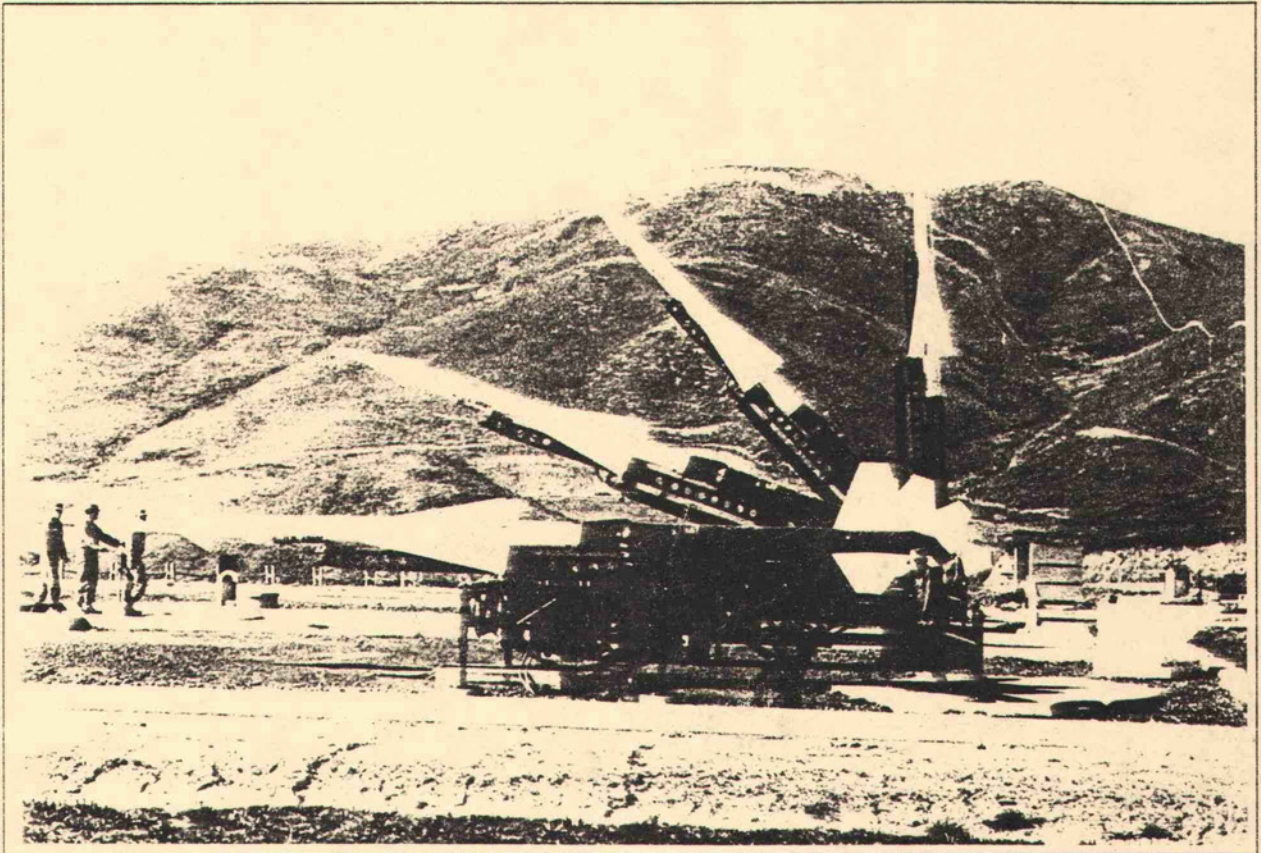


# *What We Have We Shall Defend:*

An Interim History and Preservation Plan  
for Nike Site SF-88L, Fort Barry, California



by  
John A. Martini  
Stephen A. Haller

National Park Service  
Golden Gate National Recreation Area  
San Francisco, California  
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## Preface

This document is intended to serve as a guide for the restoration and interpretation of Nike Site SF-88 in the Marin Headlands of Golden Gate National Recreation Area. Eventually, a full historic resource study, historic structure report and historic furnishings plan will need to be completed to complete the process begun here.

That process is a direct outgrowth of a meeting held in the Fall of 1996 between the Nike site volunteers, and park Maintenance, Interpretation and Resource Management personnel with the intent of better coordinating daily operations and future preservation treatments at SF-88. At that meeting, the need was identified to document the physical, operational and human history of the site, and to make recommendations regarding the future course of interpretation and preservation treatments there. Preparation of this document was assigned to Curator of Military History John Martini and Park Historian Stephen Haller.

The work is organized into two major sections, the operational and human history is found in Part I—Historic Resource Study, while Part II—Historic Structure Report consists of a physical history of the site. This organization is intended to reflect the anticipated use of the document in both interpretation and preservation efforts.

Working intermittently on the project over the course of the following year, the authors were able to identify most of the primary and secondary information that was available in the collections of Golden Gate National Recreation Area, at the Nike site itself, and in various local repositories. After inquiries at the National Archives, they were also able to establish that the bulk of the official records pertaining to operations at Site SF-88 remain under the control of the Headquarters, Department of the Army and are not at present open for research. A request for access to these records was processed under the Freedom of Information Act, but led to our referral back to the National Records Center at Suitland, MD. Through the assistance of Col. Stephen P. Moeller, USA, the authors have been put in touch with Col. Craig Glassner of the Adjutant General's Corps to follow up in this regard, and especially to locate pertinent annual historical summaries and battery morning reports. The National Personnel Records Center, in St. Louis, MO has also indicated that certain morning reports may be located at that repository.

In order to summarize information gathered to date, the authors have proceeded with the writing of this document, knowing full well that it does not yet tell the story of Nike Site SF-88 in exhaustive detail. It is our hope that in its present form it does provide an adequate summary of the historic context of the Nike missile system, of operations at the site from 1954-1974, and of the physical development at the site during those years.

Further research into official documents, secondary material at repositories outside the Bay Area, and a continuing program of oral history interviews will be necessary to fill out the picture. With the continued cooperation of park management and staff and, especially, the help of the people who served at SF-88 and still volunteer there today, the complete story may one day be told.

Finally, it was decided early on that this study would primarily address the history and preservation of the SF-88 Launching Area, and only provide summary information on the histories of the Administrative and Integrated Fire Control areas (SF-88A and SF-88C). These sites are not planned for immediate preservation or interpretation actions, at least not anywhere near the level of activity and importance currently focused on the Launching area. It is hoped that future research efforts will focus specifically on these two areas.



## Acknowledgments

The authors wish to thank numerous people who have helped in the research, writing and production of this study.

This document focuses on Nike Site SF-88, but is based on the firm foundation already established by others. In particular, the authors of this study wish to draw attention to the invaluable assistance received from the editor and authors of *Last Line of Defense: Nike Missile Sites in Illinois*, Christine Whitacre, Christina M. Carlson and Robert Lyon, who generously allowed us to use verbatim large portions of their study that describe the development, deployment and operations of the Nike system in general. Although the text “borrowed” from their work has been, with their permission, integrated into the text for the sake of readability, we have attempted to footnote it as thoroughly as possible and wish to draw special attention to their substantial contribution to this work.

In the introduction to his recent book, *Citizen Soldiers: The U.S. Army from the Normandy Beaches to the Bulge to the Surrender of Germany*, Stephen E. Ambrose wrote, “Long ago my mentors...taught me to let my characters speak for themselves by quoting liberally. They were there. I wasn’t. They saw with their own eyes, they put their own lives on the line. I didn’t. They speak with an authenticity no one else can match. Their phrases, their word choices, their slang are unique—naturally enough, as their experiences are unique.”<sup>i</sup> For much the same reasons, we have chosen to make extensive use of quotations from oral histories representing officers, warrant officer technicians, and enlisted personnel who served at Nike site SF-88. The authors of this study owe them a debt of thanks for the information they freely shared, and for the service they gave to their fellow soldiers and fellow citizens.

Although numerous former soldiers at the site deserve our thanks for recording their memories in oral history interviews, the authors are especially grateful to Terry Abel, Peter J. Bohan, Susan E. Cheney, Henry E. Paine and Ron Parshall for the extensive use we made of their recorded interviews in this study. The full text of these interviews are on deposit at the Park Archives and Records Center of the Golden Gate National Recreation Area.

Milton B. “Bud” Halsey, Jr. (Col., USA, ret.) has generously shared his wealth of information on the Nike site with the authors and taken the time to work individually with us to ensure as complete and accurate treatment of the site as possible. More than any one person, he has been responsible for leading the volunteers on site in the hard and dedicated work of preservation, restoration and interpretation. In many ways, he has been a silent

partner to this study, but any errors or misinterpretations contained herein are our responsibility alone.

Col. Stephen E. Moeller, USA, has been a great source of information that places the Nike system firmly within the context of the development and operations of anti-aircraft defense in the Cold War era. His interest in this manuscript and assistance in locating source material are greatly appreciated.

Mark L. Morgan and Mark A. Berhow, through their previous works on the Nike system, which have been quoted extensively in this document, helped provide a framework within which to discuss SF-88 specifically.

We thank Ric Borjes, Chief, Branch of Cultural Resources; and Diane Nicholson, Chief, Branch of Museum Management at Golden Gate National Recreation Area for supporting this project and allowing us enough time away from our other duties to make progress. We also owe a special thanks to the Laurel Mackay, Secretary at the Division of Resource Management and Planning for her skill and hard work in producing verbatim transcriptions of lengthy oral history tapes on such a short deadline. Gordon Chappell of the Pacific Great Basin System Office read the manuscript very thoroughly and provided many useful suggestions.

We also wish to acknowledge the reference assistance received from: Rose Marie Christensen, Chief, Freedom of Information and Privacy Acts Office of the Department of the Army; Louise Arnold-Friend, Reference Librarian at the U.S. Army Military History Institute, Carlisle Barracks, PA; William H. Davis and Rebecca Lentz Collier at the National Archives; David A. Ross at the U.S. Army Air Defense Artillery Museum, Fort Bliss, Texas; and Mrs. John P. Fanning at the Air Defense Artillery Association, Fort Bliss, Texas.

And all the volunteers at SF-88 deserve our thanks for their devotion to the preservation of this unique historic resource.

## Introduction

The Cold War has passed into history. As it does, we are able to perceive more clearly the significance of this era which defined much of the second half of the twentieth century. The World War II alliance that had defeated fascism quickly deteriorated in the late 1940s, as the Soviet Union entrenched its sphere of influence and relentlessly installed Communist regimes in eastern Europe while the United States countered with a policy of containment. By the end of the decade, not ten years after the attack on Pearl Harbor propelled the United States into war, Communist forces had taken over China, and the American monopoly on the atomic bomb had been broken. For the next forty years, until the fall of the Berlin Wall in 1989 demonstrated the loss of Soviet dominance in eastern Europe and the United States took most of its strategic bomber and missile force off high alert in 1991, we all lived in a heretofore unheard of state of permanent partial mobilization and under the ever present threat of nuclear Armageddon.

Nearly half a century of head to head competition between Communism and Democracy cost both sides huge sums of money to compete, allocated resources from the civilian to the military sectors, accelerated technological change, fostered inflation, and affected the destiny of nations and the lives of millions of people.

“The children of the Baby Boom were not, as their fathers who defeated Germany and Japan had imagined, destined to grow up in a non-threatening world. At home their parents built backyard bomb shelters they would later convert into fallout shelters. During air raid drills, schoolchildren left their classrooms to huddle in darkened hallways. Announcements that ‘interrupted the innocent melodies of the ‘Hit Parade.’ The Cold War had arrived, bringing with it the threat of undreamed horrors. It was to last nearly half a century, and for the greater part of the struggle, antiaircraft artillerymen were to serve as front-line soldiers.”<sup>ii</sup>

As the threat of devastating aerial attack on the American homeland became a reality for the first time, the nation responded by threatening its potential enemies with punishing retaliatory strikes, a policy known as “Mutually Assured Destruction.” The acronym MAD became a widespread metaphor expressing the worst fears of the era. The nation also responded by deploying a vast air defense network consisting of early warning radars, fighter interceptors, and antiaircraft units. The Nike surface to air missile system was a key component of this air defense network for more than twenty years.

The Nike missile system was exceptional in a number of ways. It was the first practical antiaircraft missile placed into operation, it was in service for an exceptionally long time, it was deployed in great numbers and covered large areas around many major American



cities, it was very expensive, and it brought the possibility of nuclear war to the very back yards of the nation's civilian population.<sup>iii</sup>

It was also the last weapons system to directly protect San Francisco Bay from attack; the last in a long line of coast defenses that date back to 1794 when the Spanish frigate *Arazan* brought bronze muzzle-loading cannon to protect the isolated frontier from Russian and British warships.

For all these reasons, the Nike missile system is worthy of interest. Out of some 300 Nike sites scattered across thirty states, the one known as SF-88 that helped to defend the San Francisco Bay Area is the only one preserved and interpreted as a historic resource. We are fortunate to have this unique opportunity to see the intimate reality of a military mission that went on around the clock for more than forty years, out of sight and mind for most of us, but almost always dimly in our consciousness.

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<sup>i</sup> Stephen E. Ambrose *Citizen Soldiers: The U.S. Army from the Normandy Beaches to the Bulge to the Surrender of Germany, June 7, 1944--May 7, 1945* (New York: Simon and Schuster, 1997), 13.

<sup>ii</sup> Stephen P. Moeller, "Vigilant and Invincible," *ADA Magazine*, May-June 1995 (Department of the Army, Washington, DC), 5.

<sup>iii</sup> Michael J. Binder, lecture on the historic significance of the Cold War at the National Council on Public History annual meeting, Sacramento, CA, Mar. 18, 1994.

## Part I — Historic Resource Study

### A FRAGILE PEACE

At the end of World War II, Americans hoped for peace and an end to the trauma of the previous 15 years of depression and war. Victory in World War II had led to a period of prosperity and growth for America, but did not result in a sense of security. Within five years after the war, the United States would help rebuild its recent enemy, Germany, and create an alliance to oppose its former ally, the Soviet Union. The Soviet Union and the United States soon engaged in a Cold War, each side convinced the other was plotting its domination and destruction. In the ensuing arms race, both superpowers developed new weapons systems in a seemingly endless competition. Defensive as well as offensive weapon systems became part of the race, as both the Soviets and the United States strived to gain a military advantage. The U.S. Army's Nike missile would play an important role in America's air defense strategy.

The roots of the Cold War can be traced on the Soviet side to American intervention, 1918-1920, in the Russian Civil War against the Bolsheviks, and subsequent non-recognition of the Soviet regime until 1933. For Americans, suspicion of the Soviets was rooted in the Bolshevik calls for world revolution, the mass purges of the 1920s and 1930s, and the cynical Soviet-German Non Aggression Pact of August 1939 that led to the outbreak of war and a new partition of Poland. During World War II, disputes over the timing of the invasion of France, and differing visions of the shape of post-war Europe exacerbated these tensions.

In 1941, while the Red Army reeled in retreat, Soviet leader Joseph Stalin demanded territorial concessions during Allied discussions of post-war aims. Stalin wanted to keep the territory taken from Poland and Finland in 1939 and 1940, as well as the Baltic states of Estonia, Latvia, and Lithuania. Before the Teheran Conference in November 1943, Averill Harriman, U.S. Ambassador to the Soviet Union, briefed President Franklin Roosevelt on Soviet objectives. Harriman told Roosevelt that the Soviets would insist on their 1941 frontiers and were determined to have a friendly government in Poland.<sup>1</sup> At the same time, domestic political pressures restrained Roosevelt from making the Soviet aims clear to the American public. Congressmen with Polish-American constituencies worried about the fate of Poland long before Teheran. In August 1943, Representative John Dingell of Michigan told Roosevelt that "we Americans are not sacrificing, fighting, and dying to make permanent and more powerful the Communistic Government of Russia and to make Joseph Stalin a dictator over the liberated countries of Europe."<sup>2</sup> Fearing loss of support in the 1944 elections, and also fearing that Congress might refuse to join the United Nations over this issue, Roosevelt kept the issue quiet. However, he could be blunt when necessary. In the summer of 1943, the President warned Polish Ambassador Jan Ciechanowski that the United States would not fight Stalin to prevent the taking of eastern Poland or the Baltic States.<sup>3</sup>

Disagreements between the two sides became obvious during the Yalta Conference in February 1945. Roosevelt essentially gave Soviet leader Joseph Stalin a free hand in eastern Europe because he knew there was no way to prevent it. Roosevelt understood that the American public would not have supported a new war against the Soviets in order to save eastern Europe. However, when the reality of Soviet policies became obvious, the reactions of the American



public and Congress against the Soviets were predictable.<sup>4</sup> On February 9, 1946, Stalin gave a rare public address in which he suggested that future wars were inevitable until the ultimate triumph of communism. The West reacted with dismay. Time magazine characterized Stalin's remarks as, "The most warlike pronouncement uttered by any top-rank statesman since V-J Day." Supreme Court Justice William O. Douglas described the speech as "the Declaration of World War III."<sup>5</sup>

Also in February 1946, the Canadian government arrested 22 people for espionage on behalf of the Soviet Union. Searching for a rationale to explain Soviet behavior, the administration of President Harry S Truman queried the Moscow's U.S. Embassy staff. George F. Kennan, minister-counselor at the embassy and a 20-year veteran of the Foreign Service, replied with the "long telegram," an 8,000-word explanation of the sources of Soviet conduct. Kennan argued that Soviet hostility to the West would last as long as its regime was based not so much on ideology as the need to justify dictatorial rule. Kennan noted that the tsars had also claimed dangers from abroad as justification for harsh methods at home. The implication was clear: Soviet behavior was based on the Soviet system's needs, not on Western actions. Hence, negotiation would have little effect towards resolving problems. Defining a policy that later became known as "containment," Kennan suggested that the United States strengthen the West, resist Soviet expansion, and wait for internal changes in the Soviet Union. Shortly after Kennan's telegram, former British Prime Minister Winston Churchill visited the United States. In a speech delivered at Westminster College on March 5, 1946, Churchill lamented that "from Stettin on the Baltic to Trieste on the Adriatic an Iron Curtain has fallen across Europe."<sup>6</sup>

In February 1947, the British informed President Truman they were giving up part of their sphere of influence in the eastern Mediterranean, specifically Greece and Turkey. Greece was in the midst of a civil war between the royalist government and communist guerrillas, and Turkey was under continuing pressure from the Soviet Union to revise the Montreux Convention—which limited Soviet access to the Dardanelles Straits and the Mediterranean. Together, these countries needed over \$400,000,000 in immediate aid, which the British could not afford. In requesting funding from Congress, President Truman characterized the war in Greece as a Soviet attempt to establish control in the Middle East. In addition, Truman stressed, "I believe that it must be the policy of the United States to support free peoples who are resisting attempted subjugation by armed minorities or by outside pressures."<sup>7</sup> Congress approved the \$400,000,000 for Greece and Turkey. This policy—soon known as the Truman Doctrine—committed U.S. assistance to any country struggling against communism. Containment had officially replaced the wartime alliance with the Soviet Union.

The Berlin-Crisis of 1948-1949 further escalated Cold War tensions. After World War II, Germany had been partitioned into four Allied occupation zones: American, Soviet, British, and French. The weak and dependent Germans were unable to support themselves. This situation suited the Soviets, who wanted to keep Germany from ever again becoming a threat. The Western Allies wanted a rejuvenated Germany able to contribute to the European economy, and proposed currency reform among the occupation zones to revive commerce and regularize financial matters. When the Soviets refused, the Western Allies went ahead with the reform within their own zones. This move sealed the division of Germany into East and West. On June 24, 1948, the Soviets isolated Berlin, which was 90 miles inside the Soviet zone, from all ground traffic.

While the United Nations debated the crisis, President Truman used aerial transport to bring fuel and food to the desperate Berliners in "Operation Vittles." Thousands of World War II pilots were called back into service to deliver 4,500 tons of supplies per day, making more than 250,000 flights.<sup>8</sup> The blockade and airlift ended 11 months later when the Soviet Union gave up, in May 1949.<sup>9</sup> However, the damage was done. The Berlin Blockade, together with the 1948 communist coup in Czechoslovakia, convinced many Americans that Stalin would seize every opportunity to expand Soviet control.

In 1949, at the urging of the United States, the North Atlantic Treaty Organization (NATO) was formed. This new alliance included the United States, the United Kingdom, Canada, Iceland, Norway, France, Italy, Portugal, the Netherlands, Denmark, Belgium, and Luxembourg.<sup>10</sup> Each signatory pledged to regard an attack on any of them as an attack on all of them.<sup>11</sup> By banding together, the West could begin to match the numerically superior Red Army. Indeed, this policy allowed the United States to "get tough with Russia" without building an enormous military structure. By joining NATO, America committed itself to containing the Soviet Union within the territories it occupied in 1949.<sup>12</sup>

While most Americans shared a common concern over the spread of communism, a more immediate threat was demonstrated by the Soviet Union on September 2, 1949. On that day the Soviet Union exploded an atomic bomb—abruptly ending America's monopoly on nuclear weapons. The explosion shocked Americans who had perceived the Russians as technologically behind the United States. When the Soviet Union exploded an even more powerful hydrogen bomb in August 1953, only ten months after America's first H-bomb test, the sense of fear and urgency increased in the United States.<sup>13</sup>

Although the Soviets had suffered more in World War II than perhaps any other nation, they had also profited greatly in their development of their armed forces and related technology, "through the acquisition and reproduction of modern weaponry like the Tu-4 'Bull' bomber, a copy of the U.S. B-29; the capture of German scientists, who would help them develop modern atomic weapons and missiles, and the conduct of scientific and industrial espionage. The impact on the United States was two fold: first, the Tu-4 gave the Soviets the capability to strike the United States by flying over the North Pole, and second, once they developed the atom bomb, they could visit massive destruction on the United States with just a few sorties, as the United States has done to Japan with its bombings of Hiroshima and Nagasaki."<sup>14</sup>

American fears intensified when the Soviets unveiled their first long-range bomber, the Mya-4 Bison [with the capability to strike the U.S. mainland and return], during their 1954 May Day parade. The following year, an American Embassy air attaché visited Tushino Airport and observed twice as many Bisons as American military intelligence had estimated. Soviet officials had actually deceived the American observer. The ten Bisons that had flown overhead had made a wide circle and then had been joined by an additional eight aircraft, which made another pass over the viewing platform. The hoax succeeded in creating the impression of a larger Soviet bomber force than actually existed. When the Soviets introduced a second long-range bomber, the Tu-20 Bear, talk of a bomber "gap" began. Succumbing to the deception, Air Force intelligence estimated that the Russians would have 600 to 700 strategic bombers operational by 1959.<sup>15</sup>

Despite the hoax, the United States was forced to acknowledge that the Soviet Union had developed a long-range bomber capable of delivering a nuclear weapon from Siberian air fields to the continental United States. The frightening prospect of a long-range Soviet bomber dropping a nuclear warhead on an unsuspecting American city resurrected a Pearl Harbor atmosphere in the United States. As nuclear stockpiles increased, the United States encouraged citizens to build fallout shelters and created civil defense systems designed to cope with an enemy attack.<sup>16</sup> In 1956, Congress added \$928 million to the Air Force budget for the purchase of B-52 aircraft. At the same time, the U. S. Army, the armed service responsible for protecting American ground forces, also was anticipating the threat of an enemy strike. As early as 1953, the Army began deploying the first Nike anti-aircraft batteries around American cities.<sup>17</sup>



## NIKE DEPLOYMENT AND U.S. AIR DEFENSE

Prior to World War II, the possibility of America being struck by an enemy air attack was remote. Protected on both sides by oceans—and with the limited range of aircraft—America seemed insulated from European or Asian air attack. Although small inroads had been made regarding U.S. air defense, it was only after the Japanese attack on Pearl Harbor that America devoted serious attention to the Nation's air defense.

America's first military organization devoted entirely to air defense was the Air Defense Command (ADC), which was created on February 26, 1940, at Mitchel Field, New York, following a recommendation by Major General Henry "Hap" Arnold. In November 1939, Arnold had pointed out the weaknesses in America's air defense system. The Air Defense Command was formed to "conduct experiments in the northeastern states to determine how fighter planes, antiaircraft artillery, and an air warning system could be integrated into a single air defense network."<sup>18</sup> Prior to the first effective use of radar by the British in 1940, typical early warning systems included batteries of sensitive listening devices, looking much like outsized ear trumpets mounted on trailers, intended to pick up the first sounds of approaching aircraft.

New to the problem of air defense, the Air Defense Command looked to the British example. In August and September 1940, during the Battle of Britain, the British had shown that a well-dispersed air force was a difficult bombing target, and demonstrated the value of an early warning system based on radar.<sup>19</sup> The United States undertook several large-scale exercises that attempted to unify all air defense elements. On the basis of this experimentation, the Air Defense Command recommended that the United States follow Britain's practice of placing air defense responsibility under pursuit aviation commanders.<sup>20</sup>

On March 7, 1941, the War Department assigned the mission of air defense to the Army Air Corps. The Army Air Corps created four numbered air forces, each with an interceptor command assigned the mission of air defense. The numbered air forces retained responsibility for organization and planning, while the interceptor commands carried out air defense operations. These operations included control of antiaircraft artillery (AAA) units trained and administered by the Coast Artillery Corps, which was charged with the mission of developing weapons and techniques.<sup>21</sup> However, lack of funds and commitment prevented these units from becoming part of a unified, fully prepared air defense system.

The bombing of Pearl Harbor on December 7, 1941, dramatically illustrated the weaknesses of the American air defense command. Following Pearl Harbor, the nation was forced to implement an air defense system that was still in its infancy; only eight months had passed since the Air Corps had received overall responsibility. Early in 1942, the Army reorganized into three principal elements: the Army Ground Forces, the Army Air Forces, and the Army Service Forces. Each received separate but related duties.<sup>22</sup>

As the United States entered World War II, little doubt existed concerning the important role that antiaircraft artillery would play. On March 9, 1942, the War Department activated the Antiaircraft Command as part of the Army Ground Forces. With Major General Joseph A. Green serving as its first commanding general, the Antiaircraft Command's primary mission was "to instruct and

train officers and enlisted men for duty with antiaircraft artillery and barrage balloon units, and to activate, organize, equip and efficiently train such units for combat service."<sup>23</sup> The War Department established the Antiaircraft Artillery School at Camp Davis, North Carolina. Two years later, the school moved to Fort Bliss, Texas, where the clear weather and solitude provided excellent year-round antiaircraft training and testing grounds. Between March 9, 1942, and September 2, 1945, the command trained 613 antiaircraft artillery combat units for deployment overseas and in the continental United States.

The Army Service Forces, through the Chief of Ordnance and Chief Signal Officer, also played a significant role in air defense through procurement, delivery, and equipment maintenance.<sup>24</sup> At the same time, the Army Air Forces maintained operational control of air defense through its four numbered air forces. This complex organizational structure caused difficulties. In 1942, the Army Ground Forces and the Army Air Forces had "sharp disagreements" concerning the circumstances under which an antiaircraft artillery unit could begin firing.<sup>25</sup> Each side argued that it should have the command to control the antiaircraft artillery units. The issue, however, remained unresolved and would surface again with the development of the Nike missile system.

As Nike missile research began in 1945, the rivalry over the control of America's air defense systems escalated. The Army Ordnance Corps had full responsibility over Nike development, but the Army Air Forces had overall responsibility for air defense of the United States. In 1946, the War Department issued several directives that led to different interpretations by the Army Air Forces and Army Ground Forces. Finally, in September 1946, the War Department resolved the controversy by declaring that Army Air Forces would control antiaircraft artillery units with air defense missions. The War Department also determined that the Air Defense Command would provide Army Ground Forces with some degree of influence by integrating antiaircraft artillery officers into its staff. Army Ground Forces also remained responsible for providing the technical training of antiaircraft units.

The 1947 National Security Act separated the Army Air Force from the Army and established it as the United States Air Force. Separate from the National Security Act, the Army and the Air Force formulated over 200 agreements regarding air defense. These agreements, which became known as the Eisenhower-Spaatz Agreements, resulted in the Air Force having operational control of air defense, while the Army staffed the air defense units. In September 1947, as part of these agreements, the Army also gained control over the development of missiles "designed for employment in support of Army tactical operations," while the Air Force was assigned "missiles designed for employment in area air defense"<sup>26</sup>

President Harry S Truman, in an effort to strengthen America's air defense, directed the Air Force to reorganize in October 1948. The Continental Air Command was formed on December 1, 1948, headed by Lieutenant General George E. Stratemeyer. The Air Defense Command fell under the Continental Air Command jurisdiction, resulting in the Air Force retaining overall responsibility for air defense. At the same time, the Army continued to provide antiaircraft artillery units and personnel to support the air defense function. As a result, disagreements continued between the Army and Air Force over air defense responsibilities. However, one concession the Army won was to establish an antiaircraft artillery chain of command, which became the Army Antiaircraft Command (ARAACOM).

The Army activated ARAACOM in 1950, immediately following the beginning of the Korean War. ARAACOM was based at Ent Air Force Base at Colorado Springs, Colorado. At first, ARAACOM only had oversight for planning and training.<sup>27</sup> In August 1950 the Army and the Air Force agreed upon antiaircraft artillery procedures similar to those in place during World War II, allowing Air Force "air division commanders to exercise operational control of all antiaircraft artillery units assigned to their sectors. Division heads were expected to establish flexible conditions under which the units would go into action...it authorized...an antiaircraft artillery component at each echelon of the air defense forces. The officers in charge of the artillery units were expected to serve as the principal advisers to their respective air defense chiefs. Antiaircraft artillery commanders in the field, therefore, would be assured that the orders they received had been confirmed by or, at the very least, coordinated through their own services."<sup>28</sup> On April 10, 1951, ARAACOM assumed actual command of Army air defense units [less operational command, which remained with the Air Force, and was assumed by the North American Air Defense Command (NORAD), upon its establishment in 1957]. By July 1951, ARAACOM headquarters commanded a total of 38 antiaircraft artillery battalions.<sup>29</sup>

Indeed, "the Korean War provided the impetus that got the air defense program rolling on many levels and in many areas. The fielding of AAA forces, interceptor squadrons and supporting elements shifted into high gear. ... Just a few days after the North Korean invasion of the South, the United States air defenses, consisting mostly of fighter interceptors, commenced around-the-clock operations. ARAACOM was formed within a week."<sup>30</sup>

In support of the combat arms, the U.S. Army Corps of Engineers oversaw preparation of antiaircraft artillery sites, construction of Air Control and Warning radar stations, and rehabilitation and expansion of Air Force bases over the rest of the decade.<sup>31</sup>

At Fort Barry and Fort Cronkhite, batteries of the 740th AAA Gun Battalion manned their 90-mm pieces in earthen revetments overlooking Bird Rock, and the 9th AAA Gun Battalion emplaced their heavier 120-mm guns near the World War II antiaircraft battery on Wolf Ridge. The *Star Presidian* reported the "transporting gasoline, water and rations to field posts and support of movements of heavy guns throughout the county area are daily problems of the motor pool of the 9th AAA Gun Battalion<sup>32</sup> which make their activities more like an overseas outfit than the average stateside unit. Outlying batteries in Marin, San Francisco and San Mateo counties are dependent upon the motor pool for supplying their daily needs. Although these batteries are within a metropolitan area, none has such conveniences as running water or electricity."<sup>33</sup> Army Chief of Staff, General Maxwell Taylor, who served as a paratrooper in combat in World War II, offered little sympathy to the artillerymen, remarking "that is was about time the Coast Artillery got a taste of field life."<sup>34</sup>

More than twenty years after Taylor's remarks, Colonel (then Lieutenant) Susan E. Cheney, the last Battery Executive Officer of Nike Site SF-88, was asked to comment on the kind of reputation these air defenders, heir to the old Coast Artillery Corps, had among their fellow soldiers:

Very good. We were the elite. We were the high tech. We were the people that were going to defend the continental United States. ...Now that is [the feeling] among the Air Defenders. Among our support people I am afraid that our reputation wasn't quite

as good because we worked very long hours. Here in CONUS [Continental United States] in particular, we were the one group of people that worked twenty-four hours a day, seven days a week. There was no such thing as Christmas.

...We spent way more time than other lieutenants in other branches here in school. Our training was much longer than the other basics, but you see it is also how we came up with this...elitist attitude that I say has hurt the branch in later years.

Ron Parshall was a generator mechanic and launcher crewman (nicknamed "pit rats") at SF-88 in 1960-1961. He indicates that, at least some of, the enlisted personnel shared this assessment:

I have to say that the officers when I was here...were always top notch. In fact when people ask me, I always had to brag about the officers. No matter what questions you had, they had the answers. And they were precise answers, they were the answers you were looking for. You know, you always had questions and (and this is what I and most people say is what they liked about the launcher area) you got to talk with the officers. When you are first going through basic, you have these hard-nosed sergeants and 'ninety day wonders' as lieutenants, and we had imagined they would be the first people that you would shoot in war, and then you would go after the enemy. Whereas when we got to the air defenders, the officers were always top rank.

...I remember the esprit de corps to be a part of this branch. ...A lot of pride, too. You heard of service pride or shining your shoes out of pride or whatever it is. The engineers were the only ones allowed to go without shiney shoes, and that was my duty because we dealt a lot with hydraulic fluids and but everybody else, you know, they were ready for parade at all times.

In January 1956, Secretary of Defense Charles Wilson assigned ARAACOM exclusive responsibility for surface-to-air missiles used in point defense, including Nike missiles, which had been deployed since 1953.<sup>35</sup> The Army was given a revised "combat zone responsibility up to 100 miles forward of the line of contact with an enemy..." while the Air Force continued to "maintain area defense against air attack..."<sup>36</sup>

By 1957 thirty-seven percent of the Army's total military construction program was devoted to missile projects, the next year it had increased to forty-eight percent—nearly half of all Army construction funding was devoted to missiles in the year that Nike Ajax systems began to upgrade to nuclear-capable Nike Hercules.<sup>37</sup> On March 21, 1957, ARAACOM was redesignated as the U.S. Army Air Defense Command (ARADCOM)—the term "antiaircraft" was no longer favored, as air defense was targeted against both aircraft and missiles.<sup>38</sup> ARADCOM units defended major industrial and population centers of the United States, as well as selected Strategic Air Command bases. Army Air Defense Command Posts were established for each defense at battalion, group, or brigade level to provide command and control coordination with the Air Force at each operational echelon.<sup>39</sup>

The assignment of research and development for guided missiles—whether for area or point defense—to two services, created not only rivalry but a duplication of effort. However, the military rationalized the duplication as a means of maximizing America's ability to have the

flexibility to adjust a weapons system design to changing technological innovations and political circumstances.<sup>40</sup>

As a result, the Army and the Air Force developed separate air defense missile programs. While the Army worked with Bell Laboratories on the development of Nike, the Air Force conducted simultaneous missile development with various contractors, including a series of studies that eventually led to the development of the BOMARC missile system.<sup>41</sup>

In 1958, illustrative of the competition that soon developed between the Army's and Air Force's missile systems, Air Force officials called for a plan to replace the Nike sites surrounding Chicago with BOMARC bases. ... As the Chicago Sun Times reported, "The basis of the Air Force plan is a charge that the atom-tipped Nike-Hercules, already stationed at one site in Chicago cannot cope with Russia's fast new jet bombers. Army officials rebutted this contention with the "hardfact" that the Hercules is already operational and easily adaptable to existing bases [properly "sites" in Army terminology], while the BOMARC is distinctly a weapon of the future."<sup>42</sup>

Charging the Air Force with "planning in World War II terms," the Army predicted that by the time BOMARC was fully combat-ready, Soviet bombers would no longer be the major threat to American security. The Army claimed that by 1960 "the main Russian threat will be the ICBM and its answer is the Army's Nike-Zeus," which was the last of the three types of Nike missile.<sup>43</sup> In 1959, the Department of Defense conducted a mock attack on Chicago to evaluate the effectiveness of Nike Hercules. Strategic Air Command bombers carried out the simulated attack. When Nike Hercules proved to be only eight percent effective against these bombers, Air Force officials used this event as an opportunity to push the BOMARC missile.<sup>44</sup> Ultimately, however, the Department of Defense utilized both missile systems for America's air defense — although there were far more Nike than BOMARC bases.<sup>45</sup> BOMARC was soon phased out, and never achieved the widespread deployment of the Nike system.



## DEVELOPMENT OF THE NIKE MISSILE SYSTEM

The first-generation Nike missile, the Ajax, was designed to intercept and destroy Soviet manned bombers. In the event that the Cold War turned hot, Nike missiles were designed to provide the last line of defense for the Nation's population and industrial centers against any hostile aircraft that had broken through the U.S. Air Force's interceptors. Although the U.S. Army did not build the first Nike missile batteries until 1953, research and development of the defensive anti-aircraft weapon systems began during World War II.

The United States entered World War II equipped primarily with three-inch anti-aircraft artillery guns, but increasing aircraft altitudes soon made these guns obsolete. In 1938, the United States had initiated development of an integrated anti-aircraft defense system. That investment resulted in the development of the 90mm gun, which was standardized in February 1940. Using the M-9 director radar system, the 90mm gun could hit aircraft flying at 30,000 feet, and the combination of the 90mm gun and M-9 radar proved successful in World War II against the German V-1 rockets. By 1942, the 90mm anti-aircraft artillery gun became the basic anti-aircraft weapon. The War Department also developed a 120mm anti-aircraft gun, but its large size limited mobility.<sup>46,47</sup>

The M-9 and M-10 gun director systems, produced during World War II, were initially fielded with most ARAACOM units, until the more modern M-33 system could be mass produced. The M-9 and M-10 consisted of an analog computer and a two-seat directing apparatus, called the tracker head, in which two soldiers sat and tracked the target. Information on azimuth, elevation and range of the target was automatically sent to the computer by the tracker head and the SCR-584 tracking radar. The computer then calculated the vertical angle and horizontal direction the guns should point to hit the target.<sup>48</sup>

By the close of the war, advances in air warfare made it plain that even the latest anti-aircraft weapons were not capable of countering future air threats. Guided missiles capable of striking high-flying aircraft were necessary. The B-29 atomic bombing mission of Hiroshima and Nagasaki in August 1945 vividly demonstrated the destructive power of high-altitude heavy aircraft. As World War II drew to a close, America's military planners began planning for air defense systems that could counter these new offensive weapons. In response to potential threats from the air, the Army began developing two separate, but related, pieces of equipment: the M-33 integrated fire control system and what would become the Nike missile.

In 1944, the U.S. Army contracted with Bell Telephone Laboratories to develop a fully integrated radar/computer anti-aircraft fire control system. The result was the M-33 system. Earlier systems, such as the M-9, while successful, were a collection of individual equipment elements from various sources that were organized into working units by the military. The M-33 system, however, offered a complete radar/computer system.<sup>49</sup> This system, which would later operate with the Nike Ajax missile, provided the basis for a significantly improved fire control system.<sup>50</sup>

"Rather than just two tracker operators plus the SCR-584 crew, the M-33 crew consisted of five soldiers who worked in a trailer. Within their trailer, they received a video display from one of their two radars, the acquisition radar. This radar gave them the general locations of aircraft that flew within approximately 75 miles of their site. They were also linked by telephone to their

battalion antiaircraft operations center (AAOC), which provided them warning of attack. Once warned, the tactical control officer, a member of the five-man crew, assigned the target to a radar operator who aimed the second radar, a tracking radar, at the target. When he found the target, he had the radar 'lock on' to it electronically, and the radar began tracking the target automatically, sending range, bearing and deviation data to the computer. Once the target was within range and determined to be hostile, the four guns of the battery began firing on it."<sup>51</sup> Thus the final generation of 90mm and 120mm antiaircraft guns were already using the basics of the fire control apparatus later incorporated into the Nike system (with the exception of the Missile Tracking Radar).

On August 17, 1944, Army Lieutenant Jacob W. Schaefer submitted a memorandum proposing a new anti-aircraft weapon system. The heart of this proposed system was a rocket guided from the ground, which would work in conjunction with two radars linked to a computer. One radar would track incoming enemy aircraft, transmitting current location points to the computer. The computer would then calculate future target positions and be able to relay to the missile, through the other radar, any course corrections needed to intercept the enemy aircraft. The Army sent copies of Lieutenant Schaefer's technical proposal to Radio Corporation of America (RCA) and Bell Telephone Laboratories (BTL) for their consideration.<sup>52</sup>

In May 1945, Bell Laboratories presented a verbal report to the Army on "Project Nike" (named after the winged goddess of victory in Greek mythology). A written report, "A Study of an Antiaircraft Guided Missile System," was released the following July. The report, which was the work of a group of Bell Laboratories' scientists and engineers that included W. A. McNair, H.W. Bode, G.N. Thayer, J.W. Tukey, and B.D. Holbrook, stressed swift deployment of a weapon system that could combat high-speed, high-altitude bombers. The engineers recommended a weapon that was derived, to every extent possible, from existing technology. In order to save time and money, the engineers also recommended that the missile be as simple as possible. Bell Laboratories' engineers also urged that the more expensive and complex equipment, such as the radar system, remain on the ground where it could be re-used and have the benefit of routine maintenance.<sup>53</sup>

The Bell Laboratories' report recommended that Project Nike be comprised of a supersonic rocket missile that could be vertically launched under the thrust of a solid-fuel booster, which would drop on completion of its function. The launched missile would be propelled by a liquid-fuel motor, and guided to a predicted "intercept point" in space. The commands for missile detonation would be controlled from the ground—and would be transmitted by radio signals from a ground-based computer and radar system that would track both the target and the missile in flight.<sup>54</sup>

A few months later, the Antiaircraft Artillery Board published a report that listed more specific, desired characteristics of the proposed Nike missile. The board wanted a missile that had: 1) the ability to operate effectively in high altitudes up to altitudes of 60,000 feet and at ranges of 50,000 yards; 2) the ability to destroy large bombardment-type aircraft when detonated within 60 feet of the airplane; 3) a self-destruction feature; 4) the highest degree of security against interference or enemy electronic countermeasures; 5) the ability to be transported by motor vehicle; and 6) an assembly period of no more than three hours.<sup>55</sup>



In June 1945, the Rocket Branch of the Army Ordnance Corps (co-sponsored by a division of the Army and the Air Force) assumed full responsibility for Project Nike, and named Western Electric and Bell Laboratories as the prime contractors for development of the radar system. As designed by Bell Laboratories and Western Electric, the missile command and control radar system incorporated characteristics of the M-33 anti-aircraft fire control system, saving both time and money on research and development, production, logistics, and personnel training.<sup>56</sup> The Army selected Douglas Aircraft Company (later the McDonnell Douglas Astronautics Corporation)<sup>57</sup> as the major contractor for the design of the missile, booster, and launcher. In turn, Douglas Aircraft contracted with the Aerojet Engineering Corporation to design the liquid-fuel rocket motor and solid-fuel booster rockets. Following the start of the Korean War in 1950, the Department of Defense asked the contractors to produce a working version of the Nike system as soon as possible. This first missile was the Nike Ajax.<sup>58</sup>

## NIKE AJAX

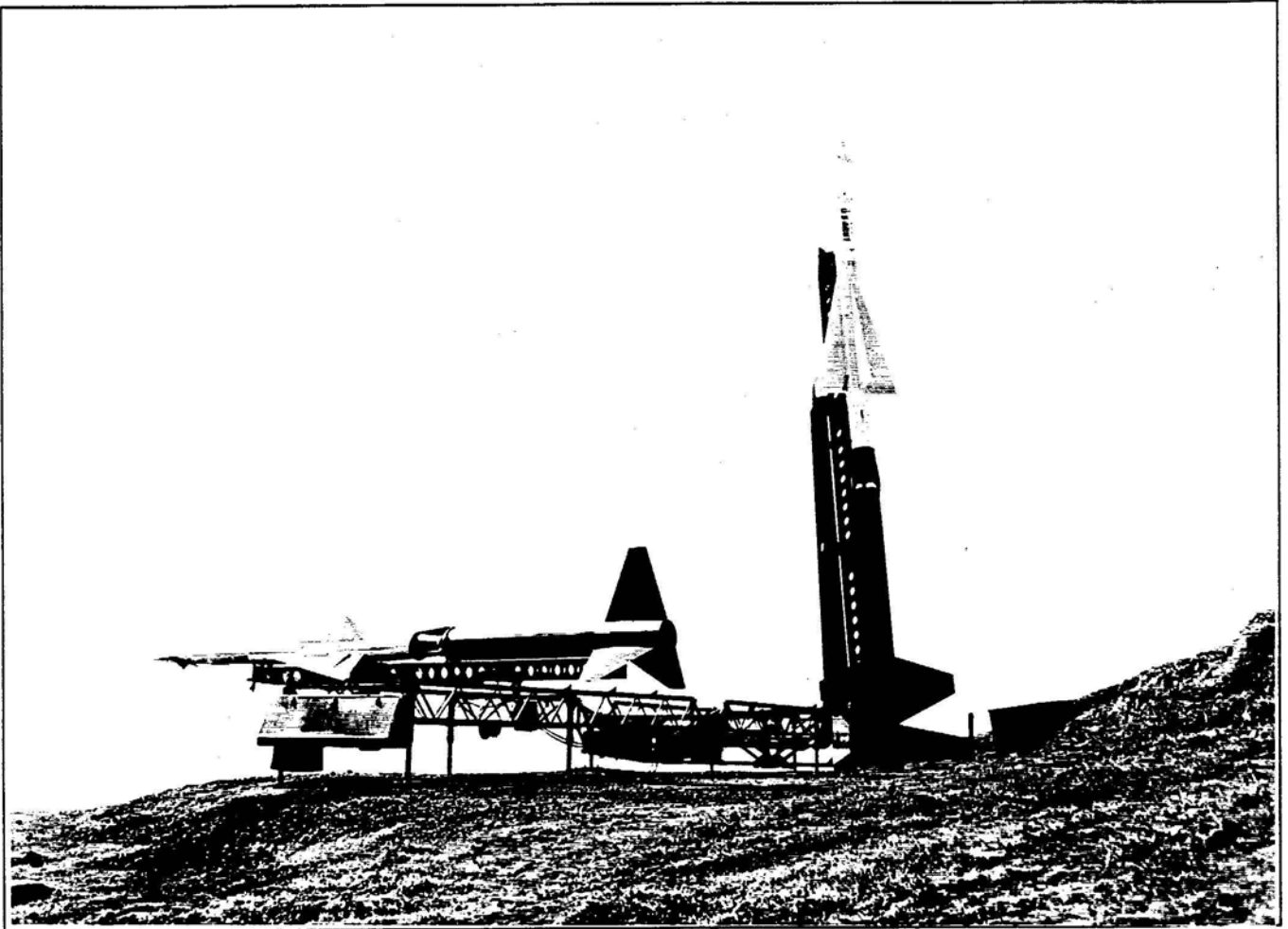
The Nike Ajax was the first in the Army's family of guided missiles, and the world's first operational, guided, surface-to-air missile system.<sup>59</sup> The Nike Ajax was a two-stage, supersonic missile. The missile was extremely slender, only 12 inches in diameter. Twenty-one feet long and 34 feet high with the booster attached, the missile weighed slightly over 2,455 pounds.<sup>60</sup> Nike Ajax carried three high-explosive warheads, weighing 12, 179, and 122 pounds, each wrapped in 1/4 inch, optimum cubic fragments. The warheads were mounted in the nose, center, and aft sections. Two arming mechanisms and five detonating cords activated the warheads, following burst orders issued from the ground.<sup>61</sup>

The Nike Ajax missile had a two-stage propulsion. The first-stage, solid-propellant booster produced a 59,000-pound thrust for 2 1/2 seconds, then separated and fell away as the second stage fired. A liquid-fueled sustainer motor powered the second stage. It burned jet fuel, JP-4, with red fuming nitric acid as the oxidizer. As JP-4 and red fuming nitric acid are not self-igniting, a small quantity of aniline/furfuryl alcohol (and later dimethyl hydrazine) provided the catalyst for combustion.<sup>62</sup> In flight, the sustained motor burned for 70 seconds and consumed 135 kilograms of JP-4.<sup>63</sup> Nike Ajax had a burnout speed of Mach 2.3, a range of 25-30 miles, and a ceiling of 65,000 feet. (Mach 1 is the speed of sound; Mach 2.3 is 2.3 times as fast as the speed of sound, or 1,679 mph.)<sup>64</sup>

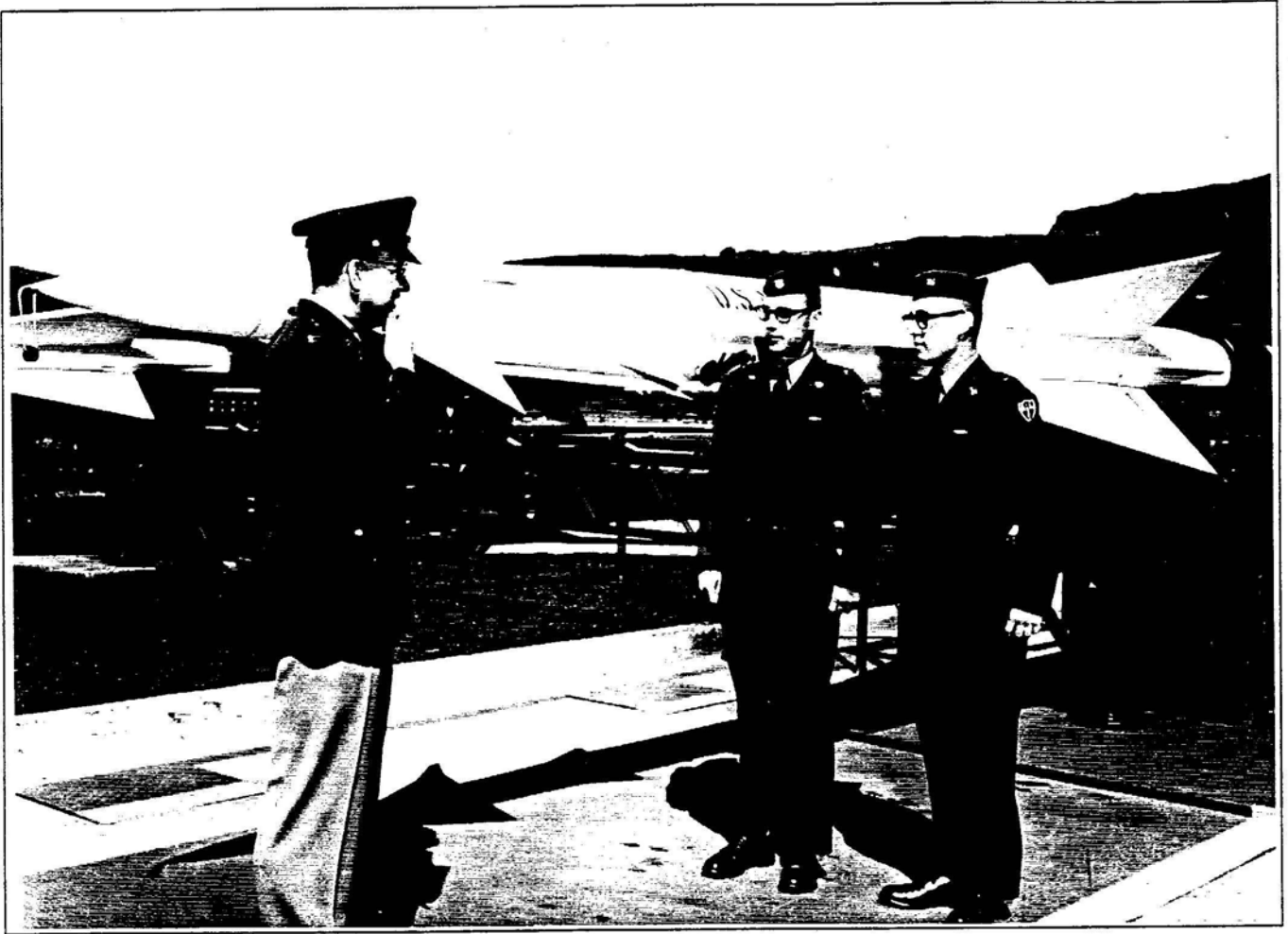
The Nike Ajax had three sets of cross-shaped fins, in addition to those on the booster. The forward set of fins was for steering, the middle set was mounted with sensing equipment, while the rear set provided stability. Douglas Aircraft manufactured the Nike airframes and assembled the missiles at its plant in Santa Monica and, later, at the Army Ordnance Missile Plant in Charlotte, North Carolina. In total, Western Electric and Douglas Aircraft produced 358 ground batteries and nearly 14,000 Nike Ajax missiles for the Army during the duration of the missile's deployment.<sup>65</sup> In addition to Western Electric, Bell Laboratories, and Douglas Aircraft, the U.S. Army subcontracted with hundreds of other companies to supply parts for the Nike Ajax weapon system. These contracts valued approximately \$1.16 billion. Research, development, and design engineering came to approximately \$179.2 million; industrial services and supplies cost about \$947.6 million; and the remaining \$39.1 million was invested in production facilities.<sup>66</sup>

In April 1953, Secretary of the Army Robert T. Stevens announced "action to establish anti-aircraft batteries equipped with Nike guided missiles."<sup>67</sup> The first Nike Ajax site was activated in December 1953, at Fort George G. Meade, Maryland. The 36th Anti-aircraft Artillery Missile Battalion tactically deployed at this site on March 20, 1954, as part of the Washington-Baltimore Defense Area. Battery B of the 36th was declared operational and combat ready on May 30, 1954.<sup>68</sup>

Closer to home, the *San Francisco Chronicle* reported on July 7, 1954 that, "four Nike launching sites are already under construction in the Bay Area, the Army Engineers said. They include installations near Lake Chabot in the East Oakland hills, and at Forts Baker, Barry and Cronkhite in Marin county."<sup>69</sup>



Temporary launching section of Nike-Ajax missiles assigned to Battery A, 9th AAA, Fort Barry, 1955. This view clearly illustrates the exposed nature of the field emplacement.  
*(Golden Gate National Recreation Area, DOD Still Media Records Center Collection)*



(Original caption) "Thoroughly confused is Captain Henry E. Paine, Battery Commander of "A" Battery, 9th AAA Missile Bn., of Fort Cronkhite [sic], California. Captain Paine is confused as to the newly assigned identical twins of the Battery, Pvt's Melton and Felton Boudreaux of Houston, Texas." U.S. Army Photograph. March 26, 1956. (*Golden Gate National Recreation Area, Henry E. Paine Collection*)

By October 1954, the *Star Presidian* was able to report that "the San Francisco Bay Area is substantially defended against hostile air attack at the present time...Although the Nike guided missile program is very new and the people of the Bay Area see the launching sites only in the process of completion, several sites can already launch their missiles from temporary positions. While the permanent sites are being rushed to completion, these temporary expedients for launching add greatly to the strength of the area's antiaircraft defense. These defenses will continually grow stronger. ...Bay Area antiaircraft defenses, which include 90mm guns as well as guided missiles, are manned by the 30th Antiaircraft Artillery Group with headquarters at Fort Barry, Marin County. They are part of the Western Army Antiaircraft Command, headquartered at Fort Baker."<sup>70</sup>

On October 1, 1954, the 9th, formerly an "Antiaircraft Gun Battalion," was redesignated as the 9th Antiaircraft Artillery Guided Missile Battalion and officially became a Nike-equipped unit. The first commander of Battery A was Capt. Henry Paine who had recently completed an in-depth training at Fort Bliss as part of "Nike Package 14," a specially-selected group of officers, warrant officers and enlisted men chosen to operate the new missile site at Fort Barry. Paine and the men of Battery A shortly began drawing their new missiles.<sup>71</sup> At the same time, the 359th Engineer Detachment began constructing field positions near the location of the future, permanent launch site.<sup>72</sup> The first SF-88L "Temporary" emplacements were complete and were ready for inspection by 28 October 1954.<sup>73</sup>

In February 1955, the Army noted that, "recently the 9th has turned over the 120mm guns and sites over to National Guard and is drawing Nike guided missile equipment. The manning of Nike sites in the Bay Area on a 24-hour basis adds the nation's newest antiaircraft missile to the combined fighter-gun defense which has been in operation on a round the clock basis for the past 3-1/2 years."<sup>74</sup>

The 9th Antiaircraft Artillery Guided Missile Battalion was a part of the 30th Antiaircraft Artillery Group, which, in June 1955, consisted of five battalions, "the 9th and 740th AAA [Guided] Missile Battalions, the 52nd and 536th 75mm Skysweeper Battalions, the 752nd AAA [Guided Missile] Battalion, and the 518th AA Operations Detachment."<sup>75</sup> (Battery A of the 9th remained at SF-88 until the unit was inactivated at San Francisco on September 1, 1958.<sup>76</sup>)

Although they had been previously shown to the press, it is believed that the first opportunity members of the public had to tour a Bay Area Nike site was afforded on May 18, 1957 at sites "located in the San Francisco, Marin County and East Bay areas." At that time, "Missile battalions within the 30th AAA Group are the 9th, which includes mainly the Marin County batteries; the 740th, which consists of Nike units in and around San Francisco; and the 441st, which is responsible for the East Bay defenses. The 752nd AAA Gun Battalion, the last Regular Army active gun battalion in the defense area, is also controlled by the 30th Group," although it was "scheduled for inactivation on 15 June." In addition to the Regular Army units assigned to it, the 30th Group had operational control of "two other 90-mm Gun Battalions, the 271st and the 728th, [which] are manned by the California National Guard..."<sup>77</sup>

In October 1957, eighteen gun battalions throughout ARADCOM were inactivated on orders of the Department of the Army. ARADCOM's 6th Region, on the West Coast, inactivated five

battalions in the Los Angeles, Seattle, Hanford (WA), and San Francisco Bay areas and “became an all-missile command.”<sup>78</sup>

“On 1 September 1958, Regular Army missile battalions were inactivated and replaced by missile battalions assigned to regiments [although] (the units were actually redesignated in place). ... This was done as part of the Army’s Combat Arms Regimental System (CARS), for unifying units along mission, historical and regimental lines.”<sup>79</sup> The system was further described as restoring “the lineage of traditional artillery regiments which was broken by tactical requirements for separate battalions in World War II. This program will reconstruct the framework by which the Army will maintain continuity of its most distinguished regiments, regardless of changes in tactical organization through peace and war.”<sup>80</sup>

“The Department of the Army announced on 29 August [1958] that all active U.S. Army Anti-Aircraft Artillery units have now been redesignated as elements of 24 of the parent [Air Defense] Artillery regiments selected for retention under the Combat Arms Regimental System. ... New names have been given to 13 Nike battalions of the Air Defense Command’s 6th Region. Maj. Gen. Edward J. McGaw, 6th Region commander, said the new designations will make the Nike units part of the Army’s most famous artillery outfits and should foster more tradition and pride in the units. ... The 9th AAA [Guided] Missile Battalion (Nike-Ajax) has become 2nd Missile Battalion, 51st Artillery.”<sup>81</sup> The 9th and its successor, the 2nd Battalion, 51st Air Defense Artillery Regiment, served at SF-88 well after the transition to Hercules—until June 1971—a total of seventeen years.<sup>82</sup>

The last operational Ajax site in the United States ceased operations in May 1964,<sup>83</sup> and the last missile of the Nike-Ajax type was offered to the Smithsonian the following November.<sup>84</sup> However, beginning in 1967, Nike Ajax installations were deployed in countries that shared common defense interests with the United States, such as Belgium, Denmark, France, West Germany, Greece, Italy, Japan, the Netherlands, Norway, Taiwan, and Turkey.<sup>85</sup>

The evolution of the missile technology is inextricably involved with the military and political situation as Nike Ajax gave way to Nike Hercules. In his cogent analysis of the Nike missile system entitled “Vigilant and Invincible,” Colonel Stephen P. Moeller wrote:

The decade of the 1960s was one of peaks and valleys for the United States. The confident nation that began the decade with its eyes on a bright and seemingly unlimited future reached the end of the 1960s in disillusionment and disarray, its unity, institution and sense of moral certainty disrupted by its most unpopular and divisive foreign war. This negative transformation has a significant impact on the military as a whole and, especially, the future of ARADCOM....

