies of the Nike Hercules system revealed that if appropriate changes were made in the HIPAR, computer, presentation system, and plotting boards, the improved Nike Hercules system could be used for defense against tactical ballistic missiles, as well as manned aircraft and air supported missiles. After these studies were completed, contractors were authorized to proceed with the development of the Nike Hercules ATBM air defense guided missile system.

5. APPLICATION.

a. The improved Nike Hercules air defense guided missile system is primarily designed to combat air to surface missiles and fast, high altitude formations of modern aircraft with ECM capabilities. It can be most effectively employed to defend military installations, industrial centers, large cities, and as a first line of defense in areas such as the distant early warning (DEW) line and the eastern and western seaboards of the continental United States.

b. An improved Nike Hercules battery can be

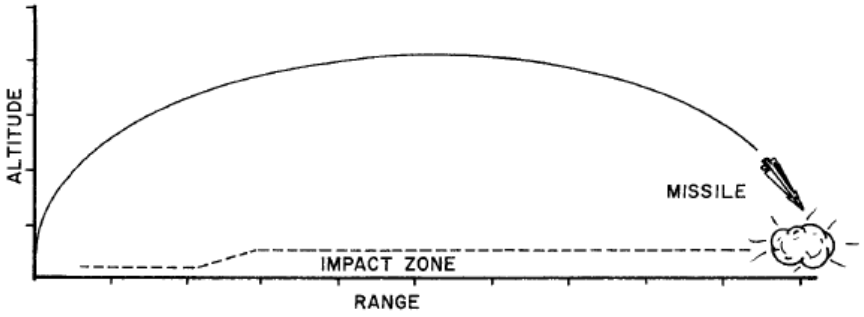


Figure 2. Surface to air low altitude mission.

employed as an individual defense unit or in combiation with other air defense units. A number of improved Nike Hercules batteries can also be employed as units of an integrated air defense system, with each system monitored and controlled by the Army Air Defense Command Post (AADCP).

c. The Nike Hercules ATBM system is primarily designed to combat aircraft, air supported missiles, and tactical ballistic missiles, but it can be conditioned to operate against surface targets.

6. MISSIONS.

a. The improved Nike Hercules system is capable of performing three types of missions: surface to air, surface to air low altitude, and surface to surface. An effort to support the Air Force has been made by providing selected systems with the capability for radar scoring of simulated bombing runs. The general capabilities of the improved Nike Hercules system are described in (1) through (4) below.

(1) Surface to air mission (SA-AA)(fig 1). The improved Nike Hercules system is designed to combat high altitude bombers or air supported missiles. The system can detect missiles traveling at supersonic speeds. Bombers with normal ECM capabilities and with a typical radar reflecting surface can be detected at greater ranges than the air supported missile. The Nike Hercules missile can attain a maximum velocity which surpasses the speed of known manned aircraft or aerodynamically supported missiles.

(2) Surface to air low altitude mission (SA-LA)(fig 2). The improved Nike Hercules system has provisions for intercepting and destroying low altitude targets. A delayed start of the missile rocket motor is employed to achieve a shorter turning radius of the missile. This permits the missile to attain a low altitude much faster; therefore, the low altitude corridor (fig 2) becomes the impact zone in the surface to air low altitude mission.

(3) Surface to surface mission (SS)(fig 3). The improved Nike Hercules system can deliver a nuclear warhead to a surface target. The missile is guided to a space reference point above the target, then a dive order

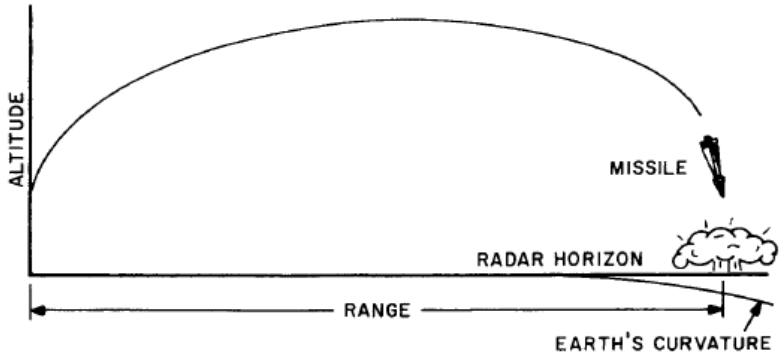


Figure 3. Surface to surface mission.

