The Nike missile was the first operational supersonic surface to air missile. The Nike Ajax and Hercules versions were all weather weapons with a range of 30-90 miles to altitudes from 60,000 to greater than 100,000 feet. Nike sites consisted of an Integrated Fire Control Facility (IFC) and a separate Launch Facility located relatively nearby. Between 1954 to as late as 1979, operational Nike anti-aircraft missile sites surrounded numer ous cities and air bases (Defense Areas) in the United States to protect them from attack by Soviet long-range bombers, the Tupolev Tu-95 Bear.

Development of Intercontinental Ballistic Missiles (ICBMs) made these facilities and their technology obsolete. Sites were abandoned, repurposed or redeveloped. Today, control sites (IFCs) are mostly unrecognizable, although a few still have the towers that supported the Acquisiition, Target Tracking and Missile Tracking radar units. By contrast, many of the nearly 300 launch sites themselves, with their complex in-ground umented coordinates for the IFC and Launch sites. I created continental and detailed maps to visualize the distribution of these historic defensive sites. Using satellite imagery, recent orthophotos, LiDAR DEMs, historic aerial photos and topographic maps, comparisons reveal the changes to some of these sites over the past 50+ years. Some launch sites are completely obliterated, some are overgrown and others are intact and readily recognizable existing as distinctive patterns surrounded by housing developments, schools, athletic fields, woods or farm land

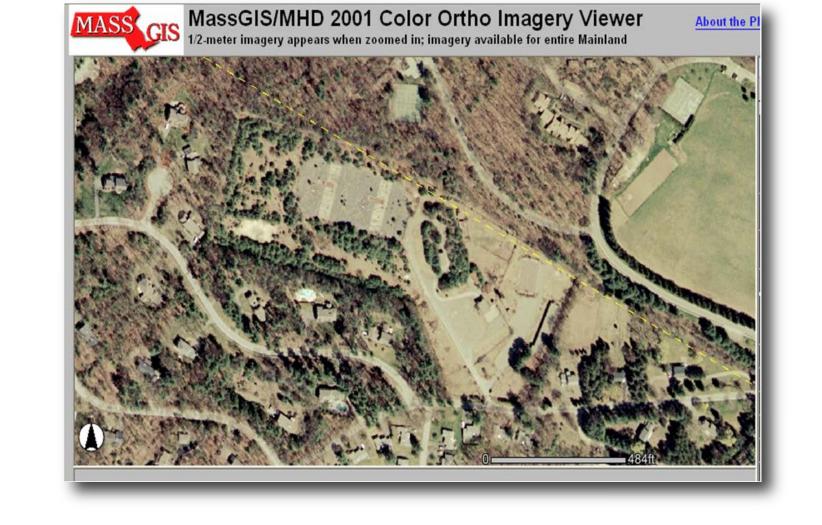


## **What Started All This**



Searching the web for some information about a festival that was held annually in my home town of Wayland, I came across this web page put together by students at the local high school. Information about the festival was there, "A sense of Community: The Strawberry Festival" but it was a link above this that caught my eye "Cold War Wayland: Nike Missile Site & Raytheon".

I grew up in Wayland and had never heard of a Nike missile site in town. The web site had a 2001 screen capture from the MASS GIS website showing the site and a bit of text that it was located on the Wayland-Lincoln town line (dashed yellow line).



http://www.whshistoryproject.org/1950s/index.html

Massachusetts GIS clearinghouse 2008 orthophoto



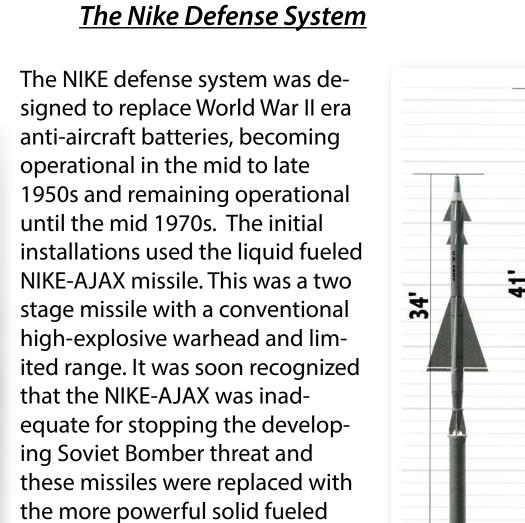
0 12.5 25 50 75 100 Meters

Massachusetts GIS clearinghouse 2010 Concord River bare earth LiDAR data

other Nike launch sites in the United States and was there more information available about the Nike system? The unique shape of the roads and earthen revetments made me Luckily the answer to both parts of the look to bare earth LiDAR as another means of visualizing the launch te. Massachusetts has flown a number of LiDAR missions and proquestion was YES! cessed data is available on the Massachusetts GIS clearinghouse website. Data for this area is part of the Concord River 2010 mission.



