

Final

Inventory and Evaluation of
Cold War Era Historical Resources

Moffett Federal Airfield
Moffett Field, California

NASA Crows Landing Flight Facility
Crows Landing, California

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ACRONYMS

AIMD	advanced intermediate maintenance depot
ASW	anti-submarine warfare
AUW	advanced underwater weapon
CANG	California Air National Guard
DIFAR	Directional Frequency and Ranging Direction of recorded sound
DoD	Department of Defense
ECM	electronic countermeasure
ESM	electronic surveillance measure
GIUK	Greenland, Iceland, United Kingdom
HTA	heavier-than-air
IFF	Identification Friend or Foe
LTA	lighter-than-air
MAD	magnetic anomaly detector
MFA	Moffett Federal Airfield
NAS	Naval Air Station
NASA	National Aeronautical and Space Administration
NATC	Naval Air Training Center
NATO	North Atlantic Treaty Organization
NATS	Naval Air Transport Service
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
SHPO	State Historic Preservation Office
SAIC	Science Applications International Corporation
SLBM	submarine-launched ballistic missile
SOSUS	sound surveillance system
SPA	SOSUS probability area
TACAN	tactical air navigation
TACCO	tactical coordinator
WST	weapons systems training

Cover: Shadow of P-3 Orion Aircraft over a Victor Class Soviet Submarine. U.S. Navy Photograph

EXECUTIVE SUMMARY

A cultural resources survey was conducted at Moffett Federal Airfield (MFA), Moffett Field, California and National Aeronautics and Space Administration (NASA) Crows Landing Flight Facility (formerly Naval Auxiliary Landing Field), Crows Landing, California, for NASA at Moffett Field. The purpose of the survey was to identify and evaluate all cultural resources within the MFA and NASA Crows Landing boundaries constructed between 1945 and 1989 for their Cold War significance. The survey consisted of an analysis of MFA and NASA Crows Landing's role in the Cold War, an architectural inventory of all buildings constructed during that period, and an evaluation of them to determine if they met the National Register of Historic Places (NRHP) criteria of *exceptional* significance used when assessing resources that are less than 50 years old (36 CFR 60.4, Criterion G).

Of the 148 buildings and structures formally evaluated, none were considered eligible for listing on the NRHP. Twenty of these buildings were used specifically to support the P-3 Orion anti-submarine warfare (ASW) mission at MFA. Although this mission was considered of *exceptional* national significance within the Cold War context, the buildings themselves do not exhibit special architectural or engineering features that would give them *exceptional* significance as representatives of the Cold War P-3 mission. The remaining 128 buildings and structures are considered support buildings found at any installation and therefore are not considered significant. After the California State Historic Preservation Office (SHPO) has concurred with the results of the survey, the Section 106 process is complete.

1.0 INTRODUCTION

This report presents the background, goals, methods and results of an architectural survey of Cold War resources conducted at MFA and NASA Crows Landing Flight Facility. In support of this survey, NASA contracted with Science Applications International Corporation (SAIC) to prepare a cultural resources investigation to fulfill the identification requirements under Section 106 of the National Historic Preservation Act of 1966 (NHPA). The architectural survey was conducted from February to April 1998, and consisted of the examination and evaluation of 148 Cold War-era (1946-1989) potentially significant historical resources within the MFA and NASA Crows Landing boundaries.

1.1 PURPOSE

The primary goal of this survey was to determine the significance of Cold War-era facilities at MFA and NASA Crows Landing to assess potential effects of the long-term goals and objectives of NASA. These goals and objectives include the possible future renovation and/or demolition of a selected number of the surveyed buildings. Recommendations regarding NRHP eligibility have been developed to allow NASA to submit a formal declaration of significance to the SHPO for review and concurrence to fulfill NASA's requirements under Section 106 of the NHPA.

1.2 LEGISLATIVE REQUIREMENTS

Numerous laws and regulations require federal agencies to consider the effects of a proposed project on cultural resources. These laws and regulations stipulate a process for compliance, define the responsibilities of the federal agency proposing the action, and prescribe the relationships among other involved agencies (e.g., State Historic Preservation Office, the Advisory Council on Historic Preservation).

1.2.1 Section 106 Requirements

The primary law governing the treatment of cultural resources is the NHPA, which requires a federal agency to consider potential impacts on historic properties resulting from any proposed undertaking. For purposes of Section 106, "historic properties" include properties listed in, or eligible for listing in, the NRHP (36 CFR 800.2 [e]). An "effect" from a federal "undertaking" would be an action that would alter characteristics of the property that may qualify the property for inclusion in the National Register. An adverse effect is one that would diminish

the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR 800.9 [a] and [b]). Adverse effects include the following:

1. Physical destruction, damage, or alteration of all or part of the property;
2. Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the National Register;
3. Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
4. Neglect of a property resulting in its deterioration or destruction; and
5. Transfer, lease or sale of the property (36 CFR 800 [b]).

Compliance with requirements of Section 106 pursuant to the demolition/remodel of MFA and NASA Flight Facility, Crows Landing Cold War-era facilities for new use involves three basic steps: (1) identification of significant cultural resources that could be affected by the implementation of the Proposed Action or its alternatives, (2) assessment of the impacts or effects of these actions, and (3) development and implementation of measures to eliminate or reduce impacts to a non-adverse level.

Only historic properties determined to be significant under cultural resource legislation are subject to protection or consideration by a federal agency. Significance criteria and integrity definitions used in this report are provided in Section 2.0.

