

---

## NIKE DEFENDS WASHINGTON

### Antiaircraft Missiles in Fairfax County, Virginia, during the Cold War, 1954–1974

by CHRISTOPHER JOHN BRIGHT\*

FOR Mark Turner, the Cold War was close to home.

In 1957 he ran a successful and well-known dairy farm of 180 acres in Fairfax County, Virginia, some sixteen miles northwest of the White House. The Beltway did not yet circumscribe Washington, and the rural western half of the county was home to the farms that fed the city. As a former member of Fairfax's governing board of supervisors, a master of the Virginia State Grange, and past chairman of the state milk commission, Turner was an accomplished farmer and community leader. He lived with his wife in a two-story frame Queen Anne–style farmhouse his father had built fifty years earlier in Forestville, between Herndon and Great Falls.<sup>1</sup>

The United States Army was his neighbor. Two years before, the federal government had condemned twelve acres of his land to build barracks for one hundred soldiers, three radar towers, and other equipment to control twelve antiaircraft missile launchers located three-quarters of a mile to the west. There, on 16.5 acres acquired from Ida Christine Money, the army had constructed additional buildings and three underground concrete bunkers for storing Nike-Ajax missiles beneath their firing platform.<sup>2</sup> The

---

\* Christopher John Bright, a lifelong resident of Fairfax County, has written on United States foreign policy. This essay received the first Nan Netherton Prize from the Fairfax County History Commission in 1996. A preliminary and abbreviated version of this article appeared as "The Quiver Of Zeus: Nike Anti-Aircraft Missiles in Fairfax County," *Fairfax Chronicles* 19 (no. 1, 1996): 1–11, published by the Fairfax County Office of Comprehensive Planning. Mr. Bright wishes to thank Fairfax County historian Donald M. Sweig for his invaluable guidance and support in the preparation of this essay.

<sup>1</sup> Nan Netherton et al., *Fairfax County, Virginia: A History* (Fairfax County, Va., 1991), pp. 559, 731; Fairfax County Office of Comprehensive Planning, Heritage Resources Branch, Historic Resources Survey, site no. 12-2-A6-A, parcel no. 12-1(1-24A), Dec. 1988 (includes a copy of Fred Brenckman, "Rural Virginians: A Visit with the Mark Turners," *National Grange Monthly* [Sept. 1948]: 3, 11), Historic Resources Survey, site no. 13-2-A9, parcel no. 13-2(1-8), 14 Nov. 1988, Historic Resources Survey, site no. 13-2-A9-A, parcel no. 13-2(1-8), 14 Nov. 1988, Historic Resources Survey, site no. 13-2-A9-C, parcel no. 13-2(1-8), 14 Nov. 1988; Fairfax County, Deed 1353-185, pp. 189–91, Fairfax Courthouse, Fairfax, Va.

<sup>2</sup> Fairfax County, Deed 1353-185, pp. 185–89, Fairfax Courthouse.

*Virginia Historical Society*

Formed in 1742, Fairfax remained largely rural until postwar development began to edge into the county. Between 1950 and 1955, the county's population increased more than 60 percent to 165,000. Fairfax was the location of three of the twenty Nike missile sites that ringed the Washington-Baltimore defense area. Site W-74 lay 2.5 miles southwest of the county seat, whose Main Street is shown here in the early 1960s.

soldiers and their weapons were there to defend the nation's capital from attack by Soviet bombers.

Collectively, the parcels adjoining Money's and the Turners' properties were considered a single missile battery, or "site," in army parlance, and it, along with similar emplacements in Fairfax County close to Lorton and what is now Fairfax City, was among twenty that encircled Washington and Baltimore. Although the Cold War had many profound effects on Fairfax County—including spurring a population explosion as families moved there to be near the Pentagon and the ancillary businesses that sprang up around it<sup>3</sup>—to Mark Turner, Ida Money, and other citizens of the time, such missiles were the most obvious and tangible manifestation of the postwar tensions between the United States and the Soviet Union.

Construction of the Fairfax installations and similar ones around Virginia's Hampton Roads and major cities and military facilities across the country marked probably the largest defensive building program in the

<sup>3</sup> In 1950 the population of Fairfax County was 98,557. Ten years later it was 248,897. See Fairfax County Office of Research and Statistics, *1991 Fairfax County Profile* (Fairfax County, Va., 1991), II-4.

continental United States since the Civil War, when a system of forts developed around many of the same areas.<sup>4</sup> Although all of the batteries closed by 1974 because of new beliefs about the means of a possible Soviet attack and a changed political climate, they were during the 1950s powerful symbols to a nation unaccustomed to direct military threats to its heartland. The funding, development, and deployment of the Nike missiles can be seen as a broad metaphor for the American conduct of the Cold War. As prevailing perceptions and attitudes about the Soviet Union changed, so did the defense programs to which they gave rise.

### *The International Scene and the American Response*

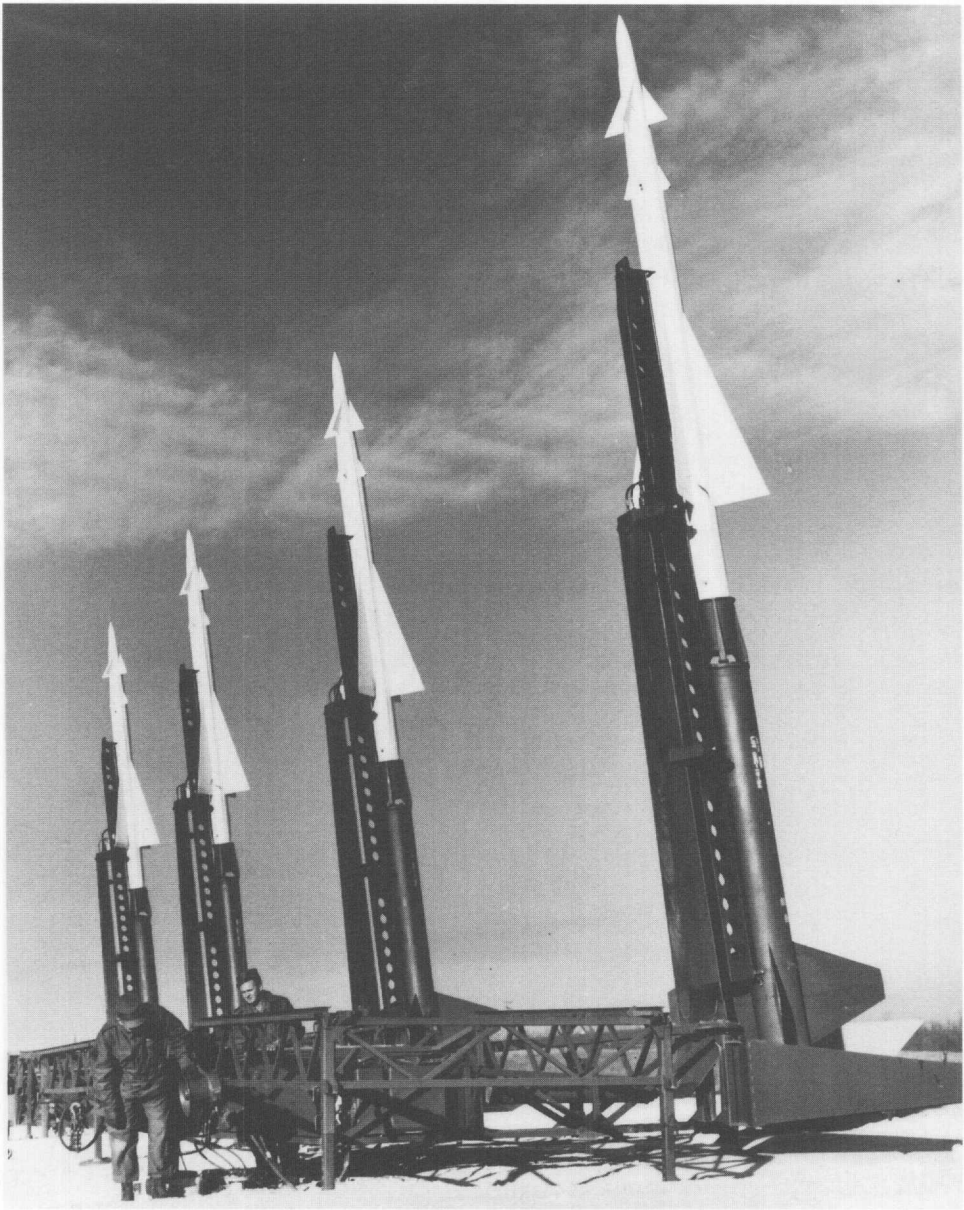
By the late 1940s, the United States and the USSR, former wartime allies, had become locked in the Cold War. The Soviets had imposed Communist governments throughout Eastern Europe, erected a blockade around the Western-controlled portion of Berlin in 1948, and broken the American monopoly on nuclear weapons a year later. President Harry S. Truman's national security advisers, fearing that a somnolent America faced an expansionist enemy governed by a messianic ideology, drafted a policy paper in 1950 calling for ambitious efforts to protect the United States and to challenge Soviet attempts to consolidate power around the world. Soviet support for North Korea's invasion of South Korea months later seemed to confirm the argument advanced in the planning document, called "NSC-68" because of its relative order among other papers produced by the National Security Council. Fear of the USSR grew.

Although the advocates of NSC-68 did not think the Soviets were on the verge of attacking the United States in 1950, they worried about this eventuality. American analysts suspected that the Soviet Union had aircraft that could deliver a total of ten to twenty nuclear weapons. They predicted the number and type of aircraft and amount of stockpiled ordnance would increase dramatically within four years. Therefore, among other recommendations, NSC-68 suggested that an "increased air defense . . . would also be necessary to provide reasonable assurance that the free world could survive an initial surprise atomic attack of the weight which it is estimated the U.S.S.R. will be capable of delivering by 1954."<sup>5</sup> This assessment of

---

<sup>4</sup> Roadside historical markers have been placed at the Fairfax and Herndon sites. For a comprehensive listing of all Nike sites in the United States, see Mark L. Morgan and Mark A. Berhow, *Rings of Supersonic Steel: Air Defenses of the United States Army, 1950–1979: An Introductory History and Site Guide* (San Pedro, Calif., 1996).

<sup>5</sup> NSC-68 is reprinted in S. Nelson Drew, ed., *NSC-68: Forging the Strategy of Containment with Analyses by Paul H. Nitze* (Washington, D.C., 1994), pp. 1–52 (quotation on p. 70).



*U.S. Army photograph; reprinted in cooperation with the D.C. Public Library*

The army's Nike-Ajax guided missile system replaced the conventional 90mm and 120mm anti-aircraft guns. Developed by Bell Telephone Laboratories and the Douglas Aircraft Company under the leadership of Western Electric, the Nike contained 1.4 million individual parts furnished by 1,300 different suppliers. Each missile assembled in the 1950s cost more than \$20,000. Here, an army team at Lorton inspects the missiles, raised for launch, in March 1955.

intentions and capabilities rested on the interpretation of available information, which in the days before spy satellites was difficult to obtain.<sup>6</sup>

This concern about a possible Soviet air strike drove American defensive preparations. The air force stationed fighter interceptors around the country and started work on a long-range antiaircraft missile. Planning began for a network of radars to stretch across Canada and the northern United States to keep watch for incoming bombers. The army created a major unit, the Army Antiaircraft Command (ARAACOM), to coordinate its related activities. ARAACOM, later renamed the Army Air Defense Command (ARADCOM), placed antiaircraft guns around key cities in 1951.<sup>7</sup> It located units between six and nine miles from downtown Washington, including in Franconia, Annandale, McLean, and Vienna, in Fairfax County.<sup>8</sup>

A potential enemy equipped with jet aircraft and nuclear bombs, however, required defenders to be able to fire quickly and accurately at attackers from the greatest possible distance. Since the closing months of World War II, technological advances had made warplanes increasingly difficult to shoot down with conventional antiaircraft guns.<sup>9</sup> As a result, in 1945 the military had turned to the Bell Telephone Laboratories and the Douglas Aircraft Company to design an antiaircraft guided missile and associated launching gear and control equipment. A self-propelled projectile that could rapidly speed toward a distant target and be controlled (or “guided”) in flight would better enable the army to defend against air attack.