US Army press photo captioned: July 15,1958. White Sands N.M. Poised for action, this atomic-capable Nike-Hercules is at defense ready on a launcher produced at U.S. Steel's Consolidated Western Steel Division.

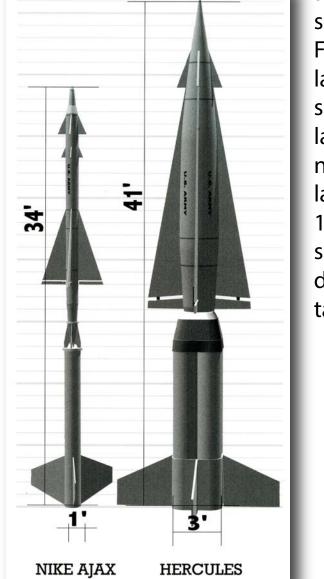


two stage NIKE-HERCULES missile

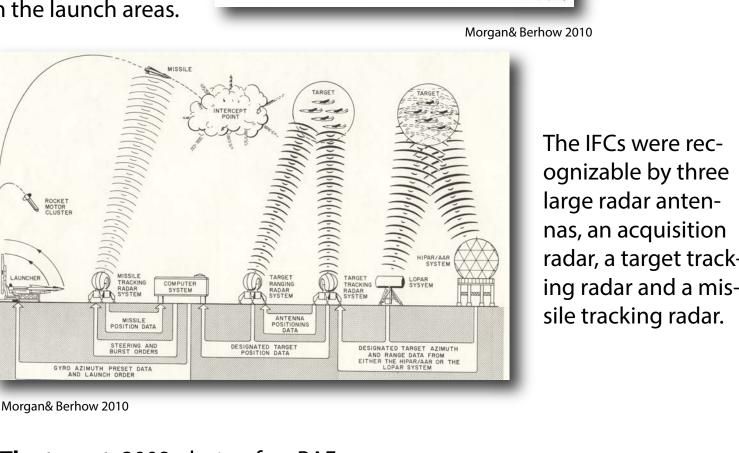
These missiles had a longer range

could achieve a higher altitude

and were capable of carrying a



A NIKE missile site consisted of two operationa sections, the Integrated Fire Control (IFC) and a launch area where the n siles were stored and launched. The IFCs were not located far from the launch areas (minimum o 1000 yards), were usually direct "line of sight" con ✓ tact with the launch areas.



**The target,** 2008 photo of an RAF QRA (Quick Reaction Alert) Typhoon fighter escorting a Russian Bear aircraft over the North Atlantic. The TU-95 carried and dropped the AN602 Tsar Bomba (Царь-бомба) the most powerful nuclear weapon eve detonated. The test on October 30 1961 remains the most powerful art mated the yield at 50-60 megatons or 1350 -1570 times the combined roshima and Nagasaki.

power of the bombs dropped on Hi-http://militaryhistorynow.com/2012/05/14/71/

nis "dark" illustration in a booklet for Western Electric employ

ees about the Nike-Ajax system (which they were assembling)

Although the Ajax missiles only carried conventional high ex-

plosive warheads, these missiles were soon replaced by the

Nike-Hercules missiles that were capable of carrying nuclear

ere modified to be surface-to-surface capable as well.

varheads and had not only surface-to-air capability but some

hints at the somber mood during the Cold War years.