The Soviet Union continued to build its strategic might to new heights. Krushchev’s desire to outpace the United States in ballistic missiles of every variety was significantly increased when he was forced to back down during the Cuban Missile Crisis. The Soviets, however, did not by any great measure increase their strategic bomber forces, which left the massive U.S. defenses guarding against them open to controversy and eventually to cutbacks....

This decade saw ARADCOM achieve maximum deployment early in the 1960s, then begin the process of downsizing. It continued to modernize with the inactivation of the last gun units, upgrading from Nike Ajax to Nike Hercules, then finally to the Improved Nike Hercules system. It added additional command and control capabilities. Missile Master systems were used for the large area defenses.... ARADCOM assumed command of the missile forces deployed to Florida for the Cuban crisis...<sup>86</sup>

When asked what would have happened if the site had gone into action and fired an entire pit of missiles, launcher crewman Parshall stated:

We would probably have been the first target that they would have taken out... There was no guns in our possession here whatsoever. So we couldn't fire back. Our job was over.

You just figured it out. You are the target. If they want to get rid of you, [they would have to] get rid of this [Nike site] so they can come through. We figured it would be close to impossible. They would have to fight the Navy first, then the Air Force and then us. So, unless they sent over a lot of planes, I doubt if they would have gotten through. We figured that any time we had a fifteen minute warning, every time we were called down here to get a missile out, that we were actually at war. It just felt that way. All of the publicity was that way. Russia was not cooperating on the table as they talked to us; they were very aggressive. They were infringing on our air space everyday, so it was a threat. Once they hit up Alaska or come even further into Canada, the whole United States was put on alert, not knowing which direction they were coming.

Because they could come through Cuba in the south, every time we had a practice we figured we were at war, and it felt like that because nobody would tell you anything until it was over. And then you would say, "Wow that was just a practice? Okay. Thank you." (Laughter). It kept you prepared. We were over prepared, not over prepared, but we knew our job and knew what to do and were very confident and had a lot of competent people. The officers especially, that I met on these sites, were a step above anything. They were great. They knew everybody's job, not only their own job, but they knew everybody else's job. We had a lot of confidence in them too.



## NIKE HERCULES

The Army began developing the next generation of Nike missile—Hercules—in 1953, even as the Nike Ajax was becoming operational. The Army named the missile for one of the most celebrated heroes of classical mythology, a figure renowned for strength and endurance. The new guided missile would need these characteristics in order to destroy the newer, more sophisticated generation of aircraft. Aircraft capabilities had increased in range and altitude, demanding an improved air defense system. In addition, nuclear payloads were a greater threat. Designed to carry either nuclear and/or high-explosive warheads, the Nike Hercules missile could attack supersonic aircraft operating at altitudes in excess of 150,000 feet and at a range of more than 87 miles.<sup>87</sup>

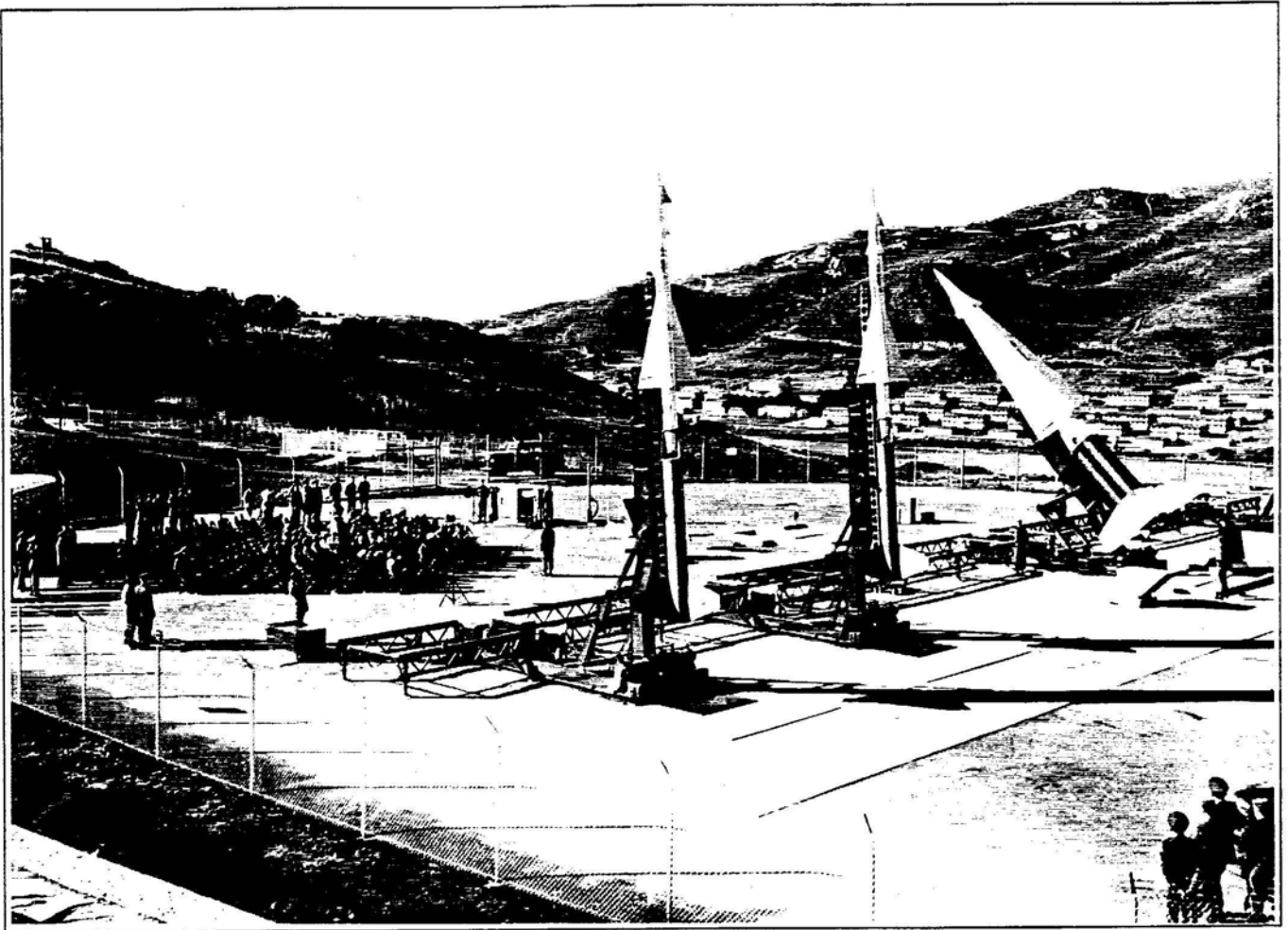
Nike Hercules represented several notable improvements over the first generation Ajax. The solid-fuel booster for the Nike Hercules was a cluster of four Nike Ajax missile booster units. Another improvement was a solid-fueled propellant that replaced liquid-fueled propellant for the sustainer motor. At launch, the Nike Hercules weighed 10,405 pounds; later versions weighed 10,710 pounds. Burn-out speed was typically Mach 3.5 in early production; that speed was later increased to Mach 3.65.<sup>88</sup> Also improved was the acquisition radar for the Nike Hercules system, which ultimately had a range of 100 miles. The missile and target-tracking radars also had increased ranges.<sup>89</sup>

In 1958, the Army began replacing Nike Ajax missiles with Nike Hercules, around the same time as the unit organizational changes mentioned in the previous chapter were instituted.<sup>90</sup> In the San Francisco Bay Area, “the local \$2-1/2 million ‘face-lifting’ project which will not hamper operational efficiency of the currently available Nike-Ajax missiles, will add complementary launching facilities at Fort Barry, San Rafael, Sharp Park, Lake Chabot and Travis Air Force Base. ...

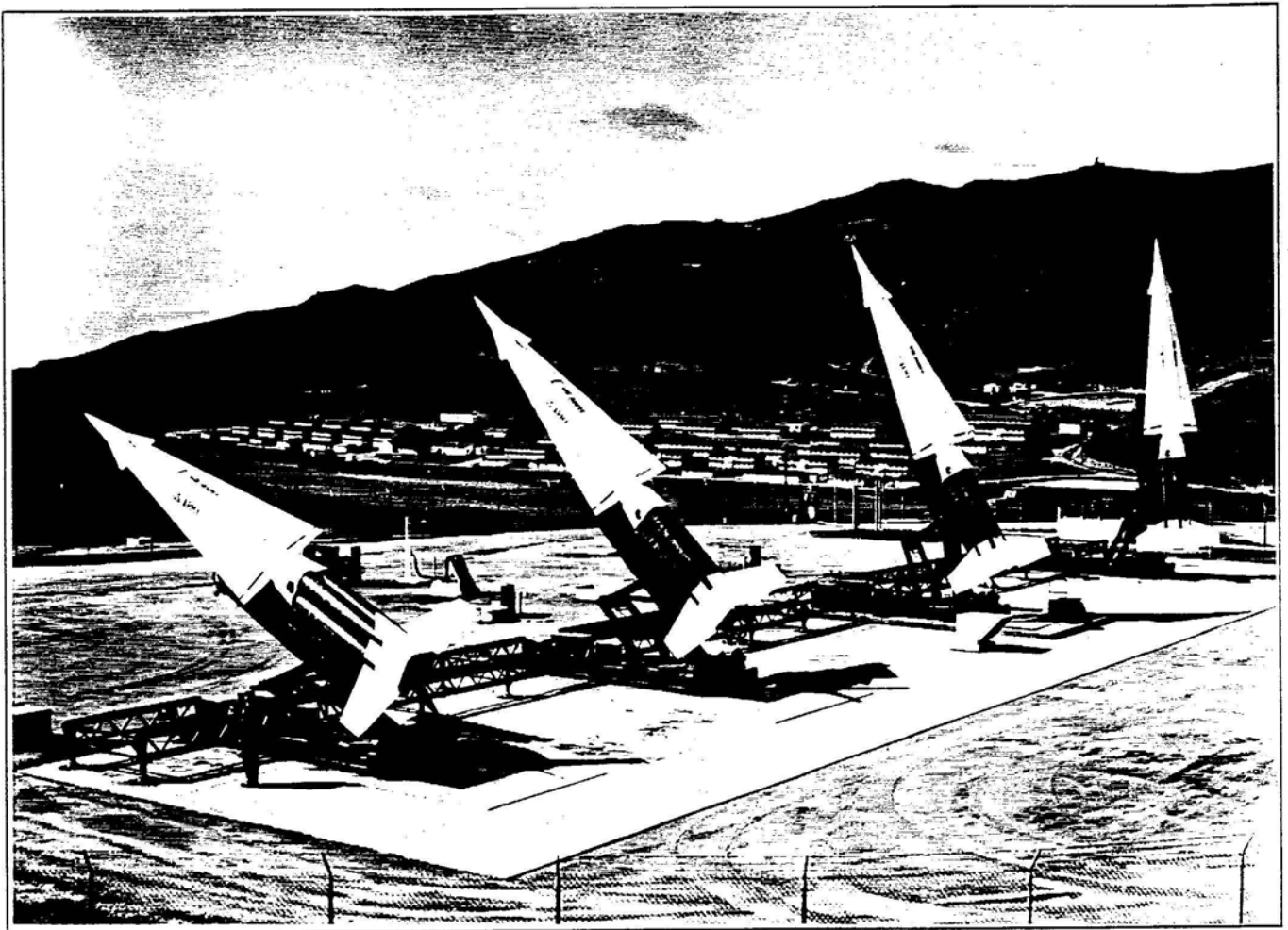
Sixth Army officials emphasized that elaborate security precautions have been taken in the design and handling of the Nike-Hercules to prevent accidents, either on the ground or in the air. The Army officials further stated that there is no radiation hazard in transit or storage of the atomic warhead and that there will be no radiation hazard to people living near or passing by locations where the nuclear warhead missiles may be deployed.<sup>91</sup>

In September 1958, the Army reported that, “the first ‘Package’ of 27 Nike Hercules missile-men-to-be, from this area will leave next month for Fort Bliss, Texas, where they will train on the new Nike-Hercules guided missile. The course of instruction runs for eight weeks. The men are part of Battery A, 2nd Missile Bn., (Nike-Ajax) 51st Artillery, formerly 9th AAA [Guided] Msl. Bn. The battery site is at Fort Barry at the north end of the Golden Gate bridge. It is commanded by Capt. Albert F. Baenzinger. The leader of the group going to Fort Bliss is SFC Jessie L. Myrick, Jr.”<sup>92</sup>

On November 20th of that year, the Army announced the return of the trainees and the installation of the missile launchers. “The Nike Hercules is being installed at a hilltop site at Fort Barry, Marin



The ceremonial first public display of Nike-Hercules missiles in the San Francisco Defense Area offered a good comparison with the about-to-be-replaced Nike-Ajax. The new sentry dog kennels are visible in the left background, above the audience. January 20, 1959 (*Golden Gate National Recreation Area, TASC Collection*)



"A" section at SF-88L, 1959. The four Nike-Hercules missiles are arrayed in non-launching elevations for the photographer's benefit. The cantonment of Fort Cronkhite is visible across the lagoon. This famous view of SF-88L was used time and time again by the Army to illustrate the Nike missile defenses of the Bay Area. U.S. Army Photograph (*Golden Gate National Recreation Area, TASC Collection*)

county. ...The first local unit trained to fire the Hercules, 27 men of Battery A, 51st Artillery, will arrive here tomorrow to supervise installation of the launchers."

The following January, the Hercules missiles at Site SF-88 were shown to the press, which reported that the "officers and men of Battery A, 2nd Missile Battalion, 51st Artillery, the first outfit in this area to get the new missile, are tremendously proud of their weapon." According to the battalion commander,<sup>93</sup> Captain Roy Higashi, "This missile can outspeed, outclimb and outfly any plane in the world." Although it was noted that "in the past, Nike Ajax sites have been open to the public...launching areas of the new missiles will not be open to guests. They will be surrounded by double fences and guarded by German shepherd sentry dogs."<sup>94</sup>

A year and two months later, on January 23, 1959, "a major reorganization of the Army Air Defense for the San Francisco Bay Area took place...when the 40th Antiaircraft Artillery Brigade was reactivated to command the Bay Area's Nike guided missile units. ...The 40th Brigade now takes command of the 29th and 30th Artillery Groups of the San Francisco-Travis AFB Army Air Defense, with headquarters at Fort Barry. 30th Group headquarters, which, until the activation of the 40th Brigade, had exercised operational and command control of the Defense, will be located at Fort Winfield Scott.

An "Improved Nike Hercules" system became operational in 1961. The Improved Hercules could combat yet more sophisticated offensive weapons, including aircraft bombers that reached speeds of Mach 2 and altitudes of 70,000 feet, as well as air-supported missiles and rockets operating at velocities of Mach 3 and altitudes of 100,000 feet. The High Power Acquisition Radar (HIPAR) built by General Electric was also an important component of the Improved Hercules system.<sup>95</sup> While the range of standard Hercules radars was 125 miles, HIPAR extended the acquisition range to 175 nautical miles, allowing more than 400 seconds from the time of target acquisition to intercept.<sup>96</sup> With the increasing speed of enemy aircraft and ballistic missiles, every extra moment was essential. The Improved Hercules system also proved effective against surface-to-surface targets and had a limited anti-missile capability. In 1960, a Hercules missile supported by HIPAR scored a direct hit against a Corporal ballistic missile at White Sands Missile Range. Later that same year, a Hercules missile successfully intercepted another Hercules traveling at [a closing speed of] Mach 7 at a height of 19 miles.<sup>97</sup>

By June 1958, the Army had converted most of the Ajax batteries around New York City, Washington, D.C., and Chicago to Hercules systems. Funding for the gigantic task of conversion and new production fluctuated between \$47.97 and \$129.6 million per month. At the peak of the Hercules effort in 1957-60, Douglas Aircraft operated not only the Charlotte Ordnance Missile Plant, but three other Nike Hercules facilities in North Carolina: Winston-Salem, Burlington, and Greensboro. At peak production, prices for the Ajax and Hercules missiles were, respectively, \$19,300 and \$55,200.<sup>98</sup>

Nike Ajax magazines (the underground storage facilities) needed modification to accommodate the heavier, longer, and wider Nike Hercules missiles. The primary change was an increase in electrical generating capacity to lift the heavier missile out of the underground facility. Fueling facilities at the launch area were required only if Ajax missiles were also operational at the site; the solid fuel booster and sustainer motor of the Hercules did not use liquid fuel.<sup>99</sup>

Chief Warrant Officer (CWO) Terry Abel, who served at SF-88 in 1971 and 1972, stated:

I am very, very fond of Hercules, I came up, I grew up, for want of a better expression, with Hercules. I am very, very fond of the weapons system. It is entirely reliable. It did everything that we asked it to do and more and I have a lot of fond memories of that. I do not have fond memories of Ajax, but I didn't grow up with the system. I came into it late. It, in my mind, was always a funny little missile system....

It took time to make the swap over and there was training considerations. Hercules was the next generation and it had several significant system capabilities over Ajax and there was training considerations in taking Ajax people, was it cost effective to take a sergeant with eighteen years that was looking at twenty and putting him through a \$50,000 tax payer paid for course or should we leave him on Ajax and get a new acquisition. So, there were a lot of planning considerations and training considerations not to mention the availability of the equipment.

Moeller explained, "ARADCOM saw its future in terms of still guarding against the old bomber threat, but counted on being able to evolve into ballistic missile defenses as the wave of the future. Therefore, Nike Zeus became the follow-on to Nike Hercules, much as Hercules was the follow-on to Ajax. But the deployment of antiballistic missiles became a political football that traveled up and down the national playing field during the 1960s."<sup>100</sup> (And ever since).

Michael Beschloss wrote of this period that, "These were the years in which humankind came closer than any other time to nuclear incineration, and in which the United State and the Soviet Union began the greatest arms race in history." He goes on to state that:

Throughout these years, Kennedy showed a fine sensitivity to the dangers of misperception and accident and a talent for intense crisis management.... But throughout his term, Kennedy rarely showed the magnanimity that should have been expected of a superior power. Instead he aroused the Western world to an hour of imminent danger that did not exist, provoked the adversary by exposing Soviet nuclear weakness to the world, and unwittingly caused the Soviets to fear that he was on the verge of exploiting American nuclear strength to settle the Cold War on American terms, perhaps even in a preemptive strike.... The more lasting effect was the Kremlin's decision, hardened between the summer of 1961 and the end of 1962, to damn the Soviet consumer and make the mighty reach for nuclear parity or superiority. Had Krushchev or a successor been encouraged to pursue the previous policy of minimum deterrence, the arms race of the next two decades could have been avoided."<sup>101</sup>

On August 31, 1963, at the height of the Cold War and two and a half months before President Kennedy's death, the western United States was defended against sudden aerial attack by the 6th Region, ARADCOM, which consisted of:

two major subordinate elements, the 40th Artillery Brigade at the Presidio of San Francisco and the 47th Artillery Brigade at Fort MacArthur. In all operational matters the 6th Region is the United States Army Air Defense Command

component of the 28th North American Air Defense Command Division at Hamilton Air Force Base. That headquarters, containing elements of the Air Defense Command (USAF) and ARADCOM, is also commanded by General Magee [of the U.S. Army, who commanded the 6th Region, ARADCOM].<sup>102</sup>

The following year, command of the 6th Region was assumed by Maj. Gen. Andrew R. Lolli, who had commanded the 40th Artillery Brigade in 1959 and 1960. Continuing the functional coordination of Army and Air Force air defenses:

General Lolli will wear two hats: he will be the Commanding General of the 28th North American Air Defense Command (NORAD) as well as Commanding General of 6th Region, ARADCOM, which is one of NORAD's components. As head of 28th NORAD Division, Major General Lolli, one of the Army's top missilemen, will direct joint-service air defense operations in seven Western states from his headquarters at Hamilton Air Force Base, California.<sup>103</sup>

Later that year the Strategic Air Command (SAC) simulated a nuclear attack on western North America while NORAD troops across the continent practiced interception, target tracing and antiaircraft defense:

Since before dawn, U.S. Army Air Defense Command missilemen from the 40th Artillery Brigade...are exercising tracking techniques from the Army's Nike Hercules missile sites, controlled by the Army Air Defense Command Post facilities atop Mt. Tamalpais. No missiles were fired during the exercise. ...

Many subsonic B-47 and B-52 global-range bombers have been flying over simulated targets at high and low altitudes close to U.S. cities in 12 states and near several cities in two of Canada's western-most provinces, and in the Northwest Territories. In addition, some B-58 "Hustler" bombers are flying high-altitude supersonic missions over U.S. cities in California and Washington State creating disturbing but harmless sonic booms. This exercise was not to last over one hour over any particular land area. Air traffic control officials in Canada and the United States had received advance information on the exercise and no suspension of normal civil air traffic was expected."<sup>104</sup>

Nevertheless, the sonic booms that reverberated over the cities of the West that winter must have been a haunting reminder of the recent Cuban Missile Crisis, and the constant threat of nuclear annihilation that the world coped with during the Cold War.

A recent historical study of the Cold War by Martin Walker evaluated these tumultuous years in broad perspective:

But if President Kennedy had expected a new era of superpower *detente* and global calm to follow the haunting experience of the Cuban missile crisis, he would have been disappointed. His assassination in Dallas in November 1963 meant that he did not live to see the anger and frustration which followed his brief presidency. But Kennedy's cabinet and White House staff, who stayed on to serve in the



entourage of President Lyndon Johnson, inherited what Kennedy had sown. At home, the demands for racial equality in the civil-rights movement escalated into riots in the cities, and abroad Kennedy's aggressive anti-Communism was followed by a war of attrition and bombing in Vietnam. The aftermath of the Kennedy Administration soured and turned upside-down the idealism and romantic self-confidence he had brought to American policy.

With the explosion of the first Chinese nuclear weapon on 14 October 1964, the nuclear balance became suddenly less predictable. Having expected a period of stability in a bipolar world run by two superpowers who had learned the need for predictability in their behavior, the 1960s became instead a decade of international revolution in each of the emergent power blocks.... After Kennedy's death, the remaining years of the 1960s saw a remarkable global convulsion, as if the entire planet was undergoing the domestic and international readjustments that usually accompany a major war.<sup>105</sup>



## NIKE OPERATIONS

“Continental air defense planners envisioned that the air battle over the United States would be fought by both Air Force and Army elements. The first step was early warning. Ground-, sea- and air-based radars would see blips on their radar screens, warning them of attack. These sentries would radio or telephone this information to control centers,” such as the joint Army/Air Force command post at the Mill Valley Air Force Station on Mt. Tamalpais, “which in turn would relay the warning down to interceptor squadrons and antiaircraft defenses. The fighter interceptors would engage the penetrators as far from their intended targets as possible. Those enemy bombers that got through would be engaged by antiaircraft batteries that were deployed around likely, high-value targets.”<sup>106</sup>

“We are the goal tenders,” stated Major General Edward J. McGaw, in 1960 commander of all Nike units west of the Rockies, “the outer defense are the jet interceptors and the warning radar systems.”<sup>107</sup>

At SF-88, Chief Warrant Officer Abel elaborated upon the threat as perceived from the front line:

There would have been a designated bomber within the flight, or maybe a flight of three designated bombers, that [was] a ‘jammer.’ Try to jam the radars off of the air so we could not see. The other thing is we would have had [been targeted by] the surface-to-surface small tactical nuke, their AK-4’s, which were designed to take out anything from ships to small centrally located targets. We labored under no illusion that Soviet intelligence knew exactly where we were. Our own population didn’t know where we were in a lot of cases, but we labored under no illusion that the Soviets knew exactly where we were and this was our wartime position. We were not moving. There was no place for us to go. We had no mobility kits on site to even move if we wanted to, or could have. Basically, we were going to fight and die in the same spot. Which is one reason, of course, that we had good esprit de corps, and that when we did something it was done right. Because this was our wartime position and the weapons we maintained were what we were going to use in combat. So, there were a lot of motivating factors.

The Nike system was part of the joint American-Canadian North American Air Defense Command (NORAD) and the U.S. Continental Air Defense Command (CONAD). Within NORAD, the Canadian and American air forces were responsible for detecting, identifying (as friend or foe), and destroying or turning back targets. Thus, the Air Force was deployed for area defense. The detection phase began with the identification of intruders through the Distant Early Warning radar system, commonly known as the DEW Line. The DEW Line, which was designed to give warning of hostile aircraft approaching from the north, consisted of a net of radar stations near the 69° north parallel that initially extended from northwestern Alaska to northeastern Canada.

The United States and Canada jointly built and operated the DEW Line. The DEW Line became operational on July 31, 1957, was extended to the Aleutian Islands in 1959, and across Greenland in 1961. The U.S. Navy and U.S. Air Force provided sea flanks for the DEW Line with radar equipped aircraft operating from the Aleutian Islands to the mid-Pacific and from Newfoundland to the mid-Atlantic. The DEW Line provided up to six hours of advance warning of aircraft

penetrating the northern hemisphere, complementary to the Ballistic Missile Early Warning System (BMEWS), which since June 1961 had been on guard to detect approaching ballistic missiles.

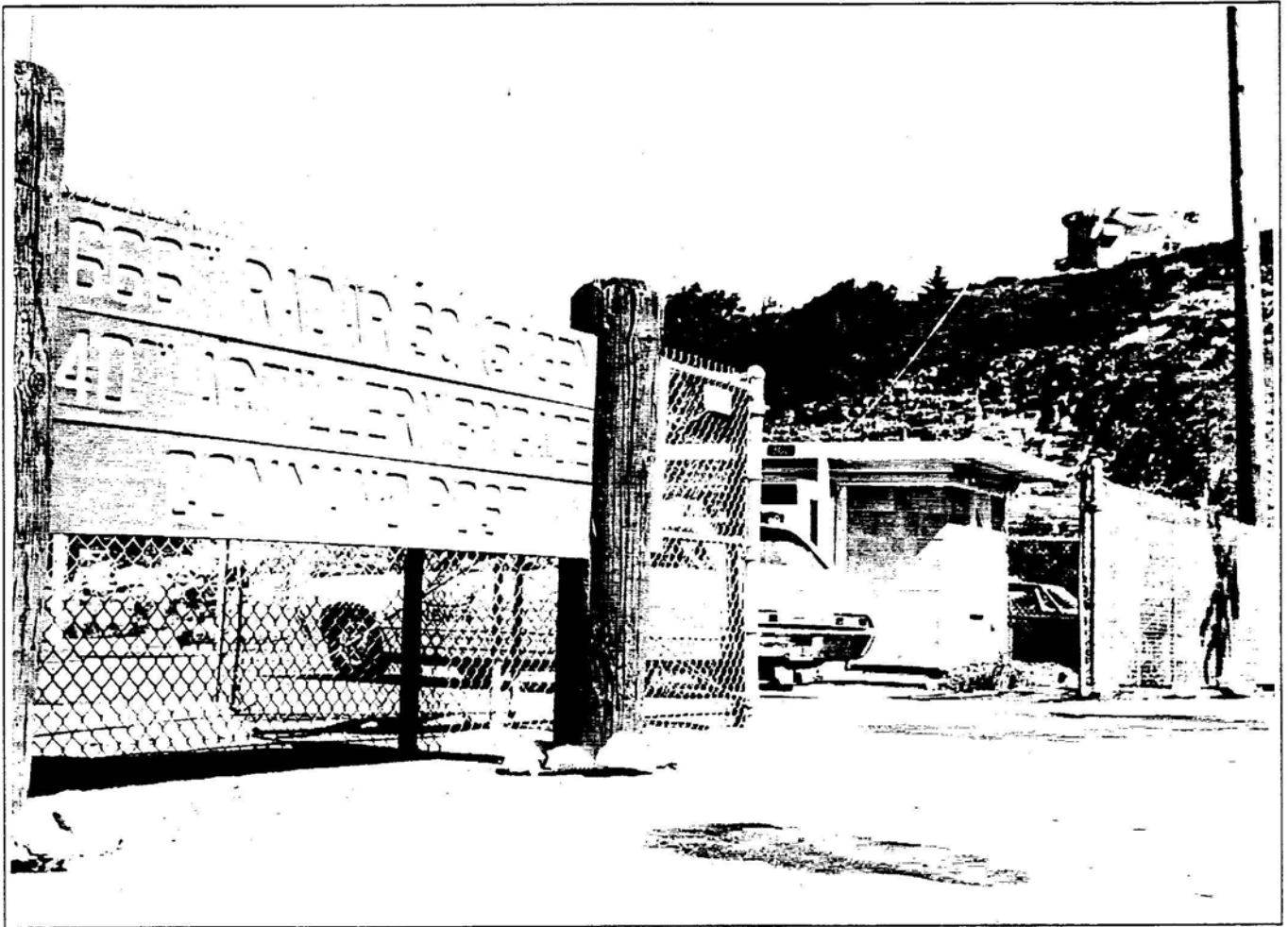
The DEW Line also alerted the back-up defenses of NORAD, including the Mid-Canada (55th parallel) and the Pine Tree (49th parallel) radar warning and control lines. The Mid-Canada Line was about 600 miles to the south, built and manned by Canada, and used Doppler detection equipment. The U.S. contiguous radar system was extended offshore by the Navy, as well as by Air Force radar-equipped aircraft. In the Atlantic Ocean, Air Force radar platforms (Texas Towers) were part of a system that was tied together by a communication network terminating in the NORAD command post.<sup>108</sup>

To tie this multi-layered early warning capability to its own fighter squadrons and the Army's Air Defense Command, the Air Force, in 1958, deployed a command and control apparatus called the SAGE. SAGE was the outgrowth of the manual Ground Control Intercept (CGI) systems used during World War II, which directed intercepting aircraft to enemy penetrators. SAGE embodied the latest innovations in computer technology. It linked many parts of the early warning network and the interceptor network together, transferring data automatically rather than requiring voice commands.<sup>109</sup>

The Semi-Automatic Ground Environment (SAGE), an Air Force command and control system, received all data from these radar networks. SAGE centers were located in several sectors and attempted to identify the intruders and transmit intruder locations to the appropriate Air Force and ARADCOM control and direction centers. According to Morgan and Berhow, "the SAGE command posts providing early warning and initial target tracking information [to the AADCP on Mt. Tamalpais] were located at Beale AFB, CA; Adair AFS, OR; Norton AFB, CA; and Luke AFB, AZ."<sup>110</sup> Hypothetically, when an enemy intruder entered the band of contiguous radar coverage overlapping the United States-Canadian border, SAGE would initiate attack by sending fighter-interceptor squadrons and launching BOMARC missiles. If the area defense provided by these weapons failed, SAGE continued tracking the intruder and passed this information to ARADCOM Nike fire units through the joint Air Force/Army command posts. Nike batteries then came into play as "the ultimate defense" of the protected localities.<sup>111 112</sup>

A fact sheet prepared about ARADCOM in 1959 described command and control of the air defense battle in three phases, "Detection—Accomplished through interlocking systems of radar, including long-range radar on the DEW line, radar on picket ships and patrol aircraft and USARADCOM's acquisition radar; Identification—Accomplished through correlation of flight plans, Air Force interceptors and electronic devices such as IFF; Direction—Fire direction and control is channeled from the NORAD COC [Combat Operations Center] in Colorado Springs through AADCs [Army Air Defense Commands], AADCPs [Army Air Defense Command Posts], SAGE and Missile Master systems to insure the engagement of all attacking forces and effective use of all weapons."<sup>113</sup>

When asked "if we had ever gone to war and we'd launch all of the missiles and there was no more than could be done at one of these sites, what was everybody's role then?" Colonel Cheney responded:



The entrance to the Mill Valley Air Force Station on Mt. Tamalpais, clearly indicates that the facility was shared by the Air Force's Radar Squadron and the Army's Air Defense Command Post (AADCAP). U.S. Army photograph. (*Golden Gate National Recreation Area, Presidio Army Museum Collection*)

By the time we launched everything, we were going to be gone. All what we were going to do was slow them down. You have got to remember. One missile, one airplane. If they were flying close enough together we probably would get two. But if the Soviets followed the attack scenario that they had in those days which was waves of airplanes, all we did was slow them down. Our life expectancy when we were lieutenants, and I still remember this, sitting in the Nike-Hercules class, we were told our life expectancy was five minutes from the time the balloon went up to the time that it was time to do it... We were told that every Air Defense site worldwide that we were their number one target. Command and control and us.

And although most lieutenants in the infantry, artillery, armor, and other combat branches were similarly encouraged to believe that the outcome of the next war lay largely on their shoulders, it is clear that suppression of anti-aircraft capability was an important part of hostile strike plans.

Moeller described how, increasingly in the 1960s and 1970s, land and submarine launched ICBMs replaced manned aircraft as the first-strike weapon of choice, and thus altered the strategic balance of power and the tactical outlook from the Nike sites:

When Hercules units came into the inventory, they were deployed, principally because of budgetary restrictions, to sites formerly occupied by Nike Ajax units. Assuming the role of Monday-morning quarterbacks, we can say now that this decision was not sound. While anti-bomber defenses were measurably strengthened, the full potential of the new Hercules system was not harnessed. Moreover, imperceptibly at first then with astonishing rapidity, the threat was becoming more and more sophisticated. Today, we find our Nike Hercules units sitting right on top of likely targets where, if their areas are hit by enemy ICBMs, anti-bomber Nike forces will be destroyed.

In a speech to the Supreme Soviet on January 14, 1960, Khrushchev declared that a future war would begin with missile attacks deep into a country's interior and that many traditional military forces should be replaced by nuclear weapons and missiles. In the year preceding this speech, he created the Strategic Rocket Forces, which were considered the preeminent service over the ground, sea, air defense, and other air forces. So the stage was set for the proliferation of nuclear tipped ballistic missiles to come. But the matter of fact was that the Soviet Union was strategically inferior to the United States" at least at the time. But over the decade, the size and nature of the threat greatly changed. "The Soviet Navy also grew during this period. In 1968, the Soviets introduced a new class of nuclear-powered submarine with 16 tubes and equipped it with SS-N-6 Sawfly missiles with a range of 1,300 nautical miles for strike missions against targets located in the United States' coastal areas. ...No new intercontinental bomber was developed during this period. Soviet leaders continued to rely on the Bears and Badgers that had been deployed during the 1950s."<sup>14</sup>

Moeller continued, on a tactical level, to describe how the challenges facing tactical command and control of numerous Nike batteries defending a major urban area were addressed:

As long as the numbers of enemy aircraft remained small, all that was envisioned was to bring up the air defense network and defend those areas assigned. However, when the threat grew and became more sophisticated, command and control of air defense forces posed new problems. With the enemy flying multiple sorties at different altitudes and many different directions, and our own aircraft flying to intercept, how could they all be sorted out? The Army's answer was special command and control operations centers that had soldiers monitoring different early warning devices, then communicating both automatically and by voice to those units that would actually engage the enemy.

...until the mid-1950s, this was accomplished by using voice, telephone and radio systems to pass information from one element to another. Manually operated plotting and status boards were used to develop and portray the air defense situation to Army air defense commanders at various echelons. Such slow and cumbersome systems did not meet the need for rapid transmission of information required for quick defense reactions needed to destroy jet aircraft by surface-to-air guided missiles.

...the U.S. Army developed the electronic fire distribution system, Missile Master, which became operational in 1957. It provided rapid and accurate flow of information between the AADCP and its associated missile fire units. Interchange of information was also made between adjacent AADCPs and the Air Force's SAGE system. Target track information and commands were transmitted as digital data via automatic data link between the AADCP and missile fire units. At the fire units, track information and commands were converted from digital data and presented on the fire unit commander's display console. Using electronic displays and controls at the AADCP, the air defense commander (usually a group commander) could monitor or direct the actions of 24 fire units against targets.<sup>115</sup>

However, "one serious flaw in automated command and control was that newly developed systems were not compatible with other systems. The Air Force's SAGE system could not pass data digitally to the Army's Missile Master system because each processed data at different rates. Further engineering was necessary to produce a digital data converter."<sup>116</sup>

Once notified of an intruder, ARADCOM would alert the appropriate Army Air Defense Command Post which, in turn, would designate one or more Nike batteries to attack the incoming target.<sup>117</sup>

The Mill Valley Air Force Station on Mt. Tamalpais was the location of the AADCP for the 40th Artillery Brigade, which distributed the targets and firing orders to SF-88 and other Bay Area Nike batteries, and for the San Francisco NORAD Control Center.<sup>118</sup> The station was integrated into the SAGE system in January, 1961 and that April, Battery Integration and Radar Display Equipment (BIRDIE) was installed, "to provide "a tightly-knit control of Nike defenses, unattainable prior to its development, assuring optimum target engagement in the most efficient and economical manner."<sup>119</sup>



Colonel Cheney described how actual control went from the top, down to the point when the order to fire was given:

...technically the way it would have passed is from the President of the United States, to the Joint Chiefs of Staff, to NORAD, to ARADCOM, to Mount Tamalpais, out here which was the AADCAP, Army Air Defense Command Post, to us. And it would have been authenticated all the way down the line by authentication; there were codes when we received an alert, we immediately went and you took certain codes out of safes [at the IFC on Wolf Ridge]. [We] always had a two person control, the actual launching of the missile was under two person control. ....

You were split into teams...they were the red team and blue team ...one team had the one safe combination and the second team had the other safe combination. ...the codes were the authentication codes. ...all you did was push a button, the computer did all of your plotting and everything else, but in order to push the button, and what the codes were for was to give you authentication that this has come from the President of the United States and that you will push that button.

The Nike system utilized a command guidance type of control system that revolved around the use of several types of radars and a computer. The target was initially picked up by the Nike acquisition radars, the LOPAR (low-power acquisition radar) or HIPAR (high-power acquisition radar in the Hercules) systems. From the information provided by the acquisition radar, the target-tracking radar acquired the designated target and tracked it throughout the engagement. The missile-tracking radar locked on the missile prior to firing, and tracked that missile throughout its entire flight.<sup>120 121</sup> Naturally, in the round-the-clock air defense of the continental United States, a key function of command and control was distinguishing friendly aircraft from potential hostiles. This was accomplished through correlation of radar data with civil and military aviation flight plans, IFF (Identification Friend or Foe), a transponder carried by all aircraft, which emitted a radio signal recognized as friendly, and by visual identification as necessary by interceptor aircraft.

Given the short warning times inherent to the defensive situation, there were inevitably moments of high tension. Ron Parshall tells of one such incident in 1960-61:

We were at fifteen minute alert and we heard the siren go off and we are running down, and the call was for one missile. We got the missile up in position and ran all of the checks to make sure we could plug in the squib. The last thing you do is plug in the squib but you don't actually do that. About that time you get a call from the IFC saying that it was just a test, everything is fine. We never got that [call]; we got the command to plug it in. Our Sergeant in charge that night said... I was standing next to, behind him ... and he had the earphones on. I didn't hear what was said to him but he kept on saying "Are you sure, sir?", "Are you sure, sir?" He repeated it five or six times and he was practically screaming it the last time, making sure this man was telling him the right thing. And the command was to plug it in which meant that we were going to fire it, because that was the end result. You never plugged it in. It was too dangerous to plug it in.

The man in charge of the IFC for that night [told us to plug it in]. It was the night shift. It was about three o'clock in the morning, actually. And so after we plugged it in we, the sergeant and I, are both are running down here. He put the keys in the console back there. We got in contact with them. It took at least five minutes before we phoned out, and then it was finally said that, "this is just a test."... All we would have had to do was just shut up and fire it. We were never given that command, but they were going through other tests at the same time—we thought waiting for the target to come closer. That's all we thought we were doing. That fifteen minute alert generally means that a plane will be here in fifteen minutes, but we had that missile up in less than five minutes, so we had ten minutes to spare by the time we had everything down here. And it's "tick, tick, tick," waiting for something to happen.

We thought we were at war. I definitely was very fearful at that time that we would be at war, and then you start thinking that San Francisco would have been gone if we don't do our job. You start wondering. There is nothing more that you can do because it's all in their hands then. The missile is plugged in and ready to go and you are [too]. ... What I would be wondering ... [was] why they had only called for one missile, you know. Didn't make any sense to me. If we are at war, let's get them up there! (Laughs).

It was a Lieutenant in charge [of the IFC that called it in] and he was using the wrong command. The problem in that day, well, it wasn't a problem, but you had to know the code of the day. There was always a two word [code] like "sling shot" or something like that. Two words for the day, and it was universal in the Bay Area so that same code would be for everybody. So when he sent it down, that meant, "Plug it in. We're at war. We got to go." And at that time, that is why he kept on asking and asking to clarify between him and them. When you plug in a missile it could go off at that time, not firing, but you could have some problem even though you had checked it out.

There was a target. It turned out to be an airliner coming in. At that time you had to approach our mainland at a certain angle you couldn't just come in at any angle, you had a certain angle, the responder box was supposed to be responding. I don't know if it did or not. The IFC would have been the only one to know that, and this guy is giving us the orders that this is the wrong thing. We would have shot it out of the sky. We would have had to, you know, because why take a chance? But luckily something got straightened out there and we got called down. Had an entire [enquire?] meeting the next day as to "What did you do? Why did you keep repeating that, Sergeant? Why did you keep repeating, why did you keep repeating?" And then he kept on telling his story that that's not proper what the man was doing. The Lieutenant was gone the next day. He was no longer on site. He probably went through basic training again. (Laughs).

It's the checks and balances in this system that are supposed to be the safety of this system and unfortunately the Sergeant should have not said that. He should have just plugged it in and left. He got reprimanded, but he was very good at his job. I knew he was doing the right thing because this guy up there, he did not know. He should have said, "This a test," or he should have used a different code word which meant, "If you want us to plug it in, we're not at war." But that is what you want to happen.



The two tracking radars fed target and missile position data into a computer located in the battery control trailer. Using this information, the computer continuously determined a predicted point of intercept and issued the steering orders that guided the missile toward that point. At the point of "highest kill probability," the computer issued a burst order to the missile. This order simultaneously detonated the three warheads in the Nike [Ajax] missile. The computer transmitted this order to the missile through the missile-tracking radar.<sup>122</sup>

Chief Warrant Officer Terry Abel recalled:

...there was a lot of competition between the launching area and the IFC area, the radar section a lot of competition. A lot of good natured kidding went on. They always called launcher crewman "pit rats" and we referred to the guys on the hill as "scope dopes" so there was a lot of good natured kidding within the unit because we worked in two separate areas, we didn't work together. The only time we really communicated to the radar section was over a headset during a crew drill or a tactical evaluation or, you know, I mean, it would be a unit party, but you pretty much hung, it was almost like a gang, you hung with the area that you were in and even though they were in the same unit, they were kind of aliens. Sometimes the bickering between the two areas over duty and other things could get really nasty and, of course, what we did as officers was to say "Okay fine, you guys can go spend two months on the hill" and bring the guys down from the hill to the launching area for two months and get a little appreciation for what the other guy is going through. And that usually put a fast stop to the inter-area griping and bitching that they got it better than I've got it.

The battery control officer, stationed in the battery control trailer, received all of the information and controls necessary to engage the enemy target. A series of lights and a meter showed the officer the number of missiles prepared for firing, and the progress of the fire unit in accomplishing the steps necessary to prepare and fire the missile. Prior to firing, the predicted point of intercept and the current position of the target were continuously displayed on two plotting boards in the battery control trailer. With this information, and knowing the rules of engagement and the restricted areas, the battery control officer determined the most advantageous time to fire the missile. After the missile was fired, the two plotting boards illustrated the course of the target and the missile flight path. These plots provided the battery control officer with a graphic presentation of the missile and target flight paths. Controls necessary for premature or delayed detonation of the warheads were incorporated into the system.

The Nike system operated with four batteries in one battalion. Each battery could acquire and track targets, as well as launch and control missiles. Each battery had three underground storage facilities, which had the capability of firing one missile from the elevator/launcher and three others from satellite launchers loaded from the same facility. [This, at least, was the ideal per the official table of organization. Often, however, the number of batteries in a battalion, and the number of pits in a battery varied according to local circumstances.] As sophisticated as the Nike missile was, however, each battery could only track and fire one missile at a time.<sup>123</sup>

Abel remembered that, "The one thing, the one smell missing kind of that lingers a little bit down in the pits is the smell of ammonia and that's from the solid propellant. You catch a whiff of it every now and

it, it seemed like every pit had it's own smell, they always had a couple of smells that were common to them and one of them was the kind of lingering odor of, not pure ammonia, but ammonia-like. That is the best way I can describe the smell. That was from the propellants. ...

## FIRING A MISSILE

Once the Army Air Defense Command Post received word of an impending attack, it notified its battalions. As the target entered the range of the acquisition radar and the missiles at each battery were readied for launching, a "blue alert" status was sounded, signaling that all personnel should go to battle stations. Three missiles were brought above ground, one at a time, on the elevator, and pushed to the satellite launchers and locked into place with pins. The fourth missile was brought to the surface on the elevator, where it could also be launched.<sup>124</sup>

The chief of the launching section removed the air regulator safety pin and the missile support yoke safety pin. The launching crew checked for stray voltage and continuity at the detonator receptacle on the launchers with the squib(or detonator) tester. If test readings were within acceptable tolerances, the launching crew made the connections and removed the booster squib shorting plug. The chief of the section then announced over the intercom: "Launcher 1, 2, 3, and 4 ready."

An Army film on Nike Hercules provides a visual re-creation of the firing of a missile. Safety was the central theme stressed in the film. Among the precautions that were employed were a series of color-coded streamers attached to critical plugs and keys. For example, red streamers were attached to those mechanical parts that had to be removed before the missile could be launched. Even when the streamers were removed, personnel had to use special keys to unlock the "awesome power" of the missile system.<sup>125 126</sup>

Terry Abel vividly recalled working in the "pits," or underground storage magazines:

It got real crowded in here. Real crowded. You got the scale of just one bird, put your six in here. You and I could not stand here, we would be crunched up and the fins on the booster almost touched, I mean there was less than an inch between fins. The space was well utilized. It was crowded. I have banged my head on more than one missile and cursed. ...

They were, let's call it an inch and a half in diameter and about three inches to three and a half inches long and with an eight inch green flag and that is one thing we wouldn't notice with all the nukes down here is that you would have noticed red flags hanging out of the right side warhead hatch. That told you that the 'safe plug' was installed so you would walk by and it was one of the things that you unconsciously noticed was you know, red flag, red flag, red flag, red flag. You didn't see a red flag. You went looking to see why you didn't see a red flag and truthfully, I have never ever recall finding a round with an arm plug installed instead of a safety flag. It just didn't happen.

So, the first thing that you noticed was, and I mean, for want of a better expression, trained eye, when you walked in you knew immediately what the nukes were by the "doghouses or mailboxes," take your pick. We called them both. HEs you would just look down and say "yep, yep, yep."

... The other way that you can tell is there was a color patch that corresponded to its [nuclear] yield right at station 150 of the missile, which is the ass end of the warhead section. The missile was always referenced to numbers, in station numbers, and that was figured from a point two and three quarter inches from the didactical nose point. ...So right about station 148 there was a six inch by eight inch colored patch on nukes and that told you what kind of yield it was and obviously, from station 150 all the way back to the end tail, to the boat tail section, is the aft body section. So it was, you know, "Make sure that you torqued the bolts at 87.5." Well, we knew 87.5 was forward body section warhead section. That is the way that we talked. I mean, it took too long for me to say "Okay, I want you to go over and torque the bolts at where the forward body section joins to..." We talked our own language.

Ron Parshall described the scene upon entering "the pit" some years earlier, in 1960:

As you came down, the first time that I came down here was through that steep ladder through the safety corridor, you came out here and there is six brand new missiles standing in front of you look like a shiny new car. You are just awed by the feeling that, all this big power and everything that you have been studying about was right here. The floors you could eat off, they were very clean, everything was in its place. All of the machinery was like brand new so, I mean it, it was unbelievable. It still is spectacular to see them sitting here even though you know they can't do anything.

There would have been six. Three on each side. "Higher power" [or "special," meaning nuclear warheads] on the left and the standards would have been on the right. Well they had, the "higher power" had the flags in front of them: red, green, yellow. Red, green, yellow. The red being the highest, the yellow being the lowest, and the ones on the right side were standard 1100 pound [TNT] warheads.

My first job [as launcher crewman, in a drill or alert], I was supposed to be the first man down the ladder and to go all the way over to the left side, slide underneath the missile because when there are six missiles there is no room to walk down between them so you would go over to the side, slide down the missile, get in the back side. My job was to pick out a missile, with another crewman, and slide it on to the elevator and the Sergeant would ride up to the top and then slide it over, I would be on the back side sliding it over to the number three position on the right side. Then while we were moving the missile over, if there was a call for more than one missile, the other two crewmen would then slide another missile on and bring it up. We would take it down the rail where it went, and they would be going down again looking for another missile, if it was being called for. When I was here, the most we had up above was two missiles...

We ran that drill hundreds of times so everybody knew their position. Plus the motorpool used to fill in if somebody was on vacation or something so, we also trained them in moving the missiles around and what position they would take. In fact, our panel operator was the head of the motorpool. That was his job. He was the head of the motorpool. He was the head of the motor pool but he was in charge of the panel.

The crew safety room [or panel room] is where everybody would have retreated. ... You would have not been in here [the magazine], in case there was a problem. It was a lot safer back there plus they had the air conditioner, I mean the exhaust fans going, if you did have a launch you would probably get a lot of smoke down here. So, they had a way of getting it out. It was a lot safer than being up above. If you are up above you are considered dead because of the flame coming out.

After preparing the missiles for launch and checking the area to ensure all personnel were below, the section chief descended into the underground personnel room [or crew safety room], closing the escape hatch cover behind him. The section chief then entered the magazine room, closed the vents, and returned to the personnel room, securing the blast-proof doors. He checked the pin board to ensure that all the safety pins and the booster squid shorting plug were present. At that time, he also inserted the crew safety keys and placed them in the "fire" position. At the launching control console, there was a green "ready" light for each section, and a green numbered launcher identification light for each section in action. The "missile prepared" meters for each section indicated the number of missiles ready for launch in each section.

As the target came within range of the acquisition radar, the battery control officer corroborated the target appearing on the plan position indicator with the early warning plot data received from the army Air Defense Command Post. At this time, the alert status switched from blue to red. The battery control officer and the acquisition radar operator designated the target to the target-tracking radar, and interrogated it by using the identification friend-or-foe facilities on the console.

The missiles were then raised to a vertical position. The missile-tracking radar shifted to the designated missile and cast its electronic beam onto it. The battery control officer determined the proper time to fire the missile—using the plotting board information, his knowledge of the defense area, the geographic limitation of his field of fire, and the method of engagement directed by the Army Air Defense Command Post. The "ready to fire" lamp in the battery control console presented a visual summary of the state of readiness of the guidance and launching area. When the missile-tracking radar and target-tracking radar were engaged, the computer was on line, and the target was identified as the enemy, the "ready to fire" lamp changed from amber to green. After these events, the battery control officer could fire the missile. If necessary, he could also designate the target as friendly aircraft, by pressing the "friend" button at the acquisition radar control panel. The battery control officer could also designate a new target that had priority by placing the "designate-abandon" switch in the "abandon" position. If the target was abandoned, the battery control officer had to designate a new target.

Historian Merle T. Cole, in his description of a Nike installation in the Maryland air defense area, described the order in which the missiles were fired:

"During a fire mission the missile on the elevator-launcher of one launching section is fired, followed by the missile on the elevator-launcher on the [second and third sections]. Using this sequence each section can reload the elevator-launcher while the other two sections are firing, and consequently maintain the maximum rate of fire. This procedure is followed as long as missiles are available in the underground [magazines]. When these have been exhausted, the three missiles located on satellite launchers at each section are fired as desired by the commander."<sup>127 128</sup>

CWO Abel elaborated:

Because of the two man rule, you normally had Section Chief, crewman three and four would be topside. One and two ran the elevator. So they would pull the missile on, load it, take it up, and three and four would kick it off, Section Chief would be up with his crew safety key. Meanwhile, the Panel Operator was on the panel talking to the Launch Control Trailer, talking to the IFC area and keying, because we had an intercom system. He would relay, like "Blue status, ten minutes to firing, five minutes..." He would relay that to the Section Chief. As soon as the missiles were loaded, "Four birds topside." One and two would head to the panel room. They were through. Three and four would get the bird finished and crewman four would head back down to the panel room. So that left the Section Chief, Crew Chief or Section Chief and crewman number three to run the squib test which was the last thing that you did.

They would run the squib test on the launcher and pull the booster igniter cable up and install it. It was a red flag item. He would physically put the shorting plug in his pocket because he had four, they were too big. Once again, you are talking something that is about six inches long, two inches in diameter you can't carry four of them in one hand because you have the test sets. As soon as the last squib test was checked, crewman number four would take off for the panel room. The Section Chief would go to the LCI's topside and do one last check and close it for firing. He would come downstairs. He'd race downstairs come through into the panel room and he would say "Crewmen count off." "Crewman one, two, three, four, panel operator. All crew present." "Red flag items on the board." Booster cables, and in the case of nukes it would be safety plugs. Okay, you would simulate if it was a drill for nukes you never took safety plugs out. "All crewman present, all red flag items present, crew safety key is being inserted." And he would put in all four [keys] and turn all four. Now you have got a live section. The blast doors are closed, all of the red flag items are accounted for, all of the personnel are accounted for, now it is just him [Section Chief] and the panel operator. He puts on his headset and now he is set. You are ready to fire. ...

When the battery control officer operated the "fire" button, the missile was launched. Four seconds after "missile away," the computer ordered the missile to execute a 7g dive (a g is equal to 32.2 feet/second). At the same time, the computer modified this order, if necessary, to insure that the missile ground path was parallel to the line between the launcher and the intercept point. Steering orders were transmitted to the missile via the missile-tracking radar. At a predetermined interval before the time of intercept, the "burst" signal was transmitted to the missile, and an arming device detonated the warheads.<sup>129</sup>

The Nike system could fire one missile per minute for one hour against targets at moderate ranges (approximately 25,000 yards) and, if required, two missiles per minute for short periods against short-range targets (approximately 15,000 yards). Actual rates, however, varied according to prevailing circumstances.<sup>130</sup> Nike crewmen needed a minimum of 36 seconds to launch the first missile. This included approximately 30 seconds to acquire, identify, designate, and track a target;



four seconds for computer settle; and two seconds for the fixed time interval between the initial fire order command and missile launch. A new missile could be launched approximately 11 seconds after the bursting or abandonment of the previous missile. After the previous target has been tracked, the acquisition radar operator was free to examine and interrogate any new targets.

There were two situations in which a missile could be rejected. Either the missile-tracking radar failed to get an adequate signal response from the missile, or the missile did not fire within five seconds after the "fire" command signal. As soon as the red "reject" lamp lit, the elevator was lowered, and the rejected missile was removed; another missile was then loaded onto the elevator launcher.<sup>131</sup>

The Panel Operator was usually an E-5, who also functioned as Assistant Section Chief. This was a great deal of responsibility for a young enlisted man who was generally nineteen or twenty years old. Abel concurred:

You know those famous commercials "The Army teaches responsibility"? That is literally it. That is who you have; you train him and you train him and you train him until the kid can do this in his sleep, and because it is a lot of responsibility you know, technically Air Defense is a self defense organization so the kid better have it right. He might not get a second shot (Laughs)....

For security reasons, there was a standing order that no single individual was allowed in the launch area; it was the "two-man rule" all the time, for officers and enlisted personnel. But practical considerations intervened, so the rule was broken as much as it was followed, admitted Battery Exec Cheney. She further described the security precautions at SF-88, and the standing order of no single individual in the launcher area:

You just prayed that nobody caught you, you know, and the bad part was it was a training issue because if you broke it, you're right, you broke it all the time the problem was you had to be careful because if you got too comfortable with it and then an evaluator... and boy that was that was death and destruction. Same thing as when you were working on the missile. One of the ways they would get you is talk you around [so] that one of you would end up on one side of the missile and one of you would end up on the other side of the missile and you could no longer observe each other.

Abel emphasized, "When you said 'nuke' you said 'security.' And I mean it was like Big Brother looking over your shoulder. Everything you did, you had at least one guy with you. If it was a five minute, one man job, it was two guys and twenty minutes. I mean it was just incredible, and you didn't have the same security on an HE. You could go in and you could take four guys in and do a warheading operation with an HE head."