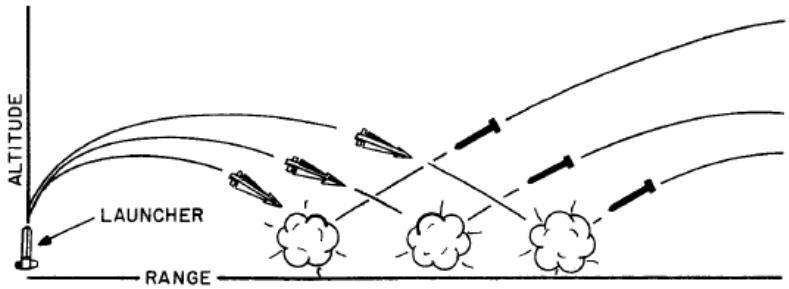


Figure 4. Surface to air mission against ballistic missile.

is issued causing the missile to approach the target vertically.

(4) Bomb scoring mission. The improved Nike Hercules system, when used in a bomb scoring mission, accurately plots the course of a bomber making a simulated bombing run and marks the point of the simulated bomb release. From this plot, the theoretical impact point is calculated and the accuracy of the bombing run can be determined.

b. The Nike Hercules ATBM system is also capable of performing three types of missions: surface to air antiaircraft (A-A), surface to air antimissile (A-M), and surface to surface (S-S). This system can also be used for radar bomb scoring of simulated bombing runs as described in paragraph (4) above. The missions of the ATBM system are the same as the improved system with one exception. The ATBM system has a surface to air antimissile mission instead of a surface to air low altitude mission. When the antimissile mission is

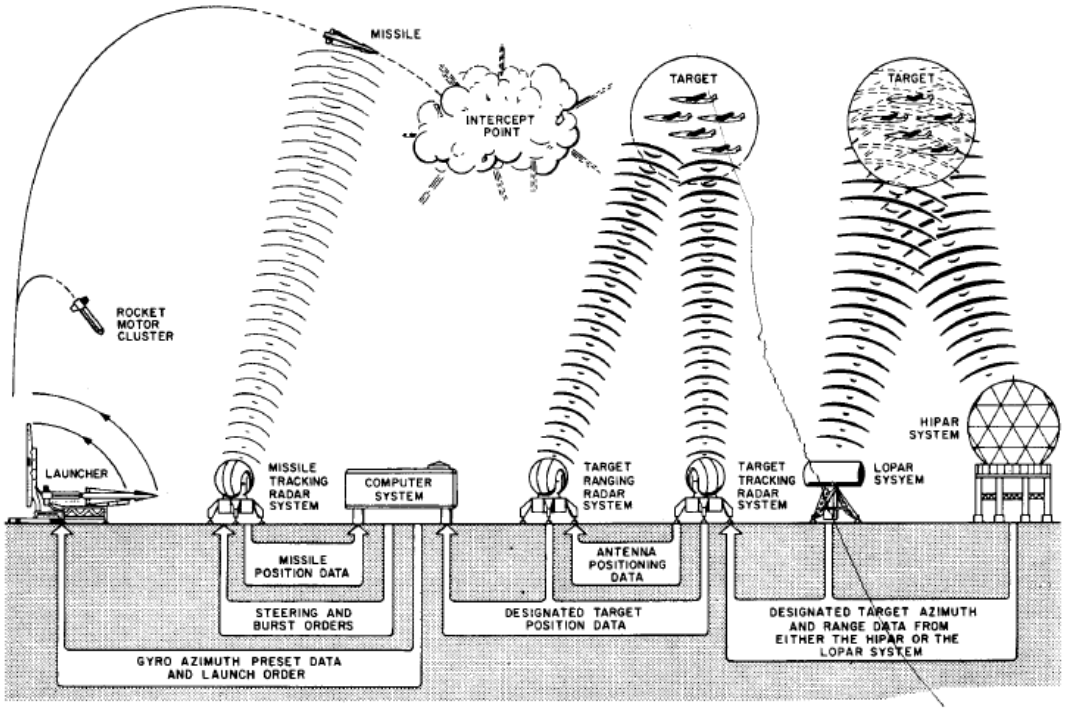


Figure 5. Surface to air mission - functional diagram.