Although Bell Telephone and Douglas had completed a prototype by 1946, the end of World War II led to funding cutbacks and development delay. With the onset of the Cold War, however, the program was rejuvenated. By 1951, the companies, coordinated by Western Electric, the prime contractor, were prepared to produce a thirty-four-foot, two-stage missile that traveled twice the speed of sound and was guided by three radars.<sup>10</sup> One, the acquisition radar, identified attacking airplanes 125 miles away. A second, the target-tracking radar, followed this target once it was within the twenty-five-mile range of the missile. A missile-tracking radar traced the missile’s course once it was launched toward the target. As the

---

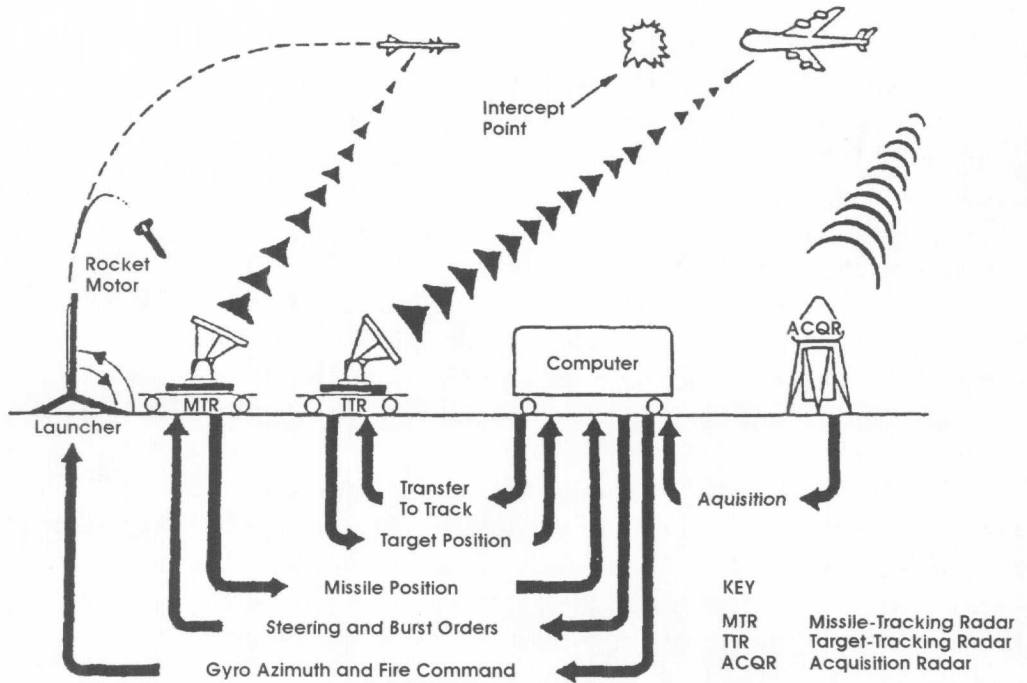
<sup>6</sup> See Allan R. Millett and Peter Maslowski, *For the Common Defense: A Military History of the United States of America* (New York and London, 1984), pp. 513–14.

<sup>7</sup> “Memorandum For: Colonel Shuler; Subject: NIKE Construction Changes in CWE.” 5 July 1955 (photocopy). Box 33 (“Anti-Ballistic Missile, Nike and Related Programs”), Folder 5 (“NIKE Construction Changes in CWE”), Office of History, Headquarters, U.S. Army Corps of Engineers, Fort Belvoir, Va. (hereafter cited as ViFbOH).

<sup>8</sup> Department of the Army, *Directory and Station List of the United States Army*, 15 Dec. 1953, Department of the Army, *Directory and Station List of the United States Army*, 16 Aug. 1954, U.S. Army Military History Institute, Carlisle Barracks, Pa. (hereafter cited as PCarlMH).

<sup>9</sup> Nels A. Parson, Jr., *Missiles and the Revolution in Warfare* (Cambridge, Mass., 1962), pp. 10–11.

<sup>10</sup> Michael J. H. Taylor and John W. R. Taylor, *Missiles of the World* (New York, 1972), pp. 84–85.



Mark L. Morgan and Mark A. Berhow, *Rings of Supersonic Steel: Air Defenses of the United States Army, 1950–1979: An Introductory History and Site Guide* (San Pedro, Calif., 1996)

Three radars guided and controlled the Nike-Ajax missile. The acquisition radar detected hostile aircraft 125 miles away. The target-tracking radar followed this target and communicated information on its location and movement to a computer. A third radar tracked the missile once it was launched toward the target. The computer coordinated the activities of all three radars and conveyed new flight plans to the missile as changes in the enemy plane's direction or altitude were detected.

target-tracking radar detected changes in direction or altitude of the targeted aircraft, a new flight plan was communicated to the missile. A computer coordinated the activities of all three and theoretically ensured an interception. It was a revolutionary and technologically complex system for its time.<sup>11</sup>

<sup>11</sup> Ibid.; Stanley M. Ulanoff, *Illustrated Guide to U.S. Missiles and Rockets* (Garden City, N.Y., 1959), pp. 15–16. The task involved thousands of contractors and suppliers in more than twenty states. In the days of computers with vacuum tubes, the electronic apparatus alone contained more than 1.5 million parts. See Craig Thompson, "They Didn't Want That Guided Missile," *Saturday Evening Post*, 3 Sept. 1955, pp. 36–37; Steven Malevich, "Nike Deployment," *The Military Engineer* 47 (Nov.–Dec. 1955): 417–18; Department of Defense, Office of Public Information, "Army's Nike Guided Missile to Be Installed in Nation's Anti-Aircraft Defense System," news release, no. 1185-53, Exhibit A, 17 Dec. 1953, reproduced in Department of the Army, Office of the Chief of Information, Policy and Programs Division, *Middletown Nike: A Case Study in Army Public Relations* (Washington, D.C., 31 Dec. 1958), PCarlMH; and Department of Defense, Office of Public Information, "Fact

The weapon was christened “Nike,” after the Greek goddess of victory, following an army decision to name each of the missile types it eventually fielded for figures from classical mythology. Later, when a more powerful model was developed, this first version assumed the designation “Nike-Ajax” to distinguish it from its progeny.<sup>12</sup>

In recognition of the world situation, the promise of the new missile, and the shortcomings of the anti-aircraft guns then in place, in 1951 the army chief of staff endorsed the construction of a nationwide network of Nike sites to guard against Soviet attack. Based on a determination of the highest defense priorities, he directed that Nikes surround Washington and Baltimore (considered a single defense area), Norfolk, Boston, New York, Niagara Falls, Philadelphia, Pittsburgh, Chicago, Detroit, San Francisco, Los Angeles, Seattle, and Hanford (the site of a large nuclear research and weapons storage facility in Washington State) by 1955. A typical metropolitan area would require four to twelve batteries.<sup>13</sup> Given the significant manufacturing and construction effort entailed, and the manpower demands it would place on the army, this was an expensive proposition and an ambitious schedule. As citizens of Fairfax County and elsewhere would learn, however, the international climate and the exigencies of the nuclear age were spurring a reorientation of American defense and foreign policy, unprecedented peacetime defense spending, and military preparedness.

In early 1953, the army empaneled site selection boards—including representatives of the Army Corps of Engineers, which was responsible for land acquisition and construction oversight—to identify appropriate locations for the Nikes. Although the government wanted to assemble the land needed to accommodate the new missiles expeditiously, it also wanted to balance the task with cost-saving measures and community concerns.

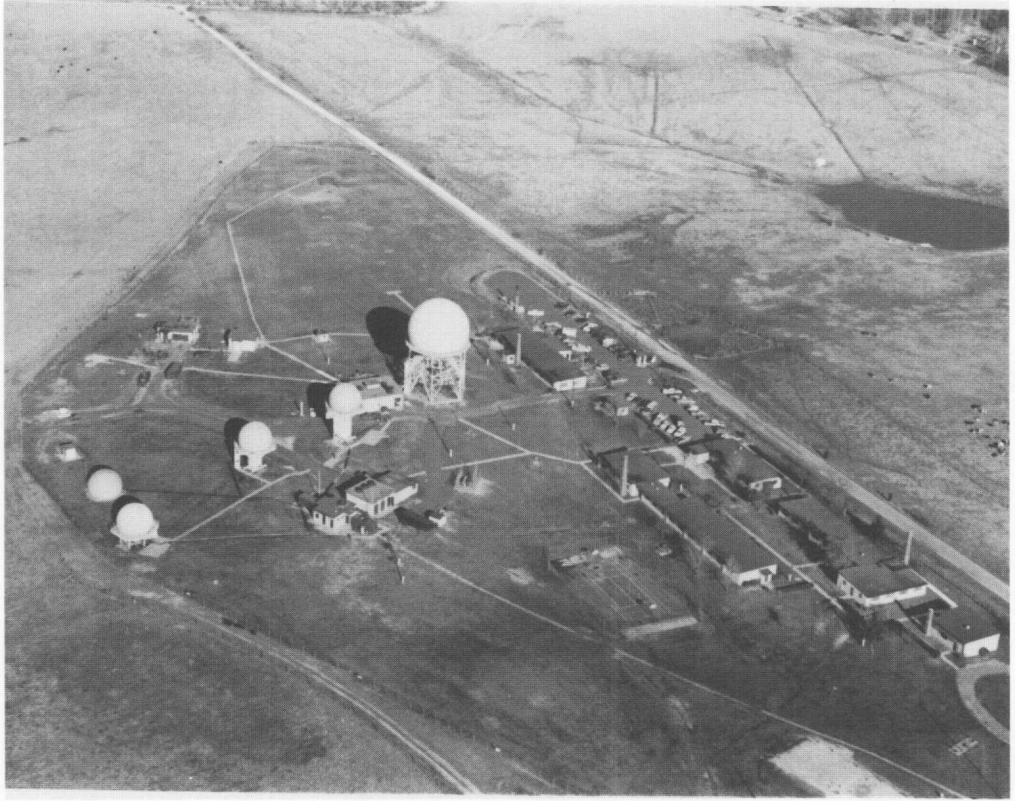
The selection boards sought paired parcels of land for purchase or lease in a twenty-five-mile radius of each municipal center. The parcels needed to meet stringent topographical, geographic, and utility requirements.<sup>14</sup> The

Sheet: Nike Surface to Air Guided Missile.” news release, no. 443-55, Exhibit C-1, 17 May 1955, p. 3, reproduced in *ibid*.

<sup>12</sup> “Fact Sheet,” news release, no. 443-55, 17 May 1955, p. 1, reproduced in *ibid*. Ajax was the name of two Greek heroes of the Trojan war. In a peculiar mix of nomenclature, the Nike-Ajax was also known as Nike I and its successor as Nike B.

<sup>13</sup> Memorandum, “Summary Sheet. Subject: Plan to Expedite the Acquisition of Surface-to-[Air Missile (NIKE) Sites.” 20 Mar. 1953 (photocopy), Box 34, Folder 1-2 (“NIKE—General”), ViFbOH; memorandum, “Status of Funding and Cost Estimates for Nike Construction,” 5 Apr. 1954 (photocopy), Box 33 (“Anti-Ballistic Missile, Nike and Related Programs”), Folder 3 (“NIKE Const Progress”), ViFbOH; Edward A. Kolodziej, *The Uncommon Defense and Congress, 1945–1963* ([Columbus, Ohio], 1966), p. 192; “FACTS Card Designed To Assist Personnel In Answering Queries About USARADCOM,” *ARADCOM Argus*, 1 Nov. 1959. The U.S. Army Military History Institute at Carlisle Barracks holds a complete run of the ARADCOM newsletter.