In spite of the high security at Nike, and especially Nike Hercules, sites, all Bay Area Nike sites were occasionally opened to the public for visits, at least in 1959, and doubtless for a period afterwards. Indeed, on March 21, 1960, the local public television station, KQED was "transformed into a Nike base for a live television demonstration of a missile attack. ...Called

'Operation Education—Army's Nike,' this documentary [was] beamed into hundreds of Bay Area classrooms.<sup>132</sup>

To supplement standing procedures for security and safety precautions, each Nike Hercules site had a Military Police platoon assigned, which provided security by manning inner and outer sentry boxes, and patrolling the perimeter with dogs. The first sentry dog unit in the Bay Area was assigned to Site SF-88 in March 1959:

The U.S. Army Air Defense Command Headquarters at Colorado Springs, Colo., feels the dogs are a necessary security measure for Nike Hercules sites because of the possibility of sabotage. The sentry dogs would provide a high degree of security by protecting the guard against surprise assault, providing psychological deterrence and active resistance to entry. The sentry dogs are noted for their keen sight, hearing and smell for more than 200 yards, even in darkness and fog.

Col. Andrew R. Lolli, commanding officer of the 40th Artillery Brigade, Fort Barry, Calif., announced that four of these sentry teams, the first to arrive in the San Francisco Bay Area, have been sent to the Hercules site, Battery A, 2nd Missile Battalion, 51st Artillery at Fort Barry. The teams are: Pfc. Harry Willson and "Rusty"; Pfc. Myron Blossom and "Prince"; Pfc. Gary Brothers and "Prince"; and Pfc. Erasmo Renteria and "Jet." ...

The most important requirement each soldier needs for this assignment is the desire to work with the dogs. ... The German shepherds, all pure bred, are purchased by the Army from kennels and private owners all over the nation.<sup>133</sup> They are from 1 to 2 years old when they begin their training at Fort Benning. Each man in the platoon gets to choose the dog that will be his for the rest of his time in the Army. ...

To be effective as sentry dogs, the powerful Shepherds must learn to attack anyone but their master, and to obey only his commands. As a result, they become strictly one-man dogs. While on guard, they patrol the area within the two steel security fences that surround the restricted area of the guided missile launching section, and at all times are under control of their trainers. ... "Getting them to cease the attack at a voice command is the hardest thing for these four-footed soldiers to learn," says Pfc Erasmo Renteria, giving his dog a welcome pat, "but Jet here caught on fast."<sup>134</sup>

The Military Police platoons at the Nike sites were not a part of the missile battalions, but were attached to each firing batteries from separate MP units. Parshall described relations with the MPs as "very bad,"

They're always 6-foot, 8-foot tall, 400 pounds, and mean. ... We didn't talk to them, they didn't talk to us. ... The dogs, German shepherds, we had four of them, at least four of them. Each dog weighed over ninety pounds and they would snarl at even their own people. If you go anywhere near the back gate, you would get attacked probably. They would want to come right through that fence at you. Whenever they were in training, they [the MPs] would come to the launching area, and grab one of us. Put us in the

padding and get us some stick and all, we'd all get tossed down and be very scared of those dogs after that. You would get a good fear of those dogs. Respect.

The handlers were always working with the dogs or the MPs that were on duty that day. Not that day, but I mean, but the dogs would be with them. During the day we had no dogs in this area, thank goodness. (Laughs). Yeah, when you come down that hill and the siren goes off and you are in that status of going downhill, you can see it is exactly like it is right today. It is terrible. It is very dangerous running down there. The only thing you worry about, not falling or anything, is hopefully they put those guard dogs away. Because they would go right after you. They don't like people (Laughs).

The officers' perspective on the MP detachments seems to not have been very different than that of the enlisted personnel. Cheney described interaction between the MPs:

None of it [was] very pleasant. ...I am sure that the MP platoon, in fact I know, the MP platoon had one part of the barracks and you tried to keep [soldiers] in the barracks the same as you do today, by platoon. But the MPs considered it beneath them to sit out here on the site. You see they thought they joined, you have to understand you have to have a lot of empathy for the MPs in those days. These kids joined the Army to be cops and they thought they were going to run around and catch criminals or at best they were going to ride around in a nice little cop car with their little siren and arrest speeders and all that. The Army sends them through cop school. They spent ninety-seven percent of their time training to be cops. They arrive in San Francisco and they say "Oh, by the way son, you are going out to guard a missile site." They had very little training in physical security. They considered themselves above us because again of the esprit that had been built. We abused them and we used them. We really did abuse them. We would not give them very good training.

I remember the "puppies" [sentry dogs] because they were a pain in the neck. Because when it came time to close, many of them were older and were going to have to be put to sleep and all we had a terrible time with the whole line. Those were their dogs and they knew these dogs and they begged, I mean, they wrote petitions, they wrote Congressmen, everything to be allowed to keep the dogs as civilian dogs. And of course the military was afraid to do that because they were trained attack dogs.

Even though they were mean, it became toward the end kind of a joke to be very honest. If you wanted them in the launcher area all you did was take some pork chop bones or steak bones out of the mess area and plop them in the launcher area, you know, toss them and they'd drop because, you see, the deal originally, I think, on the Nike site was that the dogs were to be rotated and instead they were leaving them on their sites. Well, when you do that the soldiers and they all become accustomed to one another and you lose the effectiveness of the dogs. Actually, we had good MPs in all fairness, they probably did do a lot. Their Platoon Sergeant was excellent, their Squad Leaders were good. Squad Leaders like I said, Jim Dolt was one of the Squad Leaders and he was excellent and so we probably, yeah we probably had better than most. The Military Policemen in those days were pretty sharp because they had very high standards for their guys. ...

They stayed with us as our security. Especially with nuclear weapons on hand, security was taken very seriously:

One story heard from three different people about a lieutenant who, on his own, decided to check security in a very unconventional way, was corroborated by Cheney:

Lieutenant \_\_\_\_\_, yes sir. I can give you that story first hand. It happened. I can't give you all of the details, but I can give you the name of someone that did. ...heard that he was one of those who thought he was better than anyone. A little bit of personal prejudice; he worked for me in later years and gave me a great deal of grief and he decided he was going to prove what we talked about before: those MPs were not doing their job.

And he went over the exclusion area [fence] and the MPs came... In fact, they had a gun up. Now this is second hand, but they had a gun to his head and... they would have been justified sure if they had blown this guys stuff away. They would have been justified. He came over the... I mean you were not allowed to work within six feet, eight feet. There was an area in which you could not walk within that fence and this guy... Oh Yeah.

The inner fence [right in with the launchers]. It is probably one of the reasons why they didn't shoot him because we used to be told that, oh there is a word for it, that that was basically a shot fired in the area of the missiles could cause a sympathetic launch.

National Park Service planner Ray Murray, himself a veteran of service with ARADCOM, got a first hand taste of the security at SF-88 while performing a feasibility study for the National Park Service around 1970:

I was over at Fort Barry. ... I was there taking slides, and I was where the launch area is at an overlook. I was really trying to get a shot down and show the perspective of Fort Cronkhite and the nest of buildings right next to the lagoon there, and so I started taking a few slides, and I had a car parked there; I think it was a government car. At any rate, the next thing I know, soldiers were running out of the nearby building. These were Army soldiers with drawn .45's. I was accosted, my camera was seized, and I was taken into this building. First of all, they acted like this was a security violation. "What was I doing here?" I'm trying to not give away the proposal that these forts be surplused and added to the [Golden Gate] National Recreation Area. They were carrying on a Nike air defense exercise at the time, and they thought possibly I was a part of the exercise—I was a plant to test their security control. So, they calmed down a little bit, and I kind of hemmed and hawed about what I was doing over there, so that was really interesting. ... It's a little intimidating when people are running at you with drawn .45 automatics!<sup>135</sup>

## TRAINING AND INSPECTION

The Army Air Defense Command instructed its commanders to: 1) Maintain 25 percent of all Nike batteries so that they were "capable of launching one effectively controlled missile within fifteen minutes of receipt of signal or warning, and of maintaining sustained fire until the supply of ready missiles is exhausted;" 2) ensuring that 50 percent of all batteries were "capable of launching one effectively controlled missile within thirty minutes of receipt of signal or warning, and of maintaining sustained fire until the supply of ready missiles is exhausted;" 3) allowing 25 percent of all batteries to be on a training and maintenance cycle, retaining the "capability of returning to an operational status within two hours of receipt of signal or warning."<sup>136 137</sup>

There were three different states of alert for a battery, "Basically, we referred to it [the training and maintenance cycle] as twenty-four hour release," stated CWO Abel.

Then there was three hour back-up. Then there was one hour hot status, and that meant that, literally ... there was one other status involved that we only actually went to a couple of times, and that was caused by world political events, and that was a five minute status. That's where the missiles were loaded and the crews were standing by with squib testers to run a quick squib test on the launcher and make sure there was no stray voltage and plug up the boosters and get down to the panel room

[During] the Arab Israeli 1973 War we actually were at battle stations. We were not even at five minute. Everything was hooked up, all the launchers were loaded, all the missiles were elevated and we were ready to fire. We stayed at that status for about six hours and then we were brought to a five minute status, which meant that one by one the launchers were brought down, the booster cable was taken off of the launcher and the shorting plug was put back on, and somebody had to be...

Each Section Chief and squib test operator were standing by launcher number one ready to put it back on. We stayed at that for about another twelve hours and of course we had to rotate personnel out because we only stand with a squib tester on an erecting beam so long before the body starts to go. From a normal day by day view you were one of three status. 'One hour hot,' 'three hour back-up,' 'twenty-four hour release.' [You had] Twenty-four hours from the time you are notified to be at battle stations. ...

We were only allowed to have ten percent of our people on leave, which translates "vacation" or "sick," so that meant if you wanted to take leave and you were at your ten percent limit, it was disapproved. You were stuck until somebody came off leave or somebody came back from school or the hospital or until we had ninety percent of the people available everyday. Twenty-four hour release meant that basically the radars were in a stand-by condition because the launching area could get hot within twenty minutes, irregardless of the status of the day. It was the radar sections, they had certain checks that they had to bring their system up so, it was more for the radar section than for us.



Colonel Cheney elaborated on the changes in the operations of the battery as defense readiness conditions [DEFCONs] changed:

As the DEFCON conditions increased, battery security increased. Basically you did everything in order to prepare for war and as you got closer to it then, for example, you issued all of the chemical gear and then you issued weapons, you secured your food supply, you secured your water supply... If I am not mistaken, the higher DEFCONs we totally blocked this post off, but you transitioned from a very — not laid back, it was never a laid back — but from a peace time, what we call a peace time configuration, to fully prepared for war...

These alert-status measures had a far-reaching effect. As a result, Nike sites assumed a combat--like readiness, as 15-minute status permeated the atmosphere. A siren meant an exercise, a readiness test, or an attack; one never knew. As Nike units had to meet these requirements 24 hours a day, they assumed an ever-increasing feeling of responsibility for the nation's defense.<sup>138</sup>

"You spend enough hours on site you know, something breaks, the phone rings at two o'clock, and you don't know when you are going to be back, and that has a tendency really to wear on personal relationships," mused Abel, "so... the rest of the time I was with my family doing something."

My quarters which were at Travis, so I got to drive. We had guys literally on Fort Baker. We had guys down here, just down the hill, I think that is still Cronkhite. We had some that were on the Presidio and there were a couple of couples that were living off post in San Francisco. Pretty much families could be scattered almost anywhere.

It got worse as a Warrant Officer because we always had to let him [the Duty Officer] know "I am going to the movie, this is the theater I am going to, I will be there at this time and I will be leaving at this time." You didn't have a life of your own unless you were on leave between assignments where you, and otherwise why it was always, I have been yanked out of theaters, I have been yanked out of dinners, restaurants, I have been yanked out of, because we were obviously supposed to have, if something went down, the system went down and we couldn't fire a missile, several millions dollars worth of junk, so, with that mentality, they would immediately call. We had maintenance men on call. When we were hot, I had a Maintenance man here twenty-four hours a day and if it was something that he couldn't find quickly, there were certain system problems that were just really tough to find they would immediately call me in to fix it. ...

Nevertheless, the duty had its rewards, at least from Cheney's perspective:

Oh, I loved it. I mean, you had a sense of, in those days again you have to get back into the atmosphere of the 'sixties and 'seventies, you had a sense of worth, that you were doing something and that it was important and just after my getting here we had the Israeli—the Yom Kippur War—the world situation was very tense. We thought that we were contributing something, but when you did get the opportunity to relax, the guys would be down here and fish, you would have picnics out here. Here you are a lieutenant in the Army, and you have been raised to think of the Army as the grunts out



in the mud and the dirt, and here you are sitting in San Francisco, California. You know, I lived on Kobbe Avenue [at Fort Winfield Scott] in the old BOQ which is an old, old, old home renovated into BOQ's overlooking the Golden Gate Bridge, not a tough life. (laughs).

But the rewards were offset by the constant awareness of the danger of sudden war.

"Obviously, it was a little horrifying," stated Abel about being on alert during the 1973 Arab-Israeli War:

because basically there were nuclear weapons on site and we were "Prepared" to launch those, and it was also gratifying that all of the hours of training, all the hours of maintenance, everything worked exactly the way it was supposed to. We made all alert status going up to battle stations, everything the soldiers performed magnificently. That's the only way to describe it. Everything went exactly the way we spent all those years training and in the beginning we had no idea what was going on, when it kicked off, and we were notified, it was at night. People were recalled from home because we were *not* the hot battery and people came in. We had no idea what was going on except what the alert status was, and where we were supposed to be, and we heard "battle stations." We had training terms for war, reserve terms, and "battle stations" was the war term that meant real missiles up.

It was not a drill. It was not a drill. It was not an exercise. Never had heard "battle stations" announced before. It was, the training term was "blazing skies," and when we were in training drills they would say "blazing skies, blazing skies twenty minutes" and we would run our drills, load the launchers. This time it was "battle stations."

And there was not even a moment's hesitation, I mean it struck everybody at the same time and in the back of your mind it registered that it was "battle stations" and we had no idea at the time whether the Soviets were launching a first strike, or what in God's name was going on, other than our little particular ... and that I think that is common of all soldiers of all eras of all wars. That, it is your little piece that you are concerned with, and *our* little piece was getting those missiles loaded properly, up in the air properly, as fast as we could. It was horrifying and gratifying at the same time.

I breathed easier when I had all of the launchers loaded, all the checks completed, and I had green boards all the way around and everything was working. That's the Maintenance Warrant Officer. There was nothing that had suddenly gone out of action, something had suddenly broken, everything worked perfectly. Because our mind set was that we were not on foreign soil. This was the U.S. and our job was to protect women, children and civilian assets.

At the permanent launching sites, many of the personnel had families living nearby, which put their defensive mission on a very personal level, as CWO Abel explained:

Well, it did to a certain extent and I am sure that some of the wives realized, if we were terminal defense, if something got through us, then there would be no families. That

also meant that our families were expendable because they were close to the sites and the sites were targeted. So it was literally, from that point of view, there was a little added pressure that if something did get through and they were going after us and we were, obviously, they wanted us out. Nobody likes to fly down the barrel of a gun. Our families would go with it. So...

All personnel for Nike batteries trained at the Army Air Defense Center at Fort Bliss, Texas. At the center, Nike personnel studied each element of the Nike system. Commanders were given an overall picture of the missile system and their responsibilities. Radar personnel trained on radar equipment, and each battery underwent a series of tests.<sup>139</sup>

Because of the requirement that they be operational at all times, U.S. Army Air Defense Command units cannot feasibly utilize repetitive training cycles of fixed duration so successfully utilized by other Army units. Nike Hercules firing batteries go on site at peak proficiency, their crewmen school trained. Then they must stay at that peak in spite of constant losses of trained personnel and influxes of untrained personnel, at the same time remaining ready to respond immediately to any threat.

Short-notice annual service practices at missile ranges in New Mexico, unannounced Operational Readiness Evaluations and complex air defense exercises play more or less dramatic roles in keeping Nike Hercules units combat ready; but not to be overlooked is the less colorful but still vital day-by-day program of 'on-the-job training' and 'learning by doing' carried out by air defense missilemen."<sup>140</sup>

The *Star Presidian* went on to describe the intensive training needed for the soldiers of the Air Defense Command to efficiently use their complex weapon systems:

From eight weeks to nearly a year of specialized schooling is the first step in training men to arm the complex missile system under the Army Air Defense command. After formal schooling the missilemen receive on-the-job training at the various sites and also attend annual service practice firings. ...

Recognizing the need for highly skilled men in this field, the Army has established policies which permit men to enlist or reenlist for assignment to the Army Air Defense Command. In addition ARADCOM encourages (the) top three grade enlisted men with other military occupation specialties to reenlist for reassignment to ARADCOM and retraining in the field of guided missiles."<sup>141</sup>

Recalling his training, guided missile electronic repairman Ron Parshall believed, "it would have been more advantageous to start out at Fort Bliss see what the system was then go to school and know what you are studying. But at the same time we learned our jobs. You drive a car, you want to know all about the car. Well, if you go to do something with a missile, you would like to see it and see what it worked like. I guess the Army's plans were not that way and it worked out just as well. It made us study harder I think, I really do."

Training at Fort Bliss notwithstanding, the units in the field had to exercise initiative to keep their standards high, as this 1957 anecdote from the *Star Presidian* illustrated:

Battery A of the 9th Missile Battalion recently opened its own campaign against the current service-wide shortage of trained radar and missile maintenance specialists. A Nike-firing unit battery is frequently called on to supply men for the Fort Bliss radar and missile repair schools. But to qualify for any of the nine-month courses, a man must first pass the electronics placement exam... "Unfortunately, too many of our men flunk out on the section of the test calling for some knowledge of electricity," said 1st Lt. George W. Milligan, executive officer of Battery A."

After screening the records of potential candidates for the Fort Bliss schools, Lt. Milligan decided that a short refresher course in math and the fundamentals of electricity would probably give many of them the boost they need to score... If the experiment is successful, Battery A may have gone a long way in meeting its own manpower shortage. Many of the potential trainees are three and four-year enlistees, who if trained early in their military careers will be that much more useful to the Army.

"There is also an element of self-interest involved," said Lt. Milligan. "When these men have completed the course at Fort Bliss, we can request that they be returned to their original unit, Battery A, 9th Missile Battalion."<sup>142</sup>

Nike personnel also participated in test firings of missiles at White Sands Missile Range, which occupied approximately 1,200 square miles of desert land in New Mexico. No Nike missile was ever fired from a U. S. installation, other than for training purposes at White Sands. The only exceptions were firings in [Hawaii and in] Alaska to test the operation of Nike equipment under cold weather conditions, and an accidental firing in New Jersey.<sup>143 144</sup>

As Chief Warrant Officer, Terry Abel was primarily responsible, among many other duties, for training and maintenance.

Actually, [I had] several duties. The maintenance of the missile and missile launch equipment, training of the operator and maintenance personnel, and such "duties as assigned" which was postal officer, duty officer, battery control fire officer. A Nike Hercules battery, at best, had eight officers authorized, we usually ran with six, and there were certain things under Army regulations that you must have in a unit. So, we all kind of filled in on what was referred to as "George jobs" [as in "Let George do it."]. The postal officer, voting rights officer, civil rights officer. They all call for an officer to be in charge of those programs and besides my primary responsibilities of the missile and the missile system, I also had several other additional duties.

A Warrant Officer is a—and I hate to make this sound like propaganda—but we are highly motivated individuals that are in a set weapons system. There are helicopter pilots, there are Warrant Officers, there are, I think, about over a hundred specialties in the military, but basically a Warrant Officer is the systems expert. Commissioned

Officers are expected to know within their career field, and this being air defense artillery, they would have had to know basically four or five weapons systems.

The tactics, the operations, where, the field is so technical and it takes so long to learn all aspects of it that a commissioned officer just is not going to get the assigned time so, a Warrant Officer, where by Congressional order, there has to be an officer in charge of certain operations or certain units, a Warrant Officer functions in that capability and never leaves his weapons system. You do not take a Nike Hercules Warrant Officer and assign him to a Hawk unit. It just doesn't happen. So, where a lieutenant or a captain or a major or a colonel can be assigned from Hercules to Hawk to Chaparral, Vulcan to tube artillery, and that did happen, that was expected of a commission. But for continuity in the unit, it fell upon the senior NCO's and the Warrant Officers to maintain the system on each, both operational and from a technical weapons point of view.

Annual service practice, also called short notice annual practice, [or SNAP] was initiated in July 1961 to enable batteries to fire a missile and to test their proficiency. As part of this practice, batteries traveled to Fort Bliss on only 48-hour notice. Once there, the units had one week to set up equipment, assemble, emplace, and fire their assigned missiles. Because batteries were selected at random, no one ever knew when they would be called and, therefore, could not "cram." Therefore, each battery had to maintain a high state of readiness. Competition for the annual high score was intense.<sup>145 146</sup>

In 1957, the *Star Presidian* described the annual service practice for the men of SF-88:

Four firing teams representing each battery of the 9th AA [Guided] Missile Battalion will leave tomorrow to undergo their annual service fire practice at Red Canyon Range, New Mexico. The units will compete with all other units in the U.S. Army Air Defense Command. Since Nikes would be fired in the Bay Area only in case of an enemy attack, each year battery firing teams travel to New Mexico to fire 12 actual Nikes. The missiles are fired at swift, radio controlled drone targets that can duplicate any maneuver of an enemy aircraft.

The missiles to be fired are received in factory containers by an advance party of missile maintenance men who must assemble them, attach the warheads and boosters and fuel them. The annual practice is judged on hits, battery assembly of missiles, fire control operations, launching area procedures, actual firing, time involved in firing and the checks taken."<sup>147</sup>

In this particular practice, the men stationed at SF-88 outdid themselves, "Battery A, located at Fort Barry and commanded by Capt. Albert Baenziger, was the top battery in the 9th Battalion with three successful missiles and scored 2,765 points out of a possible 3,000."<sup>148</sup>

Abel describes the payoff the men felt from live firing exercises:

A lot of pride involved. A lot of unit pride. Everybody wanted the prestige of firing Honor Battery which was ninety-five percent of a possible one hundred percent. Honor

Battery was just really a matter of pride, a real payoff when you got back, a couple of days off. You might not be visited quite so often by an inspection team. It had its own internal rewards. For officers it was a career enhancer. I only know of one battery that failed and their life was unmitigated hell for about six months until they went back to re-fire. People got relieved, it was not a good situation, we will leave it at that.

So, more pride than anything else and you needed ninety-five percent, so, basically you had to lose less than one hundred raw points. ...that was one of the real reason that they started it [annual service practice]. It wasn't that we had extra missiles to burn, but it was one way of proving to the troops that all of those hours that they were spending the thing actually did what it was supposed to do. The second thing was, it was an enhancer. If you went down, built a missile, ran through all of the checks, fired it, killed the target then somewhere along the way you had a little bit more confidence in the guy in the radar section and the guy in the radar section would say "Damn, you know, they really can put one of those things together that it works" you know, because you never could test it on site. You could run checks all day, but we never actually fired a bird off [the] site...

When not participating in annual practice—or unless the battery was "hot," meaning that it was on duty 24 hours a day—Nike servicemen often reported that life at the missile installations could be tedious.<sup>149</sup> The personnel stationed at SF-88 spent much time in the Ready Building, established just outside the perimeter fence in Building 962, a former bakery, accessible to the site by a steep set of stairs and a little footbridge. It was a fairly treacherous way to get down to the site during an alert:

"We had a couple of sprained ankles sometimes," recalled Abel:

but the guys, let's face it, heck we were all in our early twenties. Some of the crewmen were eighteen, nineteen. You know, you have got a young stud that runs down the stairs, down the hill, across the bridge and into the launching area, they could turn a pretty good time and I don't ever recall any serious accidents whatsoever. I do remember a couple of twisted ankles. But the idea was to get down as fast as possible and that was absolutely fastest way down here to get into the launch section.

The Ready Building would have had a little messing area, because guards could not leave. When you were on duty as a guard you could not leave so they brought chow down to you from the mess hall. The lieutenant and platoon leader's office would have been in there. There would have been a little arms room and ammo storage and there would have been beds for the off duty guards to sleep in. That's pretty much standard in any ready room. ...

Normally, they had a pool table, we almost had like a little game room, had a TV actually, some of them had Coke machines... As close, as comfortable as we could make it, we made it. For the simple reason that we didn't always have our full complement of troops and a lot of guys worked a lot of twenty-four on, twenty-four off, and when you are spending fifty percent of your life in one of those buildings you want as many comforts as you can provide. It is good for morale. Ping-Pong table,



pool table, almost for sure a pool table, and a TV for sure, and probably a radio, and that is about as much as we could afford out of health and welfare.

In 1957, the Army stated that, "Because of the isolated location of Nike sites and the hours the men are required to be on-site, several conveniences have been set up for the Nike soldier. Sites are equipped with complete hobby shops, above par day room facilities and in the Bay Area, a bookmobile."<sup>150</sup>

Enlisted man Ron Parshall recalled the atmosphere a few years later:

The officers had pride in the Army. They were people who were dedicated. For somebody else to do something like that, that was not the SOP of the day. You know, somebody has to pay. The officers always pulling inspections and like I told you before, the officers knew way more than we did. They knew everybody's job and they were highly qualified. Rombowski, who I talked about, was a graduate of West Point. I think we had a Captain as the CO, all with pride. You know so that it instills it into you.

I was twenty-five, twenty-six, I was still young, and these guys not any older than thirty. So, pride of what of you did, pride of your job, pride of the Army, it was there. It was there. You wouldn't think of nothing. Having your hair cut or your shoes shined or when you left here and setting the example for others rather than getting into trouble. Because you only cause yourself more trouble but at the same time you had that pride that you were a part of this unit. You hear of the infantry going into town, taking over town, fights and all of that kind of thing. That would have never happened with us, to tell you the truth, never. If you could get seven guys together, that had a pass, waiver...just a night pass...just to go off base, you had to be able to call in no matter what kind of pass you had. But they would allow us to go down to Sausalito to get a pizza and some, and a Coke, stand around a little bit and bring something back and it was...exciting. You could go over to the Presidio, but I never did, for movies. We had no movies here.

Most Nike bases did have a basketball court to relieve excess energy. Sometimes, softball teams would play against teams in the community, or football teams would be set up within the Army to play one another.<sup>151 152</sup> Parshall continued:

It started where you slept. That was the Admin area. All of the office work up there. There were wooden buildings at that time, two story high, easy to keep care of because the newer buildings you had to polish the floors all of the time because they had floor tile. These wooden floors all they wanted was them swept. They didn't so, that's all you had to do. So, that was kind of easy to take care of and you would walk into that or walk into any place and everything would be spic and span. Your bed had to be made properly and all your uniforms had to be lined up ready for inspection at all times. In fact, you even hated sleeping on your bed because you had it made in the morning and there is not that much time to make it. It had a little, just a little small area that they had for like, you could buy Coke's or candy, writing paper, stuff like that. That's where we assembled in the morning. Everyone assembled there and a few stories like that of the fog coming down when you are assembling, while you are assembling out there you



could not see the guy next to you. We had a fire drill there a couple of times. You actually had to bring out a fire extinguisher and stand there and like you are fire drilling.

The road up there where, it is still there, had a big chain over it with "Coast Guard - No Admittance." You could not go past that. Orders on this, at the base at all times, you could not go into any of the bunkers except for the ones we were using. [Such as] Battery Alexander. We could go in only certain parts of that. Our office, the motorpool, there was a little bathroom up above there, I don't know if we used that or not, but that's all. There was only a couple of little, small offices that we used and then the motorpool used that other section.

So, there was a ballfield, we used that as a ballfield and a parking lot on the other side [of Btry. Alexander] and we played baseball there a few times. It was hard to get the guys to get out after they, after a day of working to play ball. We had a basketball team here. We played the Russians one time. Just from San Francisco. There was a Russian team there and we played them .... A little grudge fight. (Laughs). A few fists were flashed. But we had the, we had the height though, we had a man here named Rombowski who was a Lieutenant in charge of our launching area. He was about 6'4" or so. He helped us and that was good.

Out of that same area, towards the end, we had , oh, two people from each Battery, we were selected for an Honor Guard. So that was another thing that I got onto because I was a very good marcher, evidently. I could take orders and march and that kind of stuff so I got onto the Honor Guard. That was another nice thing because one day a week, all your duties are gone and you go over there and get dressed up and practice. We presented, we had a couple of parades.

Inspections, planned or unplanned, broke up some of the monotony. From its inception, ARADCOM relied heavily on inspections to determine the effectiveness of its units. There were two types of inspections. The first was a formal command inspection of all assigned units conducted by the commanding general. The second consisted of an instruction visit by staff officers to units which required emphasis in some particular facet of training.<sup>153 154</sup> The *Star Presidian* described one such visit in 1957:

Nike sites throughout the 6th Region, Army Air Defense Command were recently paid short-notice visits by a three-man inspection team of experts from the Command Headquarters in Colorado. The team applies rigid checks to the operating readiness and effectiveness of Nike units across the United States. Unlike the annual service practices conducted at Red Canyon Range, the inspections are not competitive and batteries are rated either "operational" on "non-operational." Visits of the team provide a direct two-way communication channel between the commanding general and troops on the firing line.

From four to six hours are generally spent at each battery inspected. More than 50 separate checks, which take from a few seconds to 20 minutes each, are conducted. Before inspecting a battery, team members brief its key personnel on what to expect and what is expected of them. This is followed by a training test,

during which battery members simulate engagements of "targets of opportunity"—any aircraft which may be in the area at the time is utilized for the test. After the inspection, the team conducts a "de-briefing" on the day's work. Copies of the team's report are filed with the battery commander and also at the Colorado Springs headquarters, where it is reviewed by the commanding general and forwarded to the regional commander.<sup>155</sup>

Nike Site SF-88 was inspected by General Earle E. Partridge, Commander-in-Chief of the newly-organized North American Air Defense Command (NORAD) in November 1957, and by Lt. Gen. Charles E. Hart, Commanding General of ARADCOM, in February 1958. There were doubtless many other visits from top military and civilian "brass."<sup>156</sup> Both first Battery Commanding Officer, Paine, and last, Cheney, confirmed that SF-88 had a long-standing reputation of being a "show-off" battery. "Number one: because we were right here in San Francisco. Number two, because we were right here with Region headquarters," said Cheney.

Another type of inspection, which tested the firing units, was a "Blazing Skies" alert. These inspections could be either scheduled or surprise alerts, and sometimes occurred as often as once a week. As part of the alert, a randomly chosen aircraft entering the defense area was designated as an intruder, and all firing procedures, short of missile launch, were performed. In addition, the Air Force Strategic Air Command and the Aerospace Defense Command periodically provided "faker" aircraft to simulate enemy aircraft for battery training. The Strategic Air Command combat crews benefited from these exercises, as they were also scored on target run and evasion techniques.<sup>157 158</sup>

Cheney recalled alerts being held at least once a month:

Probably they [the crewmen] would know that it was an alert, and again I am trying to go over procedures because there were certain things that you could not do on a practice alert that you would do [like plugging in the missiles]. ... And there was certain things that you could not violate that were peace time safety and peace time security regulations. For example, you had to be signed in at the launcher gate. Now in war time there was no way we were going to stop to sign people in. Plus the fact that when it was an alert you were surrounded by evaluators. They were here from the moment that you gave the alert to see what would happen. So, you know all they had to do was look and see...and they would know.

"Blazing Skies" was the term used for the highest state of alert, in lieu of "Battle Stations."

Because in those days we were paranoid about security. You have got to back into the 'sixties and 'seventies in the era in which we were living. So, I mean, in retrospect, it was really kind of silly. How long did it take a kid to figure out that when the officers were talking about "blazing skies" they were talking about shooting missiles?... You know, if you put all of that in one big ball of wax, in retrospect now if you talk to young soldiers about some of the things we went through, they would think we were crazy.

In 1962, the *Star Presidian* described a training exercise which pitted the Nike sites of the 40th Artillery Brigade against aggressor aircraft represented by Strategic Air Command bombers. The Army newspaper reported proudly that the artillerymen recorded perfect scores in the competition:

Radar Bomb Scoring, or RBS, is a program by which the effectiveness of simulated tactical bomb runs by the Air Force's retaliatory force of Strategic Air Command bombers is measured. SAC's simulated bomb runs are 'scored' electronically by ground radar equipment. Currently, about 50 percent of the scoring is done by ARADCOM Nike missile site radars. This training is highly beneficial both for the bomber crews and the Army air defense radar crews, and is conducted week in and week out throughout the country.

...All seven Nike Hercules sites in the local area participate in RBS. Until last January, only one site at a time participated. Since then two have been taking part simultaneously, one site 'backing up' the other. ... RBS is conducted along tactical procedures. Simultaneous bomb runs are passed from NORAD/SAGE Control Centers, through Battery Integration and Radar Display Equipment (BIRDIE) to the firing units just as if the runs were being made by hostile aircraft, thus adding realism to the rigorous training."<sup>159</sup>

This sort of ARADCOM and SAC joint training exercise took place again two years later, and at many other times during the Cold War that have not been documented for this study.

Aside from the drills, daily routine required a demanding regime of maintenance on the complex equipment, from missiles, to electronics, to infrastructure. Ron Parshall described his duties:

I was generator operator and launcher crewman so my first duty was the generators—make sure they had [power]. We were [frequently] on our own power, even the Admin area was our power, and we powered it all the way up to there. So, there would be like two generators on at night, and we had three generators so we would be switching one of them off or two of them off and just running on a normal one generator. 250 horsepower creates a lot of electricity at 440 volts. So it would take care of this. The two or three were for extra safety in case one went out or something. They were brand new at that time, I mean they had only a few hours on them.

So, that was our first step and then the second step was to come down here and do our daily shift, mainly checking for, they are always under hydraulics, so you test them under hydraulics. Hydraulics had a tendency to spring a few leaks. So, you are checking for oil on the ground, make sure everything is working. The doors, you would run the doors a few times, make sure they are not jamming. Make sure the elevator goes up and down and there is nothing underneath. Make sure the floor is as clean as it was when you took over and then checking the missiles out. Whatever the daily, these, at least, three times a month a new directive would come down and you would have a check and change a screw or torque to the screw or something like that.

Chief Warrant Officer Abel's day usually consisted of one of three things:

Obviously, there was the usual Army organization morning formation at seven thirty in the morning up at Admin area, at which time we went to work about a quarter to eight. We arrived on the site, came through the gate, got our badges for the "limited area" which is where I primarily worked. At eighty percent of the time was in this area [between the outer perimeter fence and the inner perimeter]... That is the "limited area" and daily...we were either pulling for preventative maintenance which consisted of certain electronic and electrical checks on the missile, or we had a missile down for its biannual, every two year re-build and at that time we tore it completely apart and it was new hardware and a complete system check-out and that normally, by the time, we de-joined the missile in the launching area and moved it down, took the explosives out, brought it down here, cleaned it, completely checked it. It was about a week. We usually did one of those a month. So, one week out of the month, we were definitely eight hours or so, right here in the Assembly Building doing check-out.

We would be on twenty-four hour release. We normally did that, It didn't apply so much to, we were allowed by regulations to have one missile down for maintenance and so, most of the time we tried to do it when we were on twenty-four hour release status, but we have done them when we were 'hot.' The thing is, is when you are one hour hot status you have to quickly get in, get it out, and get out of the launching area just in case the conditions warrant having to put birds up to fire.

The dailies were power and launch checks. Basically, you checked all of the voltages and made sure they worked correctly. On the missiles, you checked them for obvious damage, you checked to make sure that the M-30A1s, located in the bottom of the warhead section, were not armed. You did, basically, it was a like a pre-flight inspection. You just completely went over and checked everything visually to make sure that it was, in fact, good. The launchers were elevated, pressures were checked, you monitored all of your controls, to see that you had all the correct indications for the type of missile you had installed. Dailies usually ran about one hour for it to do a pit of six birds with a full crew. If you had less than a full crew, dailies could run one hour and one half. If they ran less than that, it's one way that us Warrants used to check and make sure that they pulled a full set of dailies. If we came down here twenty minutes later and they were through with dailies, we went "Heh, heh, bullshit. What are you guys doing down there?"

A quarterly missile check was you checked out the guidance section and the hydraulic pumping unit. You brought two test sets down here on a dolly, or down the elevator and in this area you ran all of the cables all over the missile to its hook-ups and it was a good check, but it wasn't the same as doing your two-year service when you had it. You couldn't rotate the bird, you basically checked out all of your voltages, you checked out all your command channels: pitch, yaw [roll], yaw. You performed that electrical check on each bird once every three months so we used to...make an adjustment in the guidance section because every now and then something might drift a little out of tolerance and then you swung the nose and the hinge that was installed on the right side of the bird, of course, always remember we referenced right and left, rear looking forward so it would be on the far side of that bird. There were attach holes and

you actually had a little hinge that you hooked up and you took these six bolts loose between the guidance section and the warhead section and you swung it open, popped the cover off the guidance section, made your adjustments and when everything checked out put it back together and retorqued everything.

It used to take a couple of days to run both those. It really did because you had to take both of the guidance section hatches off. The big ones there. You used to have to take, if you had a guy with a real skinny hand and it fit through the access and not have to take the right rear hatch off for the hydraulic pumping unit, but by the time you took hatches off, and if you had to swing the noses, it took some time. But the test itself to completely run it, if it went smooth was about forty-five minutes to one hour per bird, counting hook-up and disconnecting.

## NIKE ZEUS, ABMs and the End of the Cold War

Nike Zeus, the final Nike missile, was aimed at intercontinental ballistic missiles (ICBMs). Whereas the Nike Ajax was 34 feet long, the Hercules was 41 feet long. The diameter also grew, from 12 inches to 31.5 inches. Nike Zeus was the third missile in the Nike family, and brought Nike development into the ICBM era. Named for the ruler of the Greek Gods, the Zeus missile measured 63 feet 3 inches, had a diameter of 60 inches, and weighed 40,000 pounds at launch. The tandem booster, designed by Thiokol, had a thrust of 450,000 pounds—then the highest ever attained through a single nozzle. The Zeus had a range of more than 250 miles. The Nike Zeus system also included the Zeus Acquisition Radar (ZAR), a significant improvement over the Nike Hercules HIPAR system. Shaped like a pyramid, the ZAR featured a Luneberg lens receiver aerial weighing about 1,000 tons. The first successful intercept of an ICBM by Zeus was in 1962, at Kwajalein in the Marianas Islands.<sup>160</sup>

Despite its technological advancements, the Department of Defense terminated Zeus development in 1963. The Zeus system, which cost an estimated \$15 billion, suffered from several technical flaws, including an inability to distinguish enemy warheads from chaff, reflectors, and other types of decoys.<sup>161</sup> Still, the Army continued to develop an anti-ICBM weapon system—referred to as "Nike-X"—that was largely based on the technological advances of the Zeus system. Nike-X featured phase-array radars, computer advances, and a missile tolerant of skin temperatures three times those of the Zeus. In September 1967, the Department of Defense announced the deployment of the Sentinel antiballistic missile system, its major elements drawn from Nike-X development. In March 1969, the Army deployed the Safeguard program, which was designed to defend Minuteman missiles, and which was also based on the Nike-X system.<sup>162 163</sup>

Colonel Moeller provided some context for the on-going strategic debate over anti-ballistic missile weapon systems:

Another thread woven throughout the decade [of the 1970s] was the debate over deploying defensive systems against the ever growing ballistic missile threat overwhelmingly posed by the Soviets and to a much lesser degree, by Red China. This debate centered on four basic interpretations concerning the role of ABMs. The first interpretation projected a genuine defense against the offensive might of the Soviet Union and China...as area defense (affording protection for thousands of square miles) as well as offer terminal defense protection (permitting a more intense coverage for a few hundred square miles).

A second interpretation had ABMs as the protector of America's offensive forces around U.S. land-based Minuteman ICBMs. In the remaining two, ABMs were also viewed by different camps as a symbol of the arms race and as an alternate avenue of arms control and disarmament. ABMs were a political hot potato and attracted the attention of the antiwar and antimilitary factions later in the decade. ...

In this regard, Colonel Cheney recalled the political climate as it pertained to SF-88:



We were very cautious here in San Francisco in those days.[1974] There were a great number of demonstrations against us. We were never too sure when we came to work in the morning who was going to be lined up out at the front gate. So, we were very careful on any publicity, particularly about these [Nike] sites. There were some [demonstrations] just as we were getting ready to close. Not violent, just groups gathering. "Nothing better to do" type things. Nothing that ever caused us any major problems.

But Ron Parshall recalled a different sort of atmosphere a few years earlier:

it was in the later part of the Vietnam War, not the first part, when Kennedy had all these troubles in 1962 and it was towards the later part. I think it was mainly because of the attitude towards the Army, I think in the seventies, late sixties that they were getting bombarded with rocks and pedestrians were getting in here more and more. The Army couldn't shoot them at that time which they should have done, as far as I am concerned, but that's neither here nor there, it's my own opinion. This is a top secret thing so why let anybody in there, you know, that could sabotage it. This is our defense.

Paralleling the changes presaged by the deployment of ICBMs were the political, bugetary, and personnel effects of the Vietnam War, which trickled down through the military establishment during the late 1960s and early 1970s too.

Cheney continued:

You have got to remember that a good portion of the soldiers who were stationed here, the support soldiers, usually not your defense soldiers, some of them were part of "McNamara's one hundred thousand," the men that had been offered the opportunity to go jail or go into the Army. Many of them were young men that had returned from Vietnam and were doing time finishing up their three months, four months until discharge.

We had a young mechanic. ...He was semi-literate if not illiterate, and the nickname for him was "pig pen" because this kid—the platoon leader or platoon sergeant would come over and dress him in the morning and somehow, he wouldn't go anywhere—but by the time we got to formation, he would look like a pig sty again. He eventually married, and he married a young woman who wasn't much brighter than he was. We had to shop for his groceries for him and we had to handle his paycheck. ...but when the generators, we had the old generators...that was a problem just keeping those babies going. That kid could talk to those generators. You go get this young man at any time of the day or night and he would go out there and he was the only one who could make them [work]. There was no way that he was going to above E-5 and we probably gave him the E-5 just because we felt bad .

When asked, "How did the guys here feel about being in Nikes versus Vietnam?" Cheney responded:

Most of them were Vietnam vets. In other words, you did your time in 'Nam and then you came to a site like this. And as I mentioned earlier a lot of the support soldiers, they were putting in their last four, five six months before they were released after Vietnam. So, they were a little touchy to handle at times and these were guys who had seen the worst. So, there wasn't a whole lot you could do.

The air defense personnel permanently assigned to ARADCOM, as opposed to the support personnel, remained, to a certain degree, insulated from the Vietnam era malaise. But they were directly affected by the deployment of ICBMs and the concurrent arguments over the effectiveness of anti-missile systems. In June of 1971, Battery A, 2nd Missile Battalion, 51st Air Defense Artillery Regiment was replaced at site SF-88 by Battery B, 1st Missile Battalion, 61st Air Defense Artillery Regiment.<sup>164</sup>

But, "Even as Soviet aid and arms rolled into Vietnam, to be met by American bombardments, the diplomats were negotiating what came to be the cornerstone of arms control, the Anti-ballistic Missile Treaty," which as Cold War historian Martin Walker explains,

was important not only in itself, as the first mutually restraining treaty, but also as the first formal recognition that each superpower had an interest in protecting the strategic arsenal of the other. By limiting development and deployment of missiles designed to nullify each other's deterrent by shooting them down in flight, the ABM Treaty enshrined and legitimised a strange and almost poetic stillness at the heart of the Cold War. The stability of their nuclear relationship had become more important than the ideologies and ambitions which divided them.<sup>165</sup>

"In the midst of the heated ABM debate," wrote Moeller:

four major decisions were made: the McNamara decision in April 1961 to defer production and deployment of the Army's Nike Zeus system; the McNamara decision in January 1963 to phase out Nike Zeus and to initiate research and development of a more complex and sophisticated ABM system called Nike X; the Johnson decision in September 1967 to deploy the Sentinel ABM system; and the Nixon decision in March 1969 to deploy the "hard-point" ABM system known as Safeguard."<sup>166</sup>

These decisions set in play the forces that led to the eventual phasing out of the Nike Hercules system as the ballistic missile threat increased and "Mutually Assured Destruction" (MAD) rather than anti-aircraft defense became the predominant strategy of deterrence.

From 1970 to 1974, ARADCOM continued to diminish in size. Hope for the future of the command rested in the Safeguard ABM system under construction at Grand Forks, ND, and plans for the next generations of SAMs...But ARADCOM would not exist long enough to field either of these new systems.

Although the Soviets increased and modernized their strategic ballistic missiles, they experienced a levelling off, if not a slight downward trend, in numbers of strategic bomber aircraft. Bomber forces had been totally eclipsed by Soviet land-based and submarine-launched ballistic missiles."<sup>167</sup>

In 1973, a major change was made in air defense policy [by Secretary of Defense Melvin Laird] He vocalized this change in philosophy when he stated that it was currently beyond the technological capability of the United States to meaningfully limit damage of urban areas by a well-coordinated nuclear attack.

The beginning of the end started in March 1973, when the Secretary of Defense issued a series of planning and programming guidance memorandums. ... In August the Secretary of Defense issued a program decision memorandum (PDM) that redefined the strategic air defense mission, eliminated the requirement for a defense against strategic bomber attacks, and concentrated on missions of warning of an impending bomber attack and airspace control. ... The PDM specified that 35 of ARADCOM's 48 Nike Hercules batteries, less the 31st ADA Brigade in Florida, be phased out by the end of FY75, with the remaining 13 batteries inactivated by the end of FY76.

The major premises of that rationale were an assumption that the threat of Soviet bomber attack had decreased sharply, a conviction that the current air defense force was costly and ineffective, a belief that air defense of urban areas would be eliminated by initial ICBM attack, and faith in the concept of perimeter defense by USAF airborne warning and control systems (AWACS) and F-106 aircraft. To these there had been added in the FY70 Draft Presidential Memorandum the contention that any Nike Hercules units that might survive an ICBM attack would be ineffective in countering a follow-on, low altitude bombing attack in which electronic countermeasures (ECM) were employed.

ARADCOM held that most factual evidence supported contrary views. In spite of intelligence projections of declining Soviet bomber strength, the size of the threat had remained constant; ARADCOM forces, in fact, offered protection to a significant portion of the population and economic base at relatively small cost; destruction of a significant number of Nike Hercules units would be possible only if sufficient ICBMs were available to target each unit; a perimeter defense... would inevitably be porous and require to be backed by defense in depth; and test results showed that, far from being ineffective, Nike Hercules units provided a highly effective defense in the face of fairly heavy ECM and limited early warning. Moreover, to eliminate the air defense of cities because of their vulnerability to missile attack would be to offer an attacker the option of employing bombers against little or no resistance.

These and other arguments notwithstanding, the reality of the 1970s was that ARADCOM would be reduced to zero fire units by 1974.<sup>168</sup>

On February 4, 1974 Secretary of Defense James R. Schlesinger, "announced the planned reduction of Army Air Defense Nike Hercules missile batteries in the Continental United States (CONUS) as part of an overall realignment of CONUS air defense. Specifically, Secretary Schlesinger has directed that the phase-out of 48 Nike Hercules batteries...begin by April, 1974, and be completed by the end of June, 1975."<sup>169</sup> And, in accordance with orders, so it was done. The Nike batteries in Alaska, Florida and Texas lasted, however, until 1979.

In the San Francisco defenses, the battalion headquarters, group headquarters and 6th Region headquarters were inactivated. During the tensest years of the Cold War, the 6<sup>th</sup> Region had protected the West Coast against sudden aerial assault, in fulfillment of its motto, "What We Have, We Will Defend."

And at Fort Barry, Nike Site SF-88 was also inactivated after twenty years of operation.<sup>170</sup>

Susan Cheney had only been at SF-88 for two months when she got the word:

I hadn't been out here very long and I am sure that I heard rumors of it even before then, even while I was at Group Headquarters. But I know that I had only been here two, two and one half months when it started. That they were going to close and move on out. Nobody was broken hearted because this was considered very tough duty. You know, in retrospect, no it wasn't, but in those days basically the tough duty part of it was the hours.

Seven days a week, 365 days a year, twenty-four on, twenty-four off, twenty-four on, twenty-four off is what most of the soldiers worked and they really didn't get a full twenty-four off because by the time they came off duty at seven, seven thirty in the morning and cleaned their weapons and turned them in and did the things that they needed to do they got home about nine, ten, eleven and then were back in here for shift change at seven o'clock the next morning. So, they did not have a lot of quality of life and this was a constant thing.

It's funny I don't remember too much consternation about it now. No. I don't think anybody even thought about it in those days. They were just young and said "I want to go someplace [else] and I am going someplace now."

She was asked if it was known why the sites were being closed, and responded:

No. ...I would assume it was because the threat had changed and you brought out the ICBM and we were not affected [ie, we could not affect?] by the ICBM. Money. It was the Cold War era, we had gone nuclear, a tit for tat type thing and we were not a tit for tat type site. But the reason why, I don't ever remember that being discussed.

Neither did she recall any discussion about intentionally leaving SF-88 intact for historic purposes:

No. No. I don't remember that at all. You see I am trying to remember whether I actually locked the key or if Captain Raat did. I am trying to remember, because we both went on. ...I can't remember which one of us closed it down.

Captain Roy Raat, Cheney's Commanding Officer told the local newspapers that the reason for the phaseout was that, "the Department of Defense has decided that there is no longer a serious threat to the continental United States from manned aircraft. The real threat is from intercontinental ballistic missiles, and that job is beyond the capabilities of the Nike Hercules missile." Captain Raat hoped his new orders would take him and his family to Hawaii.<sup>171</sup> Cheney was deployed to Redstone Arsenal and then to the Dakotas.

The missiles were replaced in their storage containers and shipped elsewhere by helicopter, which was the standard way to get explosives off the site:

"We canned them and they were flown," said Cheney.

We flew them out of here, I remember that now. I even remember the choppers coming in and I remember them being taken out of here because... we had some tight high security then because I mean we were flying some live stuff out of here. I think we did it in about two, three days. It didn't take us very long and no publicity. It was in out and out of here, and of course this site in particular you had a problem because you always had to worry about weather. And you've always got to worry about flying weather for helicopters. Everything was done by helicopter; we would not take them over the road. ...

The *San Francisco Chronicle* reported that Bay Area Nike sites were to be inactivated between March 1 and August 1, 1974. Cheney recalled:

I left here in June of '74 because I reported in July of '74 to Redstone Arsenal and I don't think I was one of the last ones out of here. I can't remember. Isn't that odd I can't remember who was the last one out of here, myself or Captain Raat (the same *Chronicle* article indicated Bay Area Nike sites were to be deactivated between March 1 and August 1, 1974). ...

Everybody on the site was dealt with individually. We were scattered nationwide. I went to Redstone Arsenal where I went into the Missile Maintenance Force and that was July, August, September, October, November. That was a five month course and then I went from there to [the] Nekoma, North Dakota [ABM site]. ...I was the Battery Commander until we closed down and I closed that one down too.

Warrant Officer Terry Abel, who served at SF-88 in 1971 and 1972, supplied a more emotional perspective about closing the Nike sites in the continental United States:

First, it came as a real surprise because it was still, even in 1974, definitely a viable missile system. And it was good enough that we kept it around in Europe until 1985. So, it came as a real shock and a lot of us old timers were really sad. It was a passing of an era and for anybody that has been involved in the passing of an era we felt we were doing a viable job with good equipment and we did everything that was asked of us and it was kind of sad to see it go. It was a good system to work on. It was reliable, it did everything we ever asked it to do and suddenly it was gone. I think a lot of us were just really kind of shocked and sad because it was a passing of an era that would never ever return again....

I mean you pick areas now, you can't defend like we, like Herc defended the U.S.— basically coast to coast, north and south. You can't do that with a Patriot fire battalion because it costs \$450 million. So, how many systems can you afford at \$450 million a system? It's a trip down memory lane every time I am here, obviously. Because it is a

way of life that is gone and will never return. ...Patriot is now carrying the torch in a reduced capability, but basically, the old coastal artillery turned into World War II AAA, which became missiles, and it is an ever shrinking field—obviously demonstrated last year in Desert Storm as a very viable field, but never the less, there is less and less...

I find it very, very hard to put it into words: walking into the launching area after twenty years that first time a couple of months ago and actually seeing an elevator go up and down. I thought I was in a dream and I was going to wake up. I spent the better part of my youth on these places doing what I felt was an important job for the country and now I find that there is gray hair where there used to be brown, and it is strange. ...those days are not so far removed that my mind, but it was built twenty to thirty years ago and as I look back over my youth, a lot of us old timers are rapidly disappearing. I was very young when I was appointed Warrant. Ten years younger than my contemporaries, and half of those contemporaries have passed away. It is a passing of an era and it is a passing of a generation and it is funny.

...[It was] the Cold War era and it worked. You know, regardless of your philosophical or political bent, MAD, Mutually Assured Destruction, worked. I mean, in forty years, we didn't have a nuclear war, and it's maybe erratic or funny but this was, we were Cold War warriors in a weapons system designed to protect our cities from nuclear holocaust and it worked. I mean, San Francisco did not become a burned out cinder so, conversely I guess you could say that it worked. Now we worked. I don't think a lot of people, well, of course, they didn't appreciate, they didn't know how hard we worked to ensure that.

The times that we were in here because an airliner's black box, their IFF, had gone out—we didn't know what was coming in and it was a scary part for the passengers if they'd known—but we were tracking them, we had a bird up and we were tracking them, **we did not know**. Aircraft appearing out of nowhere, on no flight plans—we were up and ready and tracking them.

And so we did the job as well as we could with what we had which was considerable. It was a complex system that worked very, very well, and we were so fond of saying and truthfully so, we were the only organization in the United States that had a live, twenty-four hour a day mission. There was no training mission looking forward to war time; our war time and training and peace time mission were exactly the same. If there was an aircraft and if it wasn't friendly, it would have died. The people that I served with, the ones that followed me, and the ones that came after me, did their job well.

In testimony delivered to the Senate in 1974, Secretary of Defense James Schlesinger expressed the view that, "Without an effective antimissile defense, precluded to both the U.S. and U.S.S.R. by the ABM treaty of 1972, a defense against Soviet bombers is of little practical value."<sup>172</sup> Thus, the "ABM treaty," more formally known as the Strategic Arms Limitation Agreement (or SALT I), helped seal the fate of the Nike system, but in an indirect way. Even the Air Force weighed in with a position that supported Nike, "It's hard to escape the conclusion that the United States is more vulnerable to air attack today than it was a decade ago..."<sup>173</sup>



Additional protocols to the SALT I Agreement provided for the mutual destruction of approximately 700 nuclear warheads by the United States and the Soviet Union. Many warheads for Nike Hercules missiles were among the weapons thus destroyed. However protocols also made provision for each power to retain one missile site for historical purposes. Nike site SF-88 was chosen for this distinction.<sup>174</sup>

Thus, at the same time as the Army was inactivating the Nike sites in the Bay Area, it was also preparing to transfer much of the Marin Headlands, including Fort Barry, to the newly-created Golden Gate National Recreation Area. A request was made by local Sixth Army personnel to transfer SF-88 to the National Park Service as a historic property. This request was sent up the Army chain of command via "back channel" communications route under authority of Lt. Gen. Richard G. Stilwell, Commander, Sixth US Army.

Eventually, orders came down via back channel from Gen. Creighton Abrams, Chief of Staff, US Army, authorizing the transfer of SF-88 to the National Park Service. The only stipulation was that no explosives or classified materials be transferred. Gen. Abram's directive superseded ARADCOM orders for inactivation of the site.<sup>175</sup>

On 25 February 1974 a 'Memorandum for Record' was written by the Chief, Real Estate Branch, Presidio of San Francisco. This document, prepared at the direction of Col. John Kern, the Sixth Army's "National Park Service Liaison" officer, concerned many items pertaining to closure of the remaining Nike sites and included a special directive for the Fort Barry site: "The following NIKE Site will be inactivated but retained as a memorial to Army Air Defense - NIKE Hercules: Nike SF-88 - Ft. Barry/Cronkhite." Later, under "Sequence of Real Estate Actions," the document states: "Initiate transfer of all Site related facilities to the National Park Service to be retained as an Historic Memorial to Air Defense - NIKE Hercules. Plans are for Army technicians to remain on site to explain and demonstrate NIKE operation until replaced by GGNRA personnel."<sup>176</sup>

Col. Kern elaborated on these plans during a 1998 interview with the authors. Not only did the Army plan to transfer SF-88L intact to the NPS, stated Kern, but also SF-88A and SF-88C. The only items that would be removed were munitions and classified items, and even the classified materials would be held at Ft. Bliss for the NPS until such time as they were declassified. However, the vast majority of property at all three areas would have been turned over to the National Park Service including almost all the IFC equipment. In addition, the Army offered to send NPS personnel to Fort Bliss where they could have participated in selected training programs to orient them to the Nike-Hercules system.

Although the NPS was interested in acquiring all three areas of SF-88, it declined much of the Army's offer of equipment. The NPS only expressed interest in taking control of property at the Launching and Administrative Areas, not the IFC. Also, the departure of the park's Chief of Interpretation at a crucial point in the transfer process further complicated the transition. The vacancy created by his departure was not immediately filled and resulted in the park's losing the opportunity to interview remaining site personnel as well as sending NPS staff to training at Ft. Bliss.<sup>177</sup>

William Whalen, the first Superintendent Golden Gate National Recreation Area, corroborated these discussions between the NPS and Army. In an interview concerning the early years of the park, Whalen informed the authors that the Army had indeed offered to transfer much of SF-88C to the park but he had declined the offer, reasoning was that the park was too new and its staff too small to take on responsibility for preserving the IFC equipment. Whalen felt that the remote location of SF-88C, the inclement weather conditions at the site, and the complex nature of the equipment would put a tremendous strain on his resources. The park's main interests at the time were the administrative area, which Whalen felt could easily be turned into a conference center, and the launching area, which he saw as the most dramatic part of the Site.<sup>178</sup>

Whalen agreed to accept transfer of all three areas minus the IFC equipment, and to allow the Army to retain temporary control of the administrative area. On 16 August the Presidio's Real Estate officer reported on the status of Nike Site SF-88: "IFC (Control) Area ... Transferred to Golden Gate National Recreation Area. No further requirements." "Launcher Area[sic]... .. Transferred to Golden Gate National Recreation Area. No further requirements." "Administrative Area... Assigned for Army use by Memorandum of Understanding with GGNRA. No further requirements."<sup>179</sup>

Final transfer of all three areas did not occur until early 1976 when the Army informed the NPS that it no longer required use of the administrative area. This formal document, titled "Discontinuance of Army Use and Release of Real Property," was acknowledged by then-Superintendent Jerry S. Schober on 12 February 1976.<sup>180</sup>

## Epilogue

After the Nike era, "planned improvement to the air defenses included replacing the 1950s-era interceptor force with up-to-date F-15 and F-16 fighters, modernizing the radar components in the far north and continental United States, and extending the use of AWACS in home air defense operations."<sup>181</sup> During the Persian Gulf War of 1991, the Army fielded the Patriot SAM system, which can be deployed to provide point defense against selected threatened areas.