(http://en.wikipedia.org/wiki/Tsar\_Bomba)

LAYOUT OF TYPICAL NIKE BATTERY

Nike Ajax (left) and Hercules (right) during test launches



From the same publication, this illustration of the Nike-Ajax and Hercules system shows all the major components of the system with the IFC and radars on the hill in the background, the launch area with the distinctive earthen berms around the fueling and warhead placement area and the complex underground bunker system lying below the visible launch pads with siles to the launching rails. Each of these underground bunkers are 5,000 square feet in area. Notice the city skyline on the horizon labeled as the

http://nikemissile.org/AJAX/PDFAJAX.pdf (both)



One of the first operational sites was in Lorton, Virginia. Construction began in March of 1954

and site was operational in 1955. Secretary of the Army, Charles C. Finucane, labeled it the

Initially armed with Nike-Ajax missiles, the site was upgraded to Nike-Hercules missiles around 1958. The larger Hercules missiles required some modifications to the launch sites. The elevator motors and track mechanisms had to be upgraded to handle the larger/heavier missiles and the individual launchers had to be spaced further apart to compensate for the larger rocket blast of the Hercules during launch. Site deactivated in 1973.

The changes to the launch pads can be seen by comparing the

image above, an Army press release photo from the mid-1950s, to the vertical air photo taken on 29 March 1963 when the site would have been using Nike-Hercules missiles. The lower color image is the site as it currently appears in Google Earth. The launch pad structures can still be seen between the buildings and documents show that the underground bunkers are still accessible. This site with it's underground bunkers was being

considered for"The Cold War Museum" by Francis Gary Powers Jr., son of Francis Gary Powers, whose U2 spy plane was shot down over the Soviet Union on May 1, 1960. The Google Map shows the location of the site relative to

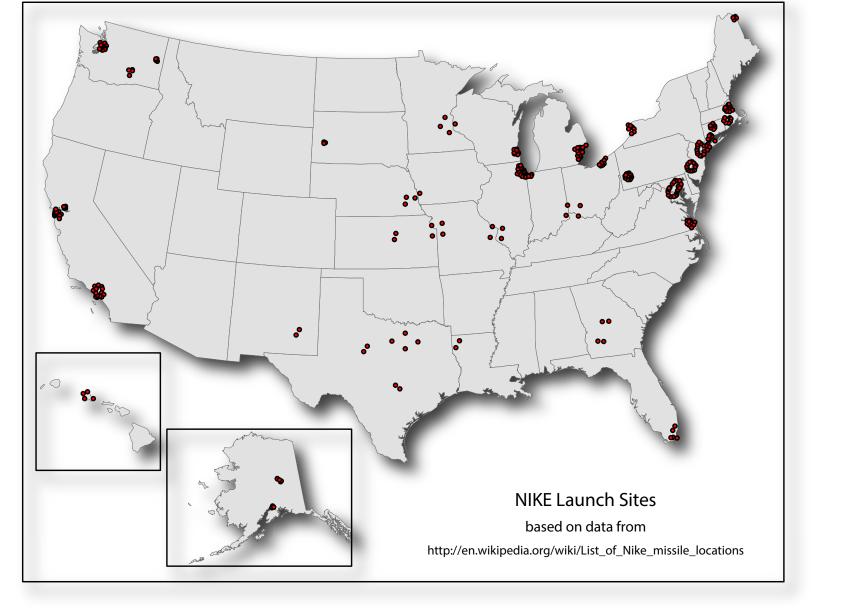
Washington DC and the surrounding area.



site W-64 29 March 1963, http://earthexplorer.usgs.gov/

Mapping and Visualizing the NIKE Site Locations

A number of websites including Wikipedia have listings for the nearly 300 locations o both the IFC and launch sites associated with the NIKE Defense System. I constructed spreadsheet with coordinates for both the IFCs and associated launch sites, converting DMS to decimal degrees, and importing the data into ArcGIS to visualize the location throughout the United States. The distribution of the sites immediately explained Morgan & Berhow's book title "Rings of Supersonic Steel".



The sites were built to protect "defense areas" which were major US cities and selected USAF Strategic Air Command bases.