<sup>14</sup> “Real Estate Planning Report. Proposed Surface to Air Missile Sites, Washington-Baltimore Area,” n.d. (photocopy), “Site Selection Criteria for Nike I Guided Missile Battalions,” 4 Mar. 1953 (photocopy), Box 34, ViFbOH. The three Fairfax County sites are within seventeen miles of



*Air Defense Artillery Museum, Fort Bliss, Texas*

Nike missile sites consisted of paired parcels of land, one housing the radars, computer, and other guidance electronics, the other storing the missiles themselves. To allow the radars to sweep the sky unimpeded and to make clear contact with the missiles, the battery control area had to be elevated, flat, and without radar masks. The distinctive radar domes of Lorton's control area are evident in this 1972 aerial view.

radar and other guidance electronics would be housed at a battery control area that would also have barracks, offices, and a mess hall. This parcel had to be elevated, rectangular, flat, and without obstructions, or "masks," so that the radars could sweep the surrounding sky unimpeded and be able to guide the missiles in flight by making clear contact with them. The missiles themselves were to be stored at battery launching areas between two-thirds and three and one-half miles away, in the direction away from the defended city.<sup>15</sup> This land also needed water and sewer or septic systems, stable

Washington. Steven Malevich notes that in 1953 officials decided to select battery locations "closer to the center of defense" (Malevich, "Nike Deployment," pp. 418-19).

<sup>15</sup> The exact distance was 1,000 and 6,000 yards, respectively (see "Site Selection Criteria for Nike I Guided Missile Battalions," 4 Mar. 1953 [photocopy], pp. 3-4, Box 34, ViFbOH). The minimum distance ensured that the missile-tracking radar could swivel skyward fast enough to stay locked on a launched missile accelerating to more than twice the speed of sound. The maximum distance was



electrical service, and year-round road access. To prevent vegetation or man-made objects from blocking the radars during operation, various easements on adjacent property were necessitated.<sup>16</sup>

Although army regulations required that the site selection boards first consider land owned by the federal government, states, or municipalities before seeking privately held property, it became apparent that around some cities, sufficient real estate in the proper location and with the necessary attributes did not exist under any ownership. In New York, Los Angeles, and Cleveland, the identified tracts lay in nascent suburbs and were prohibitively expensive. Acquisition there spawned objections from home owners, who feared the effect on property values.<sup>17</sup> The prospect of a larger Nike version, then just on the drawing boards, that would eventually equip the same sites also complicated the process of land purchase and facility design.<sup>18</sup>

As a result, by summer 1953, battery preparation nationwide had fallen behind schedule, although Douglas and Bell were producing the missiles and equipment, and soldiers to operate the system were training at Fort Bliss, Texas.<sup>19</sup> To get the deployment back on track, the army decided to

---

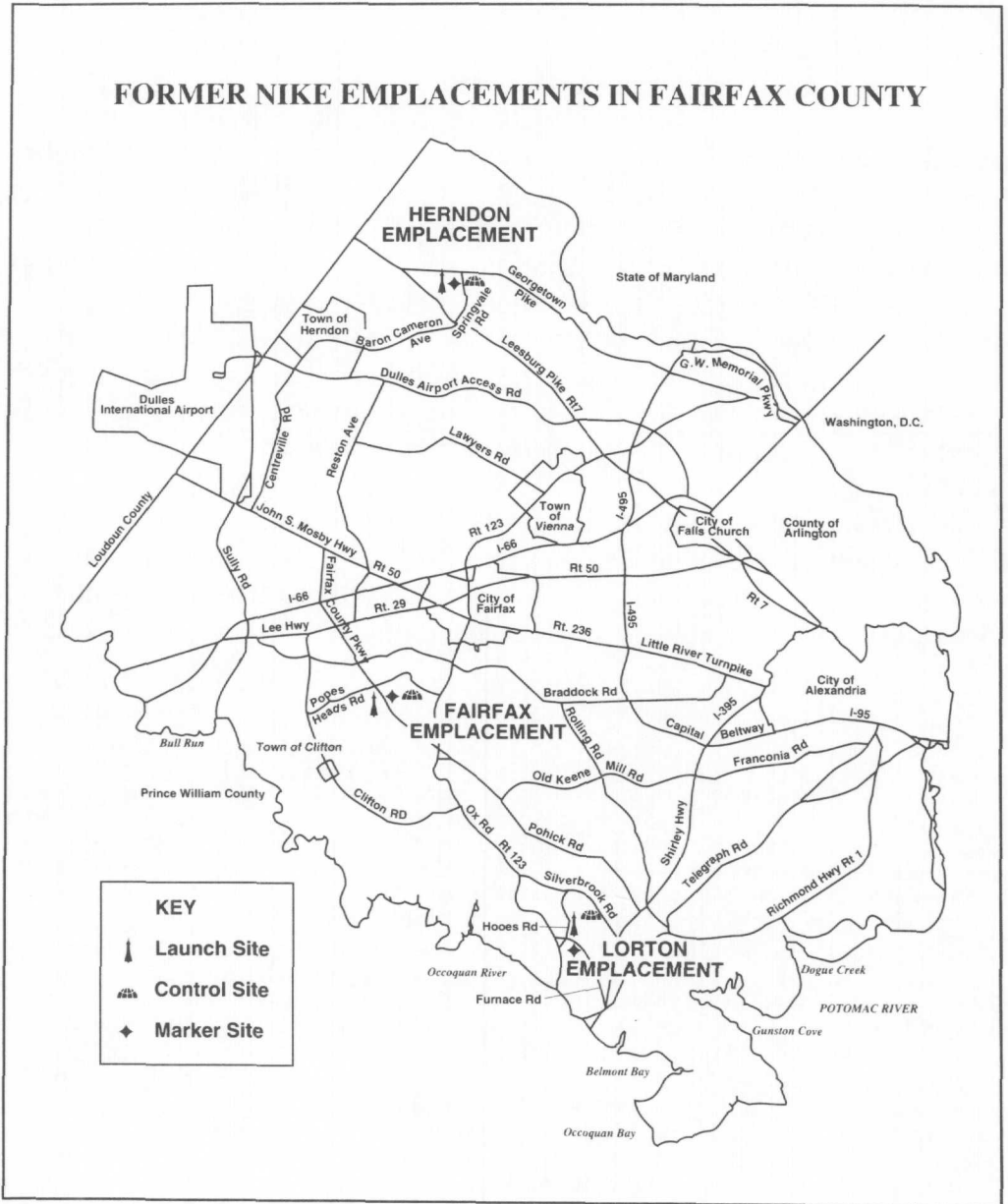
imposed by the limitations of the buried coaxial cables that connected the control and launch facilities.

<sup>16</sup> The army did reject the option of obtaining rights to the property where missile boosters would likely land after being jettisoned two and a half seconds into flight (Department of the Army, A[rmy] R[egulation] 210-30, *Installations: Selection of Sites for Army Installations*, 7 Aug. 1957 [hereafter cited as AR 210-30], pp. 5, 10, 12, 14, PCarlMH). It is probable that the government believed that if the need ever arose for Nikes to be fired, officials would be preoccupied with issues other than making amends for damage caused by falling missile parts.

<sup>17</sup> "Memorandum For: Colonel Shuler; Subject: NIKE Construction Changes in CWE." 5 July 1955 (photocopy), Box 33, Folder 5, ViFbOH; Malevich, "Nike Deployment." Scouting land was complicated by the fact that the identification of specific locations under consideration for Nike facilities remained classified until construction plans or contracts were issued. See "Amendment No. 1: Special Instructions and Basic Engineering Data for Planning and Construction in Z/I of Surface-to-Air Missile (SAM) Installations (NIKE)." 15 Sept. 1953 (photocopy), Box 34, ViFbOH. Owners who were reluctant to allow representatives of the Corps of Engineers onto their property could only be told that "entry is desired to determine the suitability of the area for an Army anti-aircraft unit" and that the government would consider acquiring the site if it met the necessary criteria. See Major General William E. Bergin, memorandum, "Subject: Release of Information Concerning NIKE Sites." 7 Dec. 1953 (photocopy), Box 34, ViFbOH. In 1955, when searching for possible Nike sites around Pittsburgh, civilian surveyors under contract to the corps caused a stir in Dorseyville, Pennsylvania, by allegedly trampling plants and declaring that they were seeking land for "dangerous NIKE explosives." A meeting between army representatives and citizens at the Dorseyville Fire Hall ensued, and the contractor was admonished. See Colonel Stephen M. Mellnik, memorandum, "Subject: Public Relations Relative to NIKE Program, Pittsburgh Defense." 9 Mar. 1955 (photocopy), Box 34, ViFbOH. For coverage in other cities, see Jess Stearn, "Put Your Nike Somewhere Else, Suburbs Tell Army." *New York Daily News*, 21 Dec. 1954; "Missile Site Battle Ends: City, Army Agree on Points for Control and Launching." *Los Angeles Examiner*, 25 Sept. 1954; and Homer Hendrickson, "2 Suburbs Cry in Protest at Rocky River Nike Site." *Cleveland Plain Dealer*, 9 May 1955.

<sup>18</sup> Colonel John F. Smoller, disposition form, "Subject[:]'Design of NIKE B Equipment.'" 18 Dec. 1953 (photocopy), and two similarly titled memoranda by Colonel J. A. Barclay, 28 May 1954, and by Lieutenant Colonel Joseph P. D'Arezzo, 24 June 1954, Box 34, ViFbOH.

<sup>19</sup> Malevich, "Nike Deployment," p. 418. Douglas, in cooperation with the army, started



*Courtesy of Fairfax Chronicles and Donald M. Sweig*

According to the army's original specifications, each missile site required forty to fifty acres, six to eight acres for the battery control area and the rest for the missile storage and launching area. Today, roadside historical markers funded by the Fairfax County History Commission and erected by the Virginia Department of Historic Resources identify the locations of two of the three Nike sites in Fairfax.

construct at each battery underground missile storage areas and specially protected buildings in which to handle the caustic liquid mix of nitric acid and jet fuel that served as Nike-Ajax's propellant. Although more expensive, this construction would reduce the acreage required and consequently remove some impediments to land acquisition, yet still protect against damage and injury from an accidental explosion during maintenance.<sup>20</sup>

The army established procedures simultaneously to negotiate land purchases and to institute condemnation proceedings in areas where missiles and troops would be ready for deployment before sites could be "acquired and prepared under normal procedures." These new guidelines enabled the Corps of Engineers to take possession of such property as soon as the federal government initiated condemnation, and "construction and other site preparation could begin two to three months earlier," explained an army memorandum. Conscious of the negative public reaction this policy was likely to provoke, the army reported that a relatively small number of individuals would be affected and argued that similar provisions had been employed during World War II.<sup>21</sup>

### *Nike Comes to Fairfax*

Notwithstanding difficulties elsewhere, the Nike siting process in Fairfax County apparently encountered few obstacles.<sup>22</sup> Ample locations throughout the region met the military's technical requirements. By early summer 1953, the capital area site selection panel completed its initial evaluation of real estate and submitted a report to the chief of engineers. According to a companion document,

[P]reliminary surveys in the Baltimore-Washington area indicate that few homes and/or other improvements will be disturbed if[n] the acquisition of NIKE sites.

---

manufacturing the missiles at an underused army quartermaster depot in North Carolina in 1955. See *ibid.*; and Exhibit F-2, reproduced in Department of the Army, Office of the Chief of Information, *Middletown Nike*.

<sup>20</sup> See "Memorandum For: Colonel Shuler; Subject: NIKE Construction Changes in CWE," 5 July 1955 (photocopy), Box 33, Folder 5, ViFbOH; and AR 210-30, p. 12. To cut costs, early proposals also suggested that soldiers install prefabricated structures at each site. After complaints from general contractors, labor unions, and prospective neighbors, the army relented and called instead for more permanent facilities of concrete block to be constructed by civilian laborers. The secretary of the army explained to a skeptical Senator John C. Stennis of Mississippi that these relatively more expensive buildings would boost troop morale. See Robert T. Stevens to John C. Stennis, n.d. [July 1955?], Box 33 ("Anti-Ballistic Missile, Nike and Related Programs"), Folder 3 ("NIKE Constr Progress"), ViFbOH. Buildings at Lorton, typical of all Nike sites, are described in a photocopy of briefing remarks, "Chart No. 1—Site Layout," n.d., Box 33 ("Anti-Ballistic Missile, Nike and Related Programs"), Folder 3 ("NIKE Constr Progress"), ViFbOH.