National Park Service guidelines regarding the definition of buildings (as opposed to structures) have been used for this study. Buildings are created to shelter human activity (e.g., administration buildings, hangars, garages); structures are designed for purposes other than human shelter (e.g., power plants, piers, swimming pools). Within this report, the term "facility" is used to refer to both "building" and "structure."

1.2.2 Cold War Building and Structure Requirements

In the Defense Appropriations Act of 1991, Congress required the Department of Defense (DoD), through its Legacy Resource Management Program, to begin reviewing Cold War-era

cultural resources. By 1993, as part of the Cold War History Project, DoD, in coordination with other federal agencies and departments, was required to develop a project to inventory and conserve resources associated with the Cold War.

1.3 LOCATION OF PROJECT AREA

Moffett Federal Airfield is located in Santa Clara County on the west side of San Francisco Bay. It is approximately 35 miles south of San Francisco and 10 miles north of San Jose. It is bounded on the west by the city of Mountain View, to the south by the City of Sunnyvale, to the north by the NASA Ames Research Center, and to the east by San Francisco Bay (see Figures 1-1 and 1-2).

NASA Crows Landing Flight Facility is located in Stanislaus County, in the northwestern part of the San Joaquin Valley between the towns of Patterson and Crows Landing. It is approximately 80 miles southeast of San Francisco. The approximately 1,500-acre parcel contains 24 buildings; 1,120 of these acres are leased for field and orchard crops (see Figures 1-3 and 1-4).

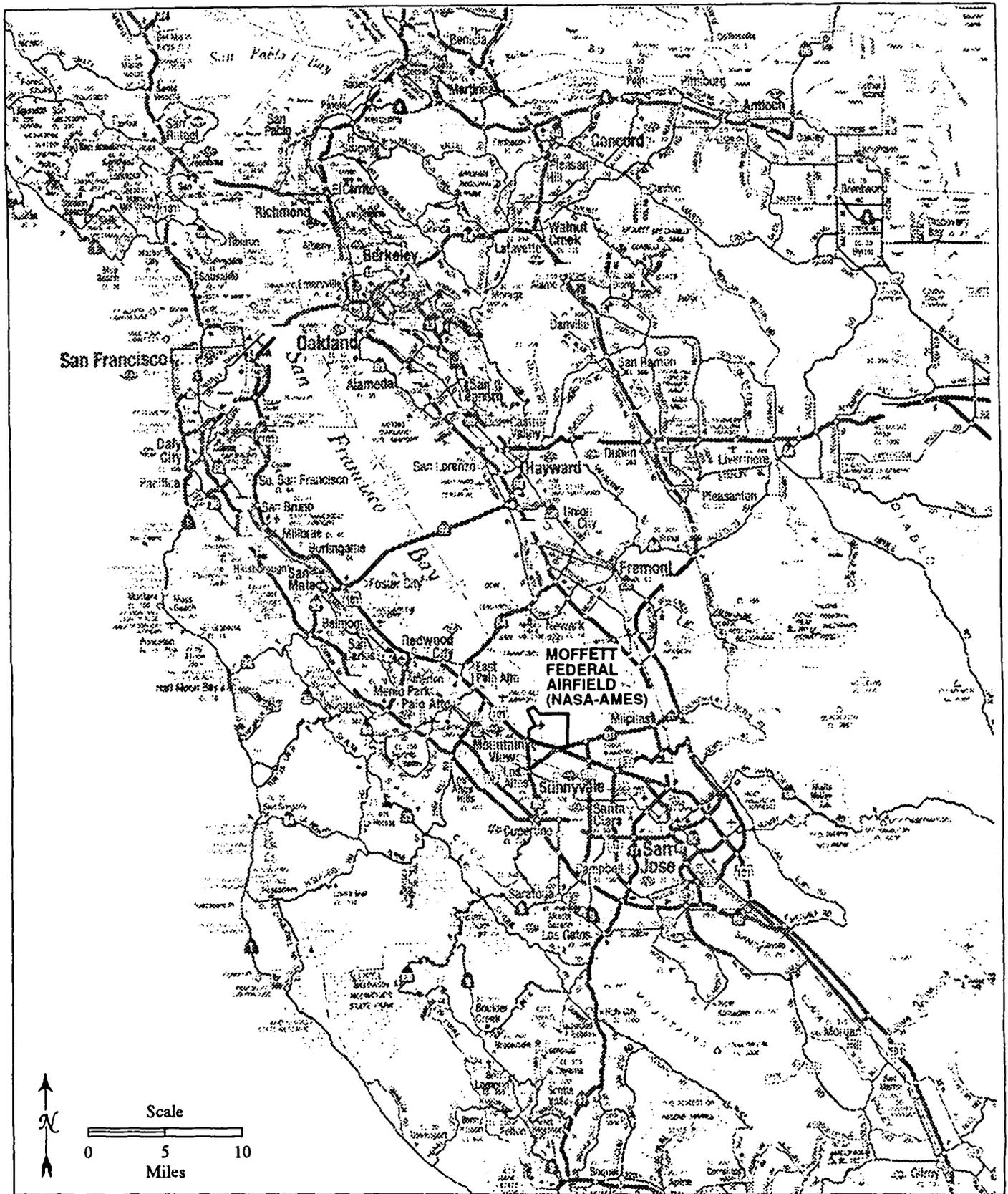


Figure 1-1. Project Location Moffett Federal Airfield