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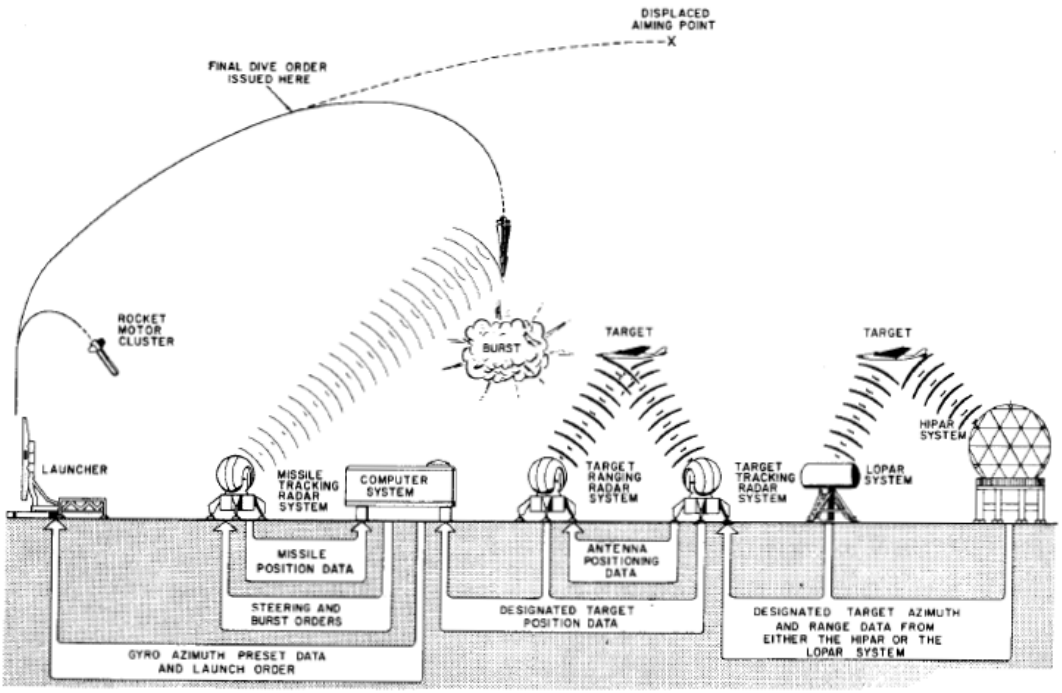


Figure 6. Surface to air low altitude mission - functional diagram.

selected, the computer is conditioned for ballistic prediction. The system is capable of guiding a Nike Hercules missile to intercept and destroy a tactical ballistic missile, as illustrated in figure 4. It should be noted that the effective destruction range is shorter for a longer range ballistic missile.

7. FUNCTIONAL DESCRIPTION.

a. Improved Nike Hercules system.

(1) Surface to air mission.

(a) In a surface to air mission (fig 5), either of two acquisition radar systems detects and identifies incoming targets. The HIPAR system operates at a greater range than the lower power acquisition radar (LOPAR); therefore, it provides more time for target evaluation. The HIPAR also provides more altitude coverage for detecting a tactical ballistic missile. Acquisition radar azimuth and range data of a designated target are electronically transferred from either acquisition radar to a target tracking radar system. These data are used by the target tracking radar operators to acquire the target. After acquiring the designated target, the target tracking radar (TTR) system continuously supplies target position data (elevation, azimuth, and range) to a computer system. When enemy countermeasure activity is adverse, target azimuth data can be attained by using the strobe line feature of either the HIPAR or LOPAR antijamming display (AJD). The target azimuth can then be transferred to the TTR and target ranging radar (TRR) which provide the computer with enemy target range, azimuth, and elevation data. From the target position data, the computer system continuously calculates a predicted intercept point. The azimuth of the predicted intercept point is sent to a previously designated missile as gyro azimuth preset data. This data orients a gyro in the missile so that after launch, the missile automatically rolls to the correct attitude with respect to the predicted intercept point. A missile tracking radar system is electronically locked on the designated missile while the missile is still on the launcher, so that, after launch, the radar system can supply uninterrupted missile position data to the computer system. At the same time, the computer system continuously supplies data to two plotting boards which enable the battery control officer to determine the optimum time to launch the missile.