<sup>21</sup> "Summary Sheet," 20 Mar. 1953 (photocopy), Box 34, Folder 1-2, ViFbOH.

<sup>22</sup> Neither the Washington dailies nor the local press featured articles about community concerns. Index searches were conducted of the Washington *Evening Star*. Key dates of the *Fairfax Herald* and other local newspapers in the holdings of the Fairfax City Regional Library were also reviewed.

The safety areas which comprise a sizable portion of the total lands required can be used by property owners for farming and grazing on a co-use basis. The lands required for cable and line of sight right of way can be similarly used on a co-use basis.<sup>23</sup>

The selection of the three locations for the Nikes in Fairfax may have been eased because the desired sites were in the rural western and southern third of the county. Although in 1953 Fairfax had approximately 130,000 residents, most lived in the east, near the federal agencies in neighboring Arlington County and Washington, D.C.<sup>24</sup> Residents may also have been preoccupied with an even larger proposed federal land purchase of twelve thousand acres in Burke, in the southwestern part of the county, for a new jet airport to serve the District of Columbia.<sup>25</sup>

The locations for the Nike sites identified by the army in the Washington-Baltimore area formed an oblong ring fifteen to twenty miles from the centers of those cities. Aside from the three batteries in Fairfax County, the others were all in Maryland. Each eventually would be known by the name of the local post office and given a letter and numeric designation based on the name and relative orientation to imaginary points due north of downtown Washington or Baltimore.<sup>26</sup>

Thus, the site southwest of Washington outside the Fairfax County community of Lorton was denoted W-64. Given the requirement to use government-owned land whenever possible, the decision to place a Nike battery on two sections of a cornfield used by the District of Columbia there was probably an easy and logical one. Although deeded to the federal government, the plot had been leased to the District for a city prison farm since 1911. In October 1953 the army obtained use of two sections totaling thirty acres.<sup>27</sup>

Because the army acquired the property so early, and because the plot was spacious and level, the Corps of Engineers decided to construct a prototype of the underground missile storage magazines, or "boxes," there

<sup>23</sup> "Real Estate Planning Report." n.d. (photocopy), "Summary Sheet," 20 Mar. 1953 (photocopy) (quotation), Box 34, ViFbOH.

<sup>24</sup> Fairfax County Office of Research and Statistics, *1991 Fairfax County Profile*, II-4.

<sup>25</sup> Local newspapers contain many articles about the proposed location in Burke of what became John Foster Dulles International Airport. See, for example, "County Chamber to Consider Airport Vote," *Fairfax Herald*, 13 May 1955. The Burke site was ultimately rejected in favor of Chantilly.

<sup>26</sup> Merle T. Cole, "W-25: The Davidsonville Site and Maryland Air Defense, 1950-1974," *Maryland Historical Magazine* 80 (1985): 240-60. A battery due north of Washington would be designated W-0, due east W-25, and due south and due west W-50 and W-75, respectively. Therefore, the number alone reveals a site's location relative to the city it was intended to defend.

<sup>27</sup> Netherton et al., *Fairfax County*, p. 503; "District of Columbia Permit to the Department of the Army to Use Property of Lorton Reformatory Reservation, Virginia." 6 Oct. 1953, Lorton site files for Defense Environmental Restoration Program for Formerly Used [Defense] Sites, Project No. CO3VA007500, Norfolk District Headquarters, U.S. Army Corps of Engineers, Norfolk, Va. The control area was south of Silverbrook Road east of its intersection with Hooes Road. The launching area was built nearly a mile south across the field at the corner of Hooes and Furnace roads.

in order to test the proposed design. Because of the size of the tract, it was also made a “double site” with eventually six rather than the standard three magazines and thus twice the normal staff complement. A construction contractor started work there in March 1954.<sup>28</sup>

The fifty-eight-by-sixty-two-foot concrete missile storage boxes with solid eighteen-inch concrete walls lay three feet underground at W-64.<sup>29</sup> In the center of each was a large rectangular platform elevator, similar to the hydraulic lifts used by service stations, designed to raise the missiles individually to the surface, where soldiers would push them along rails to one of four launch pads on top of each magazine.<sup>30</sup>

The exact dates that Lorton and the other two Fairfax batteries were completed, staffed, and declared operational are difficult to determine. Soldiers from the 71st Antiaircraft Missile Battalion’s Battery C were assigned to Lorton, and it is likely that W-64 was the first permanent operational site in the nation.<sup>31</sup> Probably because of this primacy, and because of its proximity to the national news media and policy makers in Washington, Lorton was selected in 1955 as the showpiece for the army’s full-fledged public announcement of the plans to deploy Nike nationwide. Although Nike was not a secret—the army had issued press releases about it,<sup>32</sup> land had been purchased, and contractors were building the emplace-

---

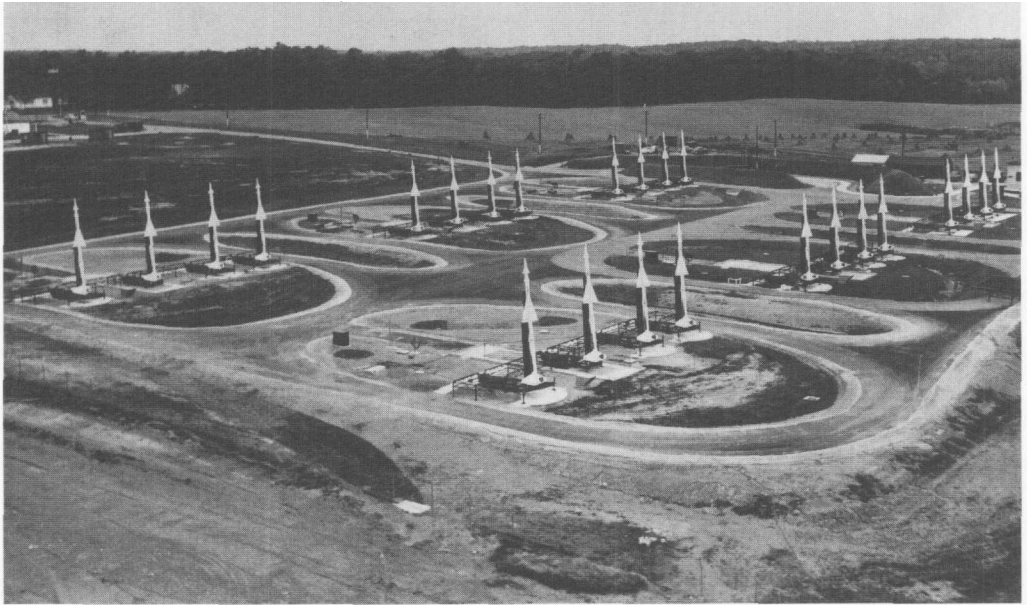
<sup>28</sup> “Construction of NIKE Installation, Lorton, Virginia,” 17 Dec. 1953 (photocopy), Box 33 (“Anti-Ballistic Missile, Nike and Related Programs”), Folder 3 (“NIKE Const Progress”), ViFbOH; “Memorandum For: Colonel Shuler; Subject: NIKE Construction Changes in CWE,” 5 July 1955 (photocopy), Box 33, Folder 5, ViFbOH.

<sup>29</sup> “Chart No. 1—Site Layout,” n.d., Box 33, Folder 3, ViFbOH. Dimensions are taken from Department of the Army, Technical Manual, F[ield] M[annual] 44-80, “Procedures and Drills for the Nike I System” (hereafter cited as FM 44-80), diagram, reproduced in Roger Hatheway et al., “Historical Cultural Resources Survey and Evaluation of the Nike Missile Sites in the Angeles National Forest, Los Angeles County, California,” U.S. Army Corps of Engineers, Los Angeles District (San Diego, Calif., 1987), p. 59, PCarlMH.

<sup>30</sup> See FM 44-80 diagrams reproduced in *ibid.*, pp. 54, 58–59. The elevators were integral components of this storage arrangement. The army approved this configuration for use nationally only because tests at White Sands Proving Ground and Lorton demonstrated that elevator lift time was less than the forty-five seconds necessary for launchers to swing a Nike up to the eighty-nine-degree launching position. Missile firing time would not be delayed as a result of underground storage because in emergencies missiles could be simultaneously raised from the magazine and tilted vertically by the elevator launcher. The elevators were complicated machines with strict specifications, and the contract to supply the Nike elevators was the largest elevator order let in the United States at the time (“Chart No. 1—Site Layout,” n.d., memorandum, “Procurement of Special-Purpose Elevators—NIKE Program,” 31 Mar. 1954 [photocopy], H. F. Carey, memorandum, “SUBJECT: Test of Prototype NIKE I Underground Launching Installation,” 22 Apr. 1954 [photocopy], Box 33 [“Anti-Ballistic Missile, Nike and Related Programs”], Folder 3 [“NIKE Const Progress”], ViFbOH).

<sup>31</sup> An article in the newsletter distributed by ARADCOM reports Lorton was the first permanent battery (“Lorton Site Turned Over To Va. ARNG,” *ARADCOM Argus*, 1 Oct. 1963, p. 1). Malevich, however, believes a Los Angeles site was the first (Malevich, “Nike Deployment,” p. 417).

<sup>32</sup> See, for example, “Army’s Nike Guided Missile to Be Installed,” news release, no. 1185-53, 17 Dec. 1953, reproduced in Department of the Army, Office of the Chief of Information, *Middletown Nike*; and “Subject: Release of Information Concerning NIKE Sites,” 7 Dec. 1953 (photocopy), Box 34, ViFbOH.



*U.S. Army photograph; reprinted in cooperation with the D.C. Public Library*

Lorton's double size and proximity to Washington led the secretary of the army to designate it the "National Nike Site" and "the Nation's NIKE Showplace." Dignitaries such as British ambassador Sir Harold Caccia, Canadian ambassador A. D. P. Heeney, and the crown prince of Iraq toured the facilities and inspected what the United States Army termed "the most deadly antiaircraft system the world has ever seen."

ments in full public view—the completion of Lorton offered an opportunity to show off an operational battery to the press. This publicity helped ease the site selection process that was in the early stages in other parts of the country.

As a result of a media tour of Lorton, articles and photographs of the battery appeared in the three daily Washington newspapers and in *Newsweek*, the *New York Times*, the *Saturday Evening Post*, and other publications across the United States. These articles described the system, showed missiles raised for launch, and detailed the precautions used in handling the highly explosive fuel. In each instance, journalists identified the site; the Associated Press, for example, reported that the Lorton battery was set amid "rolling farmland."<sup>33</sup> But this was just the start of the attention shown

---

<sup>33</sup> John G. Norris, "Nike, Washington's Last-Ditch Defense, Is Battle-Ready If Atom Attack Comes," *Washington Post and Times Herald*, 18 May 1955, p. 23; "It's Our 'Backyard' Defense," *ibid.*, 18 May 1955, p. 23; Stan Felder, "The Army Hopes We'll Like Nike," *Washington Daily News*, 18 May 1955, p. 8; John A. Giles, "Army Labels Nike Sites As Safe as Gas Stations," *Washington Evening*

Lorton. Its accessibility from Washington and its double size led the secretary of the army to designate it the “National Nike Site” and “the Nation’s NIKE Showplace.”<sup>34</sup> Until 1963, Lorton was the destination for hundreds of senior military officers, congressional leaders, and visiting dignitaries interested in seeing an example of America’s anti-aircraft missile network. The crown prince of Iraq and the Paraguayan, Chilean, and Haitian chiefs of staff all inspected the facilities in the mid-1950s. A tour by the British and Canadian ambassadors in 1957 yielded an Associated Press photograph and spurred the newsletter circulated to Nike sites nationwide to report: “Even the sophisticated Washington newspapers were interested in this visit.”<sup>35</sup>

It was not necessary to be a dignitary, however, to tour the battery. It was opened to the public for Armed Forces Day in 1956, and subsequently open houses were held each Sunday as part of a broader public relations effort. On a typical day in April 1957, 150 Cub Scouts and an equal number of “Civil Defense volunteers and family groups” stopped by. The National Education Association brought a delegation the next year, and, separately, “30 science teachers and 30 top students from Fairfax and Arlington Counties and the City of Alexandria” included a field trip to the Lorton facility as part of a ten-week course on rocketry.<sup>36</sup>

---

*Star*, 18 May 1955, p. A-26; “Can the Nike Do It?” *Newsweek*, 11 June 1956, pp. 35–36; Associated Press, “The Army Shows One of Its ‘Backyard’ Defenses,” *New York Times*, 18 May 1955, p. 1 (quotation).