Bergstrom AFB Defense Area, Cincinnati-Dayton Defense Area, OH-IN Oahu Defense Area, HI Cleveland Defense Area, OH Dallas-Fort Worth Defense Area, TX Detroit Defense Area, MI Dyess AFB Defense Area, T Ellsworth AFB Defense Area, S Fairbanks Defense Area, AK Fairchild AFB Defense Area, W Hanford Defense Area, WA Hartford Defense Area. CT Homestead-Miami Defense Area, FL Kansas City Defense Area, KS-MO Lincoln AFB Defense Area, NE Loring AFB Defense Area, ME

Pittsburgh Defense Area, PA Providence Defense Area, RI-MA Robbins AFB Defense Area, GA St. Louis Defense Area, MO San Francisco Defense Area, CA Schilling AFB Defense Area, KS Seattle Defense Area, WA Travis AFB Defense Area, CA Turner AFB Defense Area, GA Walker AFB Defense Area, NM

Los Angeles Defense Area, CA

Minneapolis-St.Paul Defense Area, MN

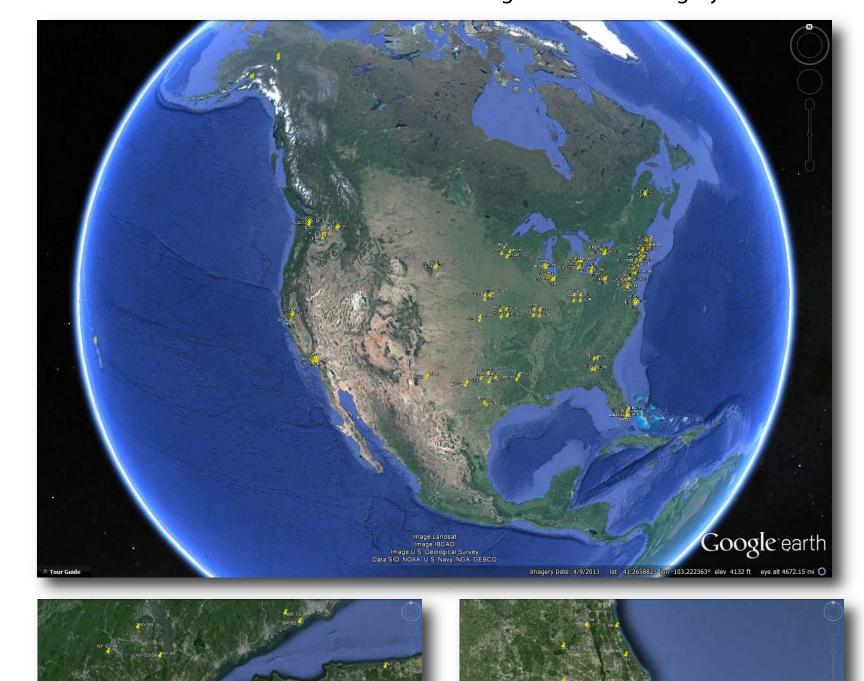
Milwaukee Defense Area, WI

Norfolk Defense Area, VA

Offutt AFB Defense Area, NE

Philadelphia Defense Area, PA-NJ

Shapefile exported out of ArcMap as a KMZ and opened in Google Earth to examine the sites with current high resolution imagery.





Google Earth screen shots of (from left to right) New York City area, Chicago, Illinois area, Seattle, Washington area, San Francisco, California area, Elmendorf Air Force base near Anchorage, Alaska, Pearl Harbor and Hickam Air Force base, near Honolulu, Hawaii, Loring Air Force base near Limestone, Maine and Ellsworth Air Force base near Rapid City, South Dakota.

Zooming in on individual sites in Google Earth produced varied results. Some sites were clearly recognizable, others partially obscured by modifications, some not visible at all but with property lines that hinted at their previous existence and finally some areas that seemed it was impossible there was ever a site located there. Detailed examination of the site areas in Google Earth using the "Time Slider"

revealed some sites that while not currently visible are visible in some of the older imagery accessed through the time slider. Sites that still posed questions were examined using mainly mid 60s historic air photos using the USGS EarthExplorer website to locate, preview and download appropriate imagery for a given site. Careful examination of these images resulted in correcting the coordinates of a number of these site locations to accurately reflect their actual locations.