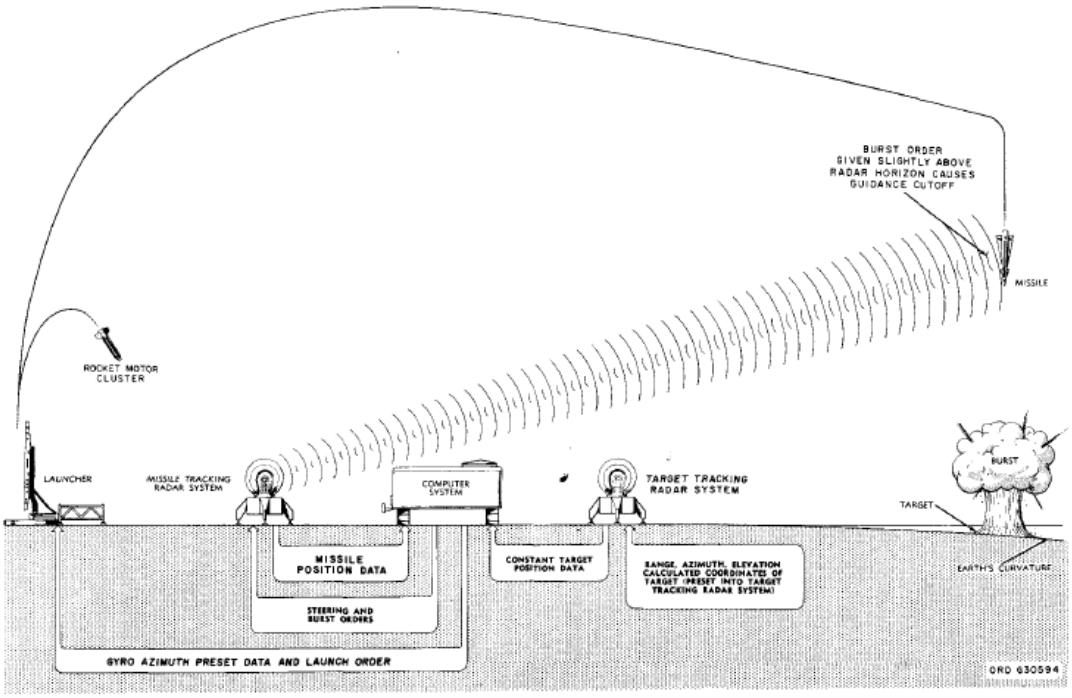


Figure 7. Surface to surface mission - functional diagram.

(b) When the missile is launched, a booster motor cluster provides the initial thrust, then separates from the missile. As determined by the designated target and missile position data being supplied by the tracking radar systems, the computer system continuously calculates the proper missile trajectory. The computer system guides the missile by sending appropriate steering orders by way of the missile tracking radar system. At a predetermined time before intercept, the computer system automatically sends a burst order by way of the missile tracking radar system. The burst order causes the missile warhead to detonate within a lethal radius of the target. Detonation of the missile warhead shortly before intercept provides the most effective burst coverage.

(2) Surface to air low altitude mission. In a surface to air low altitude mission (fig 6), the functions of the acquisition radar systems, the tracking radar systems, and the computer system are similar to those described for a normal surface to air mission (a(1) above), with the exception of the climb-and-dive trajectory used. Use of this trajectory minimizes the effects of ground clutter in the missile tracking radar system. In order to achieve the climb-and-dive trajectory, the computer system continuously calculates a displaced aiming point above the target, as determined by the designated target position data. When the time required to reach the displaced aiming point and the final dive time to the actual intercept point become equal, the computer system issues a final dive order to the missile so that the missile dives toward the actual intercept point. The computer system continues to monitor the missile, issues steering orders as necessary, and sends a burst order that causes the missile warhead to detonate a fraction of a second before intercept. The most effective burst coverage is achieved by using the overhead approach.

(3) Surface to surface mission. In a surface to surface mission (fig 7), the acquisition radars are not used because the target position is known. The range, azimuth, and elevation coordinates of the target are calculated and manually set into the TTR system, therefore, the TTR supplies constant target position data to the computer. Although the function of the computer system is similar to that described for a normal surface to air mission (a(1) above), the missile trajectory data must be manually set into the computer. This will, in turn, cause the missile to be guided toward a point in