<sup>34</sup> One source says this designation was made in 1956 (see “1956—Highlights of the Year—1956,” *Belvoir Castle*, Dec. 1956. A complete run of the newspaper of Fort Belvoir is in the collection of the Post Library, Fort Belvoir, Va.). Another indicates the secretary conferred the titles in 1957 (see “Lorton Site Turned Over To Va. ARNG,” *ARADCOM Argus*, 1 Oct. 1963, p. 1).

<sup>35</sup> “Legislators Tour Lorton Batteries,” *ARADCOM Argus*, 1 May 1962, p. 6; “Lorton Battery Hosts Hundreds Of World VIP Visiting Capitol,” *ibid.*, 1 Apr. 1958, pp. 7, 12; “Paraguay Officers Observe Function Of TEC Monday,” *Belvoir Castle*, 2 Mar. 1956, p. 1; “Dignitaries’ Visit To TEC Honored With Ceremonies,” *ibid.*, 29 June 1956, p. 1; “Ambassadors See Lorton Nike Site,” *Washington Evening Star*, 26 Jan. 1957. Indeed, so many important visitors came that the army erected a special building in which to conduct briefings at Lorton (“Chart No. 1—Site Layout,” n.d., Box 33, Folder 3, ViFbOH). Publicity surrounding the tours by distinguished guests also ensured a rich photographic record of the site.

It has been suggested that Soviet premier Nikita Khrushchev visited the Herndon battery or viewed it from the Turner farm during his visit to the United States in September 1959. No support for this contention has been found. The Washington newspapers extensively covered Khrushchev’s travels through the area but made no mention of any stop in Fairfax County. Similarly, the official itinerary maintained at the Dwight D. Eisenhower Library in Abilene, Kansas, does not show such a visit. Eisenhower did accompany Khrushchev on a marine helicopter for a thirty-four-minute aerial tour of the Washington area. Published maps of the helicopter’s route show that it flew over the eastern edge of Fairfax County and crossed the Potomac west of McLean. It is possible that the helicopter flew farther west than is noted and that the Nike site and Turner’s farm were visible from the air. If so, neither location merited a mention in any documents or news reports about the tour (see, for example, Tony Gieske, “Ike Takes Khrushchev On Tour by Helicopter,” *Washington Post*, 16 Sept. 1959, pp. A1, A6; and Earl H. Voss, “Premier Sees Panorama of D.C. Region: Rides 30 Minutes With Eisenhower In Helicopter,” *Washington Evening Star*, 16 Sept. 1959, pp. A1, A8).

<sup>36</sup> “71st Bn Batteries Opened to Public 12 to 5 Tomorrow,” *Belvoir Castle*, 18 May 1956, p. 1; “Lorton Battery Hosts Hundreds Of World VIP Visiting Capitol,” *ARADCOM Argus*, 1 Apr. 1958,

Recounting a visit to Lorton, a columnist for the *Washington Evening Star* known as “The Rambler” described in the third person his tour in 1957 with Second Lieutenant Robert M. Hardy. “In an open field they stepped on a steel platform at grass level, about 30 feet long and 15 feet wide. It was an elevator and it lowered them into a large basement. There were eight of the long white Nikes, beautiful in design, defensive in purpose.” Said the lieutenant about other guests, “This [sight] seems to awe them. When we tell them the Nikes have live warheads, some of the women utter faint screams and the noise of the elevator starts the babies crying. It’s quite dramatic.”<sup>37</sup>

In addition to Lorton, Fairfax County was home to two other Nike installations. South of Popes Head Road between state route 123 and Clifton Road lay site W-74, identified as “Fairfax” for the county seat 2.5 miles to the northeast. The negotiations for the purchase of the land apparently proceeded smoothly and rapidly because in April 1954, before the transfer of ownership was completed, project maps drawn up by the Corps of Engineers precisely delineated both the required tracts, and the corps had advertised for construction bids, even though the sale was not formally consummated for another two months. The size and topography of the Fairfax site created a number of logistical and construction problems. The area was hilly and forested, which necessitated obtaining more than thirty separate easements to prevent the masking of the radar beams and to allow for utility lines, road access, and safety zones.<sup>38</sup> The launch area was only large enough for two magazines, rather than the standard three.

Trees between the launch and control areas that blocked the acquisition and missile-tracking radars posed the most significant problem. The foliage was part of a 100-acre orchard that physician Moir F. Bowman and his wife had purchased in 1950. The couple’s distress over the army’s unannounced clearing of a grove near their home generated a story and photograph in the *Washington Evening Star* in April 1955. “We moved to the country so we would have land and trees and a place to raise our four children,” Doctor Bowman explained to the newspaper. “Then they hemmed us in with this Nike project. Now they tell us they have to take our trees.”<sup>39</sup>

---

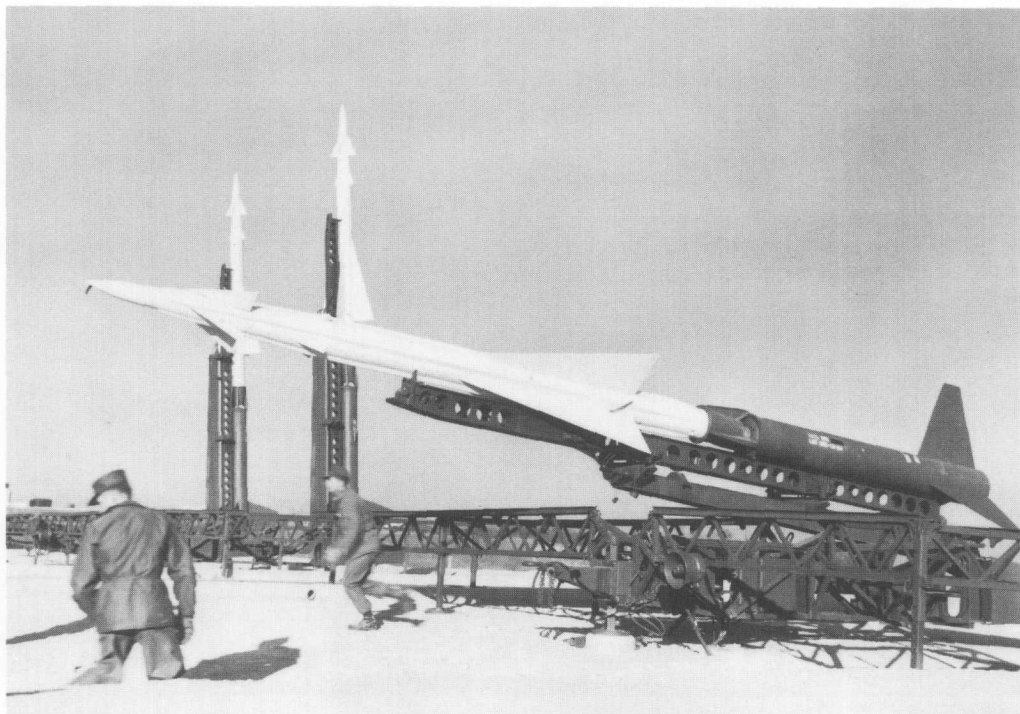
pp. 7, 12; Department of the Army, Office of the Chief of Information, *Middletown Nike: The Rambler*, “Feel Insecure? See a Nike Site,” *Washington Evening Star*, 8 Apr. 1957 (first quotation); “Rockets, Missiles Object of Study By Area Students,” *Belvoir Castle*, 7 Nov. 1958, p. 1 (second quotation); “Teenagers Pursue Series on Rockets,” *ibid.*, 21 Nov. 1958, p. 1.

<sup>37</sup> The Rambler, “Feel Insecure? See a Nike Site,” *Washington Evening Star*, 8 Apr. 1957.

<sup>38</sup> Fairfax County, Deed 1353-192, Fairfax Courthouse; “Report of NIKE Sites Advertised,” 12 Apr. 1954 (photocopy), Box 33 (“Anti-Ballistic Missile, Nike and Related Programs”), Folder 3 (“NIKE Const Progress”), ViFbOH.

<sup>39</sup> Fairfax County, Deed 1353-192, Fairfax Courthouse; “Nike Station Takes Over Air Above Doctor’s Home,” *Washington Evening Star*, 24 Apr. 1955, p. A-1 (quotation).





*U.S. Army photograph; reprinted in cooperation with the D.C. Public Library*

To allay the fears of nearby residents, Brigadier General Raleigh R. Hendrix, commander of the Nike defenses surrounding Washington and Baltimore, declared that Nike installations were “as safe as a gas station [and] as important to the security of the community as the police and fire departments.” Although no serious accidents were reported at the Fairfax missile sites, an operator at Fort Meade in Maryland was burned in 1955 when an Ajax unintentionally launched. The missile exploded shortly after lift-off, and its debris fell on the Washington-Baltimore Parkway.

Fairfax became home to the 71st’s Battery D and probably became operational at the end of 1955 or early the next year.<sup>40</sup> Notwithstanding soured relations with at least one landowner, and the proximity of the *Fairfax Herald’s* office, the site garnered only occasional references in the newspaper. A front-page article on 18 October 1957, however, noted that the battery was open to the public each Sunday. Three months later the commanding officer, Captain John H. Van Santen, entertained three representatives from the local chapter of the American Red Cross at lunch

<sup>40</sup> Neither the Fairfax nor Herndon site is listed in Department of the Army, *Directory and Station List of the United States Army*, 15 Apr. 1955, PCarlMH, but both are included in the Department of the Army, *Directory and Station List of the United States Army*, 16 Apr. 1956, PCarlMH. The *Belvoir Castle* reported in its 1955 year-end issue that the 71st Army Antiaircraft Missile Battalion, the unit assigned to all the Washington area Nikes, “[d]uring the year . . . moved from a temporary Nike site” to unspecified “permanent sites.” This probably is a reference to the occupation of the Fairfax and Herndon batteries. See “Looking Back: Belvoir News Highlights during 1955,” *Belvoir Castle*, 23 Dec. 1955, p. 3.



National Grange Monthly (Sept. 1948)

Mark Turner and his wife were charter members of the Great Falls Grange No. 738. In 1955 the federal government condemned twelve acres of their farm on which to construct the battery control area of Nike site W-83. Mark Turner (b. 1889) was master of the Virginia State Grange for three terms and longtime chairman of the state milk commission. A montage that appeared in the *National Grange Monthly* in 1948 showed the couple by their fireside juxtaposed against photographs of the exterior of their Queen Anne-style home (left) and their milk house, barn, and silo (right).

and provided “an informal, guided tour of the site.” He also spoke to thirty-five members of the Fairfax Junior Chamber of Commerce gathered for their monthly meeting. The *Herald* reported:

Jaycees heard Capt. Van Santen describe the multi-million dollar Nike Site on Popes Head Road as unusual business in the community. Few in the audience were aware of the cost of the complicated equipment used by the Army to provide air defense for this community. The explanation of the purpose and use of the various radars and missiles was interesting to the business men. . . .