The "Patterned Ground"; Detailed Views of Selected Sites

Site SUMMIT Anchorage Defense Area, AK **Summit** (61.247778, -149.548333) Located in the Chugach Mountains, 4,000 feet above

Summit and other Alaskan NIKE sites were on "five minute status" with missiles carrying nuclear warheads ready to fire in 5 minutes. Crews remained in this status for more than 30 days while President Kennedy dealt with the crisis. (Raichle, 2012) time slider 2006 imagery All three of the Anchorage Defense Area sites, Bay, Point

and Summit felt the impact of the 9.2 magnitude Good Friday earthquake on March 27, 1964. Documentation from both Point and Summit highlight the fact that earth movement knocked nuclear missiles from their launchers and storage racks. The warheads were not armed, no radiation leaks occurred, but missiles had to be rendered safe, inspected and secured. (Raichle, 2012) "We went inside the first launcher section of the fire unit

on 'hot status' after prying open the blast doors. It was a big mess. No complete missile round was intact on the tracked launchers or handling rails. All the yoke structures had been sheared. The skins were gouged open fins bent in all directions. Solid propellants cracked and the rocket motor covers were off. Strong stench from the exposed rocket propellant. Arming lanyards were pulled, energizing the on-board battery operated electrical power systems and gyros were spinning. Large components strung across the handling rails and launchers and on the floor, in all directions. Each missile representing upwards of 5 tons of high explosive just waiting for the initial spark to set off the entire lot... [After 40 years] I stil have nightmares about what I saw in the first launcher section immediately after the earthquake."

The Summit site was closed in July 1979. Site is preserved as a National Historic Site

http://nikealaska.org/AADCP/AADCP.html





## Site MS-40 Minneapolis-St.Paul Defense Area, MN **MS-40** (44.571389, -93.076944)

Located about 7 miles southeast of Farmington, Minnesota. Constructed in 1959, and closed in 1972. The Minnesota Department of Health became aware of the site in 1996

when a local high school teacher reported seeing metallic mercury at the site's waste water treatment plant while off road cycling. The source of the mercury was a broken mercury bearing in the old trickling filter. Official conclusion by the MDH following cleanup of the mercury spill and subsequent testing of soil and ground water at both the WWTP and the launch site, "exposure to

site contaminants in soil or groundwater at levels of health concern is unlikely". Additional comments include a warning that potential exposure to lead in lead based paint and asbestos in building materials needs to be considered. Finally, nuclear warheads were stored at the site during operation. No instances of radioactive leaks were reported and radioactive material was reported properly removed from the base at closure. (nike0397.pdf) Note in the Google Earth image it is clear that the under-

ground bunkers have been excavated and filled. The waste water treatment plant structures are gone as well.

Site CL-13 Cleveland Defense Area, OH

Located in the Cleveland suburbs on the south shore of Lake Erie

Comparison of the current Google Earth imagery and historic ai

photo from 13 April 1962 shows only minor changes to the resi-

dential district over the past 50 years. The Integrated Fire Contro

site (IFC) (yellow circle) has become a park, and the launch site

(red circle) is now paved over and used for parking school buse

launch site was less than 1/10 of a mile from the backyards of the

The school has a new track, but the pathways and building

shapes are quite recognizable between the two images. The

http://nikemissile.org/

**CL-13** (41.631389, -81.451667)

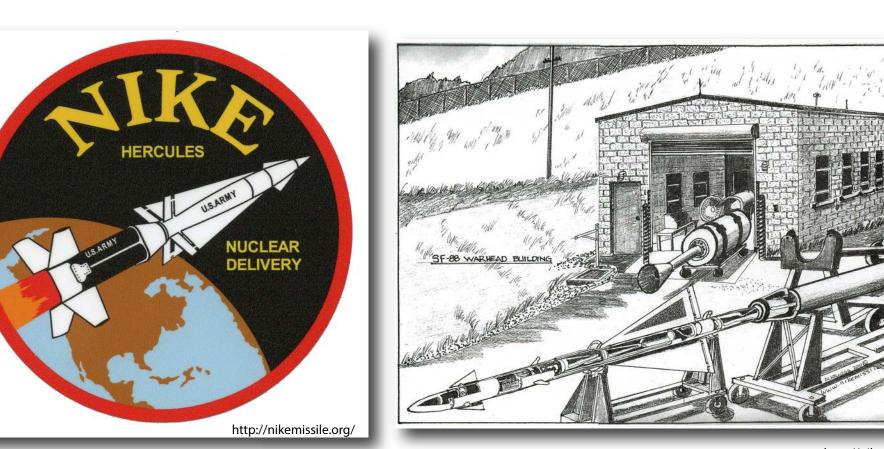




houses along Charles Street. The fact that these sites were "part of the neighborhood" and the scenery is clear from a Cheerios box from the late 1950s.