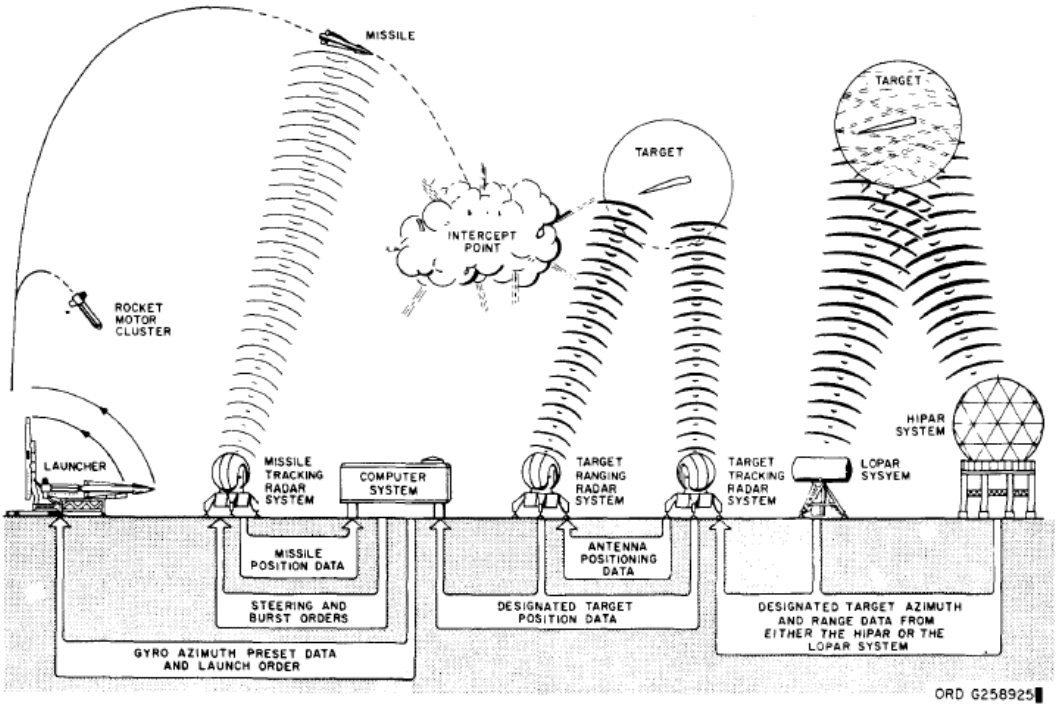


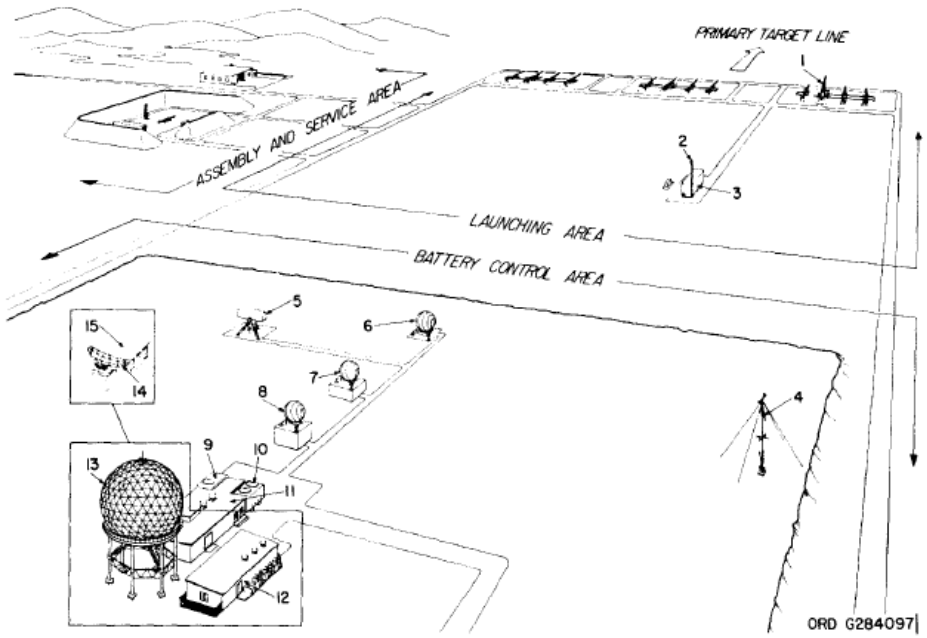
Figure 8. Surface to air antimissile mission - functional diagram.

space above the desired point of impact. When the missile reaches the space reference point, the computer system issues a dive order that will cause the missile to approach the ground target vertically. As the missile approaches the ground, the computer sends a burst order by means of the missile tracking system. Due to special missile preparation in a surface to surface mission, however, the burst order does not cause the missile warhead to detonate. Instead, the burst order disables the missile fail-safe mechanism and causes guidance cut-off by disabling the missile receiver. The burst order also arms a preset barometric fuze in the missile warhead and rolls the missile 180 degrees to compensate for any possible control surface misalinement. The missile then follows a vertical trajectory until the barometric fuze causes the nuclear warhead to detonate at a predetermined altitude above the target.

b. Nike Hercules ATBM system.