Capt. Van Santen extended a cordial invitation to all members of the Jaycees as well as residents of the community to visit the Nike Site in order to determine for themselves how their tax money for defense is being employed.<sup>41</sup>

The third site, designated W-83 and known as “Herndon” or “Dransville,” was probably constructed and operational as the 71st Battalion’s

<sup>41</sup> “Battery ‘D’ 71st AAA Missile Battalion (Nike), Fairfax, Virginia,” *Fairfax Herald*, 18 Oct. 1957, p. 1; “Nike News,” *ibid.*, 17 Jan. 1958, p. 1 (quotations).

Battery B by April 1956. The government likely condemned the land from Mark Turner and Ida Money because there was a critical need for the location.<sup>42</sup> It is difficult to determine whether this process was contentious. Neither the Washington nor the local newspapers contained any reference to the seizure, although a subsequent condemnation of three additional parcels, probably to prevent radar masks, did lead to a brief notice in the *Evening Star* in January. None of this activity appeared to hinder Turner's successful dairy operation. In October he had the third most productive milk herd in his dairy association. One particular heifer, Ramey, produced more than any other cow on any competing farm.<sup>43</sup>

### *Daily Activities*

On a day-to-day basis, troops at each Fairfax County battery ran diagnostic checks on the radars, missile electronics, and engines. Given the relative complexity of the equipment and the constant operation of some of it, there was much to do. The assignment and maintenance of one hundred men per facility necessitated considerable routine administrative work as well. Although most tasks were tedious, others, such as fueling the Nike-Ajax and replacing and testing missile parts and warheads, posed potential danger.<sup>44</sup>

When not occupied by equipment upkeep, batteries practiced alert drills, either independently or in conjunction with others in the defense area. They rehearsed the process necessary to direct the radar at targets and position the missiles for launch. Clanging alarm bells would send troops scurrying to their stations.<sup>45</sup>

---

<sup>42</sup> An army plat dated April 1954 shows the proposed control area east of Springvale Road between Route 7 and Georgetown Pike. The launching area is also between those two roads, on the east side of Utterback Store Road. The government had a temporary construction easement that expired in June 1954, although Judge Albert V. Bryan of the United States District Court for the Eastern District of Virginia did not award the land to the government until 8 July 1955 for a total price of \$47,600 (Fairfax County, Deed 1353-185, pp. 185-88, Fairfax Courthouse).

<sup>43</sup> "U.S. Files Suit For 'Nike' Site," *Washington Evening Star*, 1 Jan. 1956, p. A-26; "DHIA No. 2 Report," *Fairfax Herald*, 16 Nov. 1956, p. 1.

<sup>44</sup> These procedures were undertaken in a specially revetted building to minimize damage from an accidental explosion. The Ajax's corrosive liquid fuel required soldiers to don protective suits when filling the weapon and to work near large built-in safety showers in case they needed to bathe off any propellant (see "Chart No. 1—Site Layout," n.d., Box 33, Folder 3, ViFbOH). Although no mishaps occurred at the Fairfax batteries, there were problems elsewhere. In 1957 ten soldiers and Douglas employees were killed at a battery in New Jersey when an Ajax detonated as they replaced its trigger mechanism. Two years earlier, an operator was burned when another Ajax shot off accidentally from Maryland's Fort George C. Meade. Because the missile exploded shortly thereafter, probably as a result of a self-destruct radio command from the ground, there was little danger to others nearby, although some fragments fell on the Washington-Baltimore Parkway (L. Edward Prina, "Atom Mishap With Hercules Is Discounted," *Washington Evening Star*, 23 May 1958).

<sup>45</sup> Department of the Army, Artillery School, Antiaircraft and Guided Missiles Branch, ST 44-160, *Organization, Procedures, and Drill for Nike I Units* (Fort Bliss, Tex., Jan. 1954), PCarIMH; Malevich, "Nike Deployment," p. 417.

The units also traveled to the Red Canyon artillery range in New Mexico each year, where the army had built a Nike emplacement for training purposes. Battery D was declared the most outstanding in the mid- and southeastern United States in 1957, when it won the Regional Commander's Battery Trophy for its training performance.<sup>46</sup> As part of an effort termed Operation Understanding, meant to promote awareness of Nike operations, Fairfax County executive Carlton C. Massey, school superintendent W. T. Woodson, and the president of the Chamber of Commerce were among civic leaders flown to New Mexico in August 1957 to observe the practice drills.<sup>47</sup> Similarly, the army cautioned Nike soldiers to drive and behave courteously and encouraged them to volunteer with civic or youth groups in order to become assimilated into the community. Soldiers also received wallet cards with facts and frequently asked questions about the Nike defenses.<sup>48</sup>

Conveying information about the missile batteries was part of a broader civil defense education program conducted in keeping with the tenor of the times. Because war with the Soviet Union was considered a distinct possibility, in 1954 the federal government began Operation Alert, annual air raid drills orchestrated across the country. Virginia, like other states, established a civil defense office to plan evacuation routes and promote the construction of bomb shelters.<sup>49</sup>

In 1956 Fairfax County residents were invited to watch soldiers conduct a creek-crossing exercise at Fort Belvoir, the army installation in southeast Fairfax County that was home to the Corps of Engineers' school and that provided commissary, medical, and administrative services to the Fairfax Nike batteries. The exercise included the creation of a benign mushroom cloud with a 250-foot diameter that wafted over the simulated battlefield to provide participating troops and observers with what was considered a realistic wartime scene. Around the same time, both the Fort Belvoir newspaper and the newsletter circulated to Nike batteries ran articles on treating atomic blast survivors.<sup>50</sup>

---

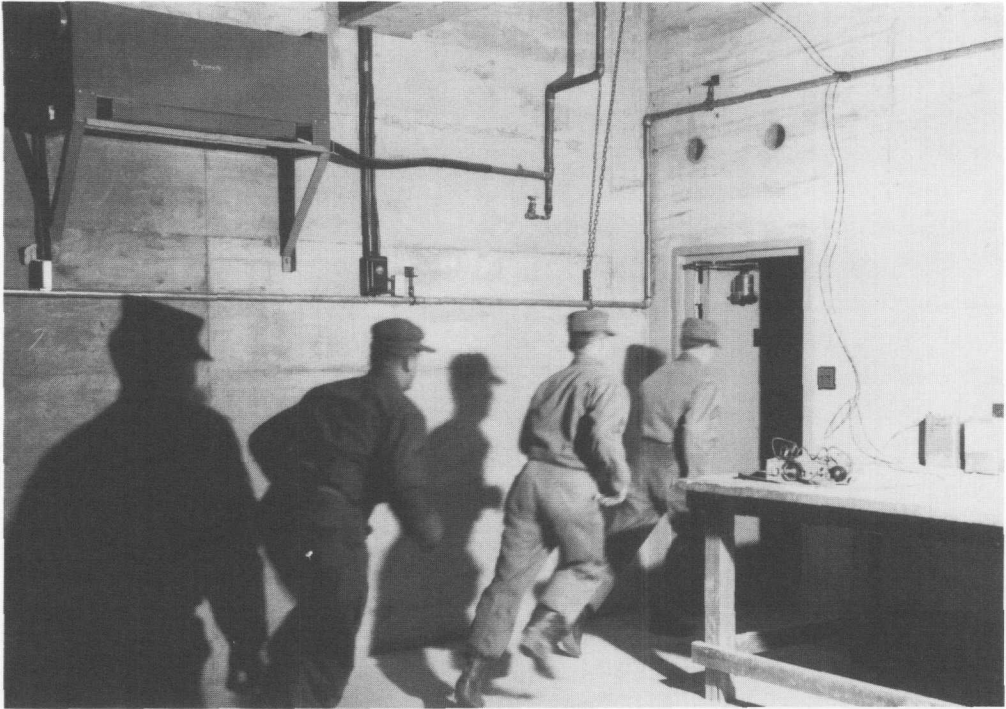
<sup>46</sup> "Nike Battery Receives Honor," *Fairfax Herald*, 11 Apr. 1958, p. 1; "71st's Battery D Named 2d Region's 'Most Outstanding,'" *ARADCOM Argus*, 1 June 1958, p. 8.

<sup>47</sup> "Group Sees Nike Firing," *Washington Evening Star*, 15 Aug. 1957, p. B-10. A complete description of Operation Understanding is included in excerpts from U.S. Army Air Defense Command, "Annual Historical Summary (U)," 1 Jan.-31 Dec. 1966, p. 138, Box 34, Folder 4 ("NIKE—Public Relations"), ViFbOH.

<sup>48</sup> Department of the Army, Office of the Chief of Information, *Middletown Nike*, pp. 1-6; "FACTS Card Designed To Assist Personnel In Answering Queries About USARADCOM," *ARADCOM Argus*, 1 Nov. 1959.

<sup>49</sup> "Simulated Air Raid Alert Proves Successful Here," *Belvoir Castle*, 18 June 1954, p. 1; "Recent Simulated Attacks Prove Many Belvoirites Confused On Red Signal," *ibid.*, 9 Dec. 1955, p. 1; "Fort Belvoir 'Alerted' As Nation Is 'Attacked,'" *ibid.*, 12 July 1957, p. 1; C. Brian Kelly, "They're Making Our Plans For H-Bomb Survival," *The Commonwealth* 28 (Apr. 1961): 14-16, 50-52.

<sup>50</sup> "Belvoir's Civilian Neighbors Given Dogue Creek Show," *Belvoir Castle*, 27 July 1956, p. 1;



*U.S. Army photograph; reprinted in cooperation with the D.C. Public Library*

During Operation Alert, the federal government orchestrated annual air raid drills across the country. In 1957 the scenario provided a five-week period of a “gradual worsening international situation.” Then, on 12 July, a simulated attack began in which 170 thermonuclear devices were “launched” against the United States and its allies. For the next fifteen days, Fort Belvoir and the Fairfax Nike batteries reacted to the changing hypothetical conditions. These soldiers at Lorton scrambled to their posts during an earlier alert drill.

Of course, the fact that Fort Belvoir and the Nike sites were all located in Fairfax County was coincidental. The missiles were intended to defend the entire Washington region, not necessarily Belvoir or the sparsely populated rural crossroads in which the Nike installations were located. The army post was where young soldiers learned construction techniques for everything from sewer systems for military bases to temporary battle-field bridges. In the event of an air attack, it was far more likely that the Soviets would target the Pentagon, the White House, and the urban center of the area, rather than this relatively esoteric facility, especially if enemy tacticians assumed only a few of their sorties would succeed.

---

“Handling of Atomic Casualties Shown in Demonstration Here,” *ibid.*, 14 Sept. 1956, pp. 1, 3; “To Survive Enemy Attack, Take These Specific Steps,” *ARADCOM Argus*, 1 Nov. 1958, p. 5.