Historian Michael Beschloss provided a broad geo-political perspective on the last years of the Cold War:

We cannot know for certain whether continued nuclear imbalance between the two powers would have brought more dangerous episodes like Berlin or Cuba, or whether a more leisurely arms race would have retarded the collapse of communism and the end of the Cold War....

We do know that by 1970 the Soviet Union could claim rough nuclear equality with the United States. Krushchev had predicted that by that year the Soviet economy would be the strongest on earth and that by 1980 Soviet sports and national defense would be conducted by spontaneous initiative of the masses. Instead, 1980 found the Soviet economy mired in a terminal stagnation that led to the rise of Mikhail Gorbachev.

...when Mikhail Gorbachev made it clear that he would no longer use Soviet tanks and lavish economic aid to prop up puppet governments unsupported by their people, Eastern Europe threw off the shackles of communism and East Germany rejoined the West."<sup>182</sup>

The Cold War was suddenly over. Fittingly, in 1990 the Gorbachev Foundation for World Peace became the first tenant as the Presidio of San Francisco converted from an Army post to a National Park. Across the Golden Gate, the restoration and interpretation of Nike Site SF-88 gives citizens of the nation and the world the opportunity to see first hand the military reality of the Cold War.

While giving a talk to a group of high school students visiting SF-88, Ron Parshall was once asked, "Where you ever scared?" He replied:

You could answer that question, "Yes." I kind of put it like when we went through basic and had to fire the rifle. You are looking down there a couple of hundred yards, you see the target and you pretend it is a man, and then you have got to pull the trigger. You do the same thing, here. You know you are actually going to kill someone. You fire this thing off and or get killed. So, the scariness wasn't for me, or this guy, it was more for the ...

I always thought of San Francisco, you know. I wouldn't want that destroyed. I feared a lot because I knew what these weapons could do and they were carrying the same thing with them so... I don't think I was ever scared for myself, I was just nervous, real

nervous. ... You don't want to lose the war before it starts. I worried that way too. I wouldn't want this country under communism no matter what, and I would still fight to the death for it. I have a strong feeling of patriotism. Everybody knows that. I would die for my country. I don't want to, but I would and it had to be that way.

You are strictly defense, you are not offense. They come to you, so you don't feel so bad if you're going to knock them down. In fact, you probably would have pleasure in saying, like they did with the SCUD—when they knocked down the SCUD over there in Desert Storm—there is a pride in doing it. Doing your job. I think the Army instills... any service instills that in you. ... If do you job properly, there is a lot of pride in it.

“The old saying ‘they also serve, who only watch and wait,’ appropriately applied to the thousands of dedicated soldiers of ARADCOM. They worked long hours and often fought boredom, which was interspersed with times of great stress. They suffered long separations from family and home, even though they worked only a few miles away.”<sup>183</sup>

## Endnotes for Part I — Historic Resource Study

- <sup>1</sup> John Lewis Gaddis, *The United States and the Origins of the Cold War, 1941-47* (New York: Columbia University Press, 1972), 137.
- <sup>2</sup> Ibid., 139.
- <sup>3</sup> Ibid., 136.
- <sup>4</sup> Ibid., 163.
- <sup>5</sup> William O'Neill, *American High: The Years of Confidence, 1945-1960* (New York: The Free Press, 1986), 66.
- <sup>6</sup> John Patrick Diggins, *The Proud Decades: America in War and Peace, 1941-1960* (New York: W.W. Norton & Company, 1988), 82.
- <sup>7</sup> Ibid., 76.
- <sup>8</sup> *Post-War Hopes, Cold War Fears*. Executive Producer: Mer Koplin. Produced by Imre Horvath. Writers: Imre Horvath, Bill Moyers, Bernard A. Weisberger. Created and developed by The Corporation for Entertainment and Learning, Inc. and Bill Moyers. Washington, D.C.: PBS Video, 1984, c1983.
- <sup>9</sup> Diggins, 80.
- <sup>10</sup> Greece and Turkey were added to NATO in 1952; West Germany was added in 1955.
- <sup>11</sup> Diggins, 81.
- <sup>12</sup> Ibid.
- <sup>13</sup> Carlson, Christina M. and Lyon, Robert. *Last Line of Defense: Nike Missile Sites in Illinois* (Denver: Rocky Mountain System Support Office, National Park Service, 1996), pgs 13-15.
- <sup>14</sup> Moeller, 2.
- <sup>15</sup> John Newhouse, *War and Peace in the Nuclear Age* (New York: Alfred A. Knopf, 1989), 110.
- <sup>16</sup> Lawrence S. Wittner, *Cold War America -- From Hiroshima to Watergate* (New York: Praeger Publishers, Inc., 1974), 144-45.
- <sup>17</sup> Carlson and Lyon, 16.
- <sup>18</sup> Lieutenant Colonel Roy S. Barnard, *The History of ARADCOM, Volume 1, The Gun Era 1950-1951* (Headquarters ARADCOM, Historical Project ARAD 5M-I, n.d.), 3.
- <sup>19</sup> BDM Corporation, Vienna, VA. "Draft: History of Strategic Air and Ballistic Missile Defense, 1945-1955 (For the Department of the Army, Chief of Military History, Washington, D.C., March 15, 1975). Volume 1. Section A, 12.
- <sup>20</sup> Barnard, 3.
- <sup>21</sup> Ibid, 5.
- <sup>22</sup> BDM Corporation, Volume I, Section A, 14.
- <sup>23</sup> Barnard, 8.
- <sup>24</sup> BDM Corporation, Volume I, Section A, 14.
- <sup>25</sup> Barnard, 9.
- <sup>26</sup> Ibid, 27.
- <sup>27</sup> Carlson and Lyon, 19-22.
- <sup>28</sup> Kenneth Schaffel, *The Emerging Shield: The Air Force and the Evolution of Continental Air Defense, 1945-1960* (Washington, DC, Office of Air Force History, 1991), 135.
- <sup>29</sup> Merle T. Cole, "W-25: The Davidson Site and Maryland Air Defense," *Maryland Historical Magazine*, Volume 80, No. 3 (Fall 1985), 241.
- <sup>30</sup> Moeller, 8.
- <sup>31</sup> Joseph J. Hagwood, Jr., *Engineers at the Golden Gate: A History of the San Francisco District U.S. Army Corps of Engineers, 1860-1980* (U.S. Army Corps of Engineers, San Francisco, 1981), 270.
- <sup>32</sup> The *Star Presidian* consistently referred to antiaircraft battalions by spelling out the numerical designation. The correct, official usage was arabic numerals, as in the text. However quotations will be transcribed verbatim for the sake of authenticity.
- <sup>33</sup> *Star Presidian*, Aug. 15, 1952.
- <sup>34</sup> Moeller, 10.
- <sup>35</sup> Carlson and Lyon, 23.
- <sup>36</sup> *Star Presidian*, Dec. 7, 1956.
- <sup>37</sup> Hagwood, 270.
- <sup>38</sup> The "U.S." was dropped in 1961.
- <sup>39</sup> Cindy Sage, A. Schilz, M. McDonald, "Mt. Gleason Nike Missile Site LA-04," HAER No. CA-57, (April 1988), 7.

<sup>40</sup> Ernest J. Yanarella, *The Missile Defense Controversy -- Strategy, Technology, and Politics, 1955-1972* (Lexington: The University Press of Kentucky, 1977), 19.

<sup>41</sup> The name BOMARC is an acronym for the Boeing Aircraft Corp. and the Michigan Air Research Center, which jointly developed the missile.

<sup>42</sup> Thomas R. Ross, "Air Force Seeks to Abolish Chicago Nike Installations," *Chicago Sun Times*, 1 September 1958.

<sup>43</sup> Ibid.

<sup>44</sup> "Poor Rating for Hercules," *The Milwaukee Journal*, 27 May 1959, Center of Military History, Washington, D.C.

<sup>45</sup> Carlson and Lyon, 23-25.

<sup>46</sup> The Army also developed a 105mm antiaircraft gun, but it, too, was not widely deployed.

<sup>47</sup> Carlson and Lyon, 27.

<sup>48</sup> Moeller, 10.

<sup>49</sup> M.D. Fagen, ed., *A History of Engineering and Science in the Bell System -- National Service in War and Peace (1925-1975)* (Bell Telephone Laboratories, Inc., 1978), 360.

<sup>50</sup> Carlson and Lyon, 28.

<sup>51</sup> Moeller, 10.

<sup>52</sup> Barnard, 15.

<sup>53</sup> Fagen, 370.

<sup>54</sup> Ibid, 371.

<sup>55</sup> Mary T. Cagle, *Historical Monograph: Development, Production, and Deployment of the Nike Ajax Missile System, 1945-1959* (Redstone Arsenal, Alabama: U.S. Army Ordnance Missile Command, 30 June 1959).

<sup>56</sup> Ibid, 133.

<sup>57</sup> In 1997 these firms have merged with Boeing under a new corporate name.

<sup>58</sup> Carlson and Lyon, quoted verbatim from 28-31.

<sup>59</sup> BDM Corporation, Volume I, Section B, 29.

<sup>60</sup> Bill Guston, *The Illustrated Encyclopedia of the World's Rockets and Missiles* (London: Salamander Books, 1979).

<sup>61</sup> Ibid., and Environmental Science and Engineering, Inc., Gainesville, Florida, *Historical Overview of the Nike Missile System* (Aberdeen Proving Ground, MD: U.S. Army Toxic and Hazardous Materials Agency, December 1984).

<sup>62</sup> The Antiaircraft Artillery and Guided Missile School, *Introduction to the Nike I System (ST44-161-1)* (Fort Bliss, Texas: U.S. Army, April 1956), 66-67.

<sup>63</sup> Environmental Science and Engineering, Inc., 5-5.

<sup>64</sup> A liquid rocket fuel and a liquid oxidant which do not automatically ignite when mixed, and require a separate source of ignition, such as in the Nike Ajax, are technically termed "monergolic." A rocket fuel and an oxidant which ignite spontaneously when mixed, and thus do not require a separate source of ignition, are termed "hypergolic." Hydrazine and red fuming nitric acid constitute a hypergolic rocket fuel and oxidant which burst spontaneously and explosively into flame when mixed. Thanks to Gordon Chappell for this information.

<sup>65</sup> Fagen, 462.

<sup>66</sup> Cagle, *Historical Monograph*, 80.

<sup>67</sup> *Star Presidian*, Apr. 10, 1953.

<sup>68</sup> Morgan, Mark.

<sup>69</sup> *San Francisco Chronicle*, Jul. 7, 1954.

<sup>70</sup> *Star Presidian*, Oct. 22, 1954.

<sup>71</sup> Interview with Capt. Henry E. Paine, US Army (Ret.), 13 January 1998.

<sup>72</sup> Letter, William E. Hunt, CSM, US Army, (Ret.) to Col. Milton Halsey, US Army (Ret.), December 1996, concerning Nike-related activities of 359th Engineer Detachment (Utility) during the period 1952-1956.

<sup>73</sup> Photograph, "Major General Hobart Hewett asks about the NIKE from Lt. Colonel Burket, Commanding Officer of the 9th AAA Missile Bn and element of the 30th AAA Group commanded by Colonel P.H. Wallaston," US Army photograph, 28 October 1954, Henry E. Paine Collection, PARC, GOGA, San Francisco, CA.

<sup>74</sup> Ibid, Feb. 11, 1955

<sup>75</sup> Ibid, June 24, 1955. The 536th may actually be the 436th. Further research will be necessary to establish the accuracy of the quotation.



- <sup>76</sup> 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, CA: Fort MacArthur Military Press, 1996), 132.
- <sup>77</sup> *Star Presidian*, May 18, 1957.
- <sup>78</sup> *Ibid.*, Oct. 4, 1957.
- <sup>79</sup> Morgan and Berhow, 32.
- <sup>80</sup> *Star Presidian*, Sep. 12, 1958.
- <sup>81</sup> *Star Presidian*, Sep. 5, 1958.
- <sup>82</sup> Morgan and Berhow, 32.
- <sup>83</sup> Mark Morgan provides information that the last Nike Ajax missile were released from alert on Nov. 18, 1964.
- <sup>84</sup> "Nike-Ajax, Now 'Senile' Missile, Institutionalized," *The Pentagon News*, 12 November 1964, Center of Military History, D.C.
- <sup>85</sup> Carlson and Lyon, 31-32
- <sup>86</sup> Moller, 18.
- <sup>87</sup> Gunston.
- <sup>88</sup> *Ibid.*
- <sup>89</sup> Fagen, 388.
- <sup>90</sup> Carlson and Lyon, 32.
- <sup>91</sup> *Star Presidian*, Sep. 12, 1958.
- <sup>92</sup> *Ibid.*, Sep. 26, 1958.
- <sup>93</sup> Captains, of course, do not generally command battalions. Perhaps the *Chronicle* mis-identified the battery commanding officer.
- <sup>94</sup> *Chronicle*, Oct. 20, 1958 and Jan. 21, 1959.
- <sup>95</sup> United States Army Missile and Munitions Center and School, *Nike Missile System Orientation* (Redstone Arsenal, Alabama: United States Army Missile and Munitions Center and School, Rev. February 1976), 4.
- <sup>96</sup> Cole, 255.
- <sup>97</sup> Gunston; and United States Army Missile and Munitions Center and School, 4.
- <sup>98</sup> Gunston.
- <sup>99</sup> Carlson and Lyon, 32-34.
- <sup>100</sup> Moeller, 18.
- <sup>101</sup> Michael R. Beschloss, *The Crisis Years, Kennedy and Khrushchev, 1960-1963* (New York, Edward Burlingame Books, 1991), 701.
- <sup>102</sup> *Star Presidian*, Aug. 30, 1963.
- <sup>103</sup> *Ibid.*, add date here
- <sup>104</sup> *Ibid.*, Dec. 11, 1964.
- <sup>105</sup> Martin Walker, *The Cold War: A History* (New York, Henry Holt and Company, 1993), 184.
- <sup>106</sup> Moeller, 8.
- <sup>107</sup> *Chronicle*, Feb. 24, 1960.
- <sup>108</sup> Carlson and Lyon, 69.
- <sup>109</sup> Moeller, 8.
- <sup>110</sup> Morgan and Berhow, 127.
- <sup>111</sup> Cole, 242.
- <sup>112</sup> Carlson and Lyon, 70.
- <sup>113</sup> "Facts: The United States Army and The U.S. Army Air Defense Command," n.d.
- <sup>114</sup> *Ibid.*, 18
- <sup>115</sup> *Ibid.*, 17.
- <sup>116</sup> *Ibid.*, 8.
- <sup>117</sup> Carlson and Lyon, 70.
- <sup>118</sup> Maley, Bridget, and Corbett, Michael, for Dames and Moore, Inc., "Historic American Buildings Survey, Mill Valley Air Force Station," HABS No. CA-2615, (May, 1995), 8. Note that this report, citing a pamphlet entitled *Ever Watchful: 666 Radar Squadron* (Mill Valley Air Force Station, CA. 1975), states that the AADCP for the 40<sup>th</sup> Artillery Brigade did not come to the MVAFS until September, 1962.
- <sup>119</sup> *Star Presidian*, May 29, 1964.
- <sup>120</sup> Brochure issued for 29 January 1958 presentation to Lieutenant Colonel Adam J. Eisenhower, by the 32nd Antiaircraft Artillery Brigade, U.S. Army, stationed in West Germany, in the files of the Center of Military History Washington, D.C.

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- <sup>121</sup> Carlson and Lyon, 70.
- <sup>122</sup> Ibid., 70.
- <sup>123</sup> Ibid., 70.
- <sup>124</sup> Ibid., 11-24.
- <sup>125</sup> United States Army film, *The Nike-Hercules Story*, produced by Herbert Kerkow, Inc., New York, presented by Bell Telephone Co., n.d.
- <sup>126</sup> Carlson and Lyon, 70-71.
- <sup>127</sup> Cole, 251.
- <sup>128</sup> Carlson and Lyon, 71-72.
- <sup>129</sup> *Introduction to Nike I System (ST 44-161-1)* 57
- <sup>130</sup> *Battery Control Circuits and AG Transmission Circuits (ST 44-161-3G)*, 8-9, 24.
- <sup>131</sup> Carlson and Lyon, 73-74.
- <sup>132</sup> *Star Presidian*, Mar. 18, 1960.
- <sup>133</sup> Most Army sentry dogs, however, were donated, not purchased.
- <sup>134</sup> Ibid., Mar. 27, 1959.
- <sup>135</sup> Ray Murray, oral history interview dated Jul. 8, 1993 (Park Archives and Records Center, Golden Gate National Recreation Area), 13.
- <sup>136</sup> Barnard, 184-5.
- <sup>137</sup> Carlson and Lyon, 74.
- <sup>138</sup> Ibid., 74.
- <sup>139</sup> Ibid., 74.
- <sup>140</sup> "40th Artillery Brigade (Air Defense): A Missile Shield for the Bay Area" (publication data unkn.)
- <sup>141</sup> Ibid., Oct. 11, 1957.
- <sup>142</sup> *Star Presidian*, Feb. 15, 1957.
- <sup>143</sup> Also described as "more of an explosion than a firing." Personal conversation, Milton B. Halsey, Jr. (Col., USA, ret.) personal conversation, Jan. 27, 1998.
- <sup>144</sup> Carlson and Lyon, 74.
- <sup>145</sup> Cole, 254.
- <sup>146</sup> Carlson and Lyon, 75.
- <sup>147</sup> *Star Presidian*, Oct. 18, 1957.
- <sup>148</sup> Ibid., Nov. 1, 1957.
- <sup>149</sup> Carlson and Lyon, 75.
- <sup>150</sup> *Star Presidian*, Oct. 11, 1957.
- <sup>151</sup> James. W. Dunn, Historian, Fort Belvoir, VA, interviewed by Christina M. Carlson. Mr. Dunn was a 2nd Lieutenant at a Nike site in Los Angeles, CA.
- <sup>152</sup> Carlson and Lyon, 76.
- <sup>153</sup> Barnard, 171-2.
- <sup>154</sup> Carlson and Lyon, 77.
- <sup>155</sup> *Star Presidian*, Oct. 18, 1957.
- <sup>156</sup> Ibid., Nov. 15, 1957 and Jan. 31, 1958.
- <sup>157</sup> Cole, 254.
- <sup>158</sup> Carlson and Lyon, 77.
- <sup>159</sup> *Star Presidian*, Jun. 8, 1962.
- <sup>160</sup> Ibid.
- <sup>161</sup> Yanarella, 60, 99.
- <sup>162</sup> Fagen, 395.
- <sup>163</sup> Carlson and Lyon, 36-37.
- <sup>164</sup> Morgan and Berhow, op. cit., 132.
- <sup>165</sup> Walker, 204.
- <sup>166</sup> Moeller, 20.
- <sup>167</sup> Ibid., 27
- <sup>168</sup> Ibid, 29.
- <sup>169</sup> Ibid, 29.
- <sup>170</sup> "United States Army Command Information Unit, ReleaseNumber 4," Feb. 4, 1974.
- <sup>171</sup> *San Francisco Chronicle*, Feb.2, 1974

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<sup>172</sup> Schaffel, 272.

<sup>173</sup> Ibid, 274.

<sup>174</sup> Center for Air Force History, *Coming in from the Cold: Military Heritage in the Cold War*, (Washington, DC, Center for Air Force History, 1994), 88; and Milton B. Halsey, Jr. (Col., USA, ret.) personal conversation, Jan. 27, 1998.

<sup>175</sup> Interview, Col. John Kern, US Army (Ret.). Kern served as 'Liaison for National Park Service" and "Coordinator, Golden Gate National Recreation Area" for Sixth US Army following legislation of Golden Gate NRA.

<sup>176</sup> "Memorandum For the Record, Subject: Operations Concise/Outline of Real Estate Actions, Presidio of San Francisco," 25 February 1974, Fran M. Roberts, Chief, Real Estate Branch, ADPWE-6, Box 1, Folder 3, PARC, GOGA, San Francisco, CA.

<sup>177</sup> Interview, Kern.

<sup>178</sup> Interview, William Whalen, 1992.

<sup>179</sup> "Memorandum For Record, Subject: Status of Disposition of Deactivated NIKE Sites in San Francisco Defense Area," 16 August 1974, Fran M. Roberts, Chief, Real Estate Branch, ADPWE-6, Box 1, Folder 3, PARC, GOGA, San Francisco, CA.

<sup>180</sup> Memorandum, "This "Discontinuance of Army Use and Release of Real Property to the Golden Gate National Recreation Area," Commander, Sixth US Army to Superintendent, GOGA, 6 February 1976, ADPWE-6, Box 4, File 349, PARC, GOGA, San Francisco, CA

<sup>181</sup> Schaffel, op. cit., 274.

<sup>182</sup> Michael R. Beschloss, *The Crisis Years, Kennedy and Khrushchev, 1960-1963* (New York, Edward Burlingame Books, 1991), 701.

<sup>183</sup> Moller, 33.

## Nike Site SF-88L Interim History & Preservation Plan

### Part II. PHYSICAL DEVELOPMENT OF NIKE SITE SF-88

#### A. Overall Site Development

##### *1. Mobile AAA Gun Position, Site No. 81, Fort Barry*

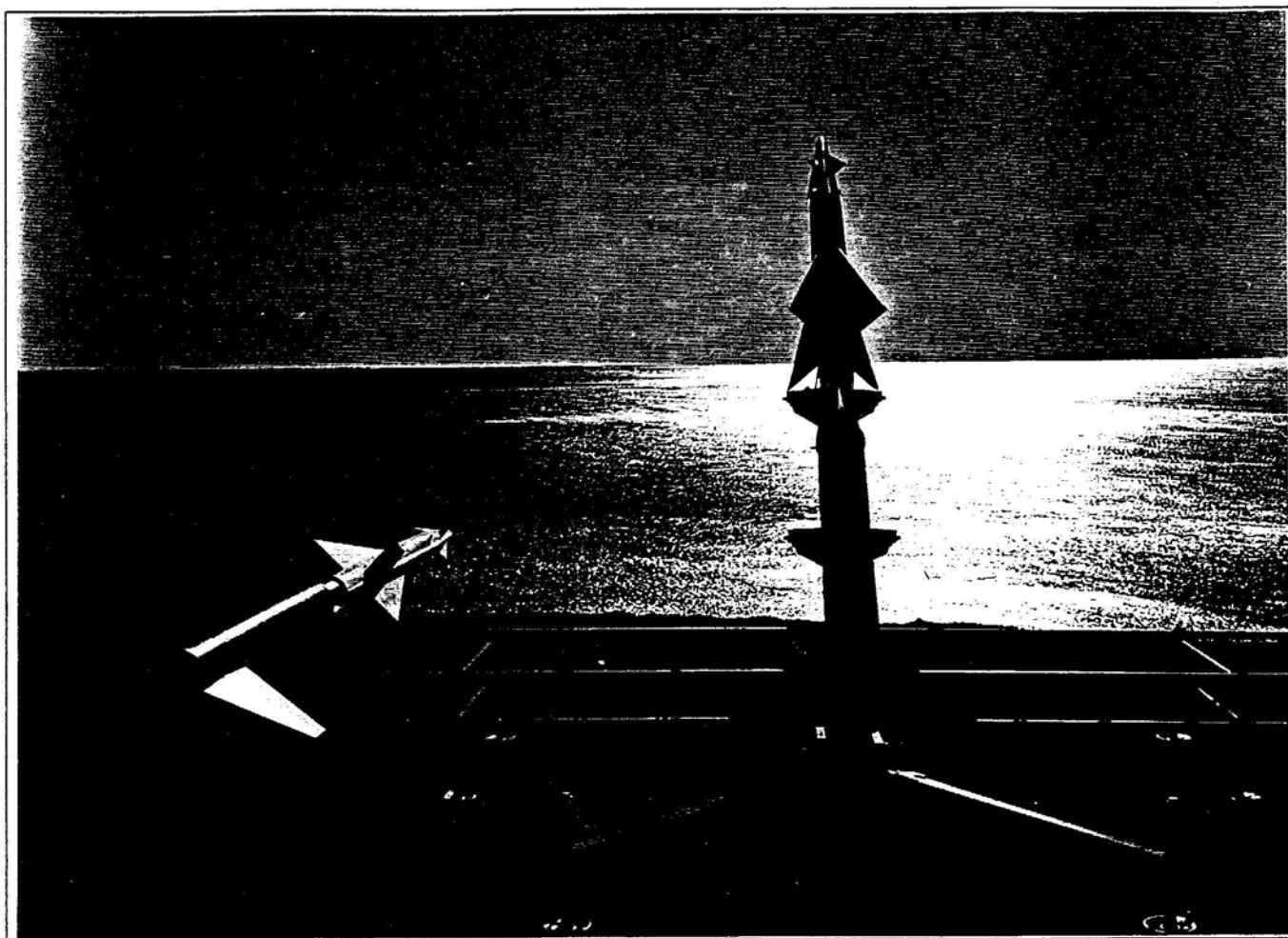
As described in the preceding portion of this report, Nike missile sites were not part of a totally new, independent weapons system. Instead, they were another step in the continuing evolution of the Army's classic mission of air defense, a role dating back to the First World War.

Beginning around 1951, Antiaircraft Artillery (AAA) Gun Battalions began manning 40mm, 75mm, 90mm, and 120mm guns at various semi-permanent sites around San Francisco Bay. These batteries existed through the late 1950s and generally consisted of four radar-directed guns, two radars, their accompanying gun director and computer vans, ammunition magazines, repair and maintenance areas, and a barracks compound.

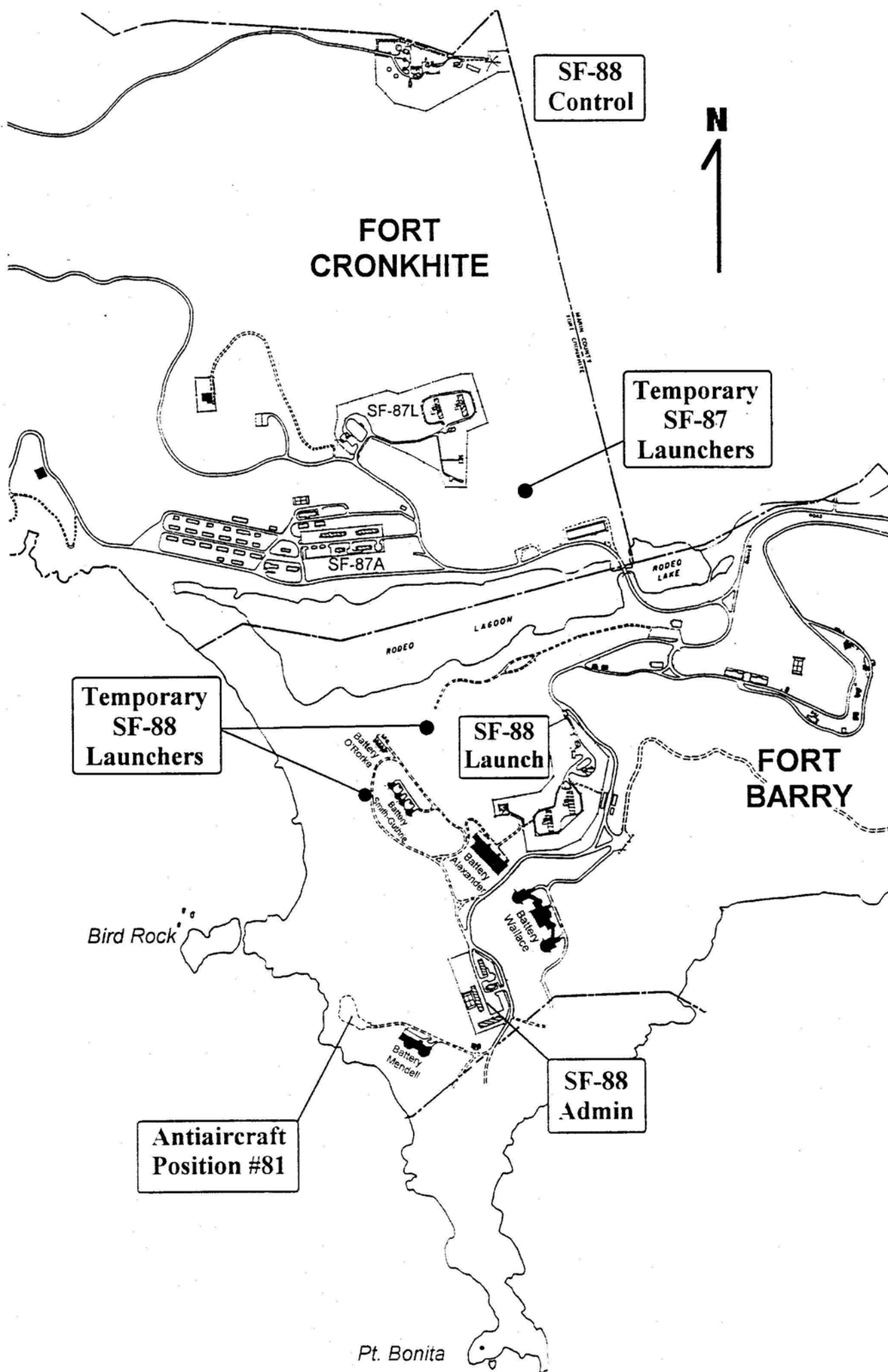
The gun sites included "Olympic" in Daly City near today's Palo Mar Riding Stables; "Fort Funston" next to Fleishacker Pool; "Fort Scott" at Robb Hill in the Presidio; "Golden Gate" in Golden Gate Park behind the Beach Chalet; "Point Richmond;" "Ring Mountain" on the Tiburon Peninsula; "Hunters Point;" "Point San Bruno" north of the International Airport; "Wolf Ridge" at Fort Cronkhite; "Bay Farm Island" in San Leandro; "Emeryville;" and "Fort Barry" at today's Bird Rock Overlook.<sup>1</sup>

The Fort Barry AAA gun site can be considered the geographical (if not lineal) ancestor of Nike Site SF-88. First manned by "A" Battery of the 718th AAA Gun Battalion in early 1952, this site was officially designated "Position No. 81" in the San Francisco Defense Area Plans.<sup>2</sup> Like most antiaircraft batteries of this era, the Fort Barry site was basically a field position consisting of four 90mm radar-directed guns surrounded by circular earthen revetments. Nearby were the associated radar screens and director vans, magazine spaces, a maintenance area, and a crew cantonment.

Unlike many AAA sites, though, where everything had to be constructed on site, Position No. 81 benefited from an abundance of nearby buildings, especially the obsolete coast artillery fortification known as Battery Mendell (built 1905). The new site's personnel quickly adapted the old battery and other structures to serve their purposes. A central ammunition storage magazine was set up within Mendell, and two adjacent "Base End Stations" dating from 1940 became ready ammunition bunkers. The antiaircraft battery's command post and the M-33 radar/gun director vans were set up on top of Mendell's parapets, while the gun computer itself was located inside one of the old fortification's underground rooms. A double row of barbed wire entanglements surrounded the



Nike-Ajax "Launching Group No. 1" in its temporary location just west of Battery Smith-Guthrie, Fort Barry. U.S. Army Photograph . March 15, 1955. (*Golden Gate National Recreation Area, TASC Collection*)





antiaircraft gun positions, radars and service magazines, and Battery Mendell. Access to the area was via a single entry gate with guard post near the Pt. Bonita Coast Guard housing area. An adjacent cantonment of 1941 Mobilization Buildings served as the battery's headquarters, barracks and repair/maintenance areas. (These same buildings would later be used until 1965 as quarters for personnel assigned to Nike Site SF-88.)<sup>3</sup>

The antiaircraft battery at Bird Rock remained in service until well after the first Nike Ajax were emplaced, although the units manning the guns changed. On 6 May 1953, Battery A of the 718th AAA was redesignated Battery A of the 740th, and in spring 1954 Battery B of the 752nd AAA Gun Bn took control of the site when "A" of the 740th moved to Nike Site SF-59 at Fort Funston.<sup>4</sup> Although no inactivation date for the antiaircraft gun battery has been found, the weapons at Position No. 81 remained in place at least through early 1956.<sup>5</sup>

## *2. Temporary Field Deployment*

In FY1953 the first recommendations for permanent Nike launch sites in the San Francisco Defense Area appear in "Estimate of Construction Program as of 30 June 1953." This nationwide program for Nike I construction reveals that work was anticipated to start by early 1954 on three sites around San Francisco, with completion dates no later than September 1954. Until construction could be completed (a task that would take nearly two years), the report called for installing Nikes in field emplacements with the first such temporary site to be completed by March 1954. Unfortunately, the report does not indicate which three sites in the Bay area are being planned for. However, it does specify that one of the temporary sites would be operated by the 9th AAA Battalion, the same unit that would eventually man SF-88.<sup>6</sup>

Beginning in 1952, responsibility for providing support to the existing antiaircraft gun battalions was given to the 359th Engineer Detachment (Utility), headquartered at the Presidio of San Francisco. Once the locations for temporary Nike batteries were chosen, the 359th undertook the construction of these field positions too. Many of the AA gun sites and temporary Nike sites were totally unimproved, so the Engineers had to bring in sewage and electrical service in addition to constructing temporary buildings and missile launchers.<sup>7</sup>

In the Marin Headlands, site work involved using bulldozers to scrape level launcher sites out of the rolling hillsides. By January 1954 the Engineers had begun work on a series of square earth revetments for the Nikes, just north of warehouse Bldg. 1111 in eastern Fort Cronkhite.<sup>8</sup> This was the first physical indication of Nike presence in the Headlands.

Although the authors did not have the opportunity to research the construction history of Site SF-88 in Army records, a detailed account of the site's planning, temporary field configuration and permanent site construction can be gained by searching through the former Presidio Engineer files. In addition, interviews with Army veterans and examination of historic photographs provide additional information on the site's history.

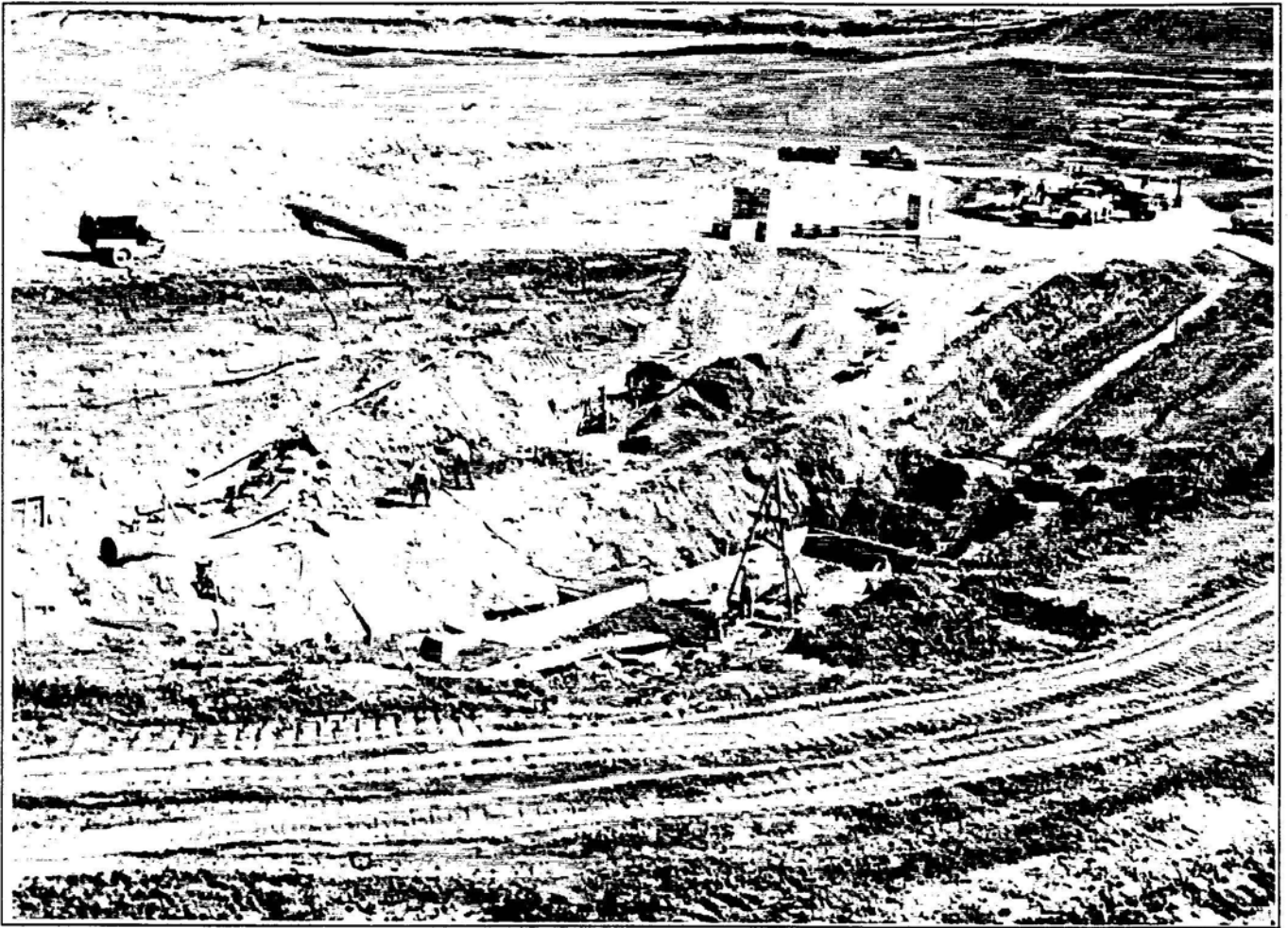
By spring of 1953, three locations in the vicinity of Battery Smith-Guthrie at Fort Barry were being evaluated as sites for temporary Nike emplacements. Each of these three proposed sites, or "launching groups," would consist of four launchers arranged either in a box formation or in-line emplacements.<sup>9</sup> By January 1954 these preliminary plans had been refined to show two launching groups, each consisting of four launchers in a box form and enclosed by rectangular earthen berms. These plans are also the first to use the site's official designation: "San Francisco Defense Area, Project SAM, SF-88-C&L."<sup>10</sup>

However, it is believed that neither of these two launch groups was constructed as shown. Instead, the completed field sites at Fort Barry comprised only two groups, one consisting of four launchers and the other of two launchers. The battery's "control" area with its radars and computer vans was sited on top of Wolf Ridge in Fort Cronkhite.<sup>11</sup> The larger section, designated Launching Group #1, was constructed directly in front of Battery Smith-Guthrie and consisted of four launchers arranged in an in-line configuration. Each launcher was separated from its neighbor by simple earthen berms or "traverses." The smaller section, located at the foot of the valley directly behind Battery O'Rourke, consisted of two launchers separated by a double set of traverses.<sup>12</sup> Its designation was Launching Group #2. The traverse berms and the access roads constructed for both of these sections are still visible today.<sup>13</sup>

The first of the temporary Nike batteries in the San Francisco Defense Area was completed by mid-1954, and in October the Army released photographs showing Nike I missiles and launchers assigned to the 30th AAA Group. These views of temporary field emplacements, shot by Army photographers with an eye for security, were generally taken from angles revealing little of the surrounding geography. The photos show missiles sitting on bare ground within simple earthen revetments, each launcher assembly consisting of the missile launcher proper flanked by two storage rail "racks" for reload missiles. No support structures are visible anywhere in the vicinity. The intentionally-vague captions on the photographs indicate only that these Nikes were newly emplaced, but offer little clue as to the missiles' location.<sup>14</sup> However, a general familiarity with the Headland's terrain reveals that these first launchers were the ones constructed at Fort Cronkhite between warehouse Bldg. 1111 and the future site SF-87L. In this location, the four launchers and revetments in their box configuration were invisible from many viewing directions. (These revetments can still be found today, although the site is heavily overgrown.)<sup>15</sup>

The early days of Nike deployment were documented in a 1972 *ARGUS* magazine article relating the careers of two veteran warrant officers of the 6th Region:

[Warrant Officers] Zempel and Thompson vividly recall the early days when Antiaircraft Artillery guns were going out and Air Defense Artillery missiles were coming in. Ajax launcher rails were above ground at first — no pits and no elevators. Liquid propellants were used in Ajax missiles and crewmen wore heavy and cumbersome acid-proof protective outfits and were hosed down after each fueling operation. Early Ajax fueling and war-heading areas were separated and isolated by berms — crude parapets



Initial construction of the base slab for "A" Section magazine, September 2, 1954.  
(*Golden Gate National Recreation Area, DOD Still Media Records Center Collection*)

constructed by piled up sand-filled 55 gallon drums. Dirt lanes connected the battery components. There were no neat, hard-top roads and no landscaped and planted sites in the early days.<sup>16</sup>

On 1 October 1954, Battery A of the 9th AAA officially became a Nike-I equipped battery. The first commander of Battery A was Captain Henry Paine who had recently completed an in-depth training at Fort Bliss as part of "Nike Package 14," a specially-selected group of officers, warrant and enlisted men chosen to operate the new missile site at Fort Barry. Paine and the men of the battery A shortly began drawing their new missiles.<sup>17</sup> At the same time, the 359th Engineer Detachment began constructing field positions near the location of the future, permanent launch site.<sup>18</sup> The first SF-88L "Temporary" emplacements were complete and ready for inspection by 28 October 1954. A Sixth Army photograph taken that date shows Capt. Paine and a group of dignitaries inspecting a Nike I in a freshly-excavated field emplacement. The topography indicates the missile was located in Launching Group #2 near Rodeo Lagoon<sup>19</sup>

In March 1955 the Army released two photographs showing Nike Is at Launching Group #1 in front of Battery Smith-Guthrie. The views show the same spartan arrangement of launchers and storage racks as at Fort Cronkhite, except the SF-88L missiles had no surrounding revetments. Instead, the missiles sat in an in-line formation and were totally open to view with only small earth traverses separating the launchers. (In one shot, the photographer made artistic use of this exposed location, artfully arranging a sunset to silhouette the missiles.) This time, the photo captions specifically gave the launcher's location as Fort Barry, California.<sup>20</sup>

The control site atop Wolf Ridge went into operation simultaneously with completion of the field launcher emplacements. There, the three radars were arrayed in a north-south line across the summit of the ridge, facing west towards the probable avenue of approach of enemy aircraft. In this arrangement, the acquisition radar (later known as LOPAR) sat in the intersection of a "T"-configured line, flanked by the target tracking radar (TTR) to the north and the missile tracking radar (MTR) to the south. In the rear of the three radars sat a battery control van, a radar control van and a spare parts van, that together formed the center leg of the T. This arrangement conformed as much as possible to US Army Air Defense standard plans for battery control areas.<sup>21</sup>

During this period, the Army apparently adapted other structures around the Marin Headlands to service the Nikes in their field positions. Plans dated 20 June 1953 show the 1920-vintage Balloon hangar at Fort Barry being converted into an "Armament Shop."<sup>22</sup> Another, undated set of plans shows the same hangar after the conversion into an assembly, test and storage area for Nike missiles, its interior filled with radio frequency and electrical test sets, propulsion pumping testers, and acid and fuel servicing areas. The hangar also contained workshops, a latrine, and storage space for a dozen Nike Ajax body sections on their missile dollies.<sup>23</sup>

This adaptation of the balloon hangar was a continuation of the Army's practice of re-using existing structures around the Headlands and updating them for more current needs. Other buildings around Forts Barry and Cronkhite also appear to have briefly contained Nike-related activities. Numerous rooms within Battery Wallace, for example, bear stenciled signs indicating their TNT capacities and other storage uses,<sup>24</sup> while other spaces within the battery may have once been used for storing nitric acid.<sup>25</sup> Inside Battery Townsley at Fort Cronkhite are two more surviving antiaircraft-related graffiti: a chalked notation reading simply "9th AAA" and a wonderful drawing of an Oozlefinch — the mythical mascot of air defense artillerymen — captioned "Nike Missiles Rule Sausalito!"<sup>26</sup> Additional research may yield more information about Nike-related uses of these buildings.

### *3. Planning and Construction of SF-88L*

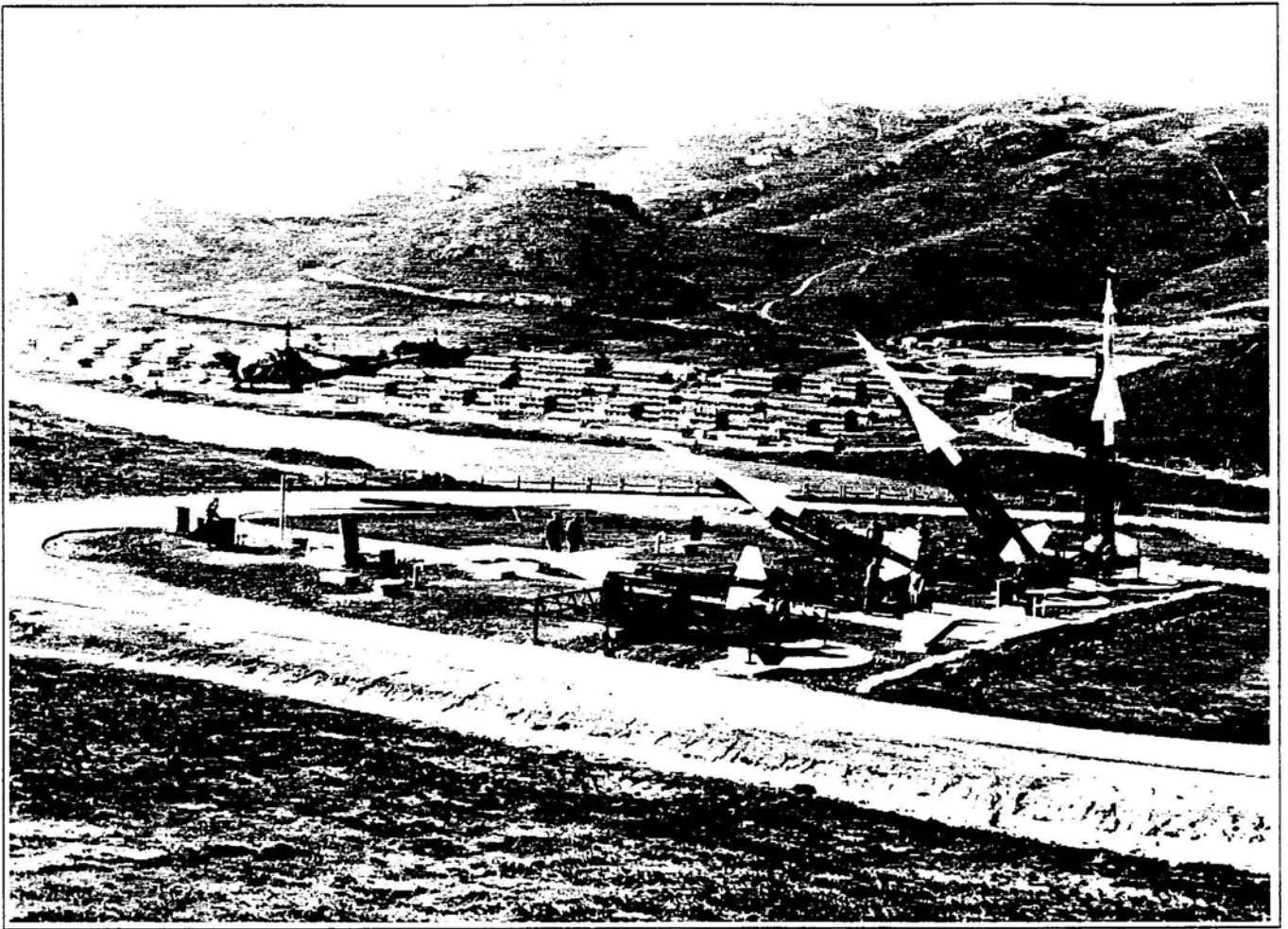
At the same time that the field emplacements were being finished, planning for the permanent launching facility at SF-88L was also underway. By summer of 1953, standard Engineer plans were being prepared for permanent buildings at the site. The earliest of these, dated 2 July 1953, tellingly shows fence and gate details for the launcher and control areas.<sup>27</sup> Over the next few months, plans appeared for a generator building, an acid storage building with attached shower, and "Type B" underground missile storage structures.

A December 1953 drawing of Forts Barry and Cronkhite shows for the first time the proposed launching area in its eventual location. (The control area is also shown atop Wolf Ridge in Fort Cronkhite, at the same location as the already-existing radar site that controlled the field positions.) The exact configuration of the permanent launching area was still undecided, though, since this plan shows six launcher sections arranged within a box-like configuration.<sup>28</sup>

Less than three months later, a revised plan showed the launching area arranged in something closer to its eventual configuration. In this version only three launch sections were proposed, arranged in a roughly east-west line directly behind Battery Alexander. A few hundred feet north of the launchers sat the fueling areas and the generator and missile assembly buildings. Oddly, the site's launch control trailer (LCT), then known as "control van," is shown more than a hundred yards northwest of the launchers near the temporary Launching Group #2. Although this plan shows the permanent site reduced to only three launchers, it still included positions for three additional "Future Launchers" immediately north of the permanent site.<sup>29</sup>

The final arrangement for the SF-88L launching area was agreed upon sometime in the spring of 1954, as evidenced by a drawing that bears a large, scrawled "X" across the westernmost of the three proposed launchers with the accompanying notation "See Revised Map 5-3-54 & 5-13-54."<sup>30</sup> Had this third launcher been included in the final project, it would have been located between today's B Section and Battery Alexander's old mortar pits.



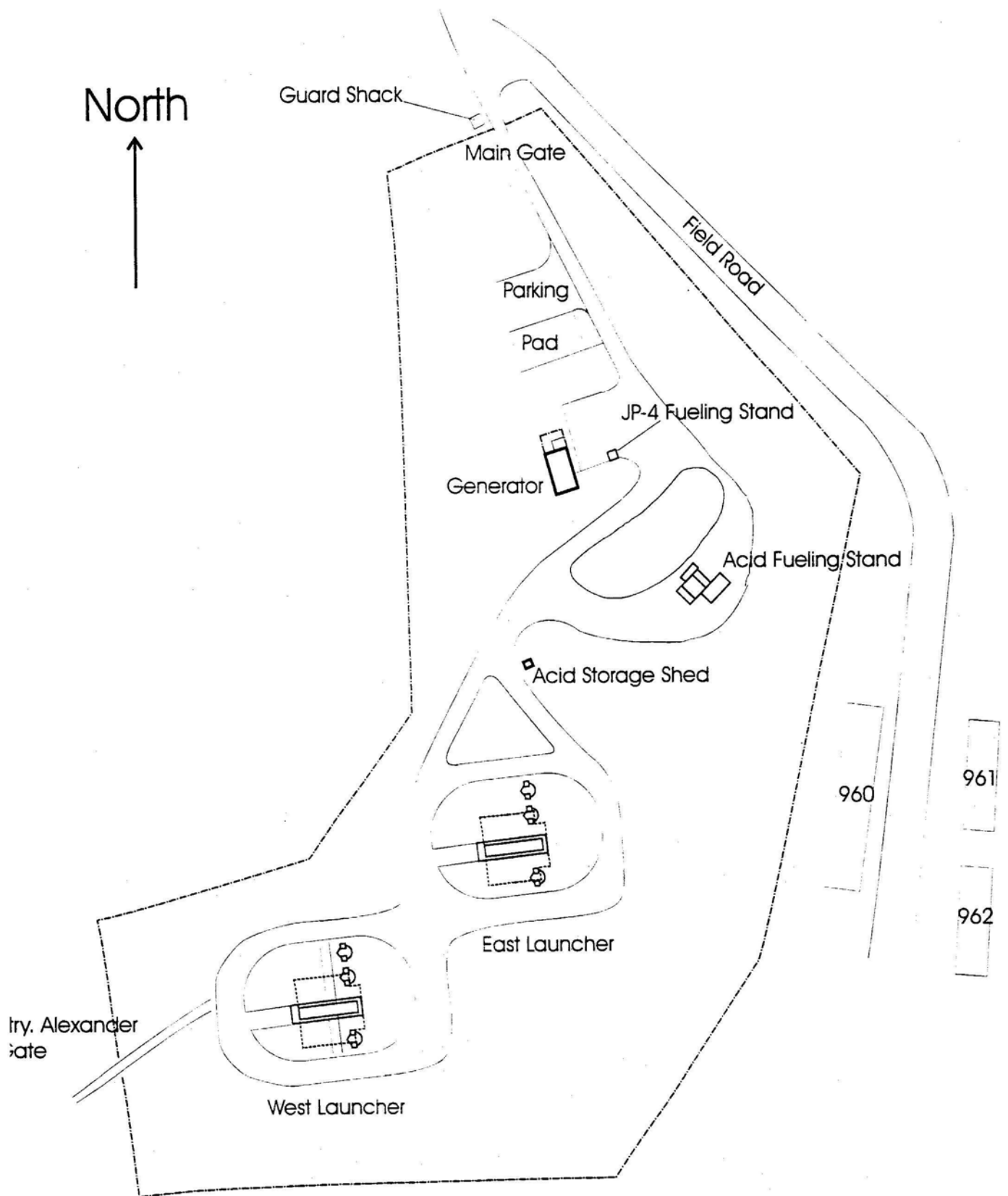


Helicopter taking off from the west launcher section, circa 1956. Note the use of white-painted concrete sandbags as decorative road curbing, and the general lack of pavement except for the semi-circular concrete blast deflectors under the Nike-Ajax missiles.  
(*Golden Gate National Recreation Area, Henry E. Paine Collection*)





The original generator shed at SF-88L. This sheet metal structure was demolished in 1965 and replaced with the present generator building. U.S. Army photograph, 1961.  
*(Golden Gate National Recreation Area, DOD Still Media Records Center Collection)*



Nike Site SF-88L  
June 1956

Figure No. 1

Across the valley at Fort Cronkhite, an identical evolutionary process took place during the planning for Site SF-87L. There, initial plans also called for constructing six launcher sections.<sup>31</sup> Eventually this number was reduced to three sections with locations for three "future launchers," then to a final arrangement of only two sections.<sup>32</sup> The reasons for reducing the number of launcher sections at both SF-87L and SF-88L are unclear, but it is probable that the topography of the Headlands was a limiting factor. Also, since the theory of deploying Nikes was still evolving, the Army may have also decided that placing a dozen sections within a half mile of each other was a bad tactical arrangement.

The site finally chosen for SF-88L was a tapering valley (actually, an oversized drainage ravine) in the rear of Battery Alexander and bordered on the east and south by Field Road. A detailed topographic survey of the future launching area was made in January 1954 preparatory to construction, and revealed a sloping area with elevations ranging from 118 feet to 170 feet above sea level. A mean reference height of 147 feet was decided upon for the site. The permanent reference point chosen was the top edge of the concrete curbing at the future elevator doors.

During the course of grading as much as 18 feet of earth was cut away in some locations. Correspondingly, the 'down slope' areas below the launchers were built up as much as 16 feet. All slopes on the newly-created hillsides surrounding the launchers would be kept at a grade not-to-exceed 1:2. Because the area was a natural drainage ravine, extra precautions had to be taken to divert runoff away from the launchers and magazines. An elaborate system of culverts, gutters, headwalls, drop boxes, and drain pipes was specified.<sup>33</sup>

Construction of permanent SF-88L began in the summer of 1954 with preliminary grading and excavations for the two subterranean concrete magazines (still referred to as "underground missile storage structures").<sup>34</sup> The work was carried out by civilian contractors and Army personnel, both under the direction of the 359th Engineer Detachment, while the overall project was managed by the San Francisco office of the Corps of Engineers.<sup>35</sup> Although no specific completion date has been found, site personnel remember that Battery A had begun moving the Ajax missiles from their field positions into the permanent underground magazines by May or June 1955.<sup>36</sup>

#### a. Ajax configuration

Nike Site SF-88L in its original configuration bore little resemblance to the site as it is preserved today. Subsequent sections of this report will go into a physical description of each part of the launch site in much greater detail, but a brief description of the launching area's appearance in 1955 may be useful.

The completed launching area initially presented a much more barren appearance than today, with the only permanent structures being the two underground missile storage magazines. Just two semi-permanent buildings stood above ground: a generator building

and an acid storage shed with attached emergency shower, both constructed of corrugated steel.<sup>37</sup> A level area had been prepared adjacent to the generator building as the future site of a "Missile Assembly and Test Building," standard plan number ME 35-60-08, but its construction had inexplicably been deferred. (Note: this proposed structure was never built. The present, prefabricated missile assembly building is a different style of structure and was not constructed until 1962.<sup>38</sup>)

A single security fence surrounded the outside perimeter of the compound with vehicle gates located at Field Road and at Battery Alexander.<sup>39</sup> The site's LCT — the communications center for the launching area — was still located outside the compound, although by this time it had been moved from the foot of the valley to a fenced-in enclosure on the site of today's Lower Fisherman's parking lot.