USGS EarthExplorer air photo 18 April 1962



## Site S-32/33 Seattle Defense Area, WA **S-32/33** (47.451944, -122.114167) Located SE of Seattle near Cascade-Fairwood

Site is due east of a large housing community that appears to be significantly lower in elevation than the land the site is on. Historic air photo from September 1968 shows no obvious surface disruption where the current housing development stands Using LiDAR data from the Puget Sound LiDAR Cor sortium, a bare earth hillshade was constructed.

That clearly shows a dramatic elevation change at

the edge of the housing development. Exporting the hillshade as a KMZ from Global Mapper I was able to overlay the semi transparent hillshade and pression the housing development occupies. Further research shows this depression to be the former site of the Fire King coal mine, which initially was an underground operation followed by surface The hillshade also shows a slight, circular depres-

sion near at the southern most end of the launch pad. A 3D view using the LAS LiDAR data clearly shows this depression in the launch pad. Perhaps this is related to subsidence associated with the Fire King coal mine workings.



USGS EarthExplorer airphoto 3 September 1968

Site C-03 Chicago-Gary Defense Area, IL-IN

**C-03** (41.938333, -87.634167)

Located on the western shore of Lake

Michigan at Montrose Beach, now Lincoln

"Chicago is loaded for bear - even the Rus

sian bear if the Reds should ever dare send

their bombers to attack the city." "A ring o

sword-like guided missiles called the Nike

ready to send sudden death belting into

are inescapable by any air maneuver now

known to aviation..." "The thing you oug

to remember is that the Nike's presence

hereabouts should enable you to sleep a

http://m-epperson.home.comcast.net/~m-epperson/nike/

Site NY-56 New York Defense Area, NY

Located on the eastern shore of Sandy Hook, New Jersey.

Hillshade created from LiDAR data collected by the Army

Corps of Engineers post super storm Sandy, shows it to be a

raised site relative to the surrounding land with a sharp ero-

from beach erosion during the super storm Sandy. 3D view of

where the warhead installation occurred. The seaward side of

sional face on the ocean side. This face may have resulted

LAS point file shows the distinctive arced earthen berm

the berm appears to have been eroded away.

Site HA-25 Hartford Defense Area, CT

Located east of Hartford about 2.5 miles south of Manchester,

low growth. Power line right of way crosses the southern end

of the site. A looping road is somewhat discernible in the

trees. Historic air photo from 1962 clearly shows the opera-

tional site, earthen berms at warhead installation site and

looping road up to the launch pad and bunker elevators.

Bare earth LiDAR hillshade created from LiDAR data from

CLEAR (Center for Land Use Education and Research) clearly

shows that the underlying structures seen in the 1962 air-

photo are present today under the vegetation.

Center for Land Use Education and Research, University of Connecticut, http://clear.uconn.edu/

stwar Life: Wayland, MA 1946-1960, http://www.whshistoryproject.org/1950s/index.htt

ogle Earth image shows the site overgrown with trees and

**HA-25** (40.433611, -73.985278)

Google Earth image shows the site washed with some sand.

**NY-56** (40.433611, -73.985278)

http://pruned.blogspot.com/2011/04/sunday-in-park-with-chicagos-cold-war.htm

Current Google Earth view of C-03 2012 imagery

LiDAR data from http://www.csc.noaa.gov/dataviewer/#

 $Site Point Alaska, The Last AADCP of the Last Operational U.S. \ Nike-Hercules \ Missile \ Battalion, updated 2009, \\ http://nikealaska.org/AADCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/ABDCP/AB$ 

 $Site Summit Alaska, Bravo \ Battery, 1^{st} Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, Bravo \ Battery, 1^{st} Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, Bravo \ Battery, 1^{st} Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, Bravo \ Battery, 1^{st} Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, Bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, Bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, Bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, Bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ Battalion, 43^{rd} Air \ Defense \ Artillery, updated \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ 2010, http://nikealaska.org/summit/SiteSUMMIT.htm. Alaska, bravo \ 2010, http://nikealaska.org/summit/SiteS$ 