*Hercules Comes to Lorton*

Dwight D. Eisenhower succeeded Harry Truman as president in January 1953, in part because of a promise to reevaluate, or take a “New Look” at, American foreign policy. He suggested that “more security could be bought at less cost” by applying America’s growing technological prowess more effectively to design more lethal weapons. This greater efficiency would, in turn, allow for a smaller military. Because a single Nike carrying a nuclear warhead could potentially destroy several attackers, it could mean that fewer missiles, launch areas, and operators would be needed. Consequently, Eisenhower authorized the development of such a nuclear Nike in 1953, and it was ready for service by October 1958.<sup>51</sup>

Although it was dubbed “Nike-Hercules” and shared a name with its predecessor, it was an entirely new missile produced by Bell Telephone, Douglas, and several other contractors. Again Western Electric served as the prime contractor. The Hercules flew higher (up to 100,000 feet) and faster (three and one-half times the speed of sound) than Ajax and had more than twice the earlier missile’s thirty-mile range. It also used a granulated fuel and thus eliminated the difficult and dangerous process of adding liquid propellant.<sup>52</sup>

Intelligence reports that the Soviet Union was building increasing numbers of high altitude jet bombers spurred development of the new version. The speed of these Russian planes and the increased destructive power of their second-generation thermonuclear munitions drove the need for defensive missiles to be able to intercept them at the greatest possible distance from their intended targets. In addition to being in consonance with Eisenhower’s New Look defense doctrine, fielding the new version “was also a logical corollary” of American efforts to deter war, because Hercules would presumably make defenses even less penetrable.<sup>53</sup> The low-yield nuclear warhead on a single Hercules was designed to destroy an entire formation of attacking supersonic high-flying airplanes, along with the atomic bombs they carried. Thus, Nike-Hercules amplified the defenses in the eyes of planners, because it negated the need to target each incoming aircraft individually and would ensure the destruction of bomb loads even if every attacker was not hit directly.<sup>54</sup>

---

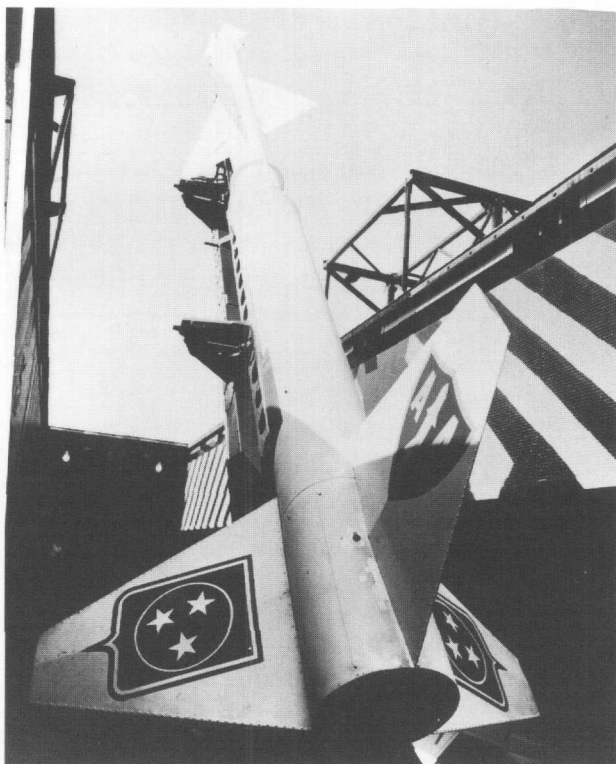
<sup>51</sup> Kolodziej, *Uncommon Defense*, p. 180 (quotation); Chuck Hansen, *U.S. Nuclear Weapons: The Secret History* (Arlington, Tex., 1988), pp. 187, 221 n. 330; Taylor and Taylor, *Missiles of the World*, pp. 84–85.

<sup>52</sup> Ulanoff, *Illustrated Guide to Missiles and Rockets*, pp. 20, 22, 24–25; Taylor and Taylor, *Missiles of the World*, pp. 84–85.

<sup>53</sup> Philip J. Klass, *Secret Sentries in Space* (New York, 1971), pp. 6–9; Kolodziej, *Uncommon Defense*, p. 192 (quotation).

<sup>54</sup> Hansen, *U.S. Nuclear Weapons*, pp. 187, 221 n. 330; “FACTS Card Designed To Assist Personnel In Answering Queries About USARADCOM,” *ARADCOM Argus*, 1 Nov. 1959.

This Nike-Ajax at Lorton, being lifted to the surface from its underground storage box by a large platform elevator, bears the distinctive insignia of a missile deployed in the Washington-Baltimore defense area. About 15,000 Nike-Ajax missiles were manufactured before the type was superseded by the nuclear Nike-Hercules, developed, as the Ajax had been, by Western Electric, Bell Telephone Laboratories, and Douglas Aircraft Company.



*U.S. Army photograph; reprinted in cooperation with the D.C. Public Library*

The army press release announcing the decision to deploy Hercules in 1957 emphasized that

[e]laborate precautions have been taken . . . to minimize harmful effects resulting from accidents either on the ground or in the air. Atomic weapons tests conducted by the Atomic Energy Commission have confirmed that the possibility of any nuclear explosion occurring as a result of an accident involving either impact or fire is virtually non-existent.<sup>55</sup>

Subsequent articles explained that “[t]hese weapons generally would be employed at altitudes where the effect of blast, heat and radiation on the ground would be negligible.” As the *Evening Star* reported, “There would be no familiar mushroom shape to the nuclear blasts,” because the tell-tale clouds were created by ground debris that was obviously absent in the atmosphere.<sup>56</sup>

<sup>55</sup> Department of Defense, Office of Public Information, “Deployment of Nuclear Weapons for Air Defense Announced,” news release, no. 147-57, Exhibit K, 20 Feb. 1957, reproduced in Department of the Army, Office of the Chief of Information, *Middletown Nike*.

<sup>56</sup> John A. Giles, “Nikes Ringing Capital To Get A-Arms Soon,” *Washington Evening Star*, 21 Feb. 1957, p. A-4.

To accommodate the Hercules, however, required some minor site alterations. The changes necessitated included strengthening the elevator motors and mechanisms to lift the heavier missile and spacing the launchers on top of each magazine farther apart to prevent the rocket blast from the newer weapons from damaging others at lift-off. Because the Hercules warhead used noxious tritium gas to spark the detonation, the installation of gas detection systems in the magazines was imperative to warn of any leakage.<sup>57</sup> Not surprisingly, in light of the prominent role that the Lorton battery played in testing and demonstrating the Nike-Ajax system, that location served as a prototype for the conversion to the new missile.<sup>58</sup> The contract for the Lorton work was awarded in July 1958 and probably completed by April 1959. As had been the case with the initial construction, the army and its civilian contractors and suppliers were under considerable pressure to complete it as soon as possible. And, like the result of the rush to build the Ajax facilities, the project suffered cost overruns, mid-course revisions, and other complications. Although the army estimated in 1957 that Hercules would require only \$200,000 worth of changes, by 1959 Lorton's bill topped \$313,000.<sup>59</sup> Only three of the magazines were initially converted for Hercules. This delay meant that until probably the early 1960s, when the other three Ajax batteries were rebuilt, Lorton had both Ajax and Hercules missiles.<sup>60</sup>

Because of increased security associated with the presence of nuclear weapons, the army added intrusion alarms and erected fences and guardhouses at Lorton to complement the fences already lining the perimeter of the site. The deployment of the new weapons led, in 1958, to the assignment of a four-man military police detachment that was assisted in sentry duty by eighty-pound purebred German shepherds. Security considerations also

---

<sup>57</sup> Cover memorandum, "Subject: Briefing, Atoms for Nike" (photocopy) and attached remarks, Box 33 ("Anti-Ballistic Missile, Nike and Related Programs"). Folder 3 ("NIKE Const Progress"), ViFbOH; Hansen, *U.S. Nuclear Weapons*, p. 187.

<sup>58</sup> At least one group of engineers and others involved in the process in other defense areas visited Lorton in July 1957 for a briefing about the construction requirements (cover memorandum, "Subject: Briefing, Atoms for Nike" [photocopy] and attached remarks, Box 33, Folder 3, ViFbOH).

<sup>59</sup> "Lorton Site Turned Over To Va. ARNG," *ARADCOM Argus*, 1 Oct. 1963, p. 1; "Army to Install Hercules On D.C. Defense Sites," *Washington Evening Star*, 28 July 1958; "Current Working Estimate, Tactical Facilities, Washington[-]Baltimore Defense Area," 9 Nov. 1959 (photocopy), Accession 70-65A3184, Box 8, National Archives, Washington, D.C.; "SUBJECT: Authorization—Conversion of Tactical Facilities, Washington-Baltimore Defense Area," 2 Jan. 1958 (photocopy), *ibid.*; memorandum, "SUBJECT: Request for Additional Funds for Construction of Modifications, Additions and Conversion of Tactical Facilities at Special AAA Sites, Washington Defense Area," n.d. (photocopy), *ibid.*; memorandum, "SUBJECT: Request for Authorization to Expend Additional Funds for Construction of Tactical Facilities, Washington-Baltimore Defense Area. FY 58 Program," 27 Oct. 1958 (photocopy), *ibid.*; chart, "Current Working Estimate," 2 Mar. 1959 (photocopy), *ibid.*; chart, "Revisions and Additions to Contract Costs," 4 May 1959 (photocopy), *ibid.*; John A. Giles, "244 Revamped Nike Sites To Cost \$200,000 Each," *Washington Evening Star*, 22 Mar. 1957.

<sup>60</sup> "Lorton Site Turned Over To Va. ARNG," *ARADCOM Argus*, 1 Oct. 1963, p. 1.



brought about the abolition of the open houses at Lorton and other Hercules installations across the country. "We're still anxious to remain a part of the community and not be shut off," explained the commander of a Maryland battery to the *Evening Star*, "[b]ut because the Hercules can carry a nuclear warhead, we are under Atomic Energy Commission [security] restrictions which are rigid."<sup>61</sup>

The Hercules could also deliver a large conventional explosive. It is not possible to confirm that the army sent such a version to Lorton, but some analysts suggest it did after the Soviet Union shot down American Francis Gary Powers's U-2 reconnaissance plane over Russia with a similar anti-aircraft guided missile in 1960. Equipping some sites with conventional Herculeses would have enabled the United States to target any such Soviet overflights without the ramifications of using a Nike with a nuclear warhead.<sup>62</sup>

### *The Guard Gets Ajax and Hercules*

Because the greater capabilities of the newer missile reduced the number needed in any given defense area, the army reconstructed only about one-third of the older batteries across the country to accommodate the new Nike. Consequently, neither the Fairfax nor the Herndon site received Hercules missiles.

The army, however, faced with the construction of new Hercules-only facilities in other cities, needed to cover the operating costs and staffing demands of the expanding air defense network. Anxious to reduce this burden, the army decided to cede the operation of many of the nation's older, conventionally armed Ajax batteries to the National Guard in each state.<sup>63</sup> Like its counterparts elsewhere, the Virginia National Guard had operated the anti-aircraft guns in the commonwealth's metropolitan areas since 1954.<sup>64</sup> The familiarity of these part-time citizen-soldiers with anti-aircraft weapons and tactics made them a logical choice to assume responsibility for the missile sites. They were eager to play a more central

---

<sup>61</sup> Cover memorandum, "Subject: Briefing, Atoms for Nike" (photocopy) and attached remarks, Box 33, Folder 3, ViFbOH; "Sentry Dogs Help Maintain Security Around Restricted Missile Areas," *ARADCOM Argus*, 1 July 1963, p. 2; A. L. Singleton, "Nike Base Rolls Up Red Carpet: Now It's Fences, Sentries, Dogs," *Washington Evening Star*, 22 June 1958 (quotation).

<sup>62</sup> Taylor and Taylor, *Missiles of the World*, p. 85; Cole, "W-25: The Davidsonville Site and Maryland Air Defense," p. 254. "Generalized Sequence of Inactivation Events for Sites," *ARADCOM Argus*, Feb. 1974, p. 12, lists the disposition schedule for Class V explosives, probably a reference to the nonnuclear Nike warheads.

<sup>63</sup> Cover memorandum, "Subject: Briefing, Atoms for Nike" (photocopy) and attached remarks, Box 33, Folder 3, ViFbOH; Departments of the Army and Air Force, National Guard Bureau, "A Final Report: Nike Hercules Air Defense Is Phased Out of the Army National Guard," p. 7, reprint of an article by Bruce Jacobs in *The National Guardsman*, Nov. 1974. U.S. Army Air Defense Artillery Museum, Fort Bliss, Tex. (hereafter cited as TxFbAD).

<sup>64</sup> Jim Birchfield, "Guard to Man Nike Batteries in Area," *Washington Evening Star*, 20 Aug. 1959.



*Copyright Washington Post; reprinted by permission of the D.C. Public Library*

The liquid mix of nitric acid and jet fuel that propelled the Nike-Ajax was caustic and required the launch crew fueling the missile to don protective rubber suits. Large built-in safety showers were constructed nearby to wash off the corrosive propellant. Private First Class Robert Ramsey and Corporal Earl Danley filled the fuel tank of an Ajax at Lorton in May 1955.

role in air defense, particularly given the obsolescence of the guns then under their charge.