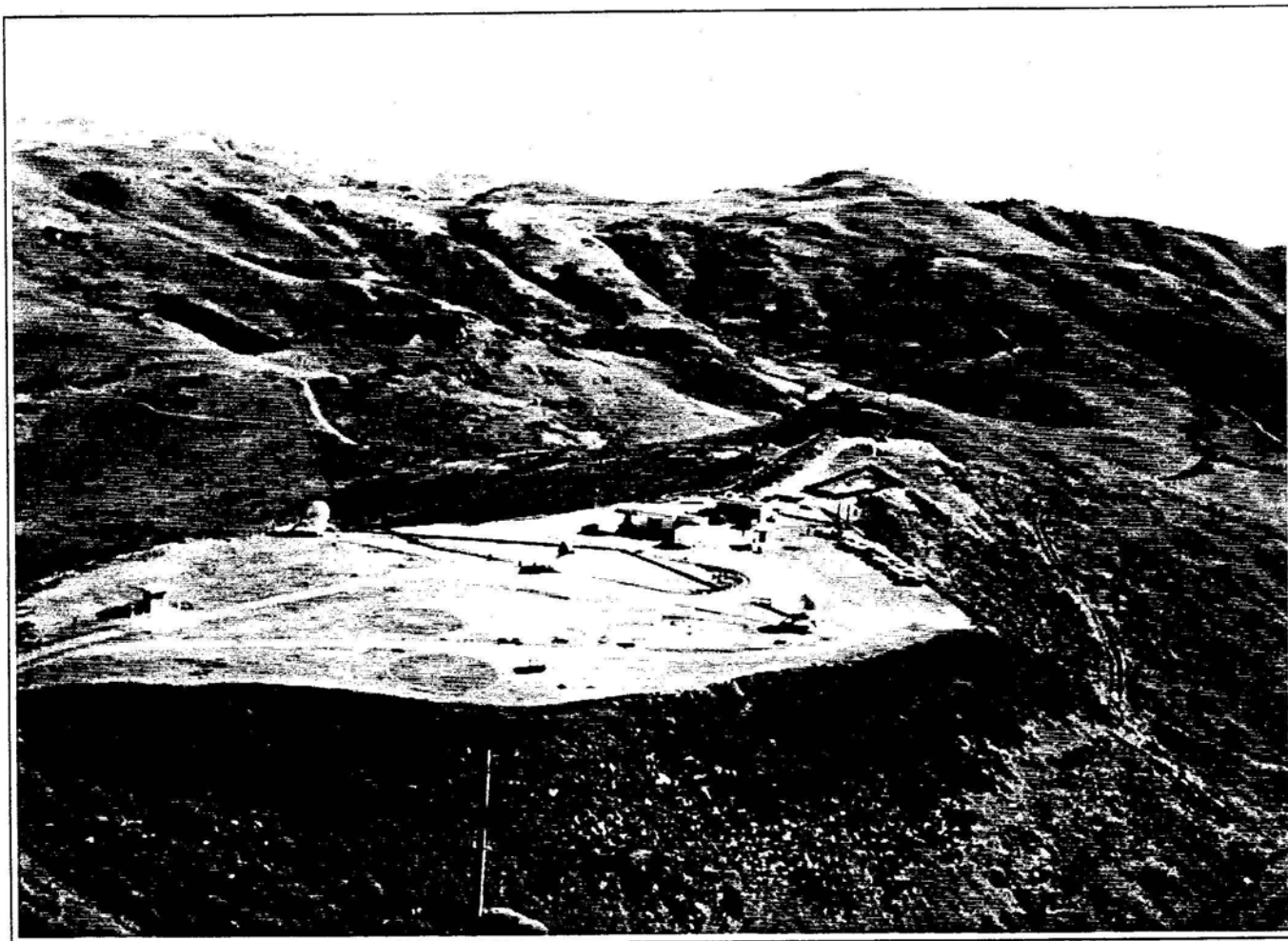
Perhaps the greatest difference between the original site and its later configurations was the layout of the missile launchers. The rectangular concrete curbs surrounding the elevator doors formed the only large areas of paving, with the rest of the surfaces composed of graded and compacted rock and gravel. Only a few small features such as ventilators, blast deflectors, shower pads and escape hatches broke this expanse of graded rock.

In an effort to landscape the site, crewmen had trimmed road edges with picket fencing and white-painted concrete sandbags presumably scavenged from 1940s anti-aircraft sites that dotted the nearby hills.<sup>40</sup> Most strikingly, instead of the fenced-in, high security "Exclusion Area" existing today, the launchers stood totally open to the rest of the compound.

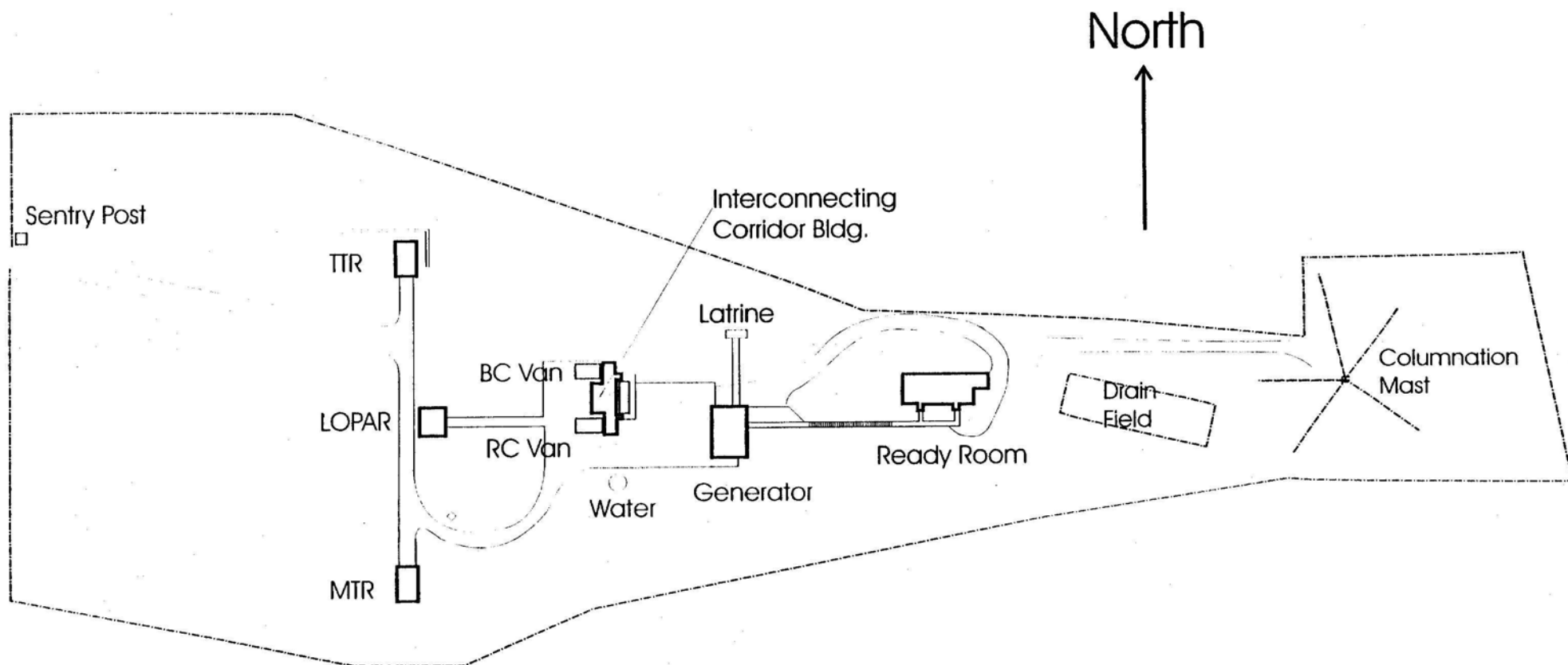
The launcher sections, originally designated "East Launcher" and "West Launcher," were also quite different from their later appearance. Each Ajax launcher sat atop a small, rectangular concrete pad while the connecting storage racks were bolted to circular concrete footings set into the crushed rock. Wedge-shaped concrete blast deflectors sat behind each above-ground launcher, designed to keep missile exhaust blast forces from tearing up the rock paving. (These above-ground launchers, it should be noted, were considered to be satellite positions while Launcher #1 was always the one on the elevator.) In this original configuration, the launch sections were grouped with two launchers to the right of each elevator and one to the left.<sup>41</sup>

Finally, these original launchers and storage racks were designed solely for handling and launching Nike Ajax missiles. They were much smaller in their dimensions and built of lighter-gauge materials than the subsequent "universal" models at the site that could handle either Ajax or Hercules missiles.

Crushed rock surrounded all the site's buildings and launchers. Road surfaces were also rock, composed of four inches of stabilized aggregate atop a base of compacted fill. The only concrete road surface was a six foot wide "missile dolly walk" extending from the



SF-88C in its original configuration, October 2, 1959, before the large HIPAR dome was installed. From left to right are the TTR, the low power acquisition radar (LOPAR), and the MTR. Behind the acquisition radar are the battery control and radar control vans, joined by a concrete connecting corridor building, and the generator building. (*Golden Gate National Recreation Area, DOD Still Media Records Center Collection*)



Nike Site SF-88C  
December 1957

Figure No. 2



proposed assembly building location to the JP fueling stand and then to the acid fueling stand.

The absence of many above-ground buildings considered essential to most Nike sites was striking. SF-88L originally contained no utility buildings, maintenance area, storage sheds, latrine, motor pool, missile assembly building or ready room. Instead, it appears the soldiers of Battery A made liberal use of adjacent coast artillery structures, much as the antiaircraft artillerymen at Position No. 81 had used the World War II buildings near Bird Rock. For example, Battery Alexander adjacent to the launcher area intermittently served a multitude of uses. For awhile its obsolete plotting room and switchboard room housed offices and workshop spaces, and the battery's bathroom served as an "improved latrine" for crewmen who preferred to hike up from the launchers where only a portable outhouse was available.<sup>42</sup> A cleared area across from the mortar pits served as a parking lot for the site's tiny motor pool. Battery Alexander's deep powder magazine also served briefly as storage space for the site's TNT warheads.<sup>43</sup> Along Field Road above the launchers, two vintage-1907 coast artillery structures were also pressed into service: Bldg. 960, a former Quartermaster warehouse that served as non-ordnance storage for the site, and Bldg. 962, an old bakery that had been converted into a crew ready building.<sup>44</sup>

Atop Wolf Ridge conditions were not much more elegant at the SF-88C control site. There, for the first three years of the site's operation, the IFC radars, vans, and generators sat atop open concrete pads connected by dirt and gravel roads. The only permanent structure on top the hill was a ready building constructed for crew comfort shortly after the site became operational.<sup>45</sup>

This simple configuration remained until 1956 when, following completion of the SF-88L launching site, the control area was also modernized with the addition of permanent roads and structures. During this upgrade several improvements such as redesigned radar pads and a generator building were made to make the entire facility more durable and livable. Also added were a water tank and a cinderblock "interconnecting corridor building" that stretched between the van bodies to provide additional work space. Aside from these structural improvements, though, no notable changes would be made to the site's radar and computer technologies for several more years.<sup>46</sup>

The IFC site was nearly two miles from the barracks area, and the drive up the switchback road could be treacherous, especially when foggy weather limited viewing conditions to a few feet at best. Only one-way traffic was permitted on the road during these conditions, and soldiers had to telephone ahead and make their intentions known before driving up or down "Hill 88."<sup>47</sup>

Within a year of completion, drainage and erosion problems at the Launching site must have become apparent. Plans were developed in 1957 for installing additional drainage channels around the launchers and for landscaping the still-barren hillsides. These erosion control measures specified planting sprigs of iceplant around much of the site on 12 inch centers, then fertilizing the areas and applying straw mulching. Some slight re-contouring

of hillsides was also proposed, along with installation of several hundred yards of asphalt drainage ditches to augment the existing runoff channels. One major addition was a 300 foot long, two foot high earthen berm that would serve as an oversized water diversion bar. Beginning near the Battery Alexander gate, this berm stretched along the top edge of the graded fill northwest of the launchers. In later years it would be extended all the way along this contour line nearly to the main gate.<sup>48</sup>

For the next three years other minor physical changes took place at SF-88L. At some time in late 1956 or early 1957, the LCT van was moved to its present location within the site on the west side of the main access road. Also in 1957, a large ready room structure was proposed for the site. This elaborate 55' x 30' cinderblock building with adjacent six-car parking lot would have been located along the east side of the access road just inside the main gate. The sixteen sheets of plans for this never-constructed structure identify it as a standard plan building designated "Nike Single Control - Launching Area - 24 EM." No work was ever begun on the complex. Instead, sometime in 1959, the existing ready room in Bldg. 962 was remodeled and a gate installed in the launching area fence to provide access for the crewmen. This wood frame building would continue to serve as the ready building until the site closed in 1974.<sup>49</sup>

A precise plan of the site prepared in February 1958 showed numerous small details around the launcher compound that had not previously been mapped: a small, four foot square sentry box on the west side of the main gate; electric cables running above ground and stretched atop wooden support brackets; a gravel road leading from the West Launcher towards Battery Alexander; the LCT labeled as a "communications van;" a gravel parking lot bordered with sandbags on the future site of the assembly building; and two sandbagged enclosures for temporary storage of gasoline and diesel fuel, each measuring about eight feet square, between the generator building and the parking lot.<sup>50</sup>

In spring of 1958, the main gate was rebuilt. This project included moving the entry gates approximately 20 feet north from their original location, adding about 50 feet of additional cyclone fencing, and constructing a small Sentry Post on the east side of the road just inside the new gates. A paint and oil storage building was also constructed north of the generator building, replacing the two sandbag-lined temporary enclosures.<sup>51</sup>

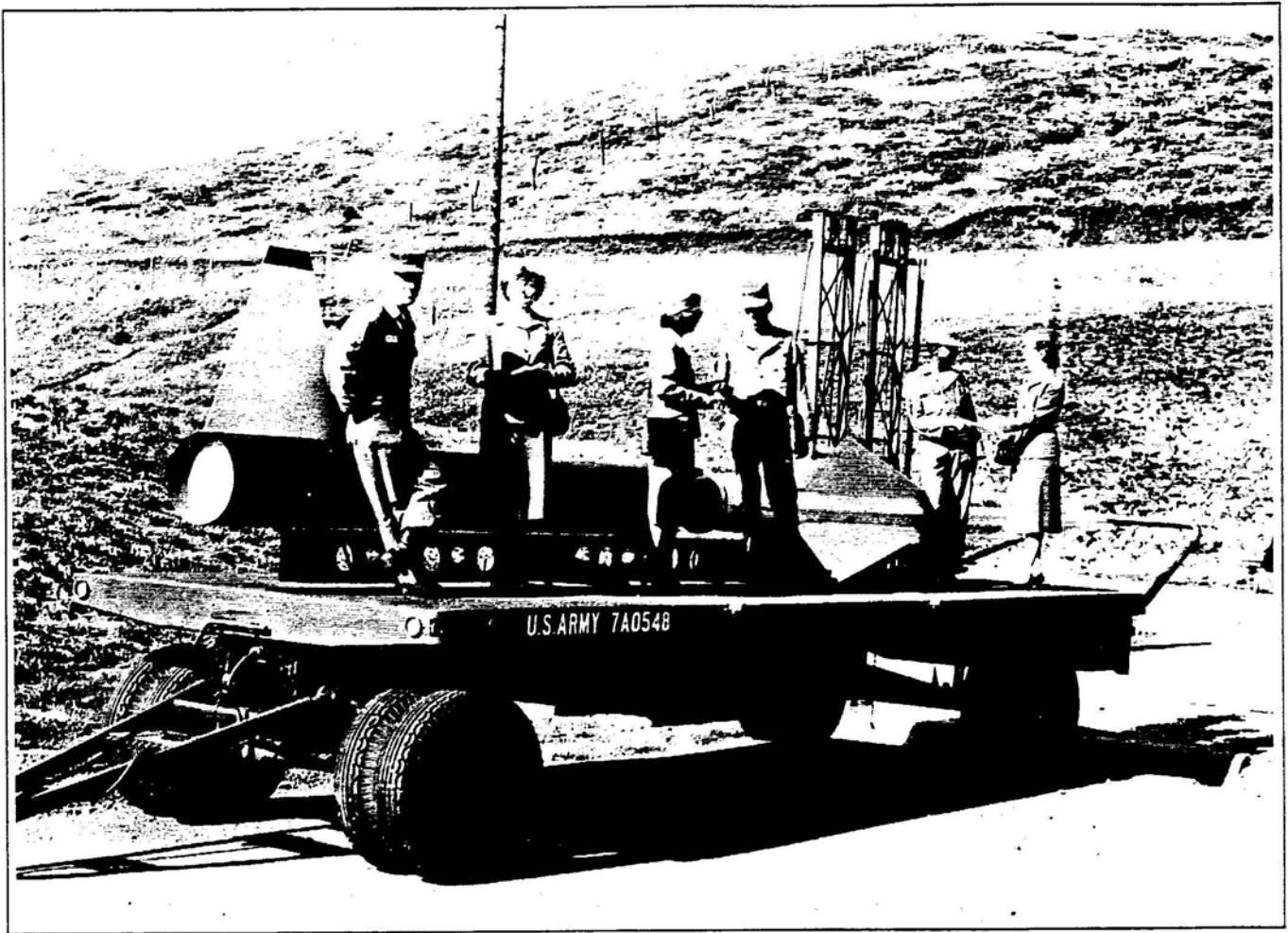
#### *b. Conversion to a Hercules site*

In 1958, work began on a total rebuild of the SF-88 launching area preparatory to the changeover to Nike Hercules missiles. Alterations planned for the site would be many and far-reaching, reflecting both the physical differences between the two weapons and the Army's security concerns surrounding the Hercules' nuclear capability.

Hercules missiles were both larger and heavier than Ajax, necessitating many physical alterations to the elevators, launchers and storage racks installed at the site. More importantly, Hercules could carry either high explosive or nuclear warheads, and both would be assembled and stored on-site. A new "Warheading Building" would be needed



Women from a Red Cross unit join soldiers receiving an orientation at SF-88L, circa 1956. The crushed rock and gravel surfaces of the original launcher area configuration are visible in this view. (*Golden Gate National Recreation Area, Henry E. Paine Collection*)



The same group of soldiers and Red Cross workers atop a Nike Ajax transport trailer, parked at the fueling area. In the background are the two fueling towers for hoisting barrels of red-fuming nitric acid and oxidizer. (*Golden Gate National Recreation Area, Henry E. Paine Collection*)

for the highly technical (and classified) assembly and installation procedures. Security also became of paramount importance. Additional security measures would appear in the form of new guard posts, sentry dogs and additional fencing.<sup>52</sup>

Some facilities at the site would also become obsolete with the introduction of Nike Hercules. The new missiles used a solid fuel propellant rather than the caustic liquid mixture that fueled Ajax, so the JP-4 and red fuming nitric acid fueling facilities became unnecessary. These were abandoned in place. Elsewhere around the site, some emergency wash showers were removed from the launchers and magazines.

The Army prepared a set of 29 sheets of plans dated 2 May 1958 that showed the scope and details of this planned work. Following are the major work items:

- Removal of all existing Ajax-pattern launchers and storage racks
- Replace launchers and storage racks with "universal" models for either Ajax or Hercules
- Demolish existing individual concrete launcher pads and blast aprons
- Construct new launcher pads that would hold all four launchers of each section
- Modifications to elevators to support increased weights and launch forces
- Modifications to locking bars beneath elevator launchers
- Miscellaneous elevator improvements such as drains, cable hangers, access panels, power unit modifications, and limit switches
- Construction of canine kennels for sentry dogs
- Installation of fencing around launchers (eventually known as "Exclusion Area")
- Construction of sentry box at launcher area gate
- Miscellaneous electrical details for site electrical service and generator building
- Additional changes and improvements to drainage around reconfigured launcher area.<sup>53</sup>

Later that same month the Army formally revealed that five sites in the San Francisco area would be converted to Nike Hercules installations. In a May 29th article headlined "5 Nike Bases In Area to Get Atom Missile," the *San Francisco Chronicle* reported that a contract had been awarded to Williams & Burroughs Construction Company of Belmont to convert the sites at a total cost of \$1,738,753. The article identified the sites as Lake Chabot, Fort Barry, Fort Cronkhite, San Rafael and Fort Funston (the latter site was never converted. Instead SF-51 at Pacifica would become a Hercules site). It was anticipated that work would require 15 months.<sup>54</sup>

Construction proceeded rapidly at SF-88L, which had been identified as the first site in the Bay Area's defenses to be armed with Nike Hercules. According to personnel stationed at the site, "A" section (formerly East Launcher) was converted first, then "B" section (formerly West Launcher) was rebuilt. The site was never out of commission at any time during the rebuild, and by the end of the conversion both launching sections were converted to Hercules configuration.<sup>55</sup>

In November the *Chronicle* reported the Army's installation of the first Hercules missiles in the Bay Area "at a hilltop site at Fort Barry, Marin county." The story went on to

describe how 27 men of Battery A, 2nd Bn, 51st Artillery would shortly be returning from Fort Bliss where they had undergone eight weeks of instruction on the new weapon.<sup>56</sup>

Work on the new warheading building lagged slightly behind the other modernization activities at the site. Located in the lee of the earth berm adjacent to the oxidizer and fueling stands, the building was designed so that Hercules missile sections could be towed in one end and out the other. To allow for this 'drive through' feature, roller doors were provided at each end of the building and additional concrete pavement was added around the warheading building and the fueling stand. (Nike crews used this large, flat area for temporary outside storage for missile and warhead shipping containers.) To make space for the new building and its access roads, a portion of the berm's southwest side had to be carved away, altering its shape from a large oval to its current 'kidney bean' form.<sup>57</sup>

According to retired Chief Warrant Officer Peter Bohan, the first nuclear-armed Nike Hercules in the San Francisco Area Defenses was assembled at SF-88L in early 1959. The new warheading facility was not yet ready, though, so the missile and warhead were assembled in Battery Alexander's old magazines.<sup>58</sup>

In January 1959 the Army hosted a press conference at SF-88L to showcase the new missiles. *Chronicle* writer Orr Kelly reported on the event in a January 21st story headlined "Bay Defense Posts Get Killer Rockets." In this article he reported how "conversion of the five Nike Ajax sites to handle the new missile will cost \$1,738,753 — about half a million dollars more than each site cost originally."<sup>59</sup> This figure indicates that SF-88's original cost was in the vicinity \$1,250,000.

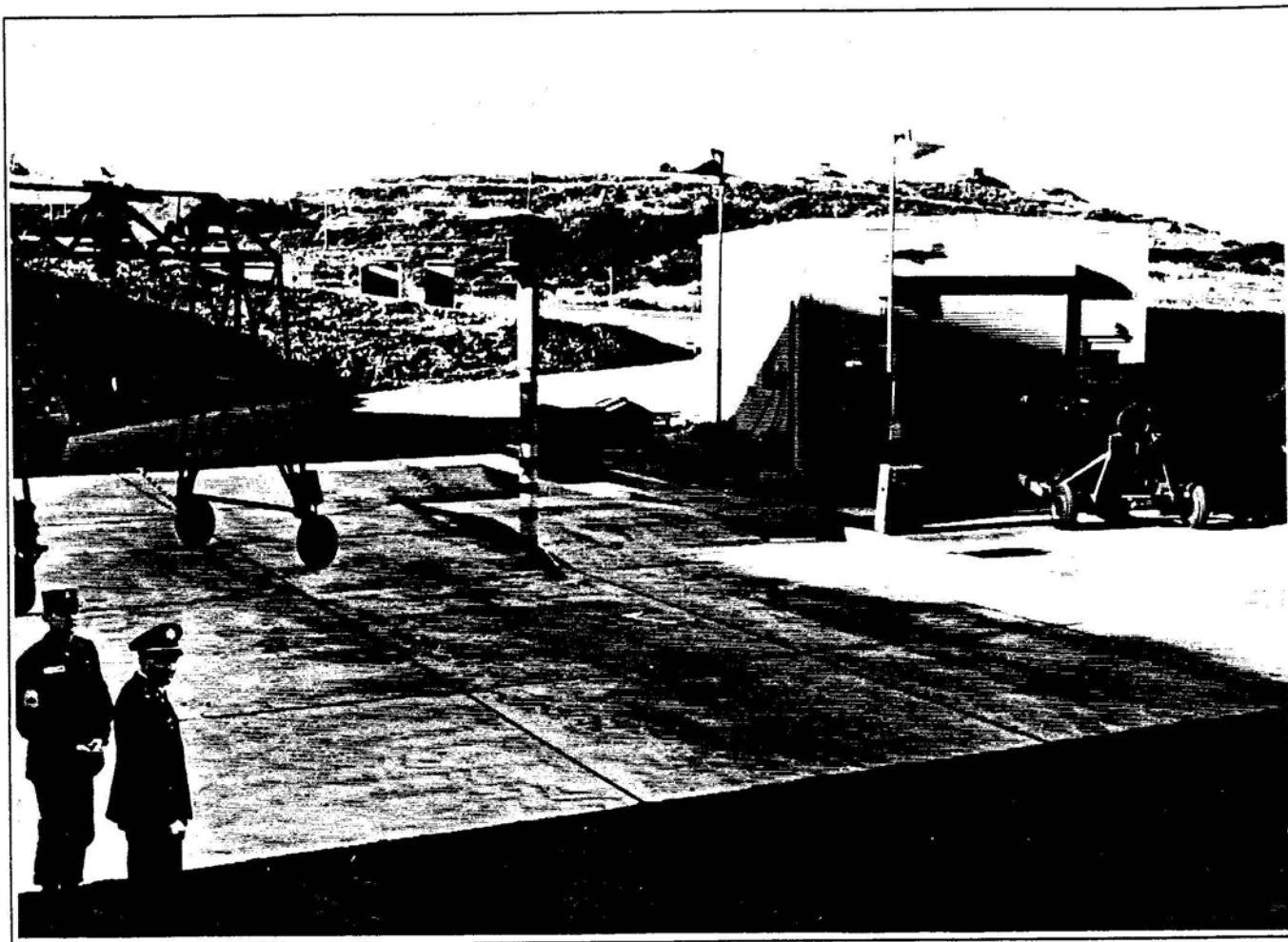
Reporters at the event raised questions about Nike site security and nuclear warheads that the Army was not prepared to answer in detail. "According to a carefully worded Army statement," wrote Kelly, "the nuclear munitions to arm the new missiles 'will be stored in areas immediately adjacent to the operational units.'"<sup>60</sup>

The unveiling ceremony itself was choreographed to heighten the dramatic differences between the Ajax and Hercules. Two Nike Ajax were first erected on "B" section's satellite launchers. After appropriate remarks had been made, the elevator doors opened and a Nike Hercules was brought up from the magazine. Once on the surface it was erected to firing position alongside the now-overshadowed Ajax.<sup>61</sup>

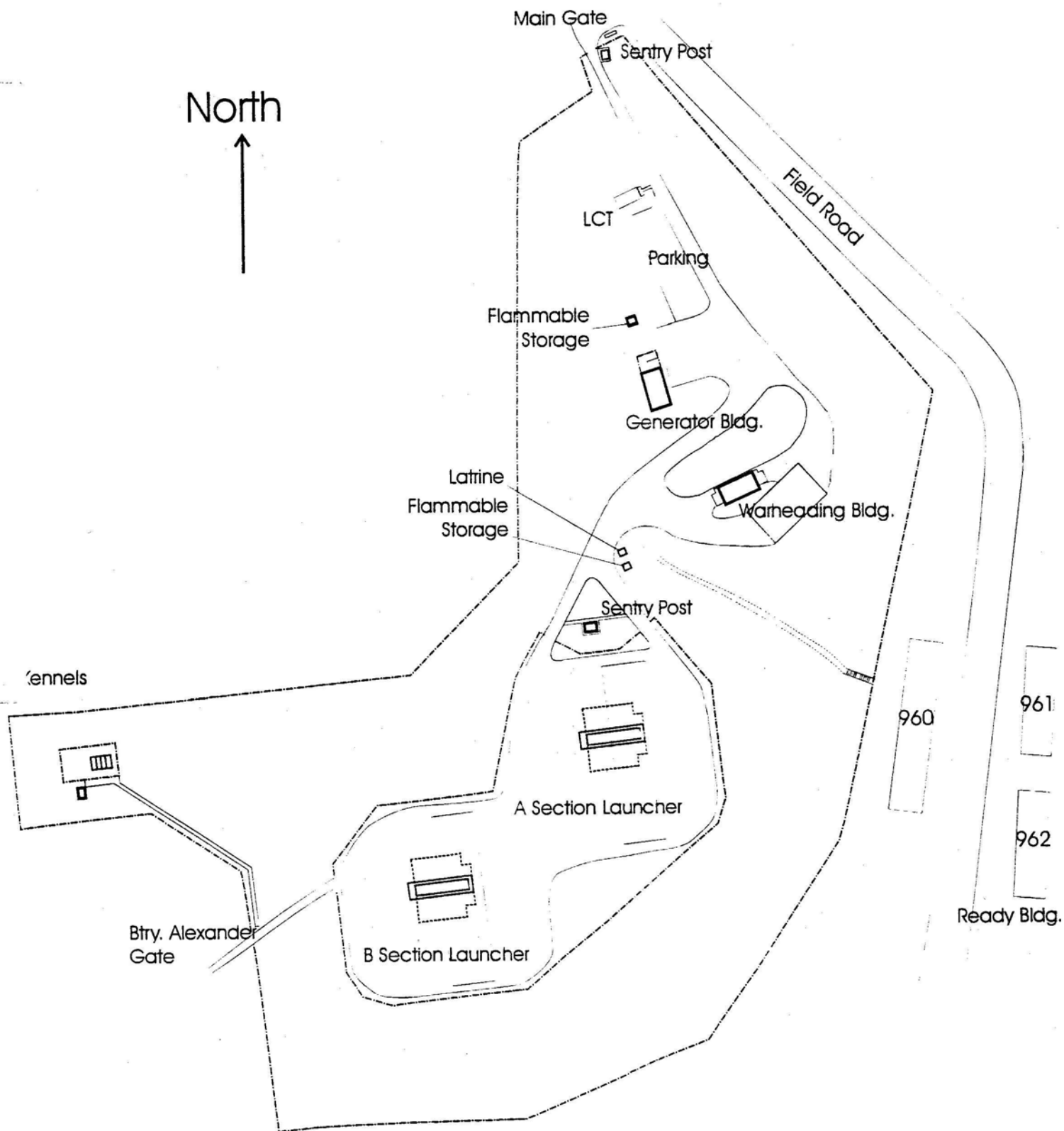
According CWO Bohan, this side-by-side pose of the two missile types was arranged purely as a photo opportunity, since Ajax and Hercules missiles were never kept within the same launcher section. However, it is unclear if all the missiles at SF-88L were replaced simultaneously. Bohan remembers an overlap period when "A" section was equipped with Nike Hercules while "B" still retained Ajax missiles.<sup>62</sup>

By mid-1959 the site had taken on an appearance much closer to today's. The warheading building was complete, as was the additional concrete paving surrounding the building. Inside the launcher area, Hercules storage racks and M36 "universal" launchers sat on top



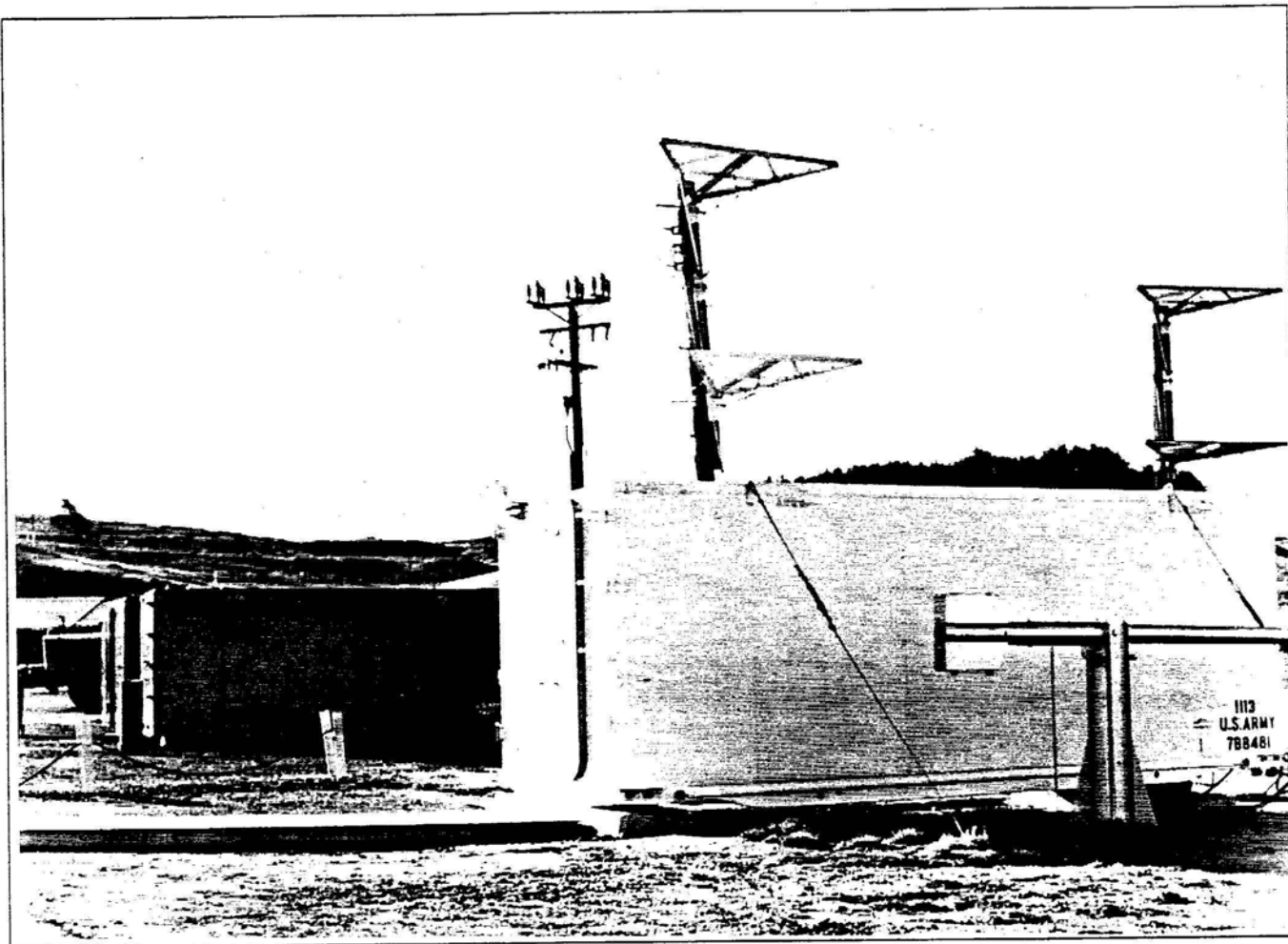


Fueling station in 1961, with "A-frame" portable hoisting unit at left and a Nike Hercules forward body section next to the Warheading Building at the right. In the background are the former Acid Storage Shed, now converted to a flammable materials storage building, and a portable latrine. U.S. Army photograph. (*Golden Gate National Recreation Area, DOD Still Media Records Center Collection*)

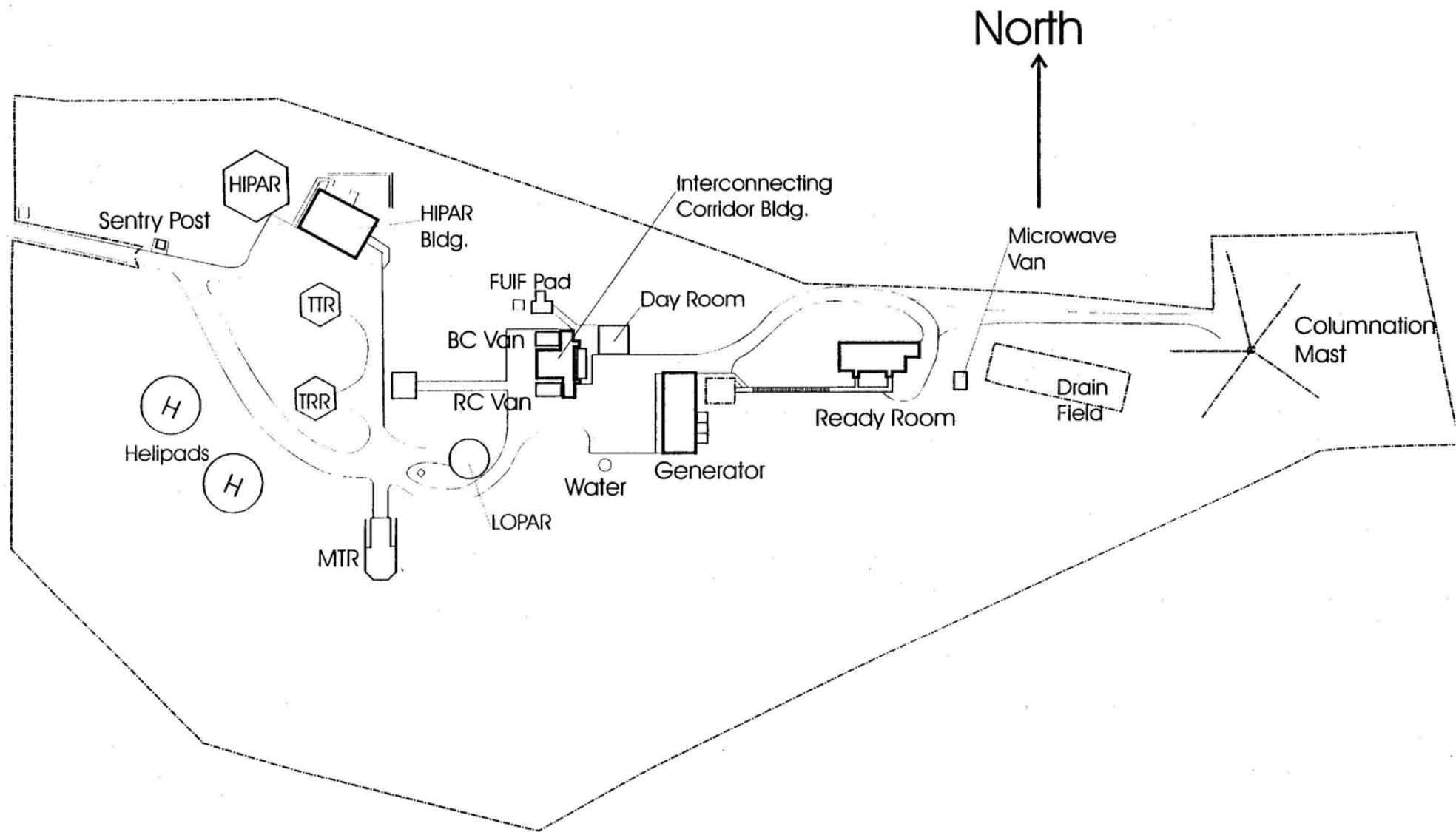


Nike Site SF-88L  
1959

Figure No. 3



(original caption) "Fort Barry, Calif... Site 88. launcher area, Btry. A... Look southeast shows LCT van and antennae and assembly vans." The antennae masts provided communications links with the IFC area. The three assembly vans in the background sit on the future location of the missile assembly and test building. U.S. Army photograph, 1961. (*Golden Gate National Recreation Area, DOD Still Media Records Center Collection*)



Nike Site SF-88C  
1962

Figure No. 4

of rectangular concrete slabs that ran the entire length of each launcher section. Crushed rock still surrounded these new launcher pads, but the remodeled area now had a sterile, freshly raked appearance instead of the sandbag and picket fence-lined launcher compound of only two years previous.

A double set of cyclone fences topped with barbed wire now enclosed the site: an outer "Limited Area" fence surrounding the entire compound and a new, inner "Exclusion Area" fence that wrapped around the two launcher sections. The limited area fence was basically the original 1955 security fence for the site, except it had been heightened by about a foot along its entire length. It still retained its two gates, although the main entrance at Field Road had been realigned and given a new concrete sentry post building. The exclusion area fence had three gates: two at the north end flanking another guard post, and one at the west end aligning with the Battery Alexander gate in the limited area fence. The sentry dog kennel area and training compound were located just north of the Battery Alexander gate, adjacent to the western edge of the launching area.

Finally, the ready room in old Bldg. 962 on Field Road had been completed. Nike crewmen responding to drills could now access the site via a new personnel gate in the limited area fence behind Bldg. 960. Once through this gate, a wooden staircase and a gravel path led directly to the launcher area gates.<sup>63</sup> In its original alignment, this steep pathway ran straight down the ridge separating the launcher sections from the warheading area. In later years, it would be slightly re-aligned to veer towards the west, necessitating the construction of a small wooden footbridge over the drainage channel adjacent to the old acid storage shed.<sup>64</sup>

### *c. Late Hercules Configuration*

Physical changes also occurred at SF-88C atop Wolf Ridge. Just as the launching area underwent a major overhaul when the Nike Hercules arrived, the control site was totally rebuilt when the Army upgraded the "Basic Nike Hercules" to the "Improved Nike Hercules." This nation-wide program included new radars and electronics at many sites, including SF-88.

The most effective (and costly) single addition to the IFC site was the High Power Acquisition Radar (HIPAR) that was able to detect targets at the longer ranges attainable with Hercules.<sup>65</sup> During the period 1961-1962, the entire appearance of the SF-88C would be changed during HIPAR installation.

The most striking feature of the Improved Nike Hercules system was an immense, 30 foot diameter, radar antennae encased in a geodesic dome. The antennae and dome assemblies in turn sat atop a 20 foot steel tower, giving an overall height of nearly 50 feet to the HIPAR radar assembly. In addition, a separate HIPAR operating building was constructed adjacent to the tower to hold the new radar's operating equipment, and the existing IFC generator building had to be enlarged to handle the increased power load.

During the course of this rebuild, various other additions and improvements took place at the IFC. These included new, relocated concrete pads and pedestals for the already existing radars, a new ready building, and an enlarged connecting corridor building between the battery control (BC) and radar control (RC) vans.<sup>66</sup>

The Army also continued to make minor alterations and improvements at the launching area following the conversion to Nike Hercules, but never again on a scale as overwhelming as the 1958 "improvement" project. With the exception of constructing a long-awaited assembly building in 1962, the Army added no further structures to the site. The primary visible changes to the area up through 1974 would be the replacement of the metal generator building with a permanent cinderblock structure, the realignment of some fence lines and gates, the ever-increasing spread of asphalt within the exclusion area (a process that continued until the entire area was paved except for a tiny pocket on the south edge), and the evolving paint schemes on the above-ground buildings.

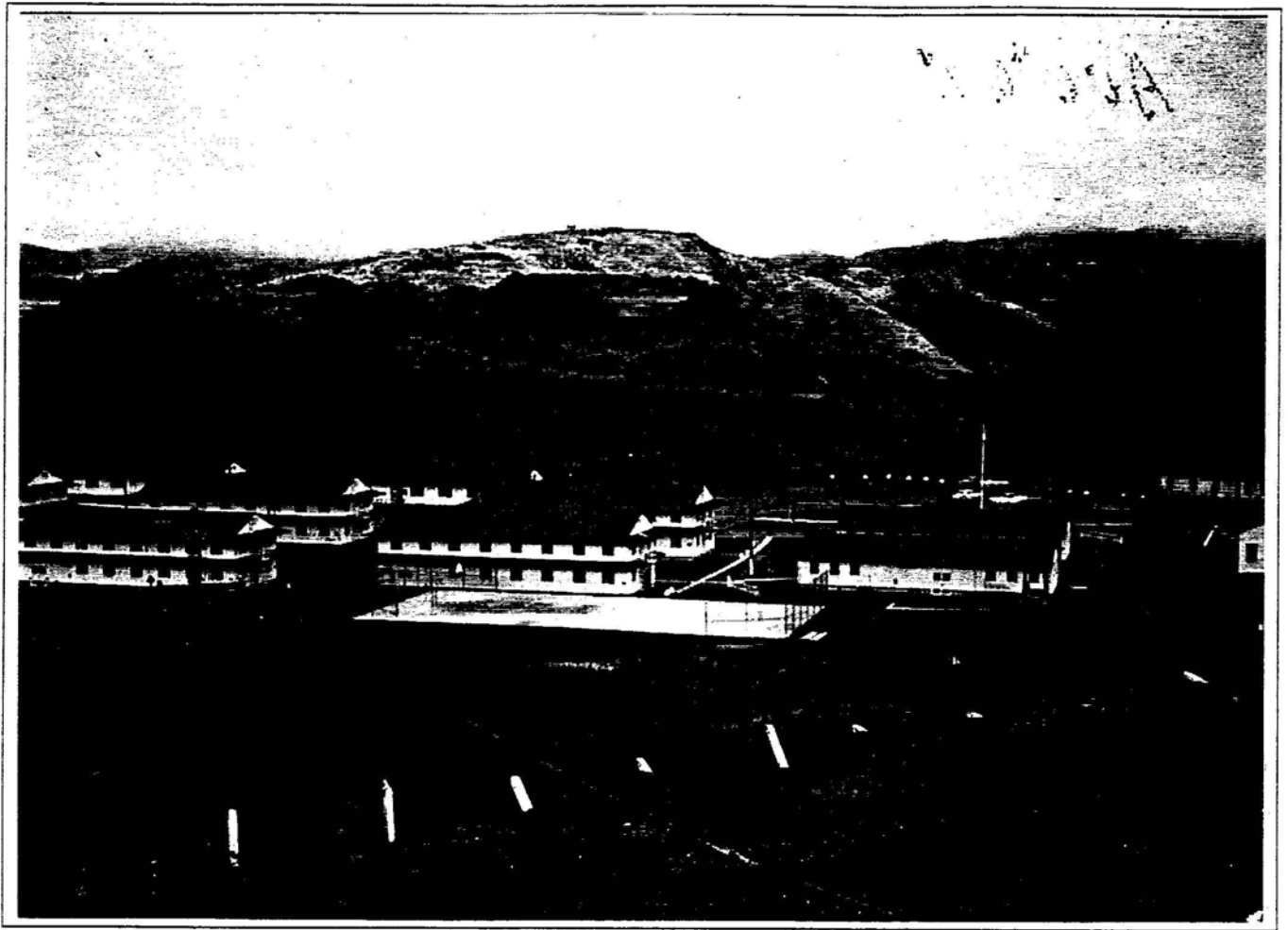
In 1961 Army photographers made an extensive photographic documentation of SF-88. These photographs, now in the Department of Defense's Still Media Records Center, show all major structures in the administrative, control and launching areas. In these photos the launching area appears very much as it does today, with the notable exception of the yet-to-be-constructed missile assembly and test building. Instead, the assembly building's place is occupied by three magnesium van bodies similar to the ones used as control vans at the IFC. It is believed that launcher crewmen somehow acquired these empty bodies and pressed them into use as storage and workshop space.<sup>67</sup>

This series of photos also gives an indication of color schemes used at the site early in the Nike Hercules era. Although all the photos are black and white, it is obvious that buildings at the launch and control areas were painted in a uniform, light color without any contrasting accents around windows, doors or eaves. Even the all-metal generator building and old nitric acid shed at SF-88L were painted this color. The only exceptions within the launching area were the three magnesium vans, which were painted olive drab, and the white launch control trailer.

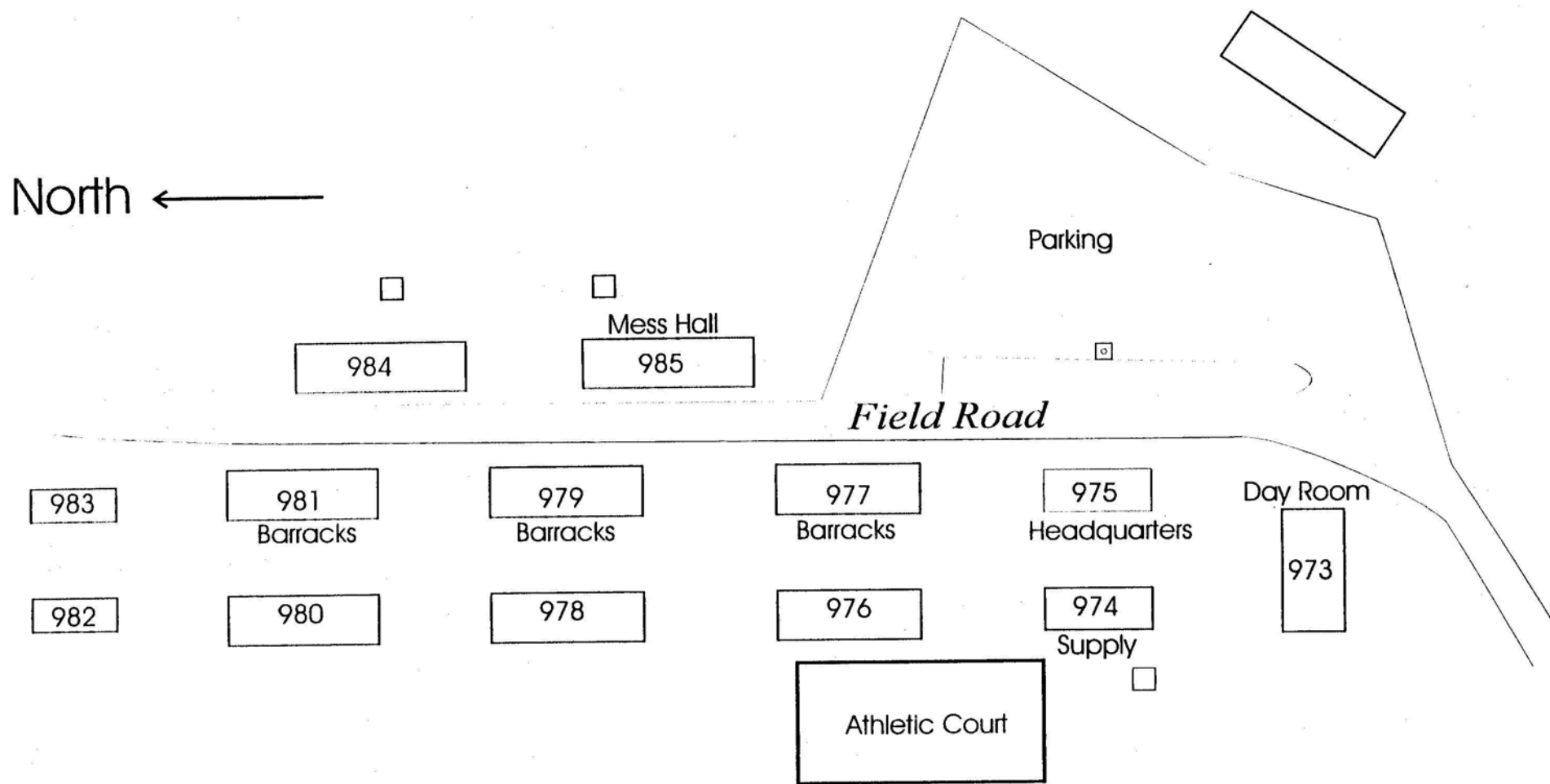
In 1962 the long-deferred "Missile Assembly and Test Building" was finally added to the site on the location previously occupied by the three van bodies. However, once again SF-88L would deviate from standard Nike sites. The assembly building originally specified on 1953 plans for the site was a standard 30' x 40' concrete building with attached boiler room and latrine. (An example of this type of structure remains at SF-87L).

What was finally constructed at SF-88L, though, was an Army "Butler Building."<sup>68</sup> This type of structure was a prefabricated building made up of interlocking metal and plywood panels that could be quickly erected in semi-permanent situations. No other Butler buildings are known to have been used for missile assembly and test structures at any other permanent Nike launch sites.



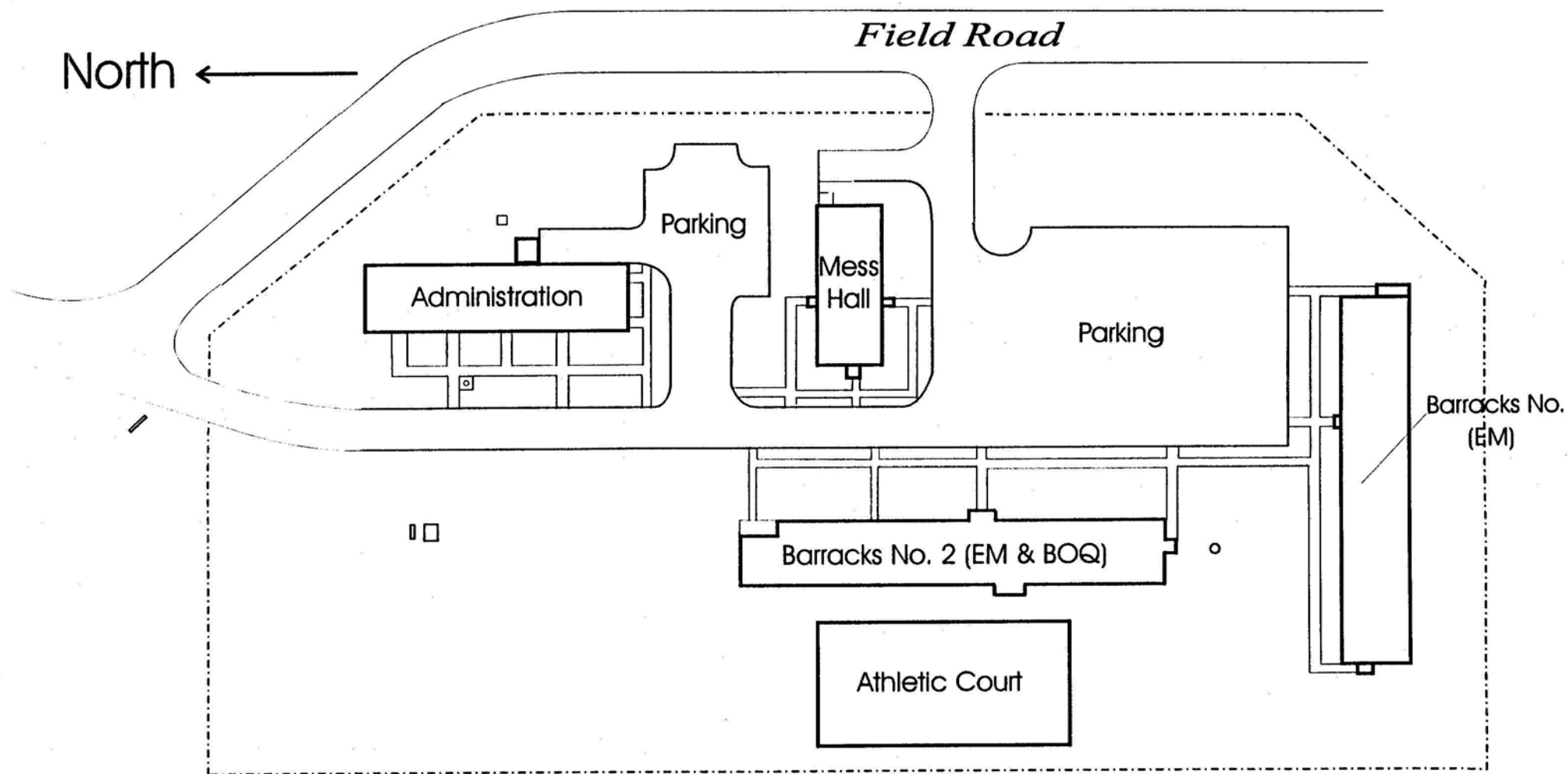


The original administration and barracks area at SF-88A, taken from atop Battery Mendell in August 1962. This cantonment of World War II buildings, sometimes known as "Mendell area" because of its proximity to the abandoned battery, was demolished in 1964. (*Robert Baker Collection, Golden Gate National Recreation Area*)



Nike Site SF-88A  
1961

Figure No. 5



**Nike Site SF-88A**  
**July 1974**

**Figure No. 6**

The completed assembly building measured only 21' x 40.' Its interior was divided into two large rooms, one for assembly and testing of missiles and the other for workshop space. It sat on a north-south axis with a pair of sliding doors on the south side for bringing forward missile body sections into the building. A small personnel door on the east side of the structure also opened directly into the test area.<sup>69</sup>

The MP dog handlers received a new kennel storage building in early 1964 when a prefabricated metal shed with a pitched roof was constructed adjacent to the kennel area. This new building contained a single room for storing equipment for the sentry dog operation, and replaced a wooden storage building that had stood on nearly the same location apparently since early 1959. The new building was completed by February 1964.<sup>70</sup>

Also in 1964, personnel staircases with weather proof enclosures were added to each of the two magazines. These stairs augmented the two emergency hatches that had previously served as the only access to the below ground magazine and panel rooms. They quickly became the preferred way for crewmen to enter the spaces during alerts and drills.<sup>71</sup>

The sheet metal generator building was demolished in 1965 and replaced with a permanent concrete structure. This new building duplicated nearly exactly the size and floorplan of the original, and is believed to have incorporated the earlier structure's generator mounts, motor mounts, transformer pad, utility hook ups and other features. This generator building would be the last structure added to the site.

Another key component of SF-88 was its Administrative Area, formally designated SF-88A. This group of buildings, sometimes referred to as "Battery Headquarters," was located in the barracks area previously occupied by the AA personnel manning the 90mm guns above Bird Rock. Sometime around 1957 this cluster of seven World War II-era buildings was taken over by SF-88, probably in conjunction with the phasing-out of the antiaircraft guns. The buildings were still serviceable, although aging.

As part of a nation-wide program to upgrade Nike living quarters, the entire SF-88A complex was torn down and rebuilt during 1964-1965. The new administrative area contained two barracks buildings, a mess hall, an administration/day room building, and several parking lots. One of the new barracks building was assigned to the launching area crewmen, while the IFC soldiers lived in the other barracks. When the project was complete, only a multi-use recreation court would survive from the previous complex. These structures served as the site's administrative area until site inactivation.<sup>72</sup>

In 1970 a planting plan was prepared for all of SF-88 that gives a good illustration of vegetation at the height of the launching area's development. The main groundcover at that time was *Carpobrotus Edulis* ("Hottentot Fig" or iceplant) that covered the hillsides and slopes west and south of the launcher sections. Interspersed with the iceplant were scattered bunches of *Baccharis Pilularis* (prostrate coyote brush) that had probably germinated naturally. Iceplant also covered the earth berm next to the warheading

building, as well as all slopes downhill of the launcher area and the hillside below Field Road. Flat areas within the site were paved with either asphalt or concrete, or remained as bare earth. Rough grass surrounded the dog kennels and main gate's sentry post. The only manicured landscaping was a patch of mown grass within the dog exercise area.<sup>73</sup>

At some unknown time after 1970, the limited area fence along the site's northwest border was repositioned. Previously, this fence line had followed the toe of the slope below the launchers that had been created during site grading. It actually ran down into the valley below the site, paralleled the slope for several hundred feet, then climbed the hill again at the main entry gate. Following reconstruction, the fence sat on top of the small earthen berm constructed in 1957 at the crest of the slope as a water diversion dam. An annotated 1970 base map of the site has been found showing the original fence line crossed out with the large notation "Removed," and a new fence line sketched in following the current alignment.<sup>74</sup> The site's fences retained this basic configuration up through inactivation.