(1) Surface to air mission.

(a) In a surface to air antiaircraft (fig 5) or antimissile mission (fig 8), either of the two acquisition radar systems can be selected for detecting and identifying oncoming targets, although the HIPAR is preferred. Azimuth and range data of a designated target are electronically relayed from either acquisition system to a target tracking radar system. This data is then used to acquire the target. After acquisition, the target tracking radar system continuously supplies target position data (elevation, azimuth, and range) to a computer system. When enemy countermeasure activity is adverse, the target azimuth is also obtained by using the strobe line feature of either HIPAR or LOPAR. When the target azimuth is transferred to TTR and TRR, the target can be tracked in range, azimuth, and elevation. The primary function of the TRR is to supply the computer with target range data when countermeasures are intense. Target azimuth and elevation data are supplied to the computer by the TTR. From the target position data, the computer system continuously calculates a predicted intercept point. The azimuth of the predicted intercept point is sent to a previously designated missile as gyro azimuth preset data. This data orients a gyro in the missile so that after launch, the missile automatically rolls to the correct attitude, with respect to the predicted intercept point. The missile tracking radar system is electronically locked on the designated missile while it is still on the launcher so that, after launch, the radar system can supply uninterrupted missile position data to the computer system. At the



1. Erected missile on launcher
2. Flight simulator group and radar target simulator
3. Trailer mounted launching control station
4. Radar test set group
5. LOPAR antenna-receiver-transmitter group
6. Missile track antenna-receiver-transmitter group
7. Target ranging antenna-receiver-transmitter group
8. Target track antenna-receiver-transmitter group
9. Trailer mounted director station
10. Trailer mounted tracking station
11. HIPAR building
12. Power building
13. HIPAR antenna radome-supported-tripod
14. AAR antenna
15. AAR shelter

Figure 9. Battery layout - typical consolidated site.

same time, the computer system continuously supplies data to two plotting boards that enable the battery control officer to determine the optimum time to launch the missile.

(b) When the missile is launched, a rocket motor cluster provides the initial thrust, then separates from the missile. As determined by the designated target and missile position data being supplied by the tracking radar systems, the computer system continuously calculates the proper missile trajectory. The computer system then sends appropriate steering orders to the missile by way of the missile tracking radar system. Moreover, at a predetermined time before intercept, the computer system automatically sends a burst order by way of the missile tracking radar system. The burst order then causes the missile warhead to detonate within a lethal radius of the target.

(2) Surface to surface mission. The functional analysis of the Nike Hercules ATBM system surface to surface mission is the same as that discussed in paragraph a(3) above.

8. OVERALL PHYSICAL DESCRIPTION AND SITE LAYOUT.

a. Operational areas. Equipment incorporated in the improved Nike Hercules or ATBM system is located in three operational areas: the battery control area, the launching area, and the assembly and service area (figure 9). The functions of these areas are briefly described in (1) through (3) below.

(1) Battery control area. The battery control area contains the radar course directing central (RCDC) which basically consists of the following: the acquisition radar systems; the target tracking, target ranging, and missile tracking radar systems; the computer system; and other associated equipment. The purpose of the RCDC is to detect, acquire, and track the

target: furnish the necessary information to the battery control officer for determining when a missile should be fired; track the missile during trajectory; and issue steering and burst orders to the missile. The battery control officer determines the type of mission, missile, and warhead to be used; supervises selection of the target to be engaged; and issues orders to ready the missile for firing and to fire the missile.

(2) Launching area. The launching area contains the guided missile launching set which consists of Nike Hercules and Nike Ajax launchers and launching control equipment or only Nike Hercules equipment. Personnel in this area are required to maintain a supply of ready missiles.