The Historical Marker Database; Lorton Nike Missile Site, http://www.hmdb.org/marker.asp?marker=2092

u-95 Bear: Extremely Loud and Incredibly Close, 2012, http://militaryhistorynow.com/2012/05/14/71/

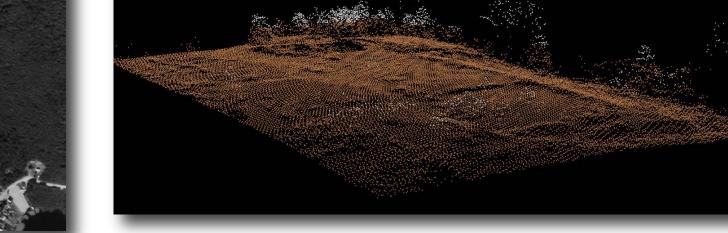
The Military Standard – Nike, http://www.techbastard.com/missile/nike/

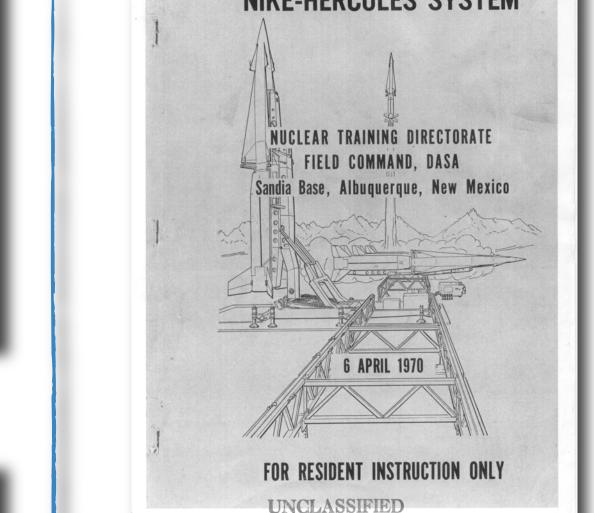
sar Bomba, Wikipedia, http://en.wikipedia.org/wiki/Tsar\_Bomba

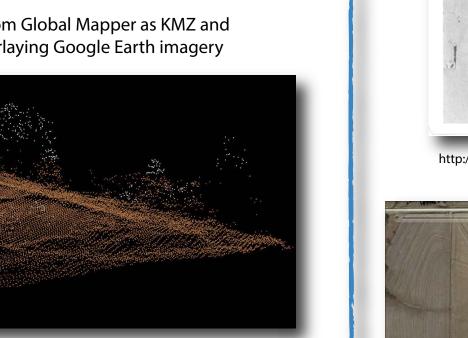
h Century Castles, Nike Missile Base, Southwest Ohio, http://wv

The Nike Historical Society, http://nikemissile.org/

p://pugetsoundlidar.ess.washington.edu viewed with reduced transparency overlaying Google Earth imagery