The last base map for SF-88 prepared prior to inactivation is dated 21 April 1972, and includes a proposal for yet another Ready building for the launcher crews. This structure, measuring 30' x 55', would have been located midway between the generator building and the exclusion area gate on the west side of the road. Had it been built, this ready building would have extended 15 feet beyond the top of the slope and necessitated extensive filling and regrading of the area.<sup>75</sup> No detailed drawings of the building have been located and no work on it was ever begun.

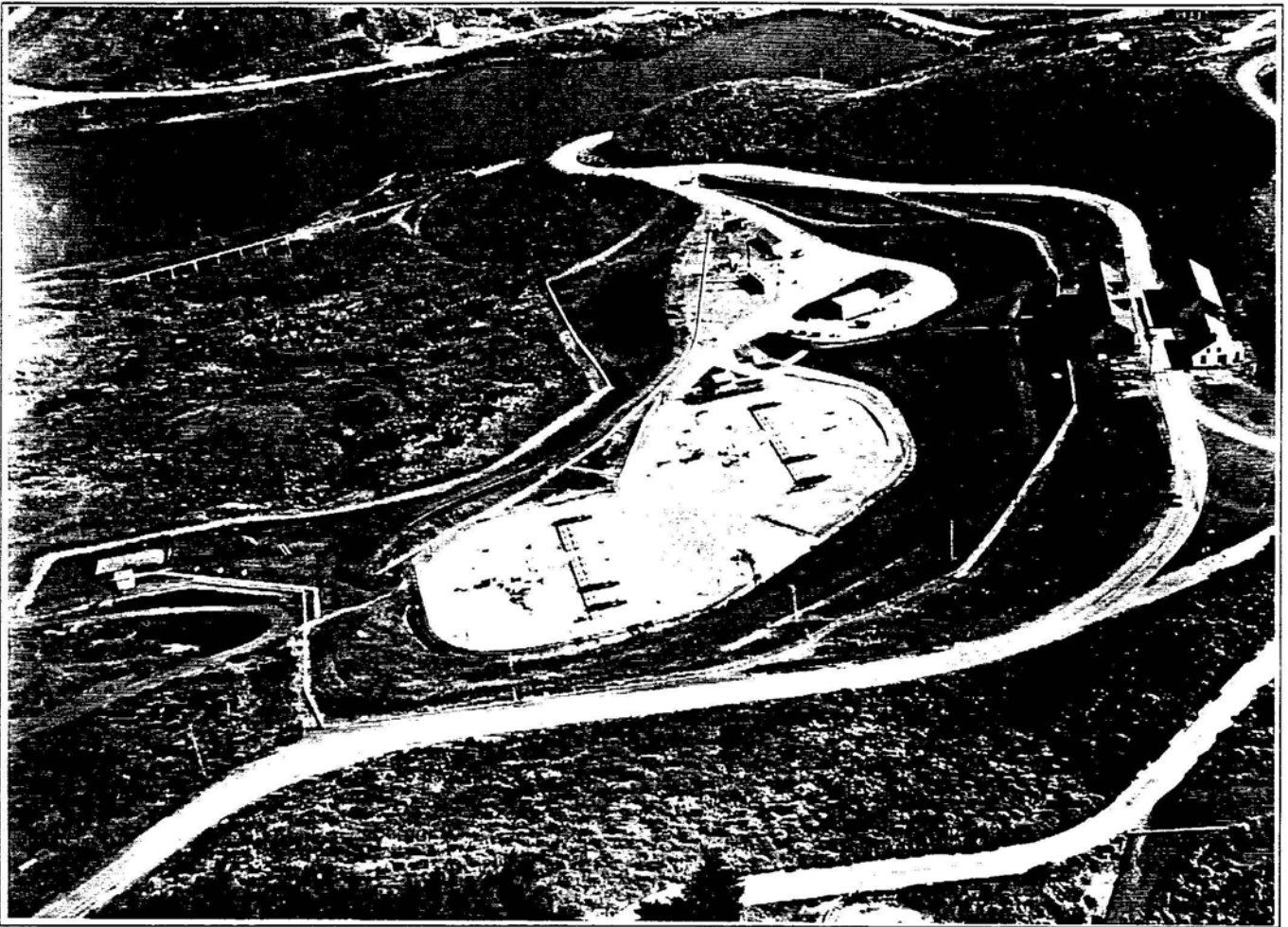
### *Site Inactivation*

Less than two years after this last map was completed, the Army decided to cease all Nike operations in the San Francisco-Travis Defense Area. At that time in late 1973, only four Defense Area sites were still active: SF-88 at Fort Barry, SF-51 at Pacifica, SF-31 at Lake Chabot and T-10 at Travis.

On 17 April 1974, Col. Clarence A. Miller, Air Defense, sent a memorandum to the Commander, Presidio of San Francisco. Referencing USARADCOM Nike Hercules Site Inactivation Plan VI of 8 November 1973, the memorandum gave target dates for closing the remaining sites in San Francisco-Travis Defense Area: 1 July 1974 for sites SF-88 and T-10, and 31 August 1974 for sites SF-51 and SF-31.<sup>76</sup>

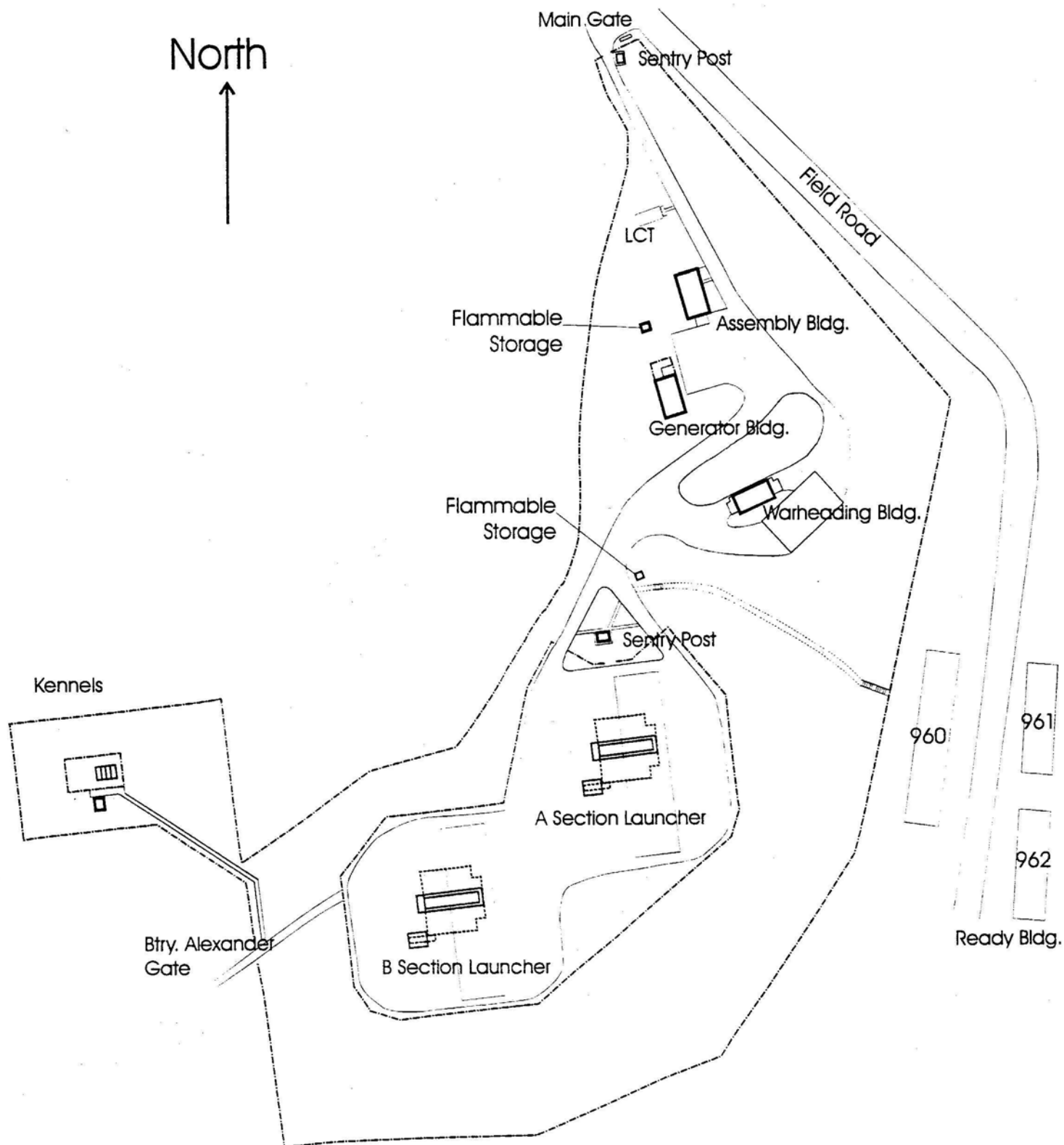
A subsequent memorandum from ARADCOM to the Presidio commander altered the inactivation date slightly to 2 August 1974: "On this date, all equipment and real property will have been turned in and the Battery's records, to include submission of the final morning report, will have been closed."<sup>77</sup>

For all intents and purposes, 2 August 1974 can be considered the official closing date for SF-88. The Nike site had been active for nineteen years and ten months.



A particularly good aerial view of SF-88L, taken sometime between 1965 and 1970, clearly illustrating the lack of vegetation within the outer "Limited Area" fence, the mowing strip just outside the fence, and the private vehicles parked adjacent to the ready building at the right. (*Golden Gate National Recreation Area, Interpretation Collection*)





Nike Site SF-88L  
July 1974

Figure No. 7

Simultaneously with Nike site inactivation, the Army was preparing to transfer much of the Marin Headlands, including Fort Barry, to the newly-legislated Golden Gate National Recreation Area. A request was made by local Sixth Army personnel to transfer SF-88 to the National Park Service as a historic property. This request was sent up the Army chain of command via "back channel" communications route under authority of Lt. Gen. Richard G. Stilwell, Commander, Sixth US Army.

Eventually, orders came down via back channel from Gen. Creighton Abrams, Chief of Staff, US Army, authorizing the transfer of SF-88 to the National Park Service. The only stipulation was that no explosives or classified materials be transferred. Gen. Abram's directive superseded ARADCOM orders for inactivation of the site.<sup>78</sup>

On 25 February 1974 a 'Memorandum for Record' was written by the Chief, Real Estate Branch, Presidio of San Francisco. This document, prepared at the direction of Col. John Kern, the Sixth Army's "National Park Service Liaison" officer, concerned many items pertaining to closure of the remaining Nike sites and included a special directive for the Fort Barry site: "The following NIKE Site will be inactivated but retained as a memorial to Army Air Defense - NIKE Hercules: Nike SF-88 - Ft. Barry/Cronkhite." Later, under "Sequence of Real Estate Actions," the document states: "Initiate transfer of all Site related facilities to the National Park Service to be retained as an Historic Memorial to Air Defense - NIKE Hercules. Plans are for Army technicians to remain on site to explain and demonstrate NIKE operation until replaced by GGNRA personnel."<sup>79</sup>

Col. Kern elaborated on these plans during a 1998 interview with the authors. Not only did the Army plan to transfer SF-88L intact to the NPS, stated Kern, but also SF-88A and SF-88C. The only items that would be removed were munitions and classified items, and even the classified materials would be held at Ft. Bliss for the NPS until such time as they were declassified. However, the vast majority of property at all three areas would have been turned over to the National Park Service including almost all the IFC equipment. In addition, the Army offered to send NPS personnel to Fort Bliss where they could have participated in selected training programs to orient them to the Nike Hercules system.

Although the NPS was interested in acquiring all three areas of SF-88, it declined much of the Army's offer of equipment. The NPS only expressed interest in taking control of property at the Launching and Administrative Areas, not the IFC. Also, the departure of the park's Chief of Interpretation at a crucial point in the transfer process further complicated the transition. The vacancy created by his departure was not immediately filled and resulted in the park's losing the opportunity to interview remaining site personnel as well as sending NPS staff to training at Ft. Bliss.<sup>80</sup>

William Whalen, the first Superintendent Golden Gate National Recreation Area, corroborated these discussions between the NPS and Army. In an interview concerning the early years of the park, Whalen informed the authors that the Army had indeed offered to transfer much of SF-88C to the park but he had declined the offer. His reasoning was that the park was too new and its staff too small to take on responsibility for preserving

the IFC equipment. Whalen felt that the remote location of SF-88C, the inclement weather conditions at the site, and the complex nature of the equipment would put a tremendous strain on his resources. The park's main interests at the time were the administrative area, which Whalen felt could easily be turned into a conference center, and the launching area, which he saw as the most dramatic part of the Site.<sup>81</sup>

Whalen agreed to accept transfer of all three areas minus the IFC equipment, and to allow the Army to retain temporary control of the administrative area. On 16 August the Presidio's Real Estate officer reported on the status of Nike Site SF-88: "IFC (Control) Area ... Transferred to Golden Gate National Recreation Area. No further requirements." "Launcher Area[sic]... ... Transferred to Golden Gate National Recreation Area. No further requirements." "Administrative Area... Assigned for Army use by Memorandum of Understanding with GGNRA. No further requirements."<sup>82</sup>

Final transfer of all three areas did not occur until early 1976 when the Army informed the NPS that it no longer required use of the administrative area. This formal document, titled "Discontinuance of Army Use and Release of Real Property," was acknowledged by then-Superintendent Jerry S. Schober on 12 February 1976.<sup>83</sup>

At the time of transfer in late 1974, SF-88L contained little equipment aside from the buildings and launcher sections themselves. Items relating to Nike Hercules missiles included two inert training missiles on handling rails, a forward missile body dolly, a sustainer motor, two plywood shipping containers (one for a booster cluster and the other for control surfaces) and a missile body shipping container.<sup>84</sup> The historic value of the site, however, was its relatively intact state. Unlike all other Nike launch sites around the country, SF-88L had been transferred with all utility systems operational, all structures intact, all elevators and doors in working condition, and all the original storage racks and launchers in place.

The challenge would be to preserve the site for future generations.

## **B. Area Development**

### *1. Launching area: SF-88L*

Originally, the Army intended Nike to be a mobile weapon system with above-ground control and launching facilities. This fulfilled the Army's requirement that the new missile system be as mobile as anti-aircraft guns. However, the Army also had to meet safety regulations that governed surface storage of explosives. If strictly followed, each above ground site would require at least 119 acres of land. As a result, in an effort to reduce the amount of land required at permanent sites, the Army developed underground missile storage structures, or magazines, for the safe storage of explosives.

A prototype magazine and launcher structure was designed, tested and adopted at White Sands Missile Range during 1953. The adoption of magazine structures and subsequent reduction in site acreage also reduced considerably the funds required for purchasing real estate, especially in urban areas.<sup>85</sup> These underground magazine spaces provided the additional benefits of providing covered storage for the missiles as well as an extra degree of security at the permanent sites.

Although each Nike installation included essentially the same facilities, the configuration varied from site to site. Preliminary siting plans were sent to ARAACOM Headquarters at Colorado Springs, then forwarded on to the Pentagon for final approval. A typical Nike launching area contained between two and six sections, each section to include an underground magazine and four missile launchers. (A "normal" Nike site held three launch sections.) In addition, each site generally had a number of above-ground support structures. At a Nike Ajax site these included a missile assembly and test building; a generator building; a ready room structure; an acid storage shed; guard posts; and a flammable materials storage building. With the advent of Nike Hercules, additional buildings were added to most sites that reflected increased concerns with security for nuclear weapons. These included an additional guard post, sentry dog kennels, kennel storage shed, and a special warheading building for assembling and testing both high explosive and nuclear warheads.

SF-88L differs from a standard Nike launch site in several respects. As mentioned previously, the convoluted topography is believed to have limited the number of launcher sections to two. Also, fewer above-ground buildings were initially needed at SF-88L because of the abundance of empty buildings and fortifications in the immediate vicinity. For many years, the launching area contained no missile assembly building since assembly and testing of Ajax missiles was accomplished at a central facility in the Fort Barry Balloon Hangar. Also, the site never had its own ready room structure despite two proposals (one in 1958 and another in 1972) to construct special buildings for this use. Instead, Bldg. 962 on Field Road, originally built as a bakery, was remodeled for use as a ready building.

By June 1970, the Army had assigned 35 building numbers to the launching area. This represents the largest number of structures associated with SF-88L, since some structures were dropped from subsequent inventories due to changes in what the Army classified as a "structure." These numbers included all above and below ground structures, regardless of size or whether or not they were currently in use.<sup>86</sup> Following is the complete list of building numbers assigned to SF-88L in 1970, with notations shown in brackets[ ].

- S-880 Gate, Exclusion Area [west side of sentry station)]
- S-881 Gate, Exclusion Area [east side of sentry station]]
- S-882 Gate, Limited Area Personnel [on Field Road]
- S-883 Gate, Limited Area Rear Entrance [at Battery Alexander]
- S-884 Gate, Kennel Area
- S-885 Gate, Exclusion Area Rear Entrance [at Battery Alexander]
- S-886 Gate, Main Entrance
- S-895 Launcher Control Indicator Pad [B section]
- S-896 Launcher Control Indicator Pad [A section]
- S-897 Underground Storage [sump]
- S-898 Underground Storage [sump]
- S-899 Communication Van Pad [Launch Control Trailer site]
- S-908 Cable Vault
- S-931 Shower Pad [B section; not in use]
- S-947 Shower Pad [A section; not in use]
- S-949 Frequency Converter[B section]
- S-953 Frequency Converter [A section]
- S-963 Missile Assembly and Test Building
- S-964 Facility Entrance Sign and Planter
- S-965 Cable Vault
- S-966 Standby Generator Plant
- S-967 Missile Warhead Building
- S-968 Liquid Propellant Storage
- S-969 Missile Launch and Storage Shelter [A section]
- S-970 Sentry Station [main gate]

- S-971 Missile Launch and Storage Shelter [B section]
- S-972 Flammable Storage (Paint)
- S-973 Septic Tank
- S-974 Kennel Storage Building
- S-975 Kennels
- S-976 Sentry Station [Exclusion Area gates]
- S-977 Fuel Oil Storage Tank (Underground - 3,000 Gal.)
- S-978 Distribution Transformer
- S-979 Lightning Pole
- S-992 Propellant Fuel Facility (Not Used)

From the above list it can be seen that the Army gave numbers to nearly every fixture within the site, including unused service pads dating back to the Ajax era. Many of these we would classify today as "site features." Therefore, this report will limit itself to major structures in the sections that follow.

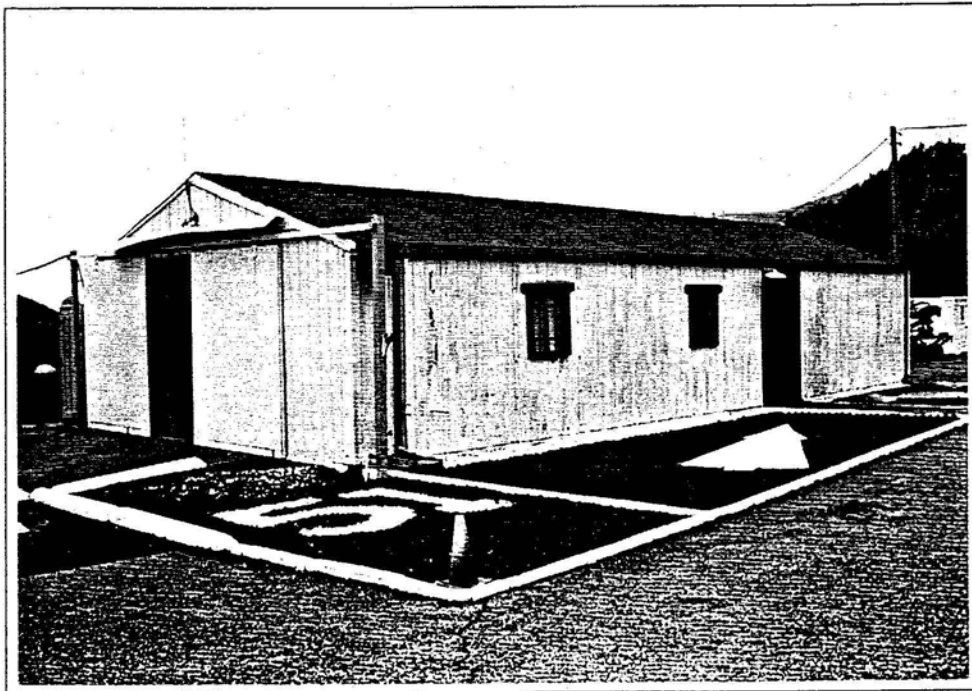


**a. Missile Assembly & Test Building (Bldg. S-963) (LCS FA-0963)**

Constructed: 1962

Size: 1,011 sq. ft.

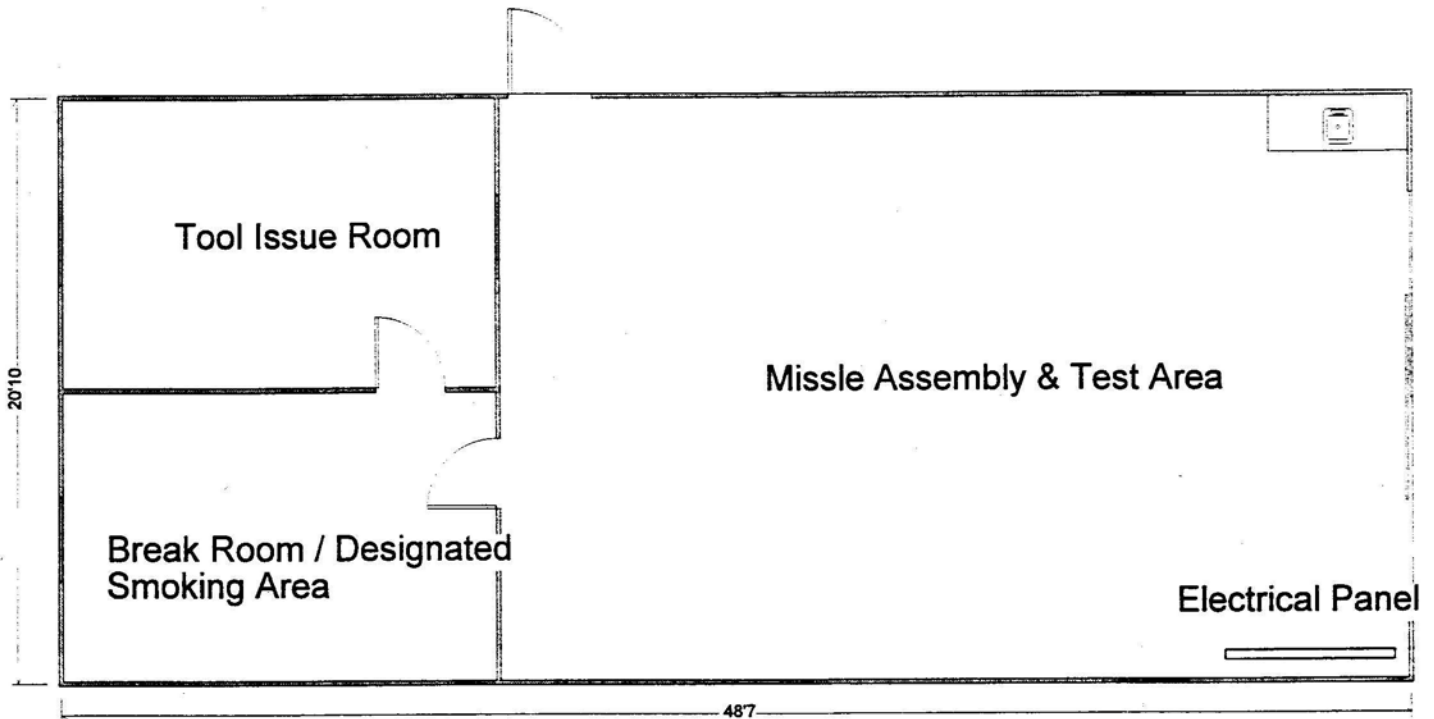
Original Cost: \$7,200



The Missile Assembly & Test Building at SF-88L is a prefabricated Army “Butler building” structure, measuring 20.8’ x 48.6’. It is constructed with a reinforced concrete foundation; steel exterior walls; wood roof and interior wall. Its interior originally consisted of three rooms separated by wooden partition walls: a large, open work area where missiles were assembled and tested, a break room that also served as a “smoking room” for the site, and a small tool room. The original interior partitions were removed before the NPS assumed control of the site.

Missiles arrived at Nike sites unassembled and unarmed, as peacetime Interstate Commerce Commission restrictions prevented the transporting of ready missiles from a central assembly site.<sup>87</sup> Nike missile bodies, guidance sections and warheads were delivered in pressurized, re-usable steel shipping containers while rocket motors, booster clusters and detachable control surfaces such as fins and wings arrived in reusable plywood boxes.

In the Missile Assembly and Test Building and adjacent paved hardstand, Nike crewmen uncrated, assembled, and tested the missiles. “Assembly” referred primarily to the installation of the missile control fins, main fins, elevons and fairings. The missile’s hydraulic and propulsion systems were also checked. The crew visually inspected the various components and lines of both systems for correct assembly and serviceable condition. Crewmen also ran leak tests on the missiles’ hydraulic lines and components.<sup>88</sup>



SF-88L Bldg. S-963  
Missile Assembly & Test Building  
c1972

Following the system tests, the crew performed a complete missile test. In preparation for this test, crewmen connected the missile to an external source of hydraulic power and to the radio frequency and electrical test sets. The missile was then operated from these external sources. In effect, the missile was made to perform as it would in flight and its performance was carefully observed. After this test, the crew connected the missile to a compressed air source, and both the hydraulic air tank and the propulsion air tank were pressurized. The crew installed a charged battery in the missile guidance section, and conducted a pressure test to assure that it was properly sealed.<sup>89</sup>

Adjoining the building on its east side is an ornamental gravel bed. Inside the bed are a concrete profile of the second stage of a Nike Hercules missile, a concrete shield originally emblazoned with the unit's designation, and two small square tablets that were repainted annually with the current year and the unit's proficiency score.<sup>90</sup>

Colors: The earliest photo of the Missile Assembly and Test Building dates from c. 1965 and shows the building painted overall light green with dark tarpaper roof (probably green or red.) In 1967, the structure had been repainted in a medium green color with dark green trim detail around windows. By inactivation, structure had returned to overall light green color, including doors and trim.

#### Furnishings/Equipment:

- (Large area) Missile test stands, hydraulics and electrical test sets, missile tester, etc.
- (Tool room) Tool boxes, tools on racks, small test sets, etc.

#### Major post-1974 Modifications:

1994 Interior partition walls reconstructed by VIPs for use as office and break room. The new walls and rooms incorporated minor alterations to meet present needs such as oversized doorways for wheelchair access and plywood subfloors and carpeting over the original concrete floor. Also, the connecting door between the two rooms was repositioned to better suit visitor and staff needs.

1995 Hot water heater replaced.

1996 Electric heaters rebuilt and replaced.

**b. Facility Sign (S-964) (LCS FA0964)**

Constructed: 1959

Size: n/a

Original cost: \$200



Structure is a 2x4 wood frame with plywood entrance sign, located on top of concrete retaining wall that probably also served as a planter box adjacent to main gate. The original framework and plywood sign existed until at least 1975 and were photographed by NPS personnel, but were destroyed sometime prior to 1986. The current sign is a replica.

Nike crewmen had tremendous esprit de corps, and this pride manifested itself at SF-88 in the form of specially-produced entrance signs at the control, administrative and launching areas. At SF-88L, the entrance sign was a 4'x8' plywood sheet painted with the unit's designation. A variety of entrance signs existed at this entrance gate, reflecting changes due to cyclical repaintings and the site's unit redesignation following the departure of the 51st ADA Regiment and arrival of the 61st ADA Regiment.

**Major post-1974 Modifications:**

1992 Replica 2x4 supporting framework constructed by NPS maintenance, and a replica of the 1974 plywood sign for Battery B, 2nd Bn, 61st ADA was painted by VIPs.

1997 Replica sign for Battery A, 1st Bn, 51st ADA painted by NPS Maintenance.

**c. Generator Building (S-966) (LCS FA0966)**

Constructed: 1965    Size: 822 sq. ft.    Original cost: \$25,800

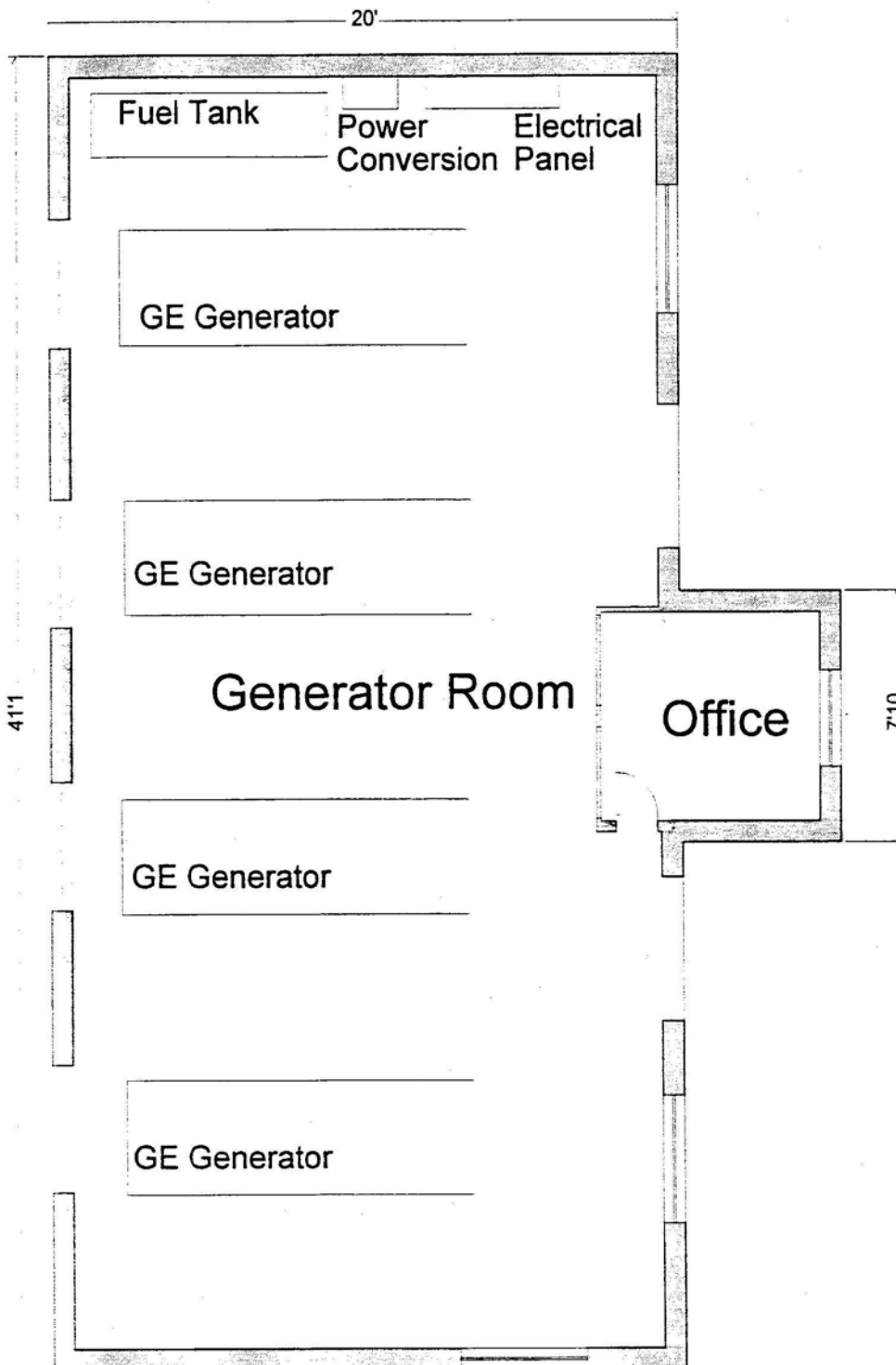


The structure has a reinforced concrete foundation and floors; steel joist and deck; wood roof. Structure measures 20' x 41.1'. The building originally contained three 150 KW diesel generators when SF-88L was Nike Ajax site. Following the 1965 reconstruction, building was equipped with four 250 KW General Electric diesel generators. A small, sound-proofed operator's office measuring 5' x 8' extends out from the east facade. A cyclone fence-enclosed transformer compound is attached to the north side of the building. It is believed that this generator building sits directly on the footprint of the original 1955 generator building, and that it incorporates the earlier structure's generator mounts, conduit leads, commercial power feeds, underground oil storage tank, and other utilities.

Also known as "Standby Generator Plant," the generator building housed diesel-driven generators for power to operate the area during periods when commercial power was not available. Transformers were mounted outside the building for utilization of commercial power. Commercial power, with electrical converters to change 60-cycle power to 440-cycle power, was utilized where available. Power source switching control also was provided at this point.<sup>91</sup> At SF-88L, the generator building also provided power to the Administrative Area in case of commercial power failure.

Major post-1974 Modifications:

1994 Broken windows re-glazed with Plexiglas



SF 88-L Bldg. S-966  
Generator Building

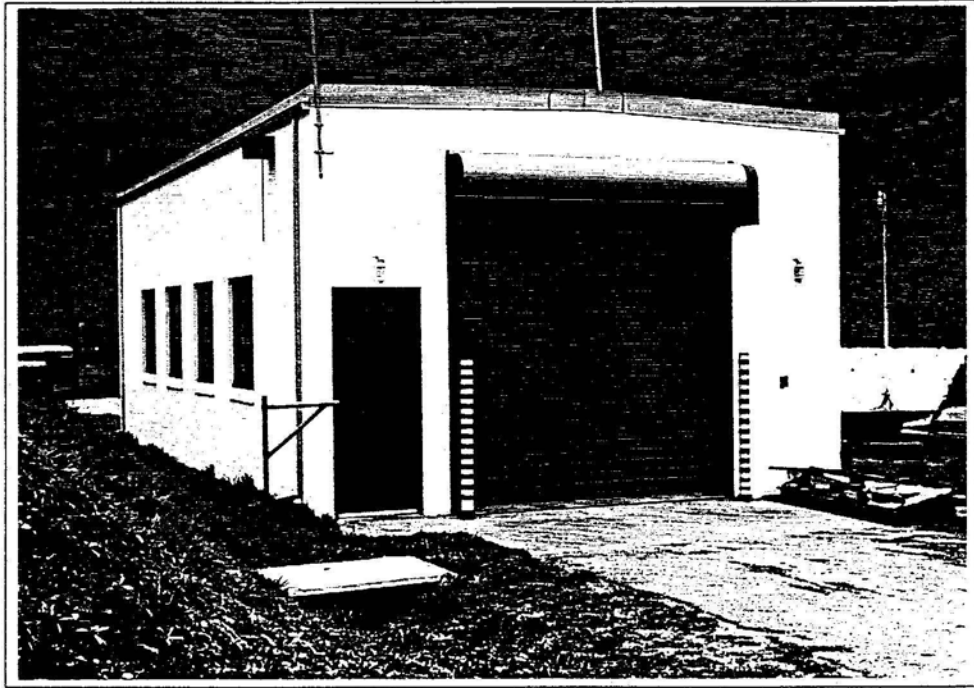


**d. Warheading Building (S-967) (LCS FA0967)**

Constructed: 1959

Size: 784 sq. ft.

Original cost: \$25,500



Also known as "Missile Warheading Building." Reinforced concrete foundation and floor; concrete cinderblock walls; tongue & groove wood roof over metal rafters. Structure measures 20' x 39.2'. Building contains a single room used for the assembly and testing of high explosive and nuclear warheads for Nike Hercules missiles.

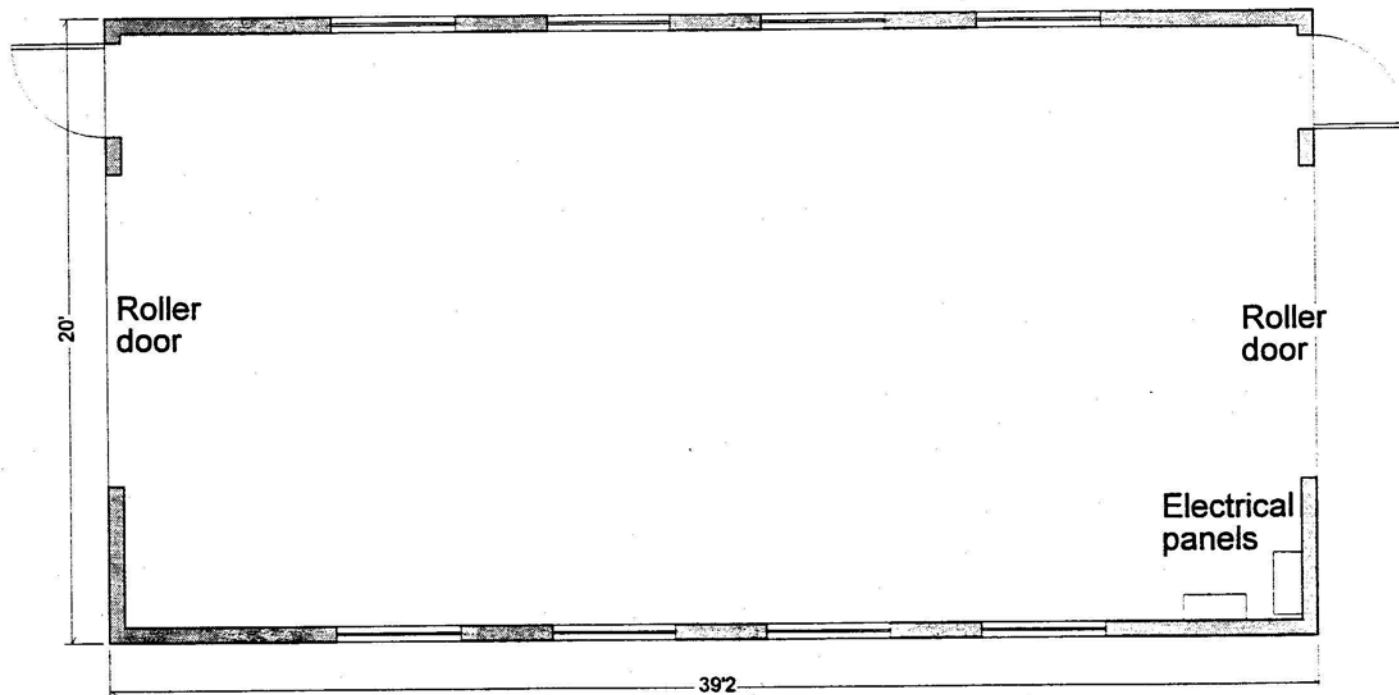
Interior furnishings were sparse, consisting of a pair of tool racks on the south wall and a work bench on the north wall. A variety of oversized lifting collars and beams necessary for lifting warhead and missile body sections were stowed on the walls. All other special assembly and testing paraphernalia was brought in as mobile equipment.

In 1966 the Army produced a training film at SF-88L "Nike Hercules Missile: Part IV: Preparation of Warhead and Forward Body Sections." There are several exterior views of the Warhead Building in this film. Interior shots, though, are believed to have been shot at another location due to inconsistencies with actual interior of Bldg. S-967 (e.g. single light instead of solid doors).<sup>92</sup>

**Colors:**

- 1961 Overall light green including doors and windows and eaves
- 1966 Same
- 1974 Light green with dark green trim and doors

**Major post-1974 Modifications:**



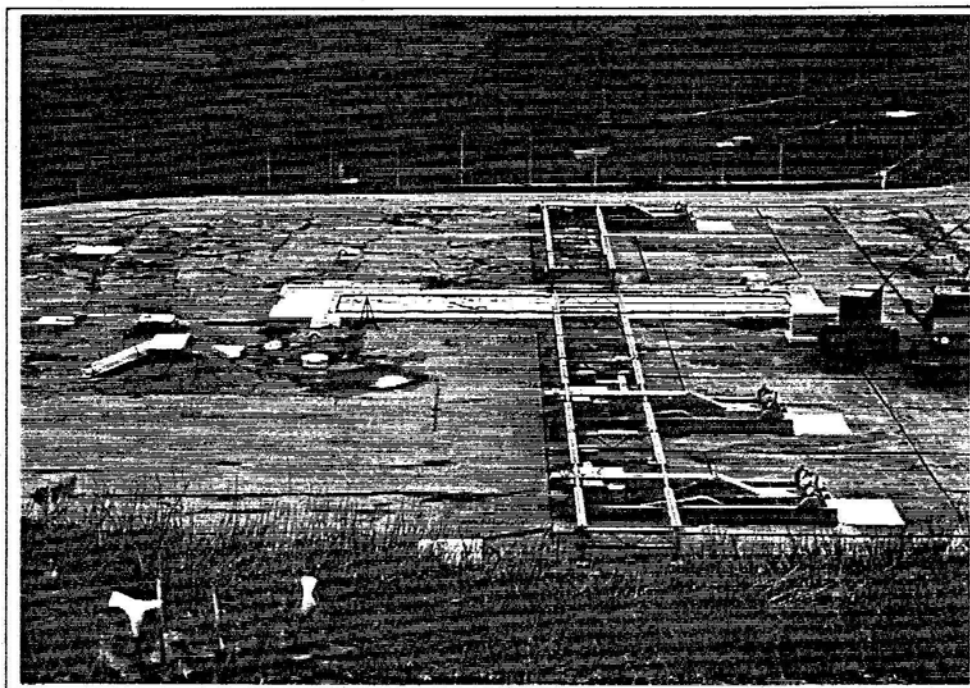
SF 88-L Bldg. S-967  
Missile Warheading Building

**f. Underground Missile Storage Structures, Type B  
(S-969) (LCS FA0969) and (S-971) (LCS FA0971)**

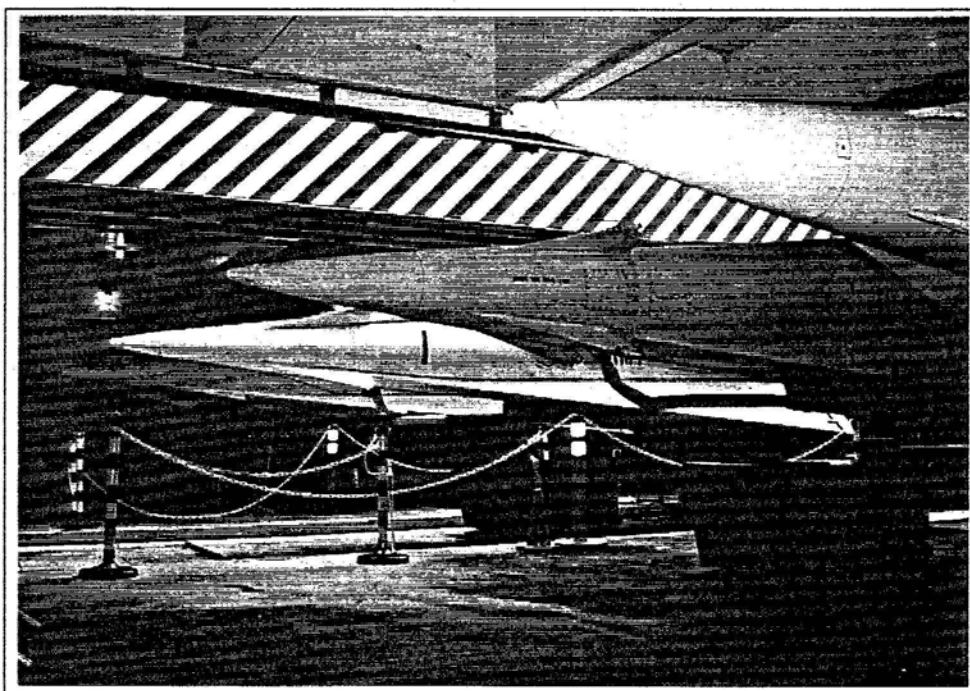
Constructed: 1955

Size: 3,976 sq. ft. each

Original cost: \$44,400 each



“B” section (above) and “A” section magazine (below)

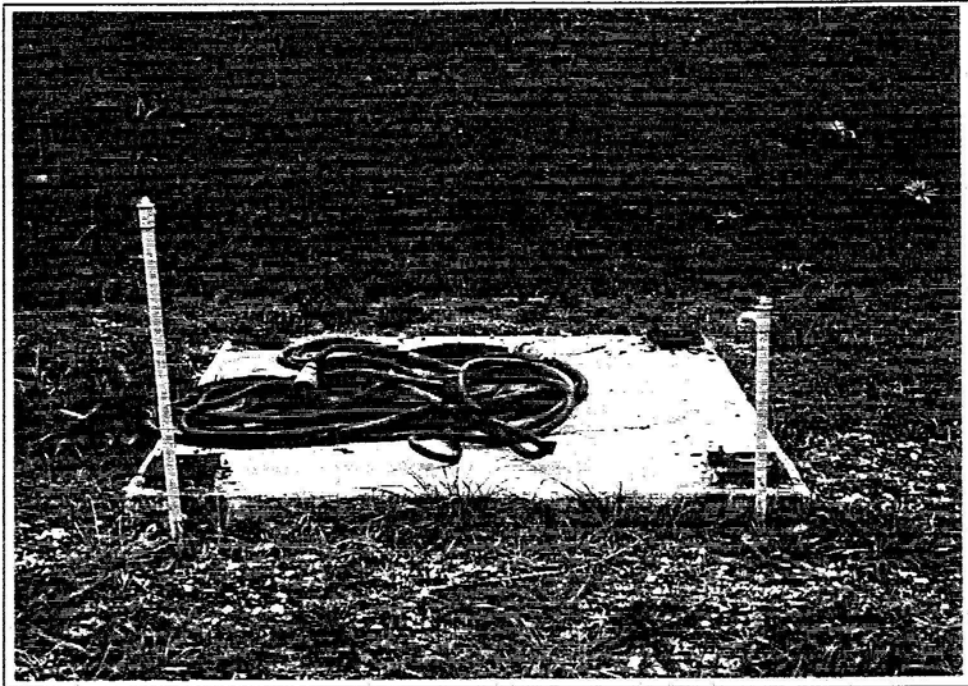


**e. Flammable Material Storage Shed. (S-968) (LCS FA0968)**

Constructed: 1955

Size: 42 sq. ft.

Original cost: \$500



Also known as “Acid Storage Shed” and “Nitric Acid Storage Building.” Reinforced concrete foundation; corrugated steel walls attached to 3” pipe columns; corrugated steel roof. Structure measures 6.5’ x 6.5’. A three-sided shed, open on the east side, originally used as storage building for containers of inhibited red fuming nitric acid (IRFNA). An “Emergency Wash Station” shower was originally affixed to one corner in case of acid spills. When first constructed, the open side of the shed faced west towards the main road, and metal acid barrels were stacked two high inside the building.

The shed became a “flammable storage building” after the need for liquid fuel ended with the changeover to Nike Hercules missiles in 1959. The building was also reconstructed at about this same time and reoriented with its open side facing away from the roadway.

According to former CWO Terry Abel “At one time, especially in Ajax, they used to store the fuming red nitric acid in there and it was far enough away from explosive handling personnel that in case something happened, in theory, it would dissipate into the air. But it eventually became petroleum products [storage]. We used to keep hydraulic oil in it. We kept grease in it... so it kind of served two purposes. One: early days, fuel and acid. Later days: hydraulic oil and fuel oil products.”<sup>93</sup>

Major post-1974 Modifications:

1996 Structure began to collapse and was removed by VIPs as a safety hazard.

Each structure measures 56.6' x 60' with attached panel rooms and staircases.

Unlike many Nike launch sites, Site SF-88L had only two underground sections. Originally labeled "East Launcher" and "West Launcher", they were eventually designated "A" and "B" sections respectively. Each section had its own associated launchers, access areas, and underground electrical and hydraulic pumping units. Each magazine pad has a set of double elevator doors that swing down to open. Access to the magazines was originally via two spring-loaded armored "escape hatches," one of which led to the panel room and the other to the magazine proper. Staircases, added in 1964, lead down to main entrances to the magazines, replacing the panel room hatch as the primary place of entry.<sup>94</sup> (Many Nike sites such as SF-89 in the Presidio never received these staircases.)

The magazines at SF-88L are officially designated "CONUS Type B (modified)" and "Missile Launch & Storage Shelter." Informal designations included "A" and "B" Magazines and "A" and "B" Pits. Each magazine is capable of holding ten Nike Ajax missiles (with fins removed) or six Nike Hercules missiles.

Each structure contains a room for storing the missiles (the magazine), an elevator to carry the missiles to the surface for firing, a panel room where the crewmen could take shelter during a launch, and four M36 launcher assemblies - one attached to the elevator and three satellite launchers mounted on the surface. When the elevator was in its lowered position, a two-man crew pushed a missile and booster "round" from the storage racks onto the launcher on the elevator. When the elevator was raised, the missile and booster on the elevator could be pushed from the elevator launcher (designated Number 1) along above-ground racks to any of the three satellite launchers.

Crewmen could operate the elevator, which could be raised, lowered or stopped, either from a master panel in the magazine room or from controls on the elevator. Hydraulic power operates the elevators as well as the steel elevator doors.

Once the specified number of missiles were brought to the surface and positioned on their launchers the six crewmen retreated to a blast-proof "panel room" located just off the magazine. There, via a section control group panel, the missiles could be selected for launch and erected to firing position. If a launch order came, the missiles could be launched either from the control area atop Wolf Ridge or, in an emergency, from this panel.

When first constructed in 1954-55, the magazines contained special handling and safety equipment for use with Nike Ajax missiles. These features included launchers and storage racks designed only to handle Nike Ajax; four "emergency wash station" showers inside each magazine; heavy-duty air ventilation and ducting systems for evacuating nitric acid or hydrazine fumes; a fin rack for detached booster fins; and an overhead "T" beams and chain hoists for servicing Ajax missiles.



In 1958 both structures were extensively remodeled for storing and firing Nike Hercules missiles. Modifications included replacing all launchers and storage racks with "universal" launchers and racks capable of handling both Nike Ajax and Nike Hercules missiles; alterations and reinforcement of the elevators to withstand the increased weights of the universal launchers and Hercules missiles; addition of drains to elevator doors; removal of safety showers; and removal of overhead chain hoists.

#### Furnishings/Equipment:

When first completed as a Nike Ajax magazine, this pit would have contained ten Ajax rounds, five on each side of the elevator. Rails and launchers were Ajax pattern rather than the existing Universal style. Four emergency showers with pull chains were attached to the walls at the four "fire points". The showers were removed as part of the Hercules "improvement" program of 1958. The stub ends of the pipe "T"s for these showers are still visible. A traveling chain hoist for servicing the Ajax would have been affixed to the I-beam to the left of the elevator. A fin rack for disassembled fins would have also been located here, along with three launch control indicator (LCI) panels.

Terry Abel described the pits appearance during his tour of duty: "We'd have six [Hercules] missiles down here. You'd have cables laid up on the floor between the test stations. Each missile was kept warm, and that launch control indicator [LCI], we used to have three of them down here. In the main magazine as you could tell there is enough warnings, cautions, you don't need anything else distracting your eye. When you walk in it should be neat and clean, like this one is, with the appropriate cautions and warnings because, like any profession, you stand a chance of getting hurt. You need to know where all the warning points are."

#### Colors:

"A" Section's magazine walls are currently painted overall light green to height of approximately 6 feet above the floor, then white to the ceiling. Ceiling is also white. A black trim approx. 4" high follows the entire baseboard. Red and yellow safety warnings and "fire Points" appear on all walls, along with black stenciled instructions for "First Aid for Electric Shock." The coming around elevator opening is Safety Yellow, as are handling rack feet and other protruding areas. Racks, launcher, PA speaker are all painted olive drab.

The elevator itself is currently all yellow. Color slides taken in 1975 show that it was once overall "equipment gray" color with yellow safety trim approx. 6" wide. Personnel doors are all painted dark blue.

Panel room colors repeat the magazine, except that the light green color only reaches a height of about four feet. Originally, the entrance hall to the panel room was covered with asbestos cement acoustic tile. These were alternately painted white and light blue in a checkerboard pattern. Selected panels were customized by crewmen with three repeating images: a Snoopy dog, a cocktail glass, and the Playboy "bunny" logo. These were removed in 1992 during an

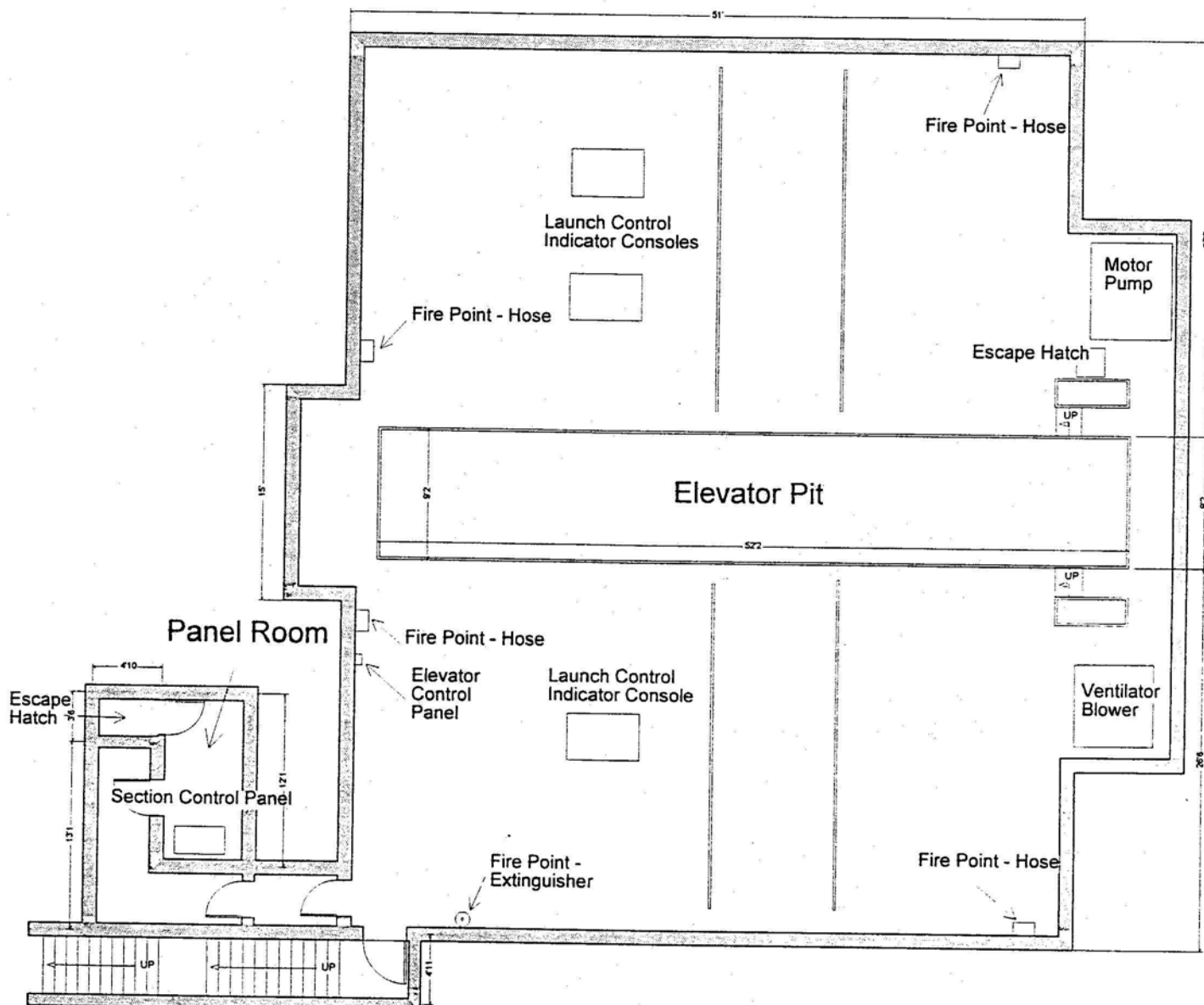


asbestos abatement project, but representative panels of each design were saved for the park museum collection.

Terry Abel continued with his memories of color schemes: "The Army in those days was into the two basic colors: eggshell green, which is this green color and you can get it by the ton, and white. The ever popular hospital white, which makes you feel like you are in a hospital. Every now and then, we did allow some of the crews to kind of personalize their pit for *esprit de corps*. You had a group of hotshots that were real good and they passed all of their inspections and they were good, and they knew they were good, yeah, we would let them sometimes paint an appropriate mural on the wall or something like that. But for the most part, pits were all white, or half green and half white. ...

"Every now and then, it seems like you always have the resident artist in a section and they used to personalize it a little bit. They would spend a lot of time down here, and within good taste and Army regulations we let them do a little personalization down there. Like I said, it was good for morale. My attitude on it, quite frankly, was it didn't hurt anything. As long as it was done in good taste. ..."