(3) Assembly and service area. The assembly and service area is a support area that provides equipment and facilities for assembling, testing, fueling, and storing missiles.

b. Physical layout. The improved Nike Hercules system and the Nike Hercules ATBM system described below is the continental United States. (CONUS) emplacement. Spacing and siting characteristics of a typical battery layout are described in (1) through (5) below and illustrated in figure 9. Emphasis is placed on the mandatory locational requirements.

(1) The site for the battery control area requires a minimum of 3.8 acres. This area is preferably situated on high ground so that the best possible radar coverage is obtained. The launching area is preferably located in front of the battery control area, with respect to the primary target line. Although an intercept can be made in any direction from the battery, the primary target line is the direction in which most intercepts are likely to be made. The location of the launching area is flexible, however. For example, due to terrain characteristics or real estate availability, it may be necessary to locate the launching area behind or to the side of the battery control area.

(2) Due to interarea cable limits, the launching area normally cannot be located further than 5,200 yards from the battery control area. However, if additional cables are employed, or if the system uses a radio-link instead of cables, the interarea separation can be extended to 6,000 yards. Separation distances in excess of 6,000 yards are possible with modification of the computer system parallax circuits. Because of the angular tracking rate limitations of the missile tracking radar system, the minimum distance between the battery control area and the launching area is approximately 1,000 yards.

(3) The launching area must be emplaced so that a line of sight exists between the missile track antenna-receiver-transmitter group (6, fig 9) in the battery control area and the flight simulator group and radar target simulator (2, fig 9) in the launching area. A line of sight must also exist between the missile track antenna-receiver-transmitter group and each erected missile (1, fig 9) in the launching area.

(4) The launching area should be fairly level and easily accessible by roads from the battery control area and the assembly and service area. Moreover, to minimize damage from falling burned out boosters, an unpopulated area forward of the launching area is required as a drop zone.

(5) The assembly and service area is a support area that provides equipment and facilities for assembling, testing, fueling, and storing of missiles; therefore, it should be located near the launching area. Army Materiel Command Regulation (AMCR) 385-224, formerly ORDM 7-224, is used as a guide for determining the minimum safe distance between the launching area and the assembly and service area. This distance will vary according to the type explosives and protective barriers employed.

(6) The auxiliary acquisition radar performs the same functions as the HIPAR and will not be discussed in this subcourse.

EXERCISES FOR LESSON 1

1. Why was the Nike Hercules system developed?

   A. To extend system range and altitude capability
   B. Because of the tactical ballistic missile threat
   C. To counter advances in ECM techniques
   D. For employment against surface targets

2. During countermeasures activity, which radar furnishes the computer with target range data?

   A. HIPAR
   B. LOPAR
   C. TTR
   D. TRR

3. What is the primary function of the missile tracking radar (MTR)?

   A. It furnishes the computer with missile and target positions and transmits steering and burst orders
   B. It presets the missile gyro and transmits steering and burst orders
   C. It furnishes the computer with differences in target and missile positions and transmits steering and burst orders
   D. It furnishes the computer with missile positions and transmits steering and burst orders

4. Which are the mission capabilities of the Nike Hercules ATBM system?

   A. SA, SA-LA, SA-AM
   B. SA-AA, SA-AM, SS
   C. SA, SA-LA, SS
   D. SA-AA, SA-AM, SA-LA

5. What type of guidance is employed by the Nike Hercules missile system?

   A. Inertial
   B. Homing
   C. Command
   D. Beam rider

6. Which radar or radars in the improved Nike Hercules system can furnish initial target range and azimuth data?

   A. HIPAR and LOPAR
   B. TTR and TRR
   C. HIPAR, LOPAR, and TTR
   D. TRR only

7. What additional radars were added to the basic Nike Hercules system to create the improved Nike Hercules system?

   A. HIPAR and AAR
   B. TRR and HIPAR or AAR
   C. TRR and LOPAR
   D. ATBM and AAR

8. Why is there a minimum distance between the battery control and launcher areas?

   A. To minimize damage from falling boosters
   B. To satisfy line of sight requirements
   C. To prevent exceeding the MTR tracking rate
   D. To limit land required to a minimum of 3.8 acres

9. What determines the minimum safe distance between the launching and the assembly and service areas?

   A. Area of land available
   B. ORDM 7-224
   C. Type explosives and revetments used
   D. Battery commander's policy

10. What are the operational areas of an improved Nike Hercules site?

    A. Block house, launching, and assembly and service
    B. RCDC, launching, and block house
    C. Battery control, RCDC, and launching
    D. Battery control, launching, and assembly and service