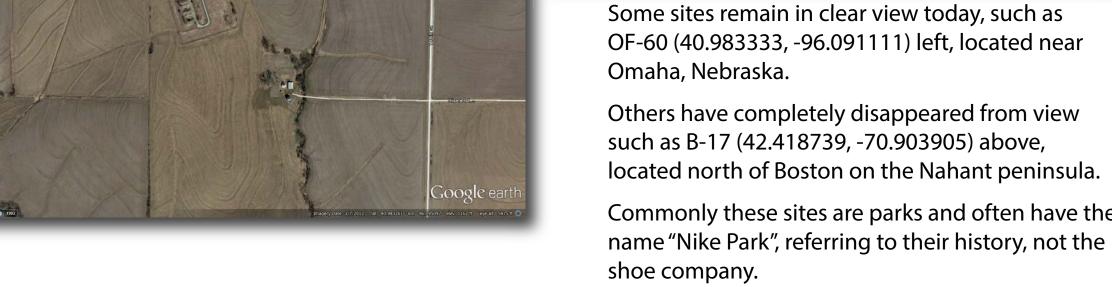






USGS EarthExplorer air photo May 3, 1971

ArcGIS 10.1 LAS toolbar 3D view of LiDAR LAS data



name "Nike Park", referring to their history, not the

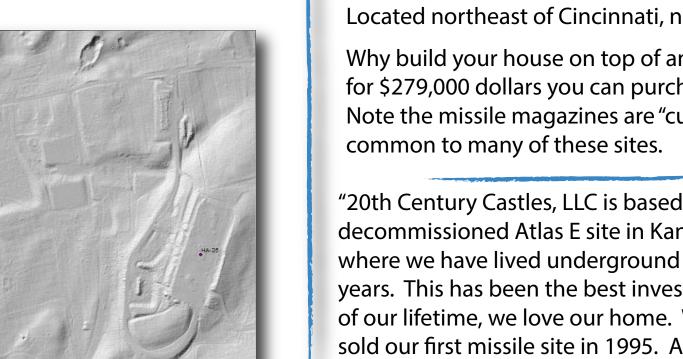
Located on a high ridge on the west side of Oahu about 4 miles from Barbers Point Naval Air Sta-Google Earth image shows the site mainland, this site had the missiles

Oahu Defense Area, HI

**OA-63** (21.364167, -158.11)

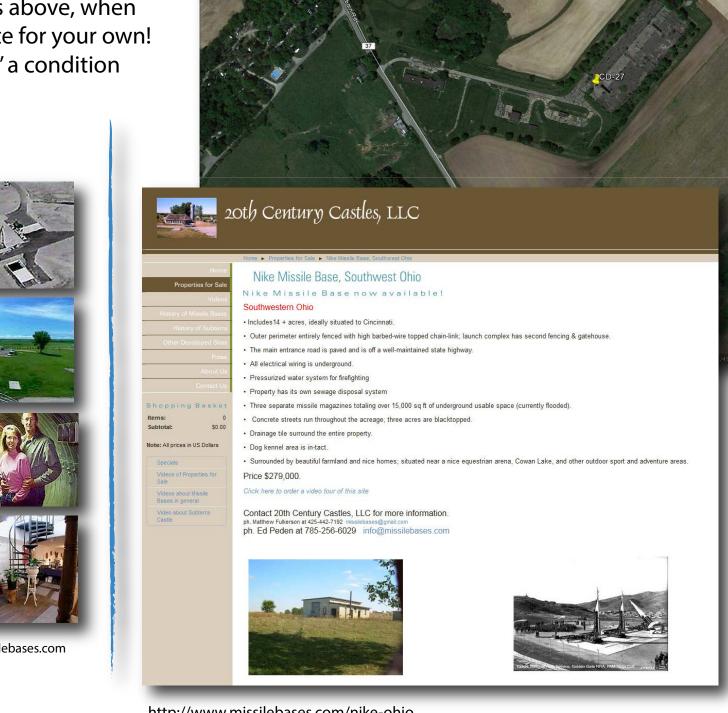


Site PI-36 Pittsburg Defense Area, PA **PI-36** (40.346111, -79.683611) Located southeast of Pittsburg near Harrison City. these houses will have any idea of the history of the land they are living on.



ciating in value, and a worthy invest-

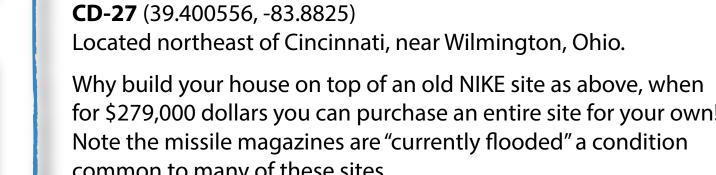


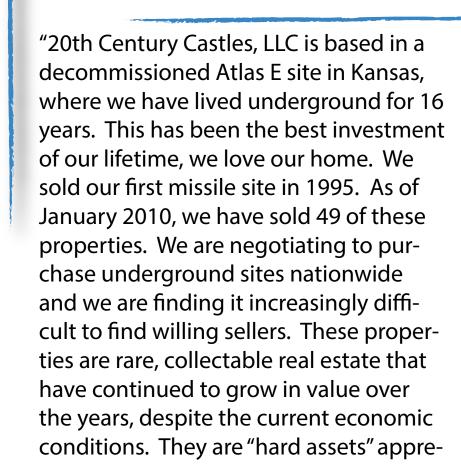






Site CD-27 Cleveland Defense Area, OH





ment consideration. Many people con-

real estate in the country."

(www.missilebases.com)

sider these properties the most coveted