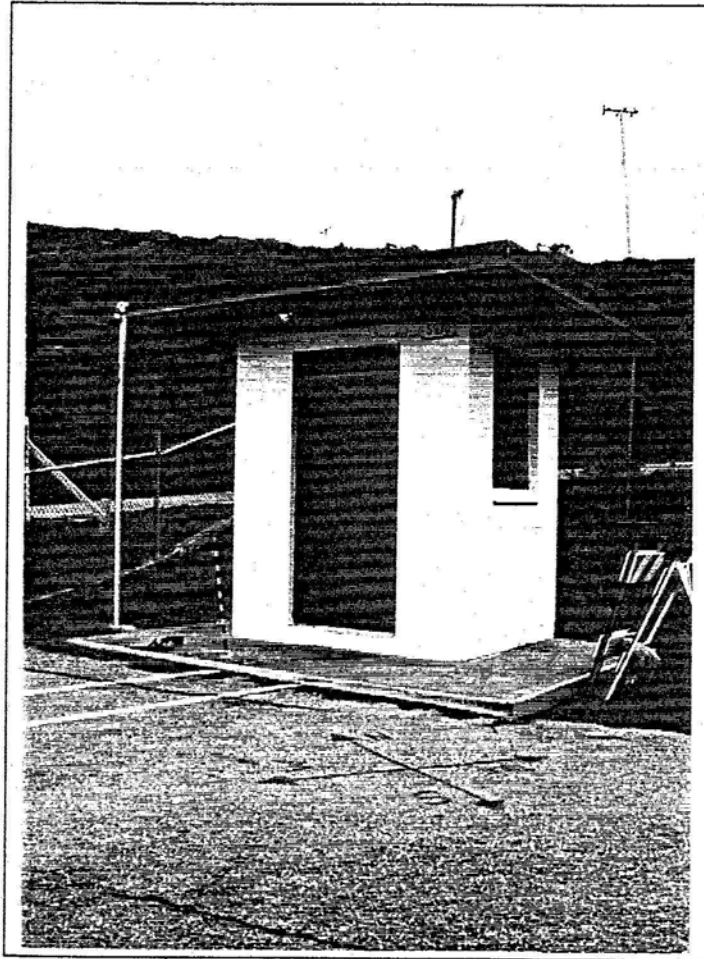
"B" Magazine differs greatly in color. The walls are dark green-gray higher up towards the ceiling than found in "A" pit, and there are minor differences in stenciling patterns. The personnel entrance staircase walls are medium blue with stenciled "psychedelic" white stars. The Panel Room hall acoustic tile panels were painted alternating yellow green and dark green in a checkerboard pattern. These were also removed in an asbestos abatement project. The Panel Room itself was dark green and yellow green [verify]. These were also removed in the 1991 asbestos abatement project. A unique feature of A magazine is a Confederate "stars and bars" battle flag painted on the overhead in the magazine room.



SF 88-L Bldg. S-969 ( "A" Magazine)  
 Missile Launcher & Storage  
 (Typical of both sections)

**g. Sentry Station - Main Gate (S-970) (LCS FA0970)**

Constructed: 1959    Size: 39 sq. ft.    Original cost: \$2,000



Also known as "Guard Station" or "Sentry Post." Reinforced concrete foundation and floor; cinderblock walls; flat wood roof. Structure measures 5.4' x 7.4'. This station was manned by MPs during daylight hours. All arriving personnel checked-in at this station where they provided identification and received blue-colored security badges allowing access to the "Limited" area, i.e. that portion of the compound between inner and outer security fences. All flame producing devices had to be deposited here, even non-functioning ones.

Ron Parshall remembers the tight security surrounding smoking: "Smoking was death. I imagine you could smoke, but once you got towards the guardhouse, you had to put anything that would light a fire in a bucket that they had there right next to the gate and then you could walk in. But, if you ever got caught with a Zippo [lighter] or anything like that, that is just as about as bad as being AWOL. You're gonna serve some time doing something. They would KP you. Whatever they got for you. Plus it would go on your record."<sup>95</sup>

## Furnishings and Equipment

As near as can be determined from interviews with MP personnel, this guard station contained only a chair, a built-in plywood shelf desk, a rotary phone and hooks where clipboards could be hung.

### Colors:

1963 Overall light green

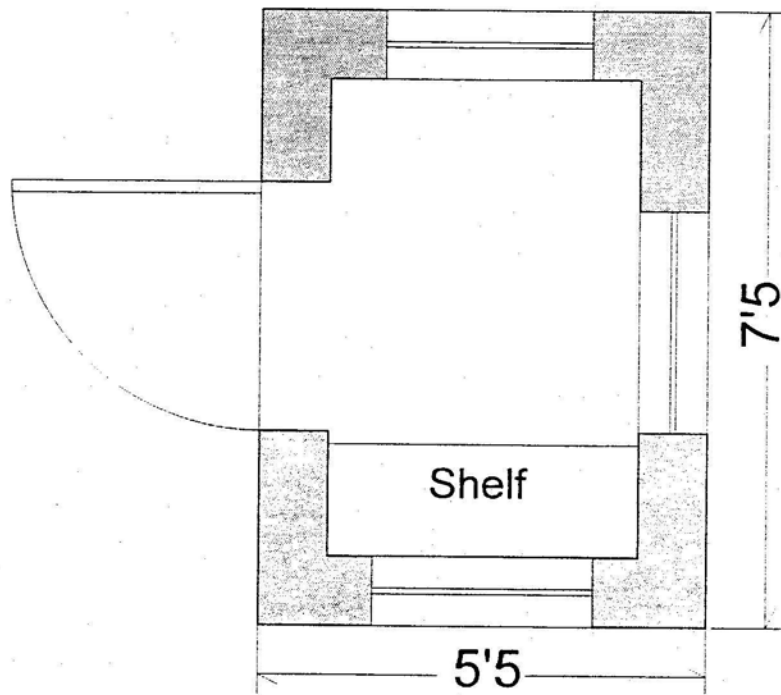
1967 Medium green walls with light green trim

1974 Light green walls with dark green window trim and light green eaves

### Major Alterations since 1974:

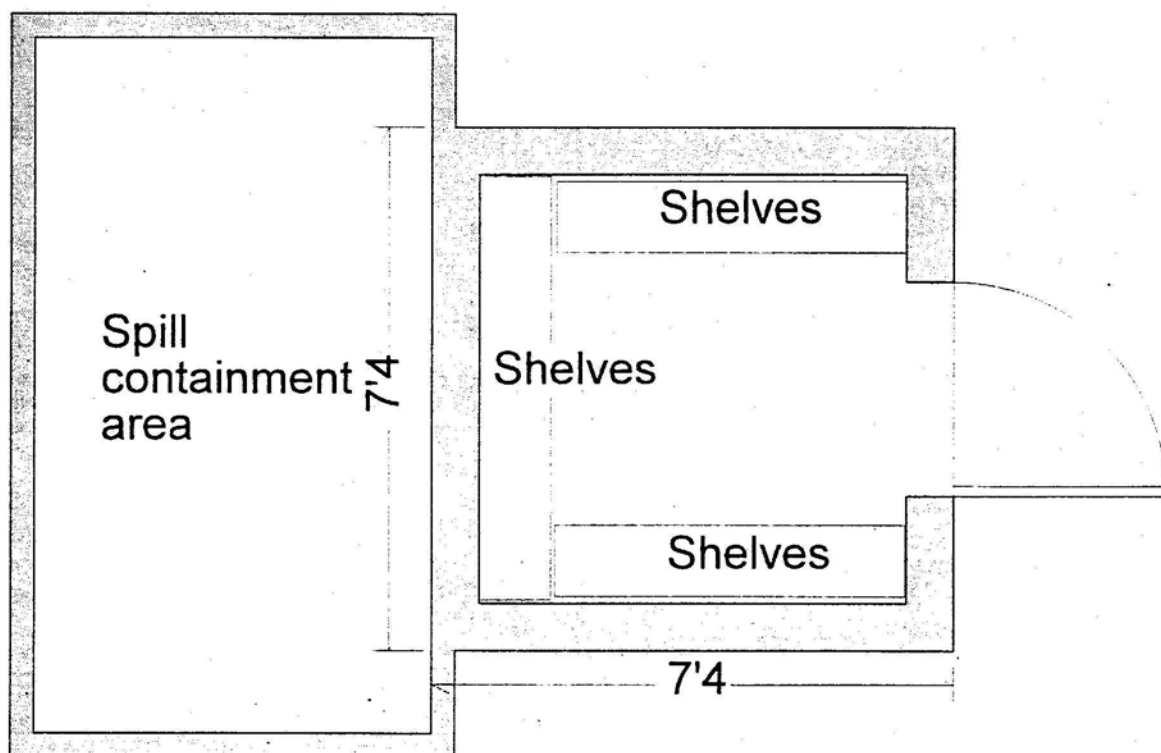
1990 New door installed by NPS Maintenance.

1991 Re-roofed.



SF 88-L Bldg. S-970

Sentry Post -  
Main Gate



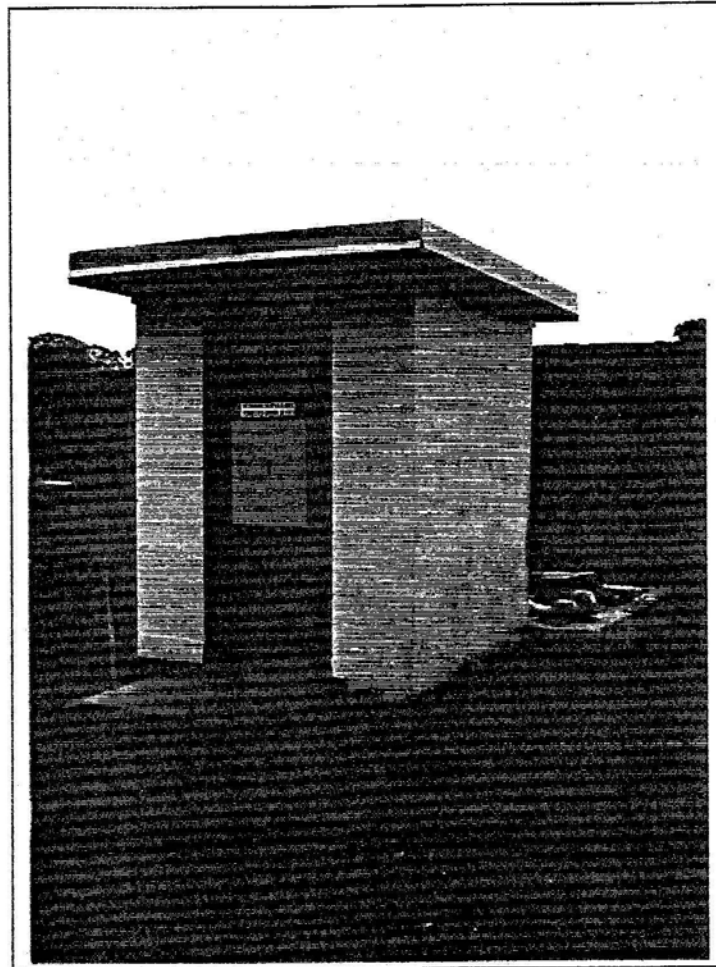
SF 88-L Bldg. S-972

Flammable Materials Storehouse



**h. Flammable Storage Building (S-972) (LCS FA0972)**

Constructed: 1959 Size: 54 sq. ft. Original cost: \$1,800



Concrete block foundation and walls; wood line walls; wood roof. Structure measures 7.3'x7.3'. Structure contains wood shelves on three sides.

In 1961, a concrete "spill containment enclosure" with beds for three 55-gallon drums was constructed on the west side.

Building is unaltered since 1974.

**Colors:**

1961 Overall light green -

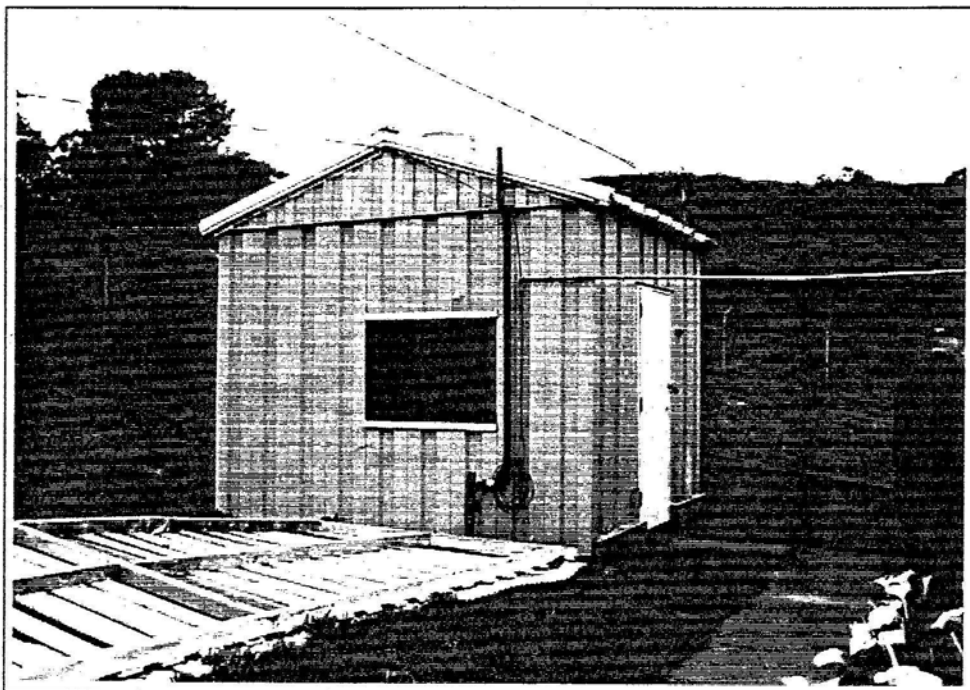
1965 Overall light green

1967 Medium green walls with dark green doors and trim

1974 Light green walls with dark green door and light green trim.

**i. Dog Kennel Storage Shed (S-974) (LCS FA0974)**

Constructed: 1964    Size: 128 sq. ft.    Original cost: \$5,000

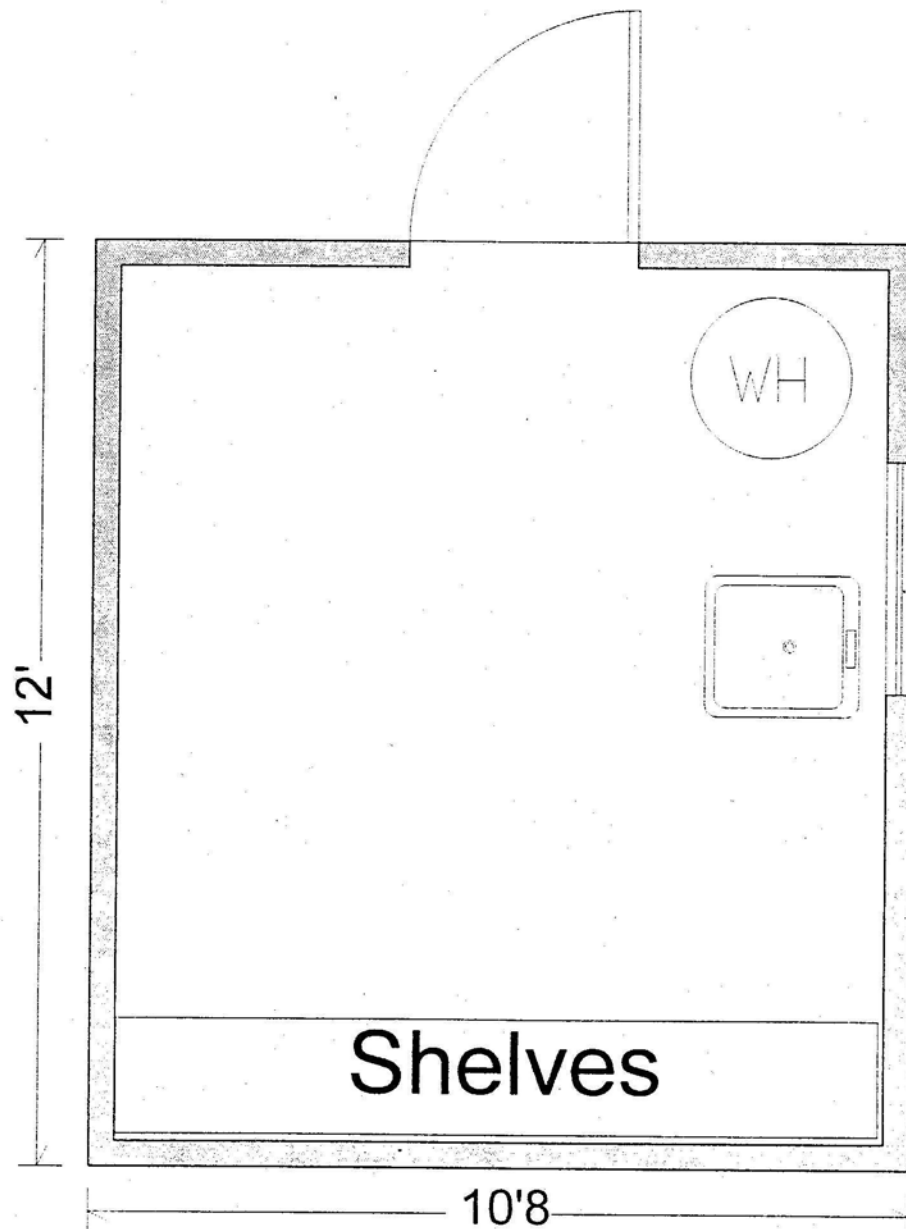


The Storage shed is a prefabricated metal building measuring 10.7' x 12' on a reinforced concrete foundation and floor. It is in same general location as a temporary plywood storage shed constructed circa 1959 for same purpose. Military Police dog handlers used the shed for storing dog food, grooming supplies, leashes, choke chains, training aids and other materials associated with the sentry dog program. Structure contains a single room with shelving on one side. Originally contained a hot water heater and wash sink (now removed.)

Guard dogs were an important part of a Nike missile site's security system. MPs and dogs constantly patrolled the launching area. At SF-88L, the kennel was a small, four-cage compound surrounded by inner and outer perimeter fences. A small Storage building nearby contained dog training supplies, equipment, food and grooming supplies. Adjacent to the kennels, handlers built a dog training area equipped with jumps and obstacles.

One interior wall has a large sign painted on its wall for "Sentry Dog Equipment" with hooks for hanging leashes, chains, food pans, muzzles, collars, combs and brushes. The opposite wall has the outline of four Snoopy dogs labeled with the names of the dogs last assigned to SF-88L: Ring, Baron, Prince and \_\_\_\_\_.

Major post-1974 Modifications:

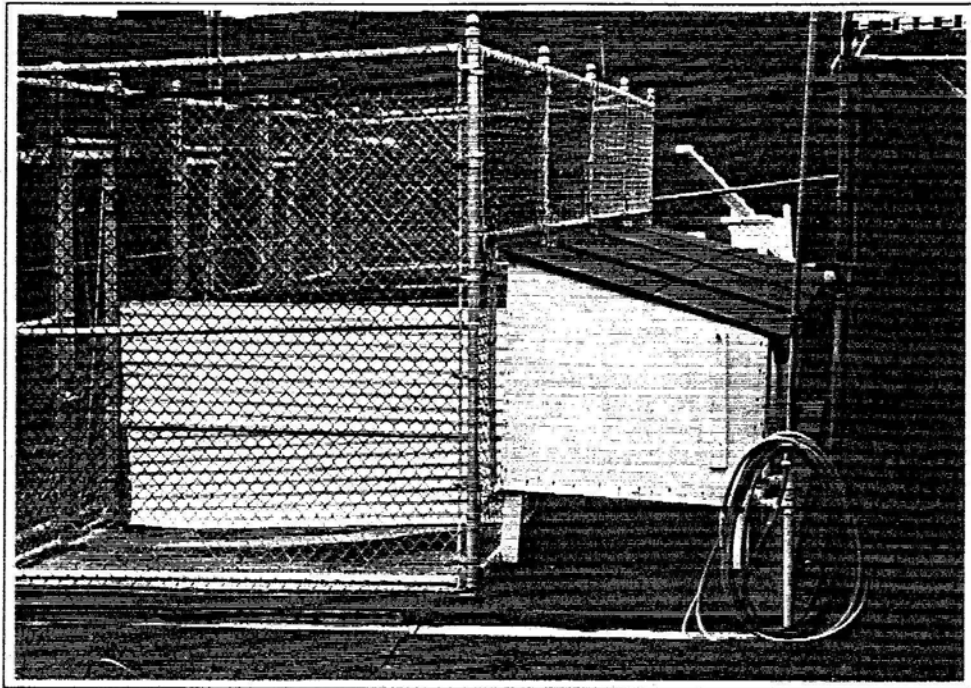


SF-88L Bldg. S-974  
Dog Kennel Storage Shed

1995 VIPs preserved the structure by repairing rusted wall surfaces and foundation skirts with Penetrol and “Bondo” patching material. New concrete foundation skirt was also poured to encapsulate treated bottom edges of wall panels.

**j. Dog Kennels (S-975) (LCS FA0975)**

Constructed: 1959    Size: 218 sq. ft.    Original cost: \$3,400



Concrete foundation and floors; cyclone fence walls; aluminum roof (later replaced with translucent corrugated fiberglass); plywood dog houses. Structure measures 12' x 20'. Complex consists of four adjacent sentry dog kennels, each with its own attached dog house, separated from each other by cyclone fencing and wire mesh screens. Kennels are surrounded by an exterior cyclone fence measuring 50' x 60'.

When first completed in 1959, the kennels were unroofed. Within a couple of years, though, a roof was added composed of corrugated plexiglas panels on a wooden frame. The perimeter kennel fence has black-painted corrugated metal panels attached with wire ties on all four sides. These panels were probably installed to prevent dogs from being distracted or agitated by adjacent training exercises.

**Major post-1974 Modifications:**

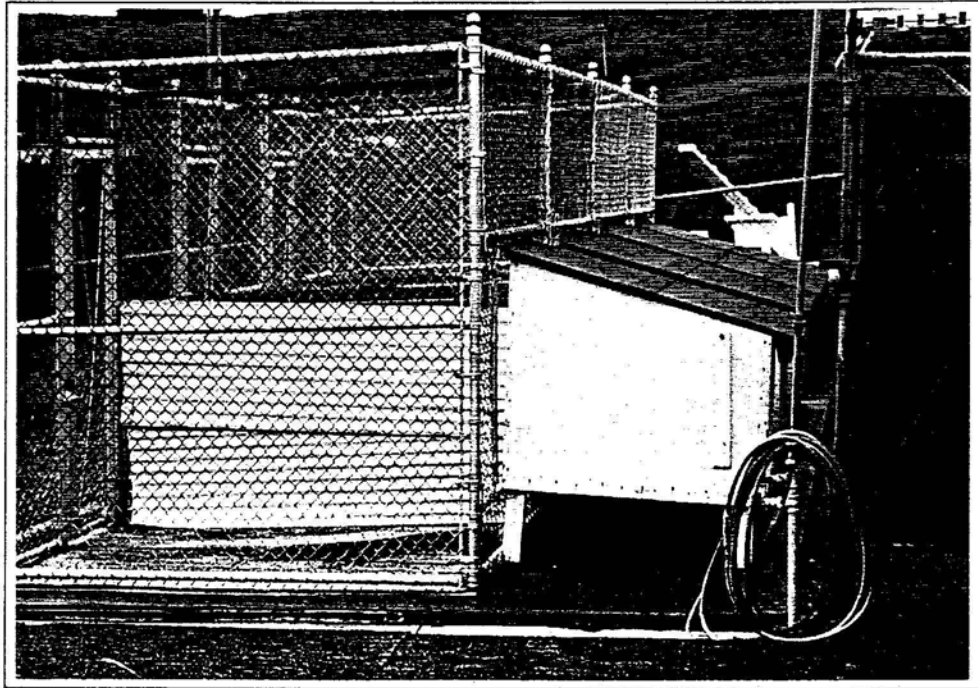
1994: Corrugated fiberglass roof panels replaced. Dog houses re-roofed. Cyclone fence panels treated with Penetrol.

1994-1995: New dog jumps, hurdles, obstacles, etc. constructed by VIPs.

1996: All corrugated fence panels repainted by Boy Scouts.

**j. Dog Kennels (S-975) (LCS FA0975)**

Constructed: 1959    Size: 218 sq. ft.    Original cost: \$3,400



Concrete foundation and floors; cyclone fence walls; aluminum roof (later replaced with translucent corrugated fiberglass); plywood dog houses. Structure measures 12' x 20'. Complex consists of four adjacent sentry dog kennels, each with its own attached dog house, separated from each other by cyclone fencing and wire mesh screens. Kennels are surrounded by an exterior cyclone fence measuring 50' x 60'.

When first completed in 1959, the kennels were unroofed. Within a couple of years, though, a roof was added composed of corrugated plexiglas panels on a wooden frame. The perimeter kennel fence has black-painted corrugated metal panels attached with wire ties on all four sides. These panels were probably installed to prevent dogs from being distracted or agitated by adjacent training exercises.

**Major post-1974 Modifications:**

1994: Corrugated fiberglass roof panels replaced. Dog houses re-roofed. Cyclone fence panels treated with Penetrol.

1994-1995: New dog jumps, hurdles, obstacles, etc. constructed by VIPs.

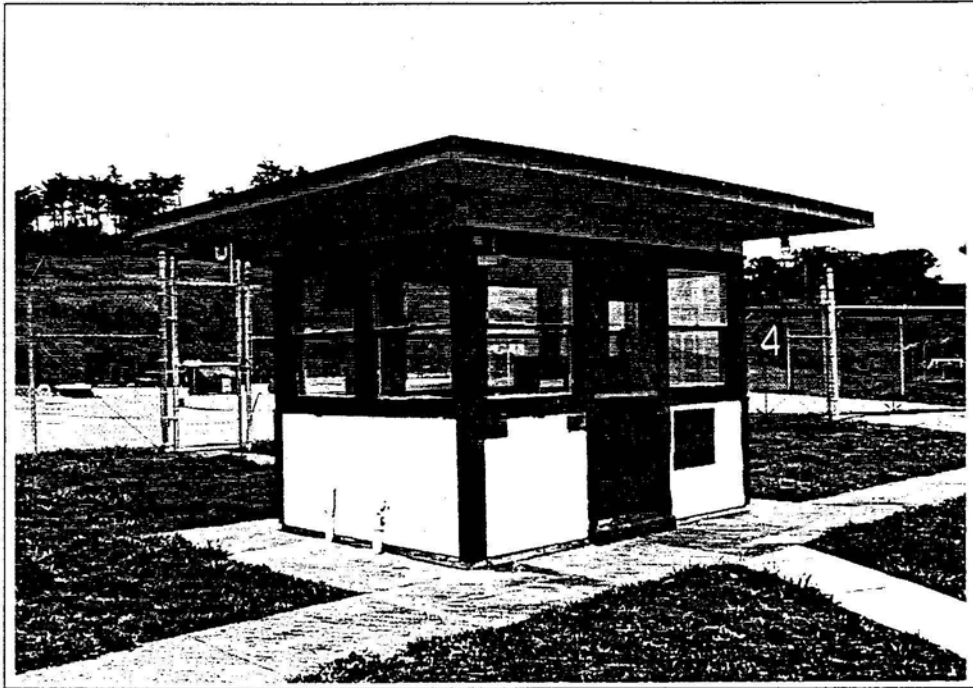
1996: All corrugated fence panels repainted by Boy Scouts.



1995 VIPs preserved the structure by repairing rusted wall surfaces and foundation skirts with Penetrol and “Bondo” patching material. New concrete foundation skirt was also poured to encapsulate treated bottom edges of wall panels.

**k. Sentry Station - Exclusion Area Gate (S-976) (FA 0976)**

Constructed: 1959    Size: 95 sq. ft.    Original cost: \$3,600



Reinforced concrete foundation; wood floor; wood framing and walls; tongue & groove wood roof. Structure measures 8.3' x 11.4'. This guard post was manned 24 hours / day by MPs. Personnel desiring to enter the exclusion area checked in here and exchanged their blue colored ID tags for red ones before entering the launcher area. MPs controlled electric gate locks, perimeter locks and ADT system from this building. Dog handlers frequently stayed in this building at night, letting their sentry dogs run loose within the limited area despite a standing rule the animals would be kept on leads at all times.<sup>96</sup>

Former CWO Terry Abel describes the interior of the building: "Two MPs on duty in here. This is where one of two ADT panels would have been. There is normally a matching duplicate control in the ready building. Everything had a backup in here as far as security. We had a two-badge system, we had two ADT panels, we had dual switches. In case one failed and did not go off, the other one would. We had a backup for everything and that would vary and correctly so that if something happened we would know about it one way or another and it worked. And [this building] was an authorized smoking area. See the kind of funny looking wired box above by the door? That would have been a[n electric] lighter, the switch is here."

"And you notice the building's 'Dutch door.' If the Platoon Leader was down and had something he wanted to put it out without coming inside and disturbing operations, they would have just passed it through here. But normally we were to have given out badges through this window and they have the little shelf for visitors to sign and the ADT panel wiring is right

down in here. [Indicates a rack of five small pipes about 2.5" diameter.] A back-up power supply would have been here because the ADT system had its own power supply. So, if we lost power on site, we still had security down here and that pretty much looks like it.

On telephone communications: "There were phones in each room in the pits and you could call up here. The exclusion area had temporary field phones. They were hooked up in here. The Ready building had security phones hooked up in here."

On entry into the exclusion area: "[This is the] personnel access gate. This is the way that you would have gotten into the launch area and normally if you notice we used to have a buzzer. This would have been hooked to an electrical switch, you got your badge and it would be closed. Either one of two things would have happened. If it was working, they would simply hit a buzzer and the gate would open, or they would unlock it, you'd enter, you pull it closed and it would be secured. If you wanted to get out and they were doing something else, you would be going [Mr. Abel waves his arms] trying to get out.

"In the other system they actually, physically, kept it locked. One of the MPs would come out, walk up here, open up the gate and let you in. I don't think security was ever lax on any site where it was just left open. It just didn't happen. I mean, they might as well have sent the MPs home if you are going to do that."

One memorable feature long-associated with this post was a tiny drone airplane mounted atop its roof. The plane, officially known as a Remote Control Aerial Target (RCAT) drone, had been unofficially awarded to A Battery for outstanding performance during an annual firing practice at McGregor Range. The unusual trophy stayed at the site until the unit departed in 1972.<sup>97</sup>

Furnishings:

Major post-1974 Modifications:

1986: Building repainted by SWAP (Sheriff's Work Alternative Program) offenders

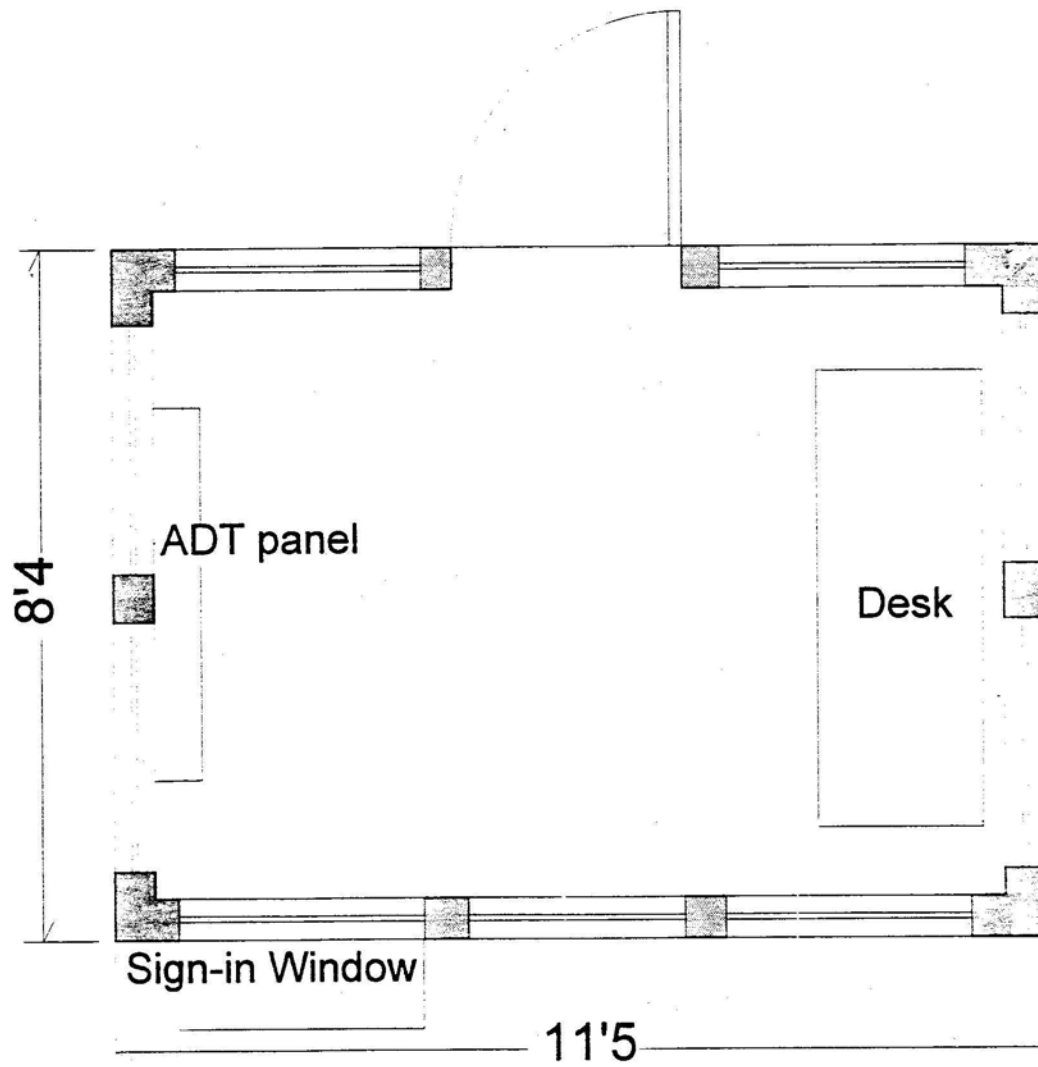
1992: Windows re-glazed with plexiglas and door replaced by NPS Maintenance.

Colors:

1959 Overall light green

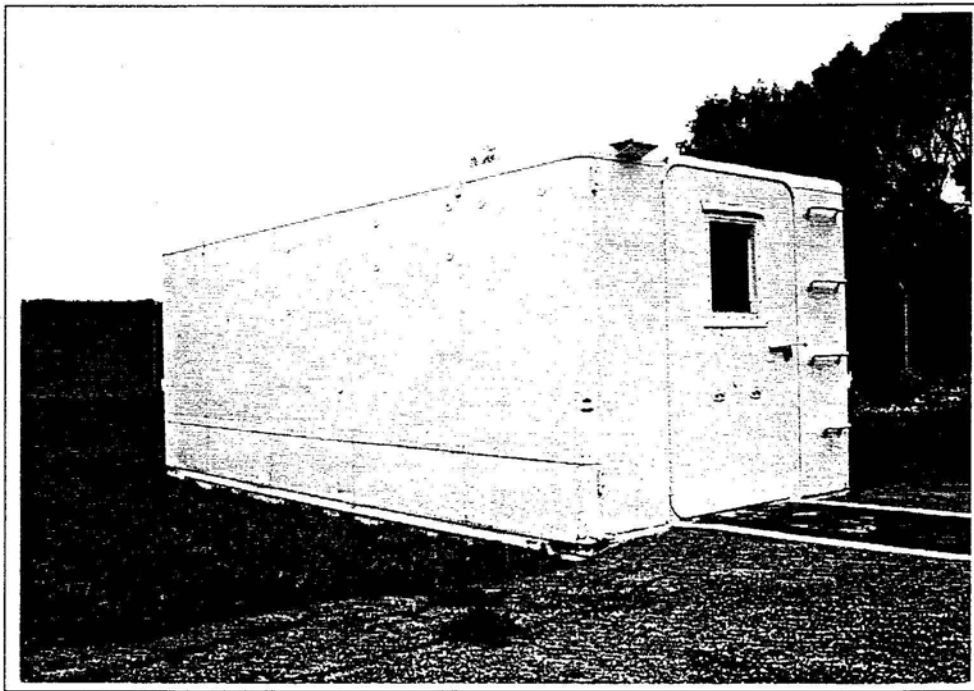
1965 Overall light green with dark green contrasting trim. RCAT mounted on roof

1974 Medium green walls with dark green doors, windows, trim and eaves.



SF 88-L Bldg. S-976  
Sentry Post  
Exclusion Area Gate

## I. LCT van



A Launch Control Trailer (LCT) served as the central communications facility at each Nike missile launching area. During alerts and launch drills, communications between the launching area and the IFC passed through this small magnesium van. LCTs were provided with wheeled truck assemblies, but these wheels were removed when the vans were installed at permanent Nike sites.

The LCT at SF-88L has been in three different locations. In 1954, when the first field emplacements were constructed, the van sat near Rodeo Lagoon adjacent to Launch Section No. 2. During construction of the permanent launching area, the van was briefly moved to location on Field Road just south of the new launchers. (Today this area is known as Lower Fisherman's Parking lot.) It remained there until shortly after the permanent launchers were completed, at which time it was moved into the launching area to a site just inside the gate.

The LCT at SF-88L sat upon a concrete "van pad" designated Bldg. S899. This pad, approached by a short asphalt walkway, was constructed in 1962 at a cost of \$200.

When the Army transferred SF-88L to the National Park Service in late 1974 they left behind a 'cannibalized' LCT body on the van pad. This van, stripped of all storage cabinets and communications gear, is not believed to be the actual LCT used at the site but an excess one chosen by the Army for display purposes.

All that remained inside the LCT body at the time NPS assumed control of the site were an empty heater cabinet and the worktable with attached stool. At the time of this writing,

this van is still located on pad S899. It is not considered to have any historic significance to SF-88L.

Interior furnishings and equipment:

Telephone switchboard, launch control panel, heater/air conditioner cabinets, storage cabinets, flight simulator, simulator mast assembly, warning siren, and a small work space consisting of a table and swing-out stool. (See attached drawing)

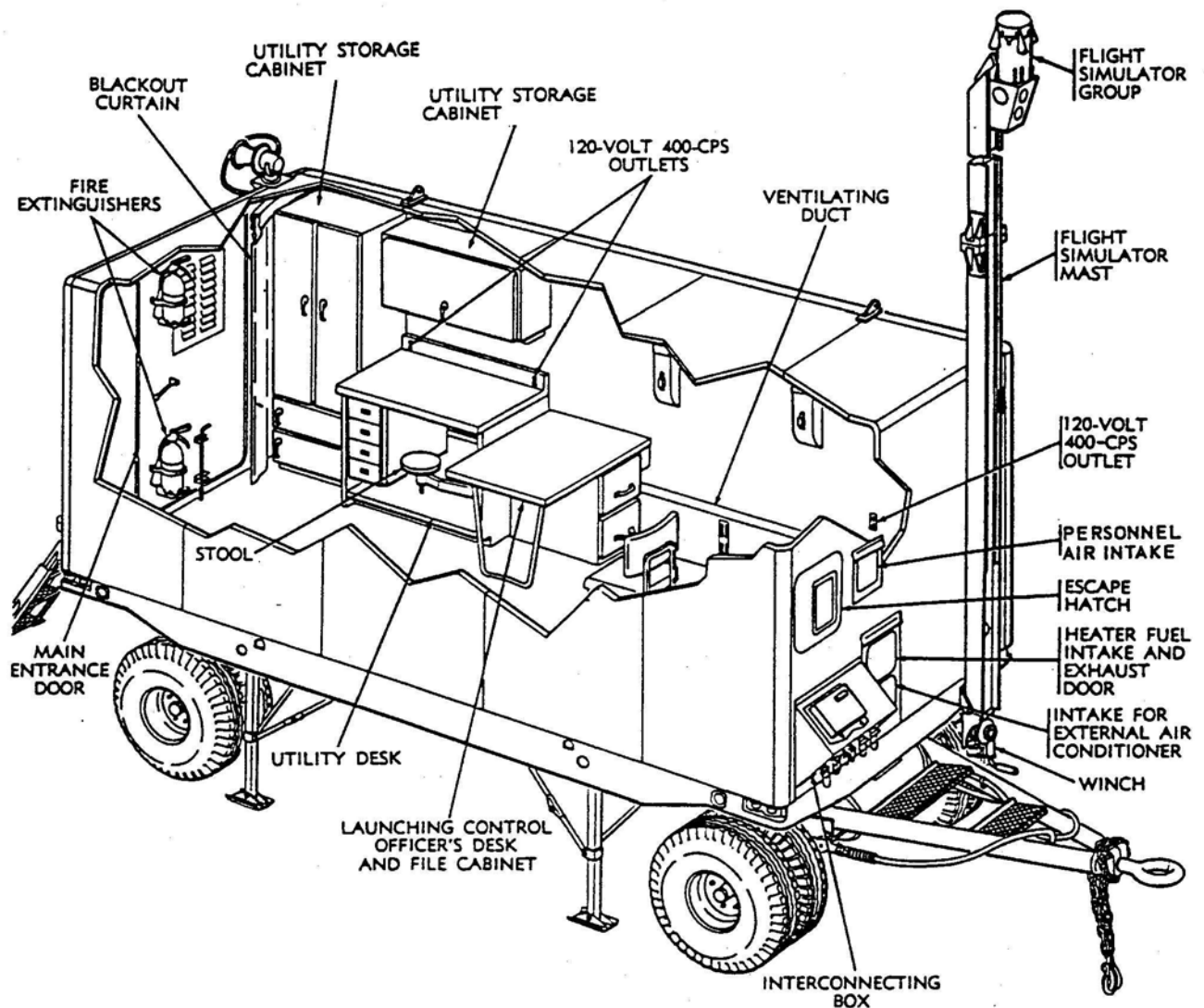
Colors:

1959 White  
1961 White  
1965 White  
1967 OD Green  
1974 OD Green

Major post-1974 Modifications:

1990. Van repainted in non-historic "faded olive drab" color by NPS contractor.  
1994 Roof treated with waterproofing sealer by VIPs.  
1997 Roof treated again and body repainted white by VIPs.

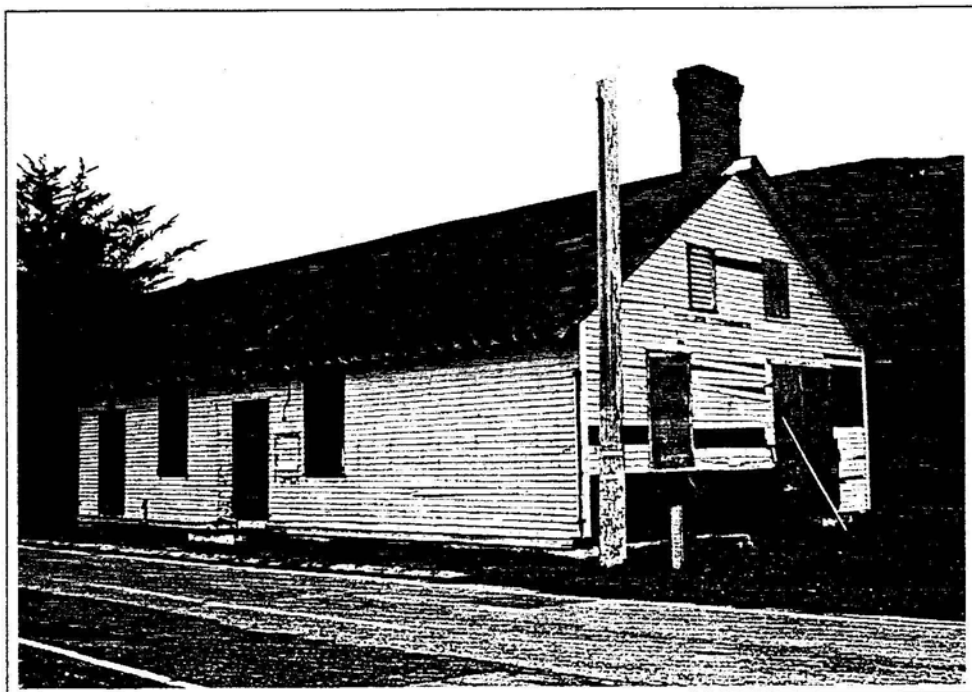




Cutaway view of a Launch Control Trailer (LCT). Wheels were removed from LCT vans at permanent Nike launching areas such as SF-88L.

**m. "Ready Building"**

Constructed: 1907 Remodeled: 1958-59 Size: 1,412 sq. ft. Cost: unk.



Every Nike site provided a space or building where missile crewmen waited to be called for drills or alerts. These ready buildings, sometimes called ready rooms, were especially needed during 'hot' status when crewmen had to respond immediately to the magazines and be ready for launch within 15 minutes. At most Nike sites the ready building was a vernacular, one-story structure with cinderblock walls. It usually included a squad room, a dining area, a day room, latrine and utility room.

Crewmen at SF-88L never enjoyed the luxury of a specially-designed ready building, although just such a structure was supposed to have been provided for the site in 1957 and again in 1972. Neither building was constructed, though. Instead, the old Fort Barry bakery on Field Road (Bldg. 962) was converted into the launching area's ready building. This wood frame structure, constructed in 1907, measured 28' x 51' with an attached utility room.

Plans for the building's conversion specified that its interior be divided into four spaces: an office for the Duty Officer, a latrine, a ready room and a squad room. The last room was to be provided with a dozen bunks and lockers, affording each soldier in both of the six-man crews his own place to sleep and stow his gear.<sup>98</sup>

Ron Parshall, who served as an ADA missileman at SF-88L in 1961, remembers the ready room: "We would be here all the time until we were off duty. It would be a full crew. Both sections would be ready, and that was a problem too because at night we would have to be

close enough to the missiles so we slept in that little building above the launching area [Bldg. 962] and when you have two crews in there and you only got five beds there's not enough room. So, everybody else sleeps on the couch. And the MPs from the Presidio used to patrol out here all the time so they would be in there, too, half the time because we had coffee and doughnuts. We had a very good cook when I was here and when we were on 'hot' he would always arrange, you know, about eleven, twelve o'clock to take [us] some cake, cookies or something like that, plus coffee. It was very nice. He didn't have to, you know. (Chuckles)."<sup>99</sup>

Unlike many ready rooms, though, the 1958 remodeling plans for the building fail to show any cooking facilities. This was probably due to the close proximity to the mess hall at the administrative area, and the willingness of the battery cook to bring chow to the launcher crews.

Terry Abel described the building in the early 1970s: "Normally, [the ready room] had a pool table, we almost had like a little game room, had a TV actually, some of them had Coke machines... As close, as comfortable as we could make it, we made it. For the simple reason that we didn't always have our full complement of troops and a lot of guys worked a lot of twenty-four on, twenty-four off and when you are spending fifty percent of your life in one of those buildings you want as many comforts as you can provide. It is good for morale. Ping-Pong table, pool table, almost for sure a pool table, and a TV for sure, and probably a radio, and that is about as much as we could afford out of health and welfare."

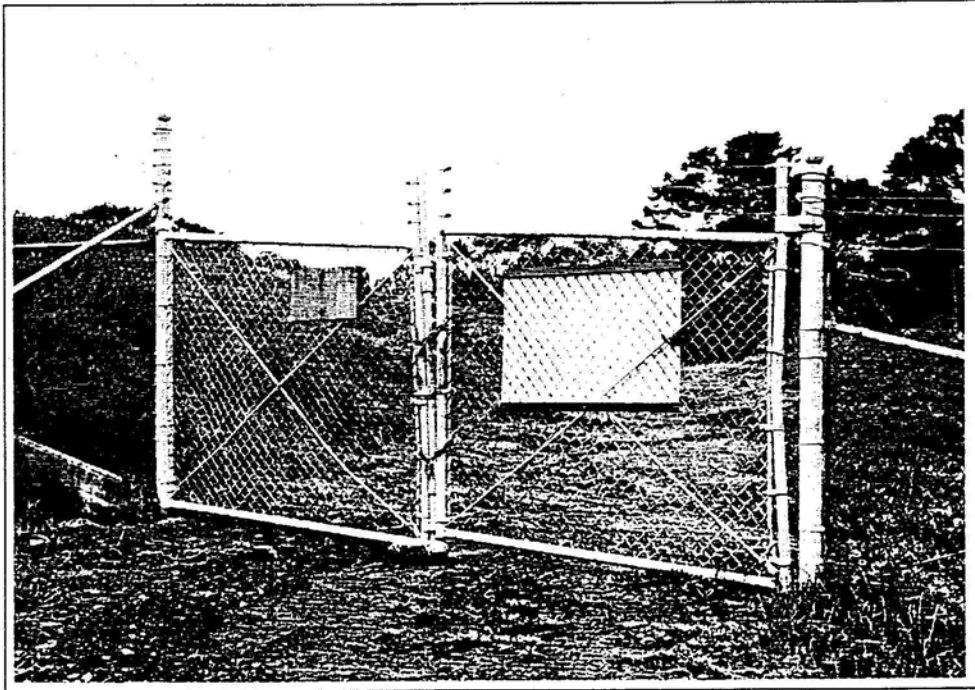
The squad room would have been initially furnished with folding end bunks or the World War II pattern, double-tiered with pipe metal "bunk extenders." Following 1967 it is likely these beds were exchanged for the new, wider, rigid bunk style adopted that year. Lockers would have been stand-up, free standing metal wall lockers with single doors. The ready room itself was generally furnished with a pool table, water cooler, coffee maker, ping pong table, television, couch, chairs, and various tables. These furnishings were generally a mixture of "issue items" and civilian equipment; crews were notable for creatively decorating their environments. The Duty Officer's office, by contrast, was an austere room furnished with government issue desk, chairs, filing cabinet and a few chairs.<sup>100</sup>

One important detail included on the plans are the paint schemes specified for the ready room. Although it is not proposed to preserve or interpret the interior of this structure, the color specifications and their corresponding Federal Standard Numbers (FSN) may be useful in other preservation projects at the site:

"Color numbers refer to Federal Standard No. 595B, March 1, 1956.

- 14491 - Light green blue, gloss
- 27855 - Eggshell white, semi-gloss
- 26555 - Light gray-brown, semi-gloss
- 36555 - Light gray-brown, flat
- 37855 - Eggshell white, flat
- 23727 - Light cream, semi-gloss
- 24491 - Light green blue, semi-gloss"<sup>101</sup>

## n. Fences and Gates



Gate in "Limited Area" fence leading to Battery Alexander

The launching area was provided with a perimeter security fence from its earliest days. In fact, the first plans located for the permanent SF-88 site provide specifications for fence and gate details to be used at the control and launching areas. Originally, the launching area fence was a 6' high cyclone fence topped with three strands of four-point galvanized barbed wire on stretchers angling 12 inches outwards from the fence, and conforming to type FE-6 on those plans.<sup>102</sup>

Two gates were initially provided in this perimeter fence. The main gate (Bldg. S886) was located on Field Road at the north end of the area. The other was at the southwest corner of the site on the road leading to Battery Alexander (Bldg. S885). Both were 10' wide double swing gates with center plunger bars.<sup>103</sup>

During the "Nike Improvement Program" of 1958, the fence at the main gate was slightly lengthened and reconfigured, and the existing double gates reinstalled about 20 feet north of their original location. (This new fencing can be distinguished from the original by its supporting poles. The original 1955 fences and gates used tubular steel poles, while the newer fence in this area is attached to steel "H" columns.<sup>104</sup>) During this rebuild project, the existing sentry building was constructed.

Also during 1958, a personnel gate was added to the perimeter fence behind Bldg. 960 on Field Road. This gate (Bldg. S882) led to a wooden staircase and path leading downhill to

the launchers, and was designed for use by crewmen responding from their ready room at Bldg. 962.<sup>105</sup>

The Army constructed an additional, inner security fence during the 1958 project. This cyclone fence, known as the exclusion area fence, was similar to the existing fencing around the perimeter, or what was now known as the Limited Area Fence. The new inner fence had three gates: two at the north end of the exclusion area (Bldgs. S880 and S881) and one at the southwest corner that aligned with the Battery Alexander Gate (Bldg. S885). The two gates at the northern end were 12' wide roller gates that flanked the new Sentry Post building, one gate for each of the two access road leading to the launcher sections, while the Alexander gate was apparently a simple 10' double swing gate. In 1959, the 12' gates were replaced by 14' gates.<sup>106</sup>

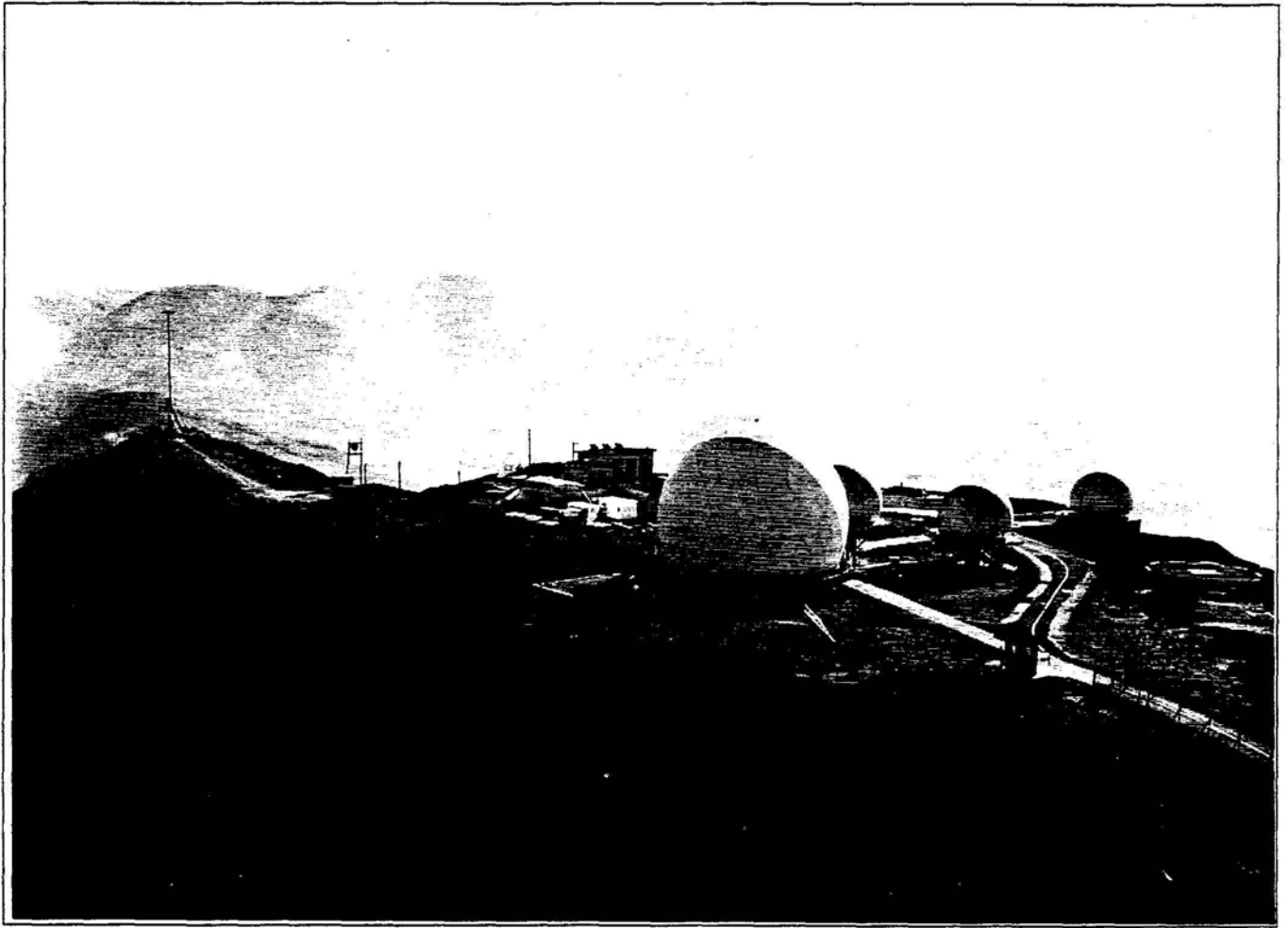
A dog kennel area and adjacent exercise compound were also constructed during the 1958 improvement program. This new compound was also enclosed by cyclone fence, similar to the rest of the limited area fence design. The kennel area measured 125' x 250', and formed a rectangular addition to the southwestern corner of the launching area. Within this enclosure, a separate inner fence measuring 50' x 60' surrounded the dog kennel building. This inner fence had its own personnel gate (S884)<sup>107</sup>

The Army decided that the original 6' fence height was too short to provide adequate security, and most fence posts on the limited area and exclusion area fences were lengthened by welding on 1' extender sections. Although no documentation has yet been located, it is believed that this occurred sometime after 1961 since photographs taken that year still appear to show the fences at their original 6' height.<sup>108</sup>

The limited area fence line remained relatively unchanged until the early 1970s when the western portion of the fence was realigned. The fence originally dipped down into the valley below the launching area, but during its rebuild it was moved to the top of the small berm constructed along the top of the slope as a water diversion dam.<sup>109</sup>

About this same time, several alterations were also made to the exclusion area fence. Sometime between 1972 (when the last base map was prepared) and inactivation in August 1974, two of the vehicle gates were removed and replaced with solid fencing, and a new personnel gate added behind the sentry building. The two demolished gates were the eastern sliding gate at the sentry post (Bldg. S881) and the double swing gate leading to Btry. Alexander (S885). The new personnel gate did not receive a number.<sup>110</sup>

Another undocumented gate was also added to the kennel area, possibly as part of the realignment of the limited area fence described above. This gate, located at the head of the sidewalk leading to the kennel area, restricted access to the training compound. The gate is oversized for its location and is probably a "recycled" gate from some other place.



Integrated Fire Control (IFC) site SF-88C about 1970. The large dome at center shelters the HIPAR (High Power Acquisition Radar). The smaller domes cover, from left to right, the TTR (Target Tracking Radar), TRR (Target Ranging Radar) and MTR (Missile Tracking Radar). On the knob at the far left is the bore-sighting mast. Following the Army's departure, this location came to be known unofficially as "Hill 88." (*Golden Gate National Recreation Area, TASC Collection*)

## *2. Control Area: SF-88C*

The Integrated Fire Control (IFC) area atop Wolf Ridge is officially designated SF-88C. Referred to by site personnel alternately as "Control" or "the IFC," SF-88C was first established in 1954 as part of the temporary Nike I missile battery at Fort Barry.<sup>111</sup> The site was improved and modernized over the years, but remained in its original location throughout SF-88s operational years.