In February 1958 the army announced that the Virginia National Guard's 125th Antiaircraft Artillery Battalion, which drew men from Alexandria and Fairfax County, would undergo training at Fort Bliss in order to take over the Fairfax site and the Ajax portion of the Lorton battery by September of the next year. Forty-eight full-time guardsmen would operate the batteries around the clock. Members of the National Guard who held other jobs but who trained at the sites one Sunday and one evening a month would supplement this staff. The fact that the guardsmen would receive the same training and be held to the same performance standards as their active-duty counterparts and be a visible and integral component of a key army function became a point of pride for the guard

throughout its involvement with Nike.<sup>65</sup> Indeed, the guardsmen destined for Lorton set a record for the highest scoring National Guard unit during their training in 1959.<sup>66</sup>

Within the next few years, the evolution of America's defense budget brought the newer Nikes under the guard's control as well. Early in the military's deployment of guided antiaircraft missiles in 1956, Defense Secretary Charles E. Wilson decreed that the army should develop systems, such as the Nike, that were capable of defending cities, military bases, and other specific, discrete points. He charged the air force with designing other missiles to protect larger areas at a longer range. This distinction between "point" and "area" and assignment of responsibility was meant to prevent duplication of effort.<sup>67</sup> By the time the Hercules had been developed, however, the air force was completing work on BOMARC, its own antiaircraft missile. When the air force sought funding for BOMARC emplacements at the same time that the army's Hercules request was pending for 1959, Congress questioned the need for both. It ordered Secretary of Defense Neil McElroy and the Joint Chiefs of Staff to determine which "missile or combination of missiles will be employed in each defended area."<sup>68</sup>

Eisenhower, when he acted on the secretary's report, favored the Hercules because of its better performance record, although eventually the president authorized the building of a few BOMARC launching sites, including one in Newport News.<sup>69</sup> Nevertheless, the army was chastened by this experience. Because increases in expenditure on antiaircraft measures apparently were no longer assured, the army sought to operate the Nike network with greater efficiency. Even when staffed by the National Guard, the Ajax sites tied up army resources and were an unnecessary supplement to the Hercules batteries. The army therefore closed its Ajax units across

---

<sup>65</sup> Ibid.: "Virginia Guard To Start Training For NIKE Ajax," *Washington Evening Star*, 7 Feb. 1958; "Guard Will Learn To Operate Nikes," *ibid.*, 16 Feb. 1958; L. Edgar Prina, "Guard Units To Run Area Nike Bases," *ibid.*, 11 Apr. 1959; Departments of the Army and Air Force, National Guard Bureau, "A Final Report," p. 9, TxFbAD. The unit was renumbered the 1st Missile Battalion of the 280th Artillery as part of an armywide nomenclature change. Although the army continued to operate the Herndon Ajax site, guardsmen probably reported there for drills. Two contemporary army publications mention only regular army units and activities at Herndon: see "83 College Students Oriented On Missiles By Virginia Nikemen," *ARADCOM Argus* 3 (1 May 1960): 1; and "Super-Grade NCO's Tour Nike-Ajax Missile Site," *Belvoir Castle*, 18 Nov. 1960, p. 3.

<sup>66</sup> Jim Birchfield, "Guard to Man Nike Batteries in Area," *Washington Evening Star*, 20 Aug. 1959.

<sup>67</sup> Millett and Maslowski suggest this delegation was a reversal of the services' desires (Millett and Maslowski, *For the Common Defense*, p. 518).

<sup>68</sup> "Decision Needed In Air Defense," *Army* 9 (Oct. 1958): 18, 63; Jack Raymond, "Pentagon Drafts a 'Master Plan' for Air Defense," *New York Times*, 24 May 1959, p. A-1.

<sup>69</sup> L. Edgar Prina, "Mixed Missile Formula OK'd to Settle Dispute," *Washington Evening Star*, 11 June 1959; Frank E. Snyder and Brian H. Guss, *The District: A History of the Philadelphia District, U.S. Army Corps of Engineers, 1866-1971* (Philadelphia, 1974), p. 152.

the country. In late 1961 or early the next year, the Herndon site ceased operations. Fairfax followed suit by 1963.<sup>70</sup>

The army, however, was pleased with the National Guard's performance. Emboldened by the success of the guard's operation of the Ajax sites, the army then decided to cede full-time control of most of the Hercules batteries in order to curb further the costs and deployment of active-duty troops. On 30 August 1963, at a ceremony at Lorton attended by senior army officers and civilian officials, the adjutant general of the Virginia National Guard, and Delegate Thomas N. Frost, the only Fairfax County Nike site still operating was turned over to the citizen-soldiers. Later, the guard assumed similar responsibility for several sites in Tidewater.<sup>71</sup> In keeping with the strict security requirements necessitated by the presence of the nuclear Nikes, however, a small number of active-duty army personnel continued to be assigned to Lorton and the other batteries to maintain official custody of the nuclear warheads and to operate the radio and teletype equipment that linked the batteries with other radars and the senior army officers who were authorized to give the order to fire.<sup>72</sup>

Sometime after the guard assumed control of Lorton, the battery was declared the "Army National Guard National Nike Site" and used to demonstrate the army's success in instituting the concept of "One Army"—the functional integration of the National Guard's activities with the regular army.<sup>73</sup> Indeed, for more than a decade, the Virginia National Guard ran Lorton with acclaim. Between 1965 and 1970, the unit earned a superior rating for annual practice missile firings conducted on short notice in New Mexico.<sup>74</sup> Other than the fact that the battery was moved to a higher state of alert because of increased superpower tensions during the Arab-Israeli war in October 1973, however, few specifics of operations in the later years are known.<sup>75</sup>

---

<sup>70</sup> "3 Nike Sites in D.C. Area Deactivated," *Washington Evening Star*, 23 Oct. 1961, p. B-1. The Fairfax site is listed in the Virginia National Guard adjutant general's annual report for 1962 but not in the 1963 report. See Commonwealth of Virginia, Department of Military Affairs, "The Report of the Adjutant General of the Commonwealth of Virginia for the Period 1 January 1962 to 31 December 1962," Commonwealth of Virginia, Department of Military Affairs, "The Report of the Adjutant General of the Commonwealth of Virginia for the Period 1 January 1963 to 31 December 1963," Library of Virginia, Richmond.

<sup>71</sup> "Lorton Site Turned Over To Va. ARNG," *ARADCOM Argus*, 1 Oct. 1963, p. 1. The Virginia National Guard operated Hercules batteries in Chesapeake and Denbigh. The regular army maintained a site at Fort Story. See "AD Posts Hit Heavily In Closings," *Army Times*, 20 Feb. 1974, p. 3.

<sup>72</sup> Cole, "W-25: The Davidsonville Site and Maryland Air Defense," p. 255; "USAC stays on job until end," *ARADCOM Argus*, Feb. 1974, p. 14.

<sup>73</sup> "Virginia ARNG has Navy touch," *ARADCOM Argus*, Feb. 1974, p. 30; "Air Defense Cuts" (editorial), *Army Times*, 21 Nov. 1973.

<sup>74</sup> John W. Listman, Jr., Robert K. Wright, Jr., and Bruce D. Harcastle, eds., *The Tradition Continues: A History of the Virginia National Guard, 1607-1985* ([Richmond], 1987), p. 57.

<sup>75</sup> "Other Jobs Waiting NG Nike Techs," *Army Times*, 21 Nov. 1973. Upgraded radars and other electronic equipment were installed at the site in January 1969 as part of a systemwide overhaul. See

*A Changing World*

During the period that the guard operated the Lorton site, the American defense posture, international circumstances, and the domestic outlook all changed. More accurate intelligence revealed that although the Soviet Union fielded 200 long-range bombers in 1967, they appeared less capable than initially thought, and their numbers were decreasing. The Russians were investing instead in intercontinental ballistic missiles and were outbuilding the United States by 1970.<sup>76</sup> Rather than continuing to deter aggression by developing defensive systems, the United States decided to construct strategic nuclear weapons that could survive a preemptive strike and subsequently inflict enormous damage on the Soviet Union. Strategists expected that this prospect of “assured destruction” would prevent Soviet attack, whether by missile or by plane, as effectively as an American defensive perimeter would. Between 1970 and 1977, Congress also cut the annual Defense Department budget and mandated troop reductions. The trauma of the Vietnam War, according to John Lewis Gaddis, had made the majority in Congress skeptical of most military spending and hostile to expressions of American power.<sup>77</sup>

Faced with these budgetary and geopolitical realities, Defense Secretary James R. Schlesinger decided in August 1973 to close the Lorton battery and all but four of the remaining fifty-two Hercules sites in the United States. It was a decision justified in many different and sometimes contradictory ways. Because of the threat posed by Soviet intercontinental ballistic missiles, Schlesinger told the House Armed Services Committee, “I think it’s recognized that we cannot through active defenses limit damages against a well coordinated Soviet strike against our cities. That is the nature of the military balance at the present time. . . . We must rely on deterrence . . . to protect our cities.”<sup>78</sup> In February 1974 a statement issued by the Pentagon indicated that “the Department of Defense has placed a lesser priority on maintenance of the existing posture for defense against manned aircraft.” Virginia National Guard officials explained to the *Richmond News*

---

excerpts of U.S. Army Air Defense Command, “Annual Historical Summary (U),” 1 Jan.–31 Dec. 1969, p. 143, Box 34, Folder 1-2, ViFbOH.

<sup>76</sup> See figures from *The Military Balance*, compiled by the International Institute for Strategic Studies and reproduced in “Soviet/US Offensive Strategic Nuclear Forces, 1967–74,” *Air Force Magazine*, Mar. 1976, p. 109.

<sup>77</sup> John Lewis Gaddis, *Strategies of Containment: A Critical Appraisal of Postwar American National Security Policy* (New York and Oxford, 1982), pp. 322–24; Michael Getler, “Big Cut Set in U.S. Air Defense Force,” *Washington Post*, 7 Oct. 1973, p. A2.

<sup>78</sup> U.S. Army Air Defense Command, “Annual Report of Major Activities,” 1 Jan.–31 Dec. 1974, Box 34, Folder 1-2 (“NIKE—General”), ViFbOH; Larry Carney, “Army Slows Here Death,” *Army Times*, 12 Dec. 1973, p. 1; “Some Protest Air Defense Cut,” *ibid.*, 27 Feb. 1974, p. 15 (quotation).

*Leader* that “the reduced nature of the potential bomber threat against the United States has made this particular weapon system unnecessary.”<sup>79</sup>

Lorton was declared inoperational on 1 April 1974. Over the coming months, soldiers packed and shipped equipment. Some may have guessed that within a few years the area that made up their battery would revert to the District of Columbia for use as a prison and offices. After razing most of the buildings and planting the launching areas with grass, the federal government deeded the Fairfax and Herndon sites to the county; one parcel even acquired the designation “Great Falls Nike Park.”

Just as the world changed over the years, so did Fairfax County. Even before the fall of the Soviet Union, Fairfax had grown to the eleventh most populous municipality in the United States. It began to wean itself from the federal orbit and develop a civic identity of its own. Throughout those changes, however, Fairfax County’s western third was kept semirural.<sup>80</sup>

In August 1974 the Lorton battery commander submitted his final morning report.<sup>81</sup> Eighteen miles away, Mark Turner’s house still stood. It remains today.

---

<sup>79</sup> “Air Defense Realigned,” *ARADCOM Argus*, Feb. 1974, p. 2 (first quotation); Steve Row, “467 Men Affected: Va. Guard Losing Nikes,” *Richmond News Leader*, 4 Feb. 1974, pp. 1, 13 (second quotation).

<sup>80</sup> James A. Bacon, “The Fairfax Revolution,” *Virginia Business* 5 (Jan. 1990): 30; Fairfax County Board of Supervisors, Office of the Chairman, Thomas M. Davis III, “Basic Facts,” 18 Mar. 1993.

<sup>81</sup> See chart, “Logistics[:] Equipment Turn-in Progress,” in U.S. Army Air Defense Command, “Annual Report of Major Activities,” 1 Jan.–31 Dec. 1974, Box 34, Folder 1-2, ViFbOH; and “Generalized Sequence of Inactivation Events for Sites,” *ARADCOM Argus*, Feb. 1974, p. 12.