The control site was originally arranged with its radars in a "T" formation conforming to US Army Air Defense standard plans, with the TTR, LOPAR antennae and MTR arrayed in a north-south line at the summit of Wolf Ridge.<sup>112</sup> To the east of the radars, forming the stem of the T, sat the Battery Control (BC) van, the Radar Control (RC) van, and a spare parts van. Behind the vans was a concrete surfaced enclosure for a portable generator and its transformers. Further east was the first permanent building at the site, a cinderblock ready building erected in 1954 for the radar crews. The last structure at SF-88C in its field arrangement was a tall metal antennae atop a concrete column. Known formally as a collimation mast (and informally as a "bore sighting mast"), the IFC crewmen used this mast as a fixed reference point for calibrating their radar antennae.<sup>113</sup>

This simple configuration remained at SF-88C through 1956 when, following completion of the SF-88L launching site, the IFC area was also modernized with the addition of permanent roads and structures. During this upgrade of the site, several improvements were made to make the entire facility more durable and livable:

- New concrete pad for LOPAR acquisition radar
- New concrete pads for BC van and RC van
- New interconnecting concrete corridor between the two vans
- New generator building and transformer pads
- New asphalt road surfacing and concrete sidewalks.<sup>114</sup>

The most conspicuous alteration at SF-88C occurred with the change over to Improved Nike Hercules in the early 1960s, and the corresponding installation of High Power Acquisition Radar (HIPAR) equipment. As noted previously, the most striking feature of HIPAR was a 50' tall tower and dome that dominated the IFC area. In addition, a separate operating building was also constructed to hold the new radar's operating equipment. The existing generator building at the IFC had to be enlarged to handle the additional power load.

By the end of 1961 the following changes had occurred at SF-88C:

- New HIPAR tower and radar installed
- New HIPAR operating building constructed
- New pads constructed for LOPAR, MTR, and TTR radars
- Target Ranging Radar (TRR) added to IFC site
- Generator Building and Interconnecting Corridor Building enlarged

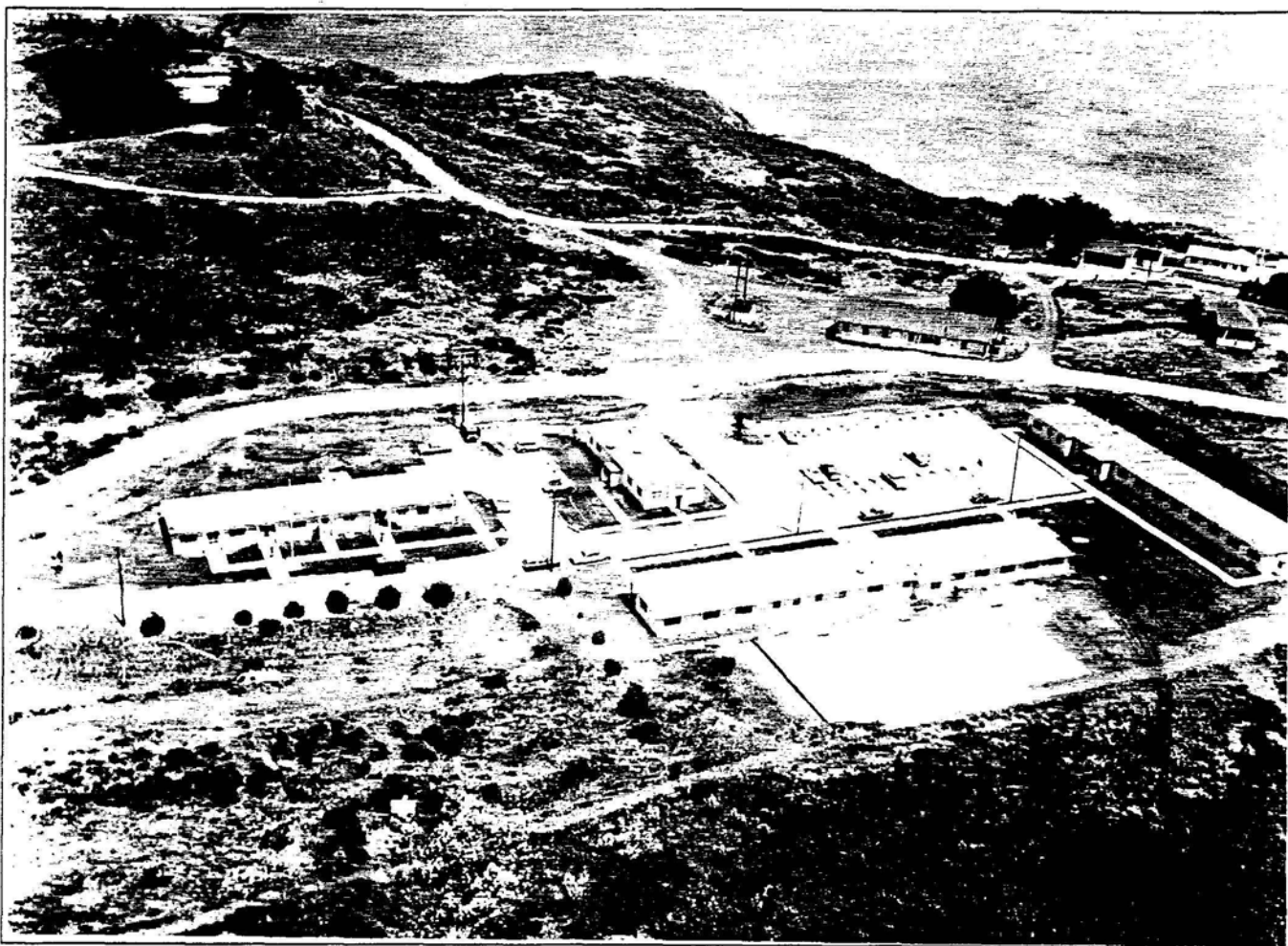


- Two new helipads constructed
- New repair shop building constructed
- Sentry post and main gate moved<sup>115</sup>

By the time this modernization was completed, the radar site contained five radars antennae of varying sizes, each enclosed in a white, weatherproof geodesic dome. Through the 1960s and early '70s, the public came to associate these "golf balls" with military presence in the Headlands, even if they weren't quite sure exactly what they were used for.

In addition to the domes, SF-88C contained a vast array of structures. A 1970 base map for the IFC listed 36 structures, ranging in size from the immense HIPAR tower to minuscule features such as drain sumps and abandoned radar pads.

Once the HIPAR project was completed in 1961, few major external changes occurred to highly visible radars and other IFC structures until the site's inactivation in 1974. Although the Nike Hercules and its IFC systems continued to be upgraded and improved, most of these were technological changes generally confined to the interiors of missile bodies and electronics consoles.



SF-88A, the Administrative Area in 1968. From left to right the buildings are: administration and day room, mess hall, barracks used by NCOs and enlisted personnel, and barracks for enlisted personnel only. One of the gun casemates of Battery Wallace is visible through the trees at top left, and the buildings of the Point Bonita Coast Guard Station are clustered at the upper right. (*Golden Gate National Recreation Area, TASC Collection*)

### *3. Administrative Area: SF-88A*

The administrative area for SF-88 has been located in three different complexes of buildings at Fort Barry. Originally, when Battery A of the 9th AAA Battalion arrived in late 1954, they billeted in Bldg. 942 at Fort Barry. This three-story wooden building on the main parade field was originally constructed in 1907 as a barracks for a company of coast artillery troops. When Capt. Paine and his men occupied the rambling building, it contained all operations associated with an Nike administrative area: battery headquarters, mess hall, offices, day room, NCO quarters and enlisted men's barracks.<sup>116</sup>

Battery A remained at the old Fort Barry barracks for at about three years, but eventually moved into the cantonment of World War II buildings near Battery Mendell when the antiaircraft gun battery that had been quartered there departed. (It is believed the move occurred sometime in late 1957 since Battery A was still in the coast artillery barracks when the commanding officer, Capt. Henry Paine, departed in the summer of that year.<sup>117</sup>) The administrative functions had definitely moved into the World War II buildings by 1958, since plans for the Nike Hercules improvement project at SF-88L call for new communications links to be made to the battery HQ in the Mendell area.<sup>118</sup>

There were fourteen buildings in the Mendell cantonment area, but the Nike personnel only used seven of them. These were a mess hall, a headquarters building, a supply room, a day room, and three barracks for EM and NCO quarters. The remaining buildings were apparently boarded up and unused. The only structure specially built for the Nike crewmen was a multi-use athletic court (Bldg. 998) constructed in 1961. Otherwise, these buildings remained relatively unchanged through the mid-1960s.

Crewman Ron Parshall remembers life in the old barracks: "The admin area. All of the office work was up there. They were wooden buildings, two stories high, easier to keep care of than the newer buildings. In newer buildings, you had to polish the floors all of the time because they had floor tiles. These wooden floors, all they wanted was them swept, so that's all you had to do. You would walk into any place and everything would be spic and span. Your bed had to be made properly, and all your uniforms had to be lined up ready for inspection at all times. It had a little area [PX] where they had Cokes, candy, writing paper, stuff like that. [The admin area was] where we assembled in the morning. There are stories of the fog coming down... so thick you could not see the guy next to you."<sup>119</sup>

In 1964, as part of a program to upgrade of Nike living quarters and administrative areas, the aging Mobilization buildings were demolished and replaced with more permanent cinderblock structures. Designed according to the Army's standard plans for "Modified Emergency Construction, Special AAA, for Firing Batteries," these new buildings were replicated around the Bay Area and the country.<sup>120</sup>

The new cantonment, completed in 1965, contained four structures: an administrative building (S981) containing offices, a day room, supply room and hobby room; a mess hall (S983); an enlisted barracks with NCO quarters (S984), and another enlisted barracks

without rooms for NCOs (S986).<sup>121</sup> Traditionally, one barracks building was occupied by launching area crewmen and the other by control area personnel. Behind the barracks was the only structure surviving from the old cantonment area - the athletic court. The completed administrative area was surrounded by cyclone security fencing.

The last, and only major, modification to the new buildings occurred in 1971 when the enlisted barracks were remodeled. In their original configuration, these barracks contained open "squad bays" where all the soldiers slept in a common room. During the remodeling, each squad room was subdivided into smaller dormitory-type rooms: eight in Bldg. 984 and twelve in Bldg. 986.<sup>122</sup> This remodeling project was part of a nation-wide VOLAR (Volunteer Army) program aimed at providing increased privacy for enlisted soldiers.

Modifications since 1974:

- 1976 Perimeter fencing removed by NPS
- c1980 Buildings repainted by YMCA
- c1986 Addition constructed on mess hall

## Endnotes for Part II— Historic Structure Report

<sup>1</sup> Maps, various, showing San Francisco Defense Area antiaircraft installations, dated 1952-1953, in the Fort Point Collection, Drawer 10, Park Archives and Records Center (PARC), Golden Gate National Recreation Area (GOGA), San Francisco, CA.

<sup>2</sup> Manuscript, "US Army Air Defense Fire Distribution Systems," Lt. Col. James W. Loop, USA (Ret.), copyright 1993.

<sup>3</sup> Map, "Position #81, 'A' Btry 740th AAA Gun Bn, Ft. Barry," n.d., circa 1952, in the Fort Point Collection, PARC, GOGA, San Francisco, CA.

<sup>4</sup> Manuscript, "US Army Air Defense Fire Distribution Systems," Lt. Col. James W. Loop, USA (Ret.), copyright 1993.

<sup>5</sup> Photograph, "Major General Hobart Hewett, Commanding General 66h AAA Regional Command ... visit[s] a gun site at "B" Btry, 752nd AAA Battalion (credit: 6th Army Photo Lab)," 20 February 1956, P81-072.15, Golden Gate NRA Collection, J. Porter Shaw Library, San Francisco Maritime National Historic Park, San Francisco, CA.

<sup>6</sup> Document, "Report On Guided Missiles (Nike) Program, Estimate of Construction Program as of 30 June 1953," document in the files of the Office of History, Army Corps of Engineers, Washington, D.C.

<sup>7</sup> Letter, William E. Hunt, CSM, US Army, (Ret.) to Col. Milton Halsey, US Army (Ret.), December 1996, concerning Nike-related activities of 359th Engineer Detachment (Utility) during the period 1952-1956.

<sup>8</sup> Photograph, aerial view of Forts Barry and Cronkhite, CA, 6 January 1954, Marin Headlands Cultural Landscape Report files, PARC, GOGA, San Francisco, CA.

<sup>9</sup> Map, "Advance Plan, Surface to Air Missile Units, Launching Positions, For Fort Cronkhite Control," 5 May 1953, Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.

<sup>10</sup> Map, "San Francisco Defense Area, Project (SAM), SF-88-C&L, Proposed Temporary Site," 4 January 1954, Drawer 247, Folder 5, PARC, GOGA, San Francisco, CA.

<sup>11</sup> Map, "Sketch Map of Fort Barry - Fort Cronkhite," 20 October 1954, Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.

<sup>12</sup> Map, "Fort Barry Topography, Vicinity of O'Rourke and Alexander," 9 October 1953, annotated with undated site plans for two launcher sections, Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.

<sup>13</sup> Site visit by John Martini, NPS, accompanied by Col. Milton Halsey, USA (Ret), July 1997.

<sup>14</sup> Photograph, "Members of an anti-aircraft missile battalion of the 30th Anti-aircraft Artillery Group uncover a newly delivered Nike missile in preparation of a position near San Francisco," 18 October 1954, SC-506857, Dept. of Defense, Still Media Records Center, Washington, D.C.

<sup>15</sup> Site visit by John Martini, NPS, August 1994.

<sup>16</sup> "Pair of 6th Region warrant officers began with guns," *ARGUS Magazine*, February 1972.

<sup>17</sup> Interview with Capt. Henry E. Paine, US Army (Ret.), 13 January 1998.

<sup>18</sup> Letter, William E. Hunt, CSM, US Army, (Ret.) to Col. Milton Halsey, US Army (Ret.), December 1996, concerning Nike-related activities of 359th Engineer Detachment (Utility) during the period 1952-1956.

<sup>19</sup> Photograph, "Major General Hobart Hewett asks about the NIKE from Lt. Colonel Burket, Commanding Officer of the 9th AAA Missile Bn and element of the 30th AAA Group commanded by Colonel P.H. Wallaston," US Army photograph, 28 October 1954, Henry E. Paine Collection, PARC, GOGA, San Francisco, CA.

<sup>20</sup> Photographs, "Fort Barry, Calif., Overlooking the Pacific Ocean is one of the Nike launchers of the 30th AAA Group [etc.] 15 March 1955," (same caption on both pictures)

SC-506878 and SC-506879, Dept. of Defense, Still Media Records Center, Washington, D.C.

<sup>21</sup> Plans, "San Francisco Defense Area, Special AAA, SF-88-C, Revised Control Area Site Plan," 21 June 1956, Drawer 246, Folder 3, PARC, GOGA, San Francisco, CA.

<sup>22</sup> Plans, "Conversion of Balloon hangar for use as Armament Shop," 20 June 1953, Drawer 191, PARC, GOGA, San Francisco, CA.

<sup>23</sup> Plan, uncaptioned, showing interior of Fort Barry Balloon hangar with Nike missiles and equipment, undated, Drawer 191, PARC, GOGA, San Francisco, CA.

<sup>24</sup> Site visit by John Martini, NPS, and Col. Milton Halsey, USA (Ret), October 1997. Elsewhere within Wallace are faint chalk markings for "Btry A", "Btry B" "Btry C" and "HQ" that possibly relate to the 9th AA Missile Battalion units stationed in Marin.

<sup>25</sup> Plan, "For Ordnance - Wallace and Alexander," n.d., Drawer 327, PARC, GOGA, San Francisco, CA. The plan displays the large notation "Acid Storage" over a portion of Wallace. It is believed to date from before 1955 based upon road arrangements that would be drastically altered with the construction of SF-88L.

<sup>26</sup> Site visit by John Martini, NPS, February 1989.

<sup>27</sup> Drawing, "Fence & Details, Type FE-5, FE-6, FE-7, SF-88-C&L," 2 July 1953, Drawer 247, Folder 6, PARC, GOGA, San Francisco, CA.

<sup>28</sup> Map, "San Francisco Defense Area, Project (SAM), Location and Vicinity Map," 15 December 1953, Drawer 247, Folder 5, PARC, GOGA, San Francisco, CA.

<sup>29</sup> Map, "SF Defense Area, Nike-I, SF-88-C&L, Location and Site Maps," 2 March 1954, Drawer 246, Folder 6, PARC, GOGA, San Francisco, CA.

<sup>30</sup> Plan, "Nike-I, SF-88-L, Utility Plan," 12 March 54, Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.

<sup>31</sup> Map, "San Francisco Defense Area (Project SAM), SF 87 C&L, Location & Vicinity Map," 15 December 1953, Drawer 245, Folder 1, PARC, GOGA, San Francisco, CA.

<sup>32</sup> Plans, "Nike-I, SF-87 C&L, Site Plan," 19 February 1954, and "Nike-I, SF-87, Launchers, Area Grading, Log of Borings," 21 April 1954, Drawer 245, Folder 2, PARC, GOGA, San Francisco, CA.

<sup>33</sup> Plans, "Marin County, California, San Francisco Defense Area, SF-88-L, Launchers" (31 sheets), Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.

<sup>34</sup> Photograph, TO BE ADDED, showing excavation for pits, DOD collection, etc. 1954, PARC, GOGA, San Francisco, CA.

<sup>35</sup> Letter, William E. Hunt, CSM, US Army (Ret.) to Col. Milton Halsey, US Army (Ret.), December 1996, concerning Nike-related activities of 359th Engineer Detachment (Utility) during the period 1952-1956.

<sup>36</sup> Interview, Peter J. Bohan, 21 January 1998. Mr. Bohan served as Chief Warrant Officer, Launching Area, at Site SF-88L from 1955 through 1963.

<sup>37</sup> Of these temporary buildings, only the acid storage shack survived through the closing of site SF-88, its last use being a flammable materials storage building. It collapsed in 1996.

<sup>38</sup> "Building and Information Schedule, DA Form 2368-R, Nike Site SF-88" July 1971, ADPWE-6, Box 4, PARC, GOGA, San Francisco, CA.

<sup>39</sup> Map, "Fort Cronkhite[sic], SF-88-L, Erosion Control, Launcher Area," 21 June 1956, Drawer 246, Folder 3, PARC, GOGA, San Francisco, CA.

<sup>40</sup> Photographs of SF-88L taken by Lt. Robert Schaeffer, circa 1957, PARC, GOGA, San Francisco, CA.

<sup>41</sup> Plan, "SF-88-L, Plan & Details of Auxiliary Launcher & Stanchion Footings," 22 November 1954, Drawer 247, Folder 6, PARC, GOGA, San Francisco, CA. Nike personnel, in the classic tradition of the Artillery, numbered their launchers from right to left as viewed when facing the direction of the enemy. However, since the elevator-mounted launcher was always designated #1, launchers #2, #3 and #4 were always the above-ground launchers.



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- <sup>42</sup> Interview, Mr. Ron Parshall, 19 July 1997. Mr. Parshall served as a launcher crewman at SF-88L in 1961.
- <sup>43</sup> Interview, Captain Harry Paine, USA (Ret.). 12 January 1997. Capt. Paine served as the first Battery Commander at SF-88L from 1954 to 1957.
- <sup>44</sup> Interview, Bohan.
- <sup>45</sup> Interview, Paine.
- <sup>46</sup> Plans, "San Francisco Defense Area, Special AAA, SF-88-C, Revised Control Area Site Plan," 21 June 1956, Drawer 246, Folder 3, PARC, GOGA, San Francisco, CA.
- <sup>47</sup> Interview, Cheney.
- <sup>48</sup> Plans, "Fort Cronkhite [sic], SF-88-L, Erosion Control, Launcher Area," 21 June 1956, Drawer 246, Folder 3, PARC, GOGA, San Francisco, CA.
- <sup>49</sup> Plan, "SF 88-L, Ready building, (24 EM), Site & Utility Plans & Details," 15 October 1957, Drawer 246, Folder 3, PARC, GOGA, San Francisco, CA.
- <sup>50</sup> Map, "Nike Battery, S.F.-88L (Fort Barry), As Built Topography," 12 February 1958, Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.
- <sup>51</sup> "S.F. 88, Ft. Cronkhite [sic], Nike Site Improvement, Structures & Utilities, Site Grading & Utility Plans," 14 March 1958, Drawer 247, Folder 6, PARC, GOGA, San Francisco, CA.
- <sup>52</sup> Plans, "Special A.A.A., San Francisco Defense Area, Modifications & Improvements, Launcher Area, SF-88-L," (29 sheets), 2 May 1958, Drawer 246, Folder 4, PARC, GOGA, San Francisco, CA.
- <sup>53</sup> Ibid.
- <sup>54</sup> "5 Nike Bases In Area to Get Atom Missiles," *San Francisco Chronicle*, 29 May 1958.
- <sup>55</sup> Interview, Bohan.
- <sup>56</sup> "Nike Hercules Missiles Installed at Marin Site." *San Francisco Chronicle*, 20 November 1958.
- <sup>57</sup> Map, "SF-88-L, Launchers, Site Plan - Warheading Building," Drawer 247, Folder 5, PARC, GOGA, San Francisco, CA.
- <sup>58</sup> Interview, Bohan.
- <sup>59</sup> "Bay Defense Posts Get Killer Rockets," Orr Kelly, *San Francisco Chronicle*, 21 January 1959.
- <sup>60</sup> *San Francisco Chronicle*, 21 January 1959.
- <sup>61</sup> (PHOTO ID TO BE ADDED)
- <sup>62</sup> Interview, Bohan.
- <sup>63</sup> Map, "Site 88 L Launcher Area (Fort Barry), Erosion Control, Plans & Details," 5 May 1959, Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.
- <sup>64</sup> Map, "Air Defense Missile Site SF-88, Master Plan, Basic Information Maps, General Site Map," 29 June 1970, Drawer 246, Folder 1, PARC, GOGA, San Francisco, CA.
- <sup>65</sup> Morgan, Mark L. and Berhow, Mark A., "Rings of Supersonic Steel,"
- <sup>66</sup> "San Francisco Defense Area, Improved Nike-Hercules with HIPAR, SF-88-C, Site Utility Plan," 27 February 1961, Drawer 247, Folder 6, PARC, GOGA, San Francisco, CA.
- <sup>67</sup> PHOTO CAPTIONS TO BE ADDED
- <sup>68</sup> "Building and Information Schedule, DA Form 2368-R, Nike Site SF-88" July 1971, ADPWE-6, Box 4, PARC, GOGA, San Francisco, CA.
- <sup>69</sup> "Building Floorplan Diagrams, Nike Site SF-88" October 1970, ADPWE-6, Box 3, Folder 198, PARC, GOGA, San Francisco, CA.
- <sup>70</sup> Plan, "Canine Equipment Storage Building, Site and Location Plan, SF-88L," 27 January 1964, Drawer 247, Folder 7, PARC, GOGA, San Francisco.
- <sup>71</sup> "Site 88-L, Two Stairwells, U.G. Mag, Plans, Elevations, Sections," 10 April 1964, Drawer 248, Folder 9, PARC, GOGA, San Francisco, CA.
- <sup>72</sup> "Building and Information Schedule, DA Form 2368-R, Nike Site SF-88" July 1971, ADPWE-6, Box 4, PARC, GOGA, San Francisco, CA.



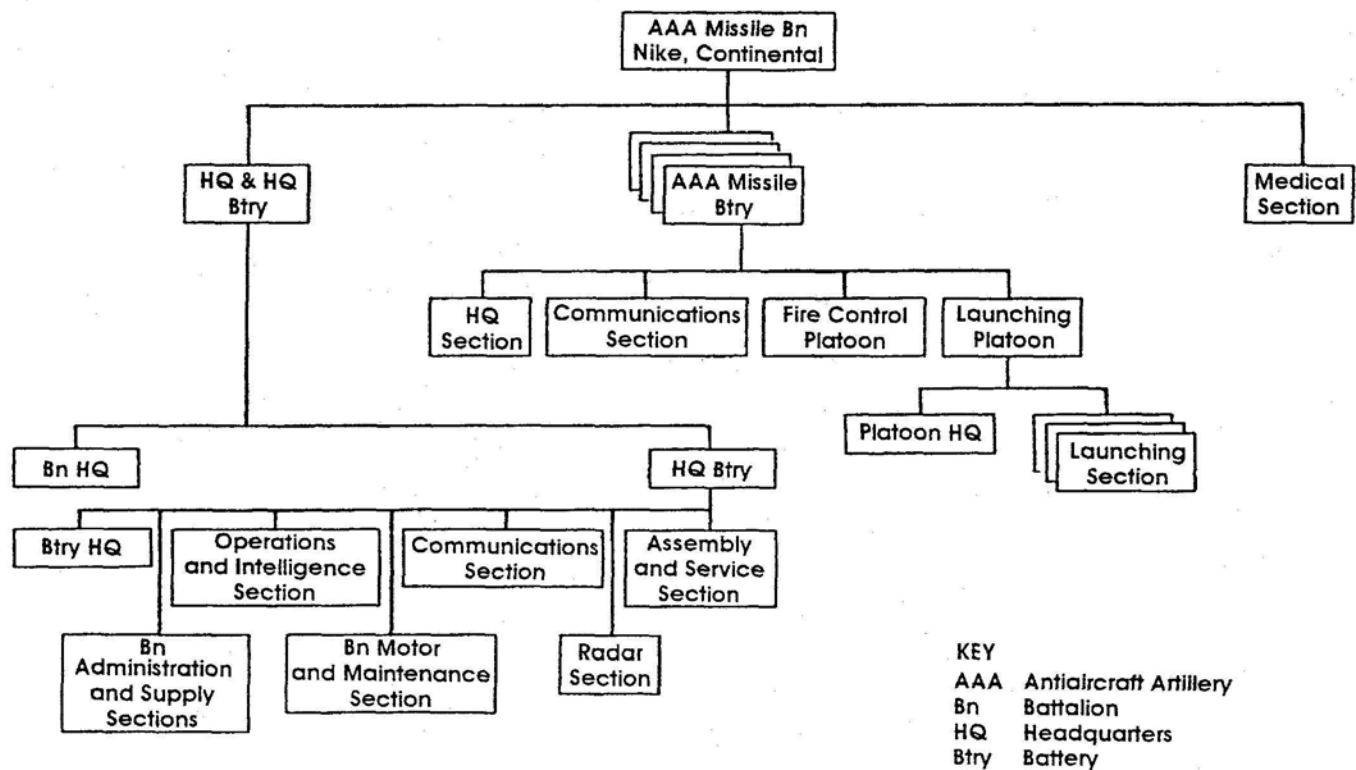
- <sup>73</sup> "Air Defense Missile Site SF-88, Planting Plan," March 1970, Drawer 247, Folder 7, PARC, GOGA, San Francisco, CA.
- <sup>74</sup> Map, "Air Defense Missile Site SF-88, General Site Map," March 1970, Drawer 246, Folder 1, PARC, GOGA, San Francisco.
- <sup>75</sup> Map, "Air Defense Site SF-88, Ready building, General Site Plan," 21 April 1972, Drawer 246, Folder 1, PARC, GOGA, San Francisco, CA.
- <sup>76</sup> Letter, "Subject: Security of Sites Upon Inactivation", Col. Clarence A. Miller, AD, to Commander, Presidio of San Francisco, 17 April 1974, ADPWE-6, Box 1, Folder 1, PARC, GOGA, San Francisco, CA.
- <sup>77</sup> Message, "Acceleration of Inactivation Dates," from Commander ARADCOM, Ent AFB, CO, to Commander, Presidio of SF, n.d., ADPWE-6, Box 1, Folder 5, PARC, GOGA, San Francisco, CA.
- <sup>78</sup> Interview, Col. John Kern, US Army (Ret.). Kern served as 'Liaison for National Park Service' and "Coordinator, Golden Gate National Recreation Area" for Sixth US Army following legislation of Golden Gate NRA.
- <sup>79</sup> "Memorandum For the Record, Subject: Operations Concise/Outline of Real Estate Actions, Presidio of San Francisco," 25 February 1974, Fran M. Roberts, Chief, Real Estate Branch, ADPWE-6, Box 1, Folder 3, PARC, GOGA, San Francisco, CA.
- <sup>80</sup> Interview, Kern.
- <sup>81</sup> Interview, William Whalen, 1992.
- <sup>82</sup> "Memorandum For Record, Subject: Status of Disposition of Deactivated NIKE Sites in San Francisco Defense Area," 16 August 1974, Fran M. Roberts, Chief, Real Estate Branch, ADPWE-6, Box 1, Folder 3, PARC, GOGA, San Francisco, CA.
- <sup>83</sup> Memorandum, "This "Discontinuance of Army Use and Release of Real Property to the Golden Gate National Recreation Area," Commander, Sixth US Army to Superintendent, GOGA, 6 February 1976, ADPWE-6, Box 4, File 349, PARC, GOGA, San Francisco, CA.
- <sup>84</sup> Site visit by John Martini, NPS, October 1974.
- <sup>85</sup> Carlson, Christina M. and Lyon, Robert, *Last Line of Defense: Nike Missile Sites in Illinois*, pp. 39-40, Denver, Rocky Mountain System Support Office, National Park Service, 1996.
- <sup>86</sup> Map, "Air Defense Missile Site SF-88, Master Plan, Basic Information Maps, General Site Map," 29 June 1970, Drawer 246, Folder 1, PARC, GOGA, San Francisco, CA.
- <sup>87</sup> The Antiaircraft Artillery and Guided Missile School, *Underground Launching Equipment (ST-44-161-31)* (Fort Bliss, Texas: October 1955), pp. 3.
- <sup>88</sup> Department of the Army, *Nike I Systems: Nike I Round Launching Area and Assembly Area Equipment (TM9-5000-4)*(Army Headquarters: April 1956), pp. 27.
- <sup>89</sup> Ibid.
- <sup>90</sup> Photograph taken 1975 by Park Technician Sara Conklin, NPS, in Interpretation Files, PARC, GOGA, San Francisco. The shield was painted "1st BN, 61st ADA" and the tablets read "97.1" and "1974."
- <sup>91</sup> Carlson, pp. 59.
- <sup>92</sup> US Army training film, "Nike Hercules Missile: Part IV: Preparation of Warhead and Forward Section," TF44 3689, (1966).
- <sup>93</sup> Oral History Interview, CWO Terry Abel, US Army (Ret.), 7 June 1992.
- <sup>94</sup> Interview, Parshall.
- <sup>95</sup> Ibid.
- <sup>96</sup> Interview, Cheney.
- <sup>97</sup> Interview, Bohan
- <sup>98</sup> Plans, "S.F. 88L, Fort Barry, Nike Site Improvement, Modifications to Bldg. #962: Ready building," 3 June 1958, Drawer 247, Folder 5, PARC, GOGA, San Francisco, CA.
- <sup>99</sup> Interview, Parshall.
- <sup>100</sup> Interviews with site personnel, various.

- <sup>101</sup> Plans, "S.F. 88L, Fort Barry, Nike Site Improvement, Modifications to Bldg. #962: Ready building," 3 June 1958, Drawer 247, Folder 5, PARC, GOGA, San Francisco, CA.
- <sup>102</sup> Drawing, "Fence & Details, Type FE-5, FE-6, FE-7, SF-88-C&L," 2 July 1953, Drawer 247, Folder 6, PARC, GOGA, San Francisco, CA.
- <sup>103</sup> Ibid.
- <sup>104</sup> Site visit by John Martini, NPS, January 1998.
- <sup>105</sup> Plans, "S.F. 88L, Fort Barry, Nike Site Improvement, Modifications to Bldg. #962: Ready building," 3 June 1958, Drawer 247, Folder 5, PARC, GOGA, San Francisco, CA.
- <sup>106</sup> Plans, "SF-88L, Erosion Control, Plans & Details," 5 May 1959, Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.
- <sup>107</sup> Map, "Site 88 L Launcher Area (Fort Barry), Erosion Control, Plans & Details," 5 May 1959, Drawer 246, Folder 2, PARC, GOGA, San Francisco, CA.
- <sup>108</sup> Photograph, "Fort Barry, CA....Site 88, launcher area...looking north shows launcher sections A and B," 1961, SC-588979, Dept. of Defense, Still Media Records Center, Washington, D.C.
- <sup>109</sup> Map, "Air Defense Missile Site SF-88, General Site Map," March 1970, Drawer 246, Folder 1, PARC, GOGA, San Francisco.
- <sup>110</sup> Map, "Air Defense Site SF-88, Ready building, General Site Plan," 21 April 1972, Drawer 246, Folder 1, PARC, GOGA, San Francisco, CA.
- <sup>111</sup> Interview, Paine.
- <sup>112</sup> Plans, "San Francisco Defense Area, Special AAA, SF-88-C, Revised Control Area Site Plan," 21 June 1956, Drawer 246, Folder 3, PARC, GOGA, San Francisco, CA.
- <sup>113</sup> Interview, Paine.
- <sup>114</sup> Plans, "San Francisco Defense Area, Special AAA, SF-88-C, Revised Control Area Site Plan," 21 June 1956, Drawer 246, Folder 3, PARC, GOGA, San Francisco, CA.
- <sup>115</sup> "San Francisco Defense Area, Improved Nike-Hercules with HIPAR, SF-88-C, Site Utility Plan," 27 February 1961, Drawer 247, Folder 6, PARC, GOGA, San Francisco, CA.
- <sup>116</sup> Interview, Paine. Captain Paine and his family had quarters at "West Portal" near the Baker-Barry Tunnel. There, he and other Nike officers lived in 1941 Mobilization Buildings that had each been converted into four apartments.
- <sup>117</sup> Ibid.
- <sup>118</sup> Plans, "Special A.A.A., San Francisco Defense Area, Modifications & Improvements, Launcher Area, SF-88-L," 2 May 1958, Drawer 246, Folder 4, PARC, GOGA, San Francisco, CA.
- <sup>119</sup> Interview, Parshall.
- <sup>120</sup> "San Francisco Defense Area, SF-88, Fort Barry, California, Battery Facilities," 27 January 1964, Drawer 247, Folder 8, PARC, GOGA, San Francisco, CA.
- <sup>121</sup> "Building and Information Schedule, DA Form 2368-R, Nike Site SF-88" July 1971, ADPWE-6, Box 4, PARC, GOGA, San Francisco, CA.
- <sup>122</sup> "San Francisco Defense Area, California, Rehab Barracks @ Nike Hercules Sites, SF-88, Ft. Barry, Electrical Plans," Drawer 248, Folder 9, PARC, GOGA, San Francisco, CA.



## Appendix 1.

### Nike Firing Battalion, Table of Organization and Equipment

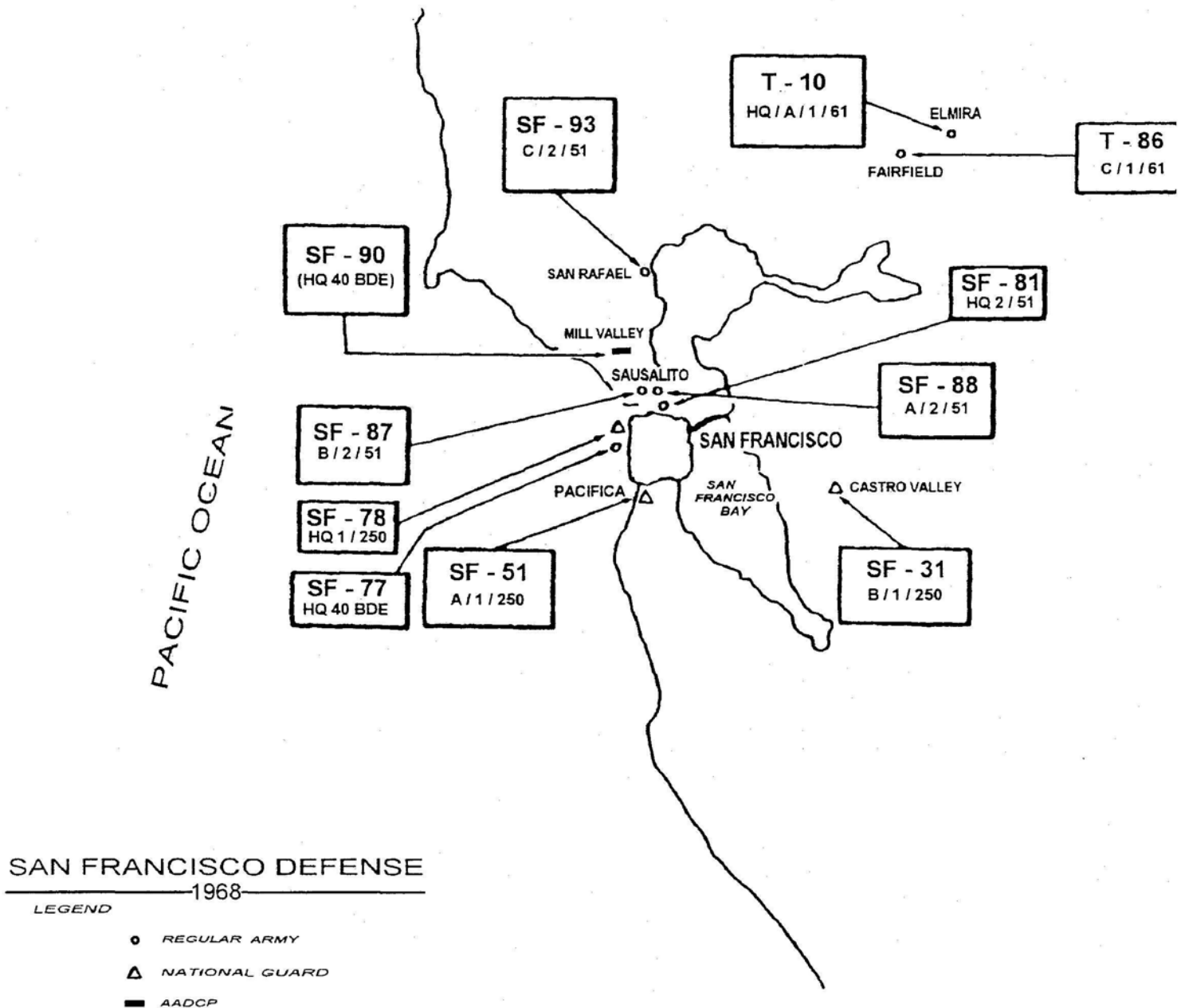


### Organization of a Typical Nike Battalion (TOE 44-145) 1956

(From: *Historical Overview of the Nike Missile System*, 1984, McMaster et al)

## Appendix 2.

### Nike Sites in the San Francisco Bay Area



Map adapted from: *Historical Overview of the Nike Missile System*, 1984, McMaster et al.

## THE SAN FRANCISCO DEFENSE AREA\*

The San Francisco-Oakland Bay Area is filled with major military installations, shipyards, industrial sites, communications systems, and financial and governmental concerns; as a leading Pacific Rim city, it was an obvious candidate for a major Nike defense.

The SF defense hosted the Sixth ARADCOM Region and stood up with one brigade, one group, and three battalions. The AADCP was located at Mill Valley AFS, on the summit of Mount Tamalpais in Marin County. The SAGE command posts providing early warning and initial target tracking information were located at Beale AFB, CA (San Francisco ADS, 2/59-8/63); Adair AFS, OR (Portland ADS/26th Air Division, 8/63-9/69); Norton AFB, CA (27th AD, 9/69-11/69), and Luke AFB, AZ (26th AD, 11/69-8/74).

In June 1971, HHB/1/61st transferred to Fort Baker from Elmira in the Travis AFB defense and assumed operational control of the remaining Regular Army firing battery in the Bay Area. Notably, many of the former ARADCOM sites in the San Francisco area are now owned by the National Park Service's Golden Gate National Recreation Area.

UNIT ASSIGNMENTS (A. = Activated I. = Inactivated rd. = redesignated)

Sixth ARADCOM Region -	A.	1 Sept 1950, Hamilton AFB, CA
	I.	1 Aug 1974
-Hamilton AFB ( /51) Fort Baker		
40th Arty Bde -	A.	23 Jan 1959, Fort Barry, CA
	I.	30 June 1971
-Fort Barry ( ) Fort Winfield Scott		
-Originally organized 31 August 1918 as 40th Artillery Brigade, Fort Hamilton, NY		
47th Arty Bde -	A.	1 Apr 1951, Camp Stewart, GA
	I.	1 June 1971
-Camp Stewart (3/52) Fort Baker, CA (11/52) Fort MacArthur, CA (11/68)		
Homestead AFB		
-Prior 47th Coast Artillery Brigade (AA)		
114th Arty Bde -	A.	1959, San Francisco, CA
CAArNG	I.	1963
13th ADA Gp -	A.	Mar 1958, Fort Stewart, GA
	I.	1 Aug 1974

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\* From *Rings of Supersonic Steel: Air Defenses of the United States Army 1950-1979*, 1996, Morgan and Berhow. Used with permission.

-Fort Stewart ( /62) Southwest Miami ( ) Homestead AFB (11/68) Snelling AFS (6/71) Presidio of San Francisco

233d Arty Gp -	A.	1959, San Francisco, CA
CAArNG	I.	63

-First constituted 1 July 1924 as 1/9th Coast Artillery (Harbor Defense); organized 10 February 1941 at Fort Warren, MA

- Not operational with Nike Ajax
- Consolidated with the 250th Artillery

-Fort Cronkhite ( /59) San Pablo Ridge  
-First constituted 21 May 1942 as the 441st Coast Artillery Battalion (Antiaircraft)  
(Automatic Weapons); activated 1 June 1942

- Not operational with Nike Ajax
- Consolidated with the 250th Artillery
- Alameda ( /58) Berkeley

-First constituted 21 May 1942 as the 1/611th Coast Artillery (Antiaircraft);  
activated 10 December 1942 at Fort Bliss, TX

- Replaced 9th AAMBN; replaced by 1/61st with consolidation of San Francisco and Travis AFB defenses
- Originally organized 3 September 1901 as 109th Company, Coast Artillery Corps, Fort Greble, RI



4/61st -	A.	1 Sept 58, Presidio of SF, CA
	I.	25 Mar 66
-Replaced 740th AAMBn		
-Presidio of San Francisco (7/59) Robins AFB		
4/67th -	A.	1 Sept 58, San Pablo Ridge, CA
	I.	28 June 63
-Replaced 441st AAMBn		
-Originally activated 10 February 1941 as Battery D, 67th Coast Artillery, Fort Bragg, NC		
1/250th -	A.	1 May 59, Presidio of SF, CA
CAArNG	I.	1 July 74
-Replaced 271st AAMBn		
2/250th -	A.	1 May 59, Berkeley, CA
CAArNG	I.	Mar 63
-Replaced 728th AAMBn		
-Berkeley (7/59) Fort Funston		

### San Francisco Area Nike Site Designations and Locations

DESIGNATIONS - Each CONUS (Continental US) Nike site was designated utilizing a 1-100 "compass," with the center of the defense area as the reference point. For example, WA-74 in the Washington-Baltimore Defense Area was due west of the Washington Monument. There were exceptions, with sites numbered apparently out of sequence, and some sites were renumbered during their service careers. Nearby towns are listed; the sites were popularly known by name over number, such as Fort Barry (SF-88) and Pacifica (SF-51). Each site designation number was followed by a letter or letters indicating its mission or use:

A - Admin facility	C - Control/IFC (integrated fire control)
DC - Direction Center	L - Launch facility

The location presented of each component is as detailed as practicable.

MISSILES/STORAGE - the first listing indicates the number of missile magazines at the site, by type:

C -	Ajax only; original design (3 satellite launchers, 1 launcher on elevator)
B -	Ajax site converted to Hercules; modifications were made for the elevator to handle the increased weight of the Hercules missile and launcher

The magazine type normally determined the number of stored missiles, presented by # of Ajax or # of Hercules, for example 20A/8H (Note: Ajax and Hercules were never stored in the same pit-- this entry would show # of Ajax stored when site was Ajax, then # of Hercules stored when site was used for Hercules). Magazine/elevators/launch structures were as follows:

- A - Ajax launch site
- H - New Hercules launch site
- U - Universal; Ajax launch site later converted to Hercules launch site

NIKE HERCULES CONVERSION (N/H) - dates when the site or a portion was converted from Nike Ajax to Nike Hercules

LOCATION - the location (LOC) and current status (CUR) of the IFC and launch sites is given where known. Current disposition is indicated by:

- (I)- Intact; buildings, launch pads and possibly radar towers in place
- (P)- Partial; some modifications or dismantling of buildings and launch facilities
- (O)- Obliterated; all traces removed

NOTE: Four temporary Nike Ajax sites have been identified in the San Francisco Defense Area. Two were emplaced in Forts Barry and Cronkhite and were superseded by sites SF-87 and SF-88. Two others received "T" designations, matching the designations of the four Travis AFB batteries. The reason for this non-standard designation has not been determined.

Site Designation/ Location (L & C)	Radars	Magazines Missiles Launchers	Conversion. to Hercules	Units assigned (years)
Berkeley				HHB/728th ( /58-5/59) HHB/2/250th (5/59-7/59)
SF-08 San Pablo Ridge (shared launch site with SF-09)		1B/2C 30 Ajax 12 L - Ajax	n/a	C/441st ( /56-9/58) C/4/67th (9/58-7/59) A/1/250th (7/59-3/63)
LOC: C - Nimitz Way L - Nike Site Rd CUR: (O) Wildcat Canyon Regional Park				

<b>SF-09</b>	1B/2C	n/a	HHB/441st (8/55-9/58)
San Pablo Ridge/	30 Ajax		HHB/4/67th (9/58-3/63)
Berkeley	12 L - Ajax		D/441st ( /56-9/58)
(shared launch site with SF-08)			D/4/67th (9/58-7/59)

LOC: C - Vollmer Peak  
L - Nike Site Rd  
CUR: (O) Wildcat Canyon Regional Park

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Benecia (temporary site)	C/441st (8/55- /56)
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<b>SF-25</b>	1B/2C	n/a	B/441st ( /56-9/58)
Rocky Ridge	30 Ajax		B/4/67th (9/58-7/59)
	12L- Ajax		

LOC: C - 4 mi N Crow Canyon Rd, top of Bollinger Canyon Rd.  
L - 5 mi N Crow Canyon Rd, Bollinger Canyon Rd.

CUR: C - (unk) Las Trampas Regional Park/microwave communications site  
L - (I) Tracor Aerospace/California Dept. of Forestry/Las Trampas  
Regional Park offices

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<b>T-25</b>	D/441st (8/55- /56)
Parks AFB (temporary site)	

LOC: 2 mi N Livermore, I 580  
CUR: Camp Parks; USAR, CAArNG activities, INS detention center

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<b>SF-31</b>	HIPAR	2B	5/58-	A/441st (8/55-9/58)
Lake Chabot/		12 Herc/20 Ajax	6/59	A/4/67th (9/58-6/63)
Castro Valley		8L-Universal		B/1/250th (6/63-3/74)

LOC: C - W of Lake Chabot  
L - SE shore of lake

CUR: C - (P) communications facility  
 L - (unk) East Bay Regional Park District; Lake Chabot Park/ Dept of  
 Public Safety service yard.

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<b>SF-37</b>	1B/2C	n/a	D/740th ( /55-9/58)
Coyote Hills/	30 Ajax		D/4/61st (9/58-7/59)
Newark	12L- Ajax		C/1/250th (7/59-3/63)

LOC: C - S Red Hill  
 L - N Red Hill

CUR: C - (P) East Bay Regional Park District, Coyote Hills Regional  
 Park/Alameda County Sheriffs Department, radio transmitter  
 L - (O) Coyote Hills Regional Park  
 A - (I) Coyote Hills Regional Park visitors center

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<b>SF-51</b>	HIPAR	2B	5/58-	C/740th ( /56-9/58)
Milagra/		12H/20A	4/59	C/4/61st (9/58-7/59)
Pacifica		8L-U		D/2/51st (7/59-6/63)
				A/1/250th (6/63-4/74)

LOC: C - Sweeney Ridge  
 L - Milagra Ridge, off Sharps Park Road

CUR: C - (P) Golden Gate NRA; Sweeney Ridge Skyline Preserve  
 L - (P) Golden Gate NRA; Milagra Ridge

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<b>SF-59</b>	1B/2C	n/a	A/740th ( /56-9/58)
Fort Funston/	30 Ajax		A/4/61st (9/58-7/59)
Mt. San Bruno	12L- Ajax		HHB/2/250th (7/59-3/63)
			D/2/250th (7/59-3/63)

LOC: C - Mt. San Bruno, Radio Road  
 L - 500 Skyline Blvd, Ft. Funston  
 A - 500 Skyline Blvd, Ft. Funston

CUR: C - (P) communications site  
 L - (P) Golden Gate NRA; parking lot  
 A - (I) Golden Gate NRA; South District ranger offices; Environmental  
 Science Center;

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SF-77  
Presidio of  
San Francisco

HQ 40th Bde ( -6/71)  
HQ 114th Bde ( /59- /63)  
HQ 13th Gp (6/71-8/74)  
HQ 233d Gp ( /59- /63)

LOC: Ralston Ave, Fort Scott, Presidio of SF, Bldg. 1201  
CUR: (I) Golden Gate NRA; unoccupied

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SF-78  
Presidio of  
San Francisco

HHB/1/250th (5/59-7/74)

LOC: Bldg 1648, Fort Scott, Presidio  
CUR: (I) Golden Gate NRA; unoccupied

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SF-81  
Fort Baker

HQ 6 ARADCOM ( /51-8/74)  
HQ 47th Bde (3/52-11/52)  
HHB/9th (10/54-9/58)  
HHB/2/51st (9/58-6/71)  
HHB/1/61st (6/71-8/74)

LOC: Fort Baker, N end of Golden Gate Bridge  
CUR: (I) Golden Gate NRA

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SF-87  
Fort Cronkhite/  
Sausalito

ABAR/75	2B	5/58-	B/9th ( /55-9/58)
	12 Herc/20 Ajax	6/59	B/2/51st (9/58-6/71)
	8L- Universal		

LOC: C - Hill 129, Ft. Barry  
L - Bunker Rd, Ft. Cronkhite  
CUR: (P) Golden Gate NRA  
(P) Golden Gate NRA; California Marine Mammal Center

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SF-88  
Fort Barry/  
Ft. Cronkhite

HIPAR	2B	5/58-	A/9th ( /55-9/58)
	12 Herc/20 Ajax	11/58	A/2/51st (9/58-6/71)
	8L- Universal		B/1/61st (6/71-3/74)

LOC: C - Wolf Ridge, Fort Cronkhite  
L - Adjacent to Battery Alexander

CUR: C - (P) Golden Gate NRA; abandoned  
L - (I) Golden Gate NRA; restored site

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Fort Barry

HQ 30th Gp (3/58-8/61)

LOC: N end, Golden Gate Bridge  
CUR: (I) Golden Gate NRA; Youth Hostel

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<b>SF-89</b>	1B/2C	n/a	HHB/740th (7/54-9/58)
Presidio of	30 Ajax		C/740th ( /55-9/58)
San Francisco/	12L- Ajax		HHB/4/61st (9/58-7/59)
Mount Sutro			C/4/61st (9/58-7/59)
			B/2/250th (7/59-3/63)

LOC: C - Mount Sutro  
L - Presidio, Battery Caulfield Rd  
CUR: C - (P) Television/communications facility  
L - (P) Golden Gate NRA; abandoned  
NOTE: named "Battery Caulfield"

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**T-89**  
Presidio of  
San Francisco  
-temporary site elsewhere on reservation

LOC: unknown  
CUR: National Park Service; Golden Gate NRA

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<b>SF-90DC</b>	AN/FSG-1	40th Arty Gp Det
Mill Valley	Missile	13th Arty Gp Det
Air Force Station	Master	USAF 666th RADS
	AN/TSQ-51	(11/50-3/81)
	Missile	
	Mentor	
	2x AN/CPS-6B	
	AN/FPS-8	
	AN/FPS-4	
	AN/GPS-3	
	2x AN/FPS-6	
	AN/FPS-6B	
	AN/FPS-7C (SLBM)	

LOC: Mount Tamalpais, Ridgecrest Blvd  
CUR: FAA JSS Facility J-33 Mill Valley;  
National Park Service, Golden Gate NRA

NOTE: SLBM detection site under Det 3, Fourteenth Air Force (7/67-7/72) and Det 3, 14th Missile Warning Squadron (7/72-4/80)

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<b>SF-91</b>	1B/2C	n/a	D/9th ( /55-9/58)
Angel Island	30 Ajax		D/2/51st (9/58- /61)
	12L- Ajax		

LOC: C - Mount Caroline Livermore, Angel Island  
L - Fort McDowell, Angel Island  
CUR: C - (P) abandoned/ Angel Island State Park  
L - (I) closed/Angel Island State Park

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<b>SF-93</b>	ABAR/71	3B	5/58-	C/9th ( /56-9/58)
San Rafael	AN/FPA-	18H/30A	2/59	C/2/51st (9/58-6/71)
	16			

LOC: C - top of Bayhills Dr  
L - end of Smith Ranch Rd  
CUR: C - (P) Harry A. Barbier Memorial Park  
L - (P) Marin County waste treatment plant  
A - (I) Youth guidance center

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## **Appendix 3.**

### **Glossary Of Nike Related Terms**

AA - antiaircraft

AAA - Antiaircraft Artillery

ARADCOM - Army Air Defense Command

Battery - Term used to designate a group of soldiers within the Artillery branch, comparable to "company" within the Infantry branch. Usually, 4 batteries made up a battalion.

Bird - Nickname for a missile

Booster - Missile rocket motor cluster. Sometimes called "first stage"

Control - Integrated Fire Control area consisting of radars and control vans

Doghouse - Plastic shield used to cover the sharp points on a missile's barometric probe. Also known as a 'mailbox.'

Exclusion Area Fence - Fence surrounding missile launcher area

HE - High explosive

Launcher - Mechanism that supports a missile and erects it to the proper launching elevation for firing

Launcher Area - Area within a launch site containing the launchers and magazines

Launching Area - All the area within a launching facility including launchers, magazines, and above ground buildings and service areas.

Magazine - Underground missile storage structure

Mailbox - Plastic shield used to cover the sharp points on a missile's barometric probe. Also known as a 'doghouse'

Panel - Section control panel. A console where an operator controlled a section of missiles

Pit - Nickname for an underground missile storage magazine

Round - A single missile

Section - A group of four missile launchers and missiles, as in "launching section." Also, a group of soldiers within a battery having a common duty, as in 'the IFC section.' Usually, 2 to 4 sections made up a battery.

Security Fence - Fence surrounding entire launching facility.

Special - Nuclear equipped missile

Storage Racks - Elevated steel rails used for moving and storing Nike missiles prior to launch.

### **Site Equipment terminology\***

RADARS - all Nike Ajax and Basic Nike Hercules sites were equipped with:

AQC-	Acquisition Radar (AQC)
MTR-	Missile Tracking Radar (MTR)
TTR-	Target Tracking Radar (TTR).

The addition of Improved Nike Hercules specific radars and equipment is identified as follows:

LOPAR-	Low Power Acquisition Radar (the redesignated acquisition radar)
HIPAR -	High Power Acquisition Radar
ABAR -	Alternate Battery Acquisition Radar; either an AN/FPS-69, -71 or -75. Listed as ABAR/#.
RRIS -	Remote Radar Integration Station
SMFU -	Secondary Master Fire Unit
TTR -	Target Ranging Radar

### **Command Structure terminology\***

ARADCOM REGIONS - the ARADCOM regions were established to provide intermediate command and control between HQ ARADCOM and the defense areas. The first three regions were activated in 1951; two additional regions were activated in 1955 and a sixth region was activated in 1960. Inactivation of regions commenced in 1963; after 1971, the First and Sixth ARADCOM Regions controlled all remaining operations in the United States.

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\* From *Rings of Supersonic Steel: Air Defenses of the United States Army 1950-1979*, 1996, Morgan and Berhow. Used with permission.

DEFENSE AREA - defense areas were initially named after the cities or air force base of their assignment. Each area consisted of a brigade, group or defense command element controlling the missile battalions. In the early 1960s, ARADCOM began a process of merging defense areas.

BRIGADES - Artillery Brigades (Air Defense Artillery Brigades after 1972) were activated as the controlling agency for major city defense areas, reporting directly to the ARADCOM region. Normally each brigade had multiple groups assigned. As ARADCOM contracted during the 1960s, brigade designations were inactivated and/or transferred among the defense areas. In several instances brigades were inactivated and replaced by group-level organizations.

GROUPS - the Artillery groups were activated to control single or multiple battalions; the early tendency was to activate a group-level unit for each single-battalion defense and one group per each two battalions in the larger defenses. As with brigades, there were multiple activations and inactivations.

DEFENSE COMMAND ELEMENTS - in the absence of a brigade or group, Defense Command Elements were designated as the senior air defense unit in each defense area.

BATTALIONS - missile battalions were the actual operational units of ARADCOM, manning the individual sites through a battery organization. As Nike Ajax came on line, several Antiaircraft Artillery Battalions were redesignated as Antiaircraft Artillery Missile Battalions (AAAMBn) or Missile Battalions (MBn) (Nike Ajax). Each battalion consisted of a Headquarters & Headquarters Battery (HHB) and normally four firing batteries.

On 1 September 1958, Regular Army missile battalions were inactivated and replaced by missile battalions assigned to regiments (the units were actually redesignated in place). For example, the former Battery A, 11th Missile Battalion (A/11th), site HA-08, East Windsor, CT, became Battery A, 2d Missile Battalion, 55th Artillery Regiment (A/2/55th). This was done as part of the Army's Combat Arms Regimental System (CARS), for unifying units along mission, historical and regimental lines. The Army National Guard missile battalions followed along the same lines during 1959.

Units active on 20 December 1965 were redesignated as battalions assigned to regiments, such as the 3d Battalion, 43d Artillery. In recognition of the division of field and air defense artillery into two separate combat arms, units active on 1 September 1971 were redesignated as battalions assigned to Air Defense Artillery regiments, such as the 4th Battalion, 60th Air Defense Artillery.

On 13 September 1972, several of the remaining ADA battalions were redesignated by the Army in order to preserve the lineage of older units. Examples included the 2/3d in the Detroit Defense Area, which replaced the 3/517th; the 2/65th in Los Angeles, which replaced the 4/65th; and the 1/4th in Seattle, which replaced the 4/4th.

## **Command and Control terminology\***

Army Air Defense Command Post (AADCP) command and control equipment is identified by name and designation.

BIRDIE -	AN/GSG-5
Missile Master-	AN/FSG-1
Missile Mentor-	AN/TSQ-51
Missile Monitor-	AN/TSQ-38 (Key West only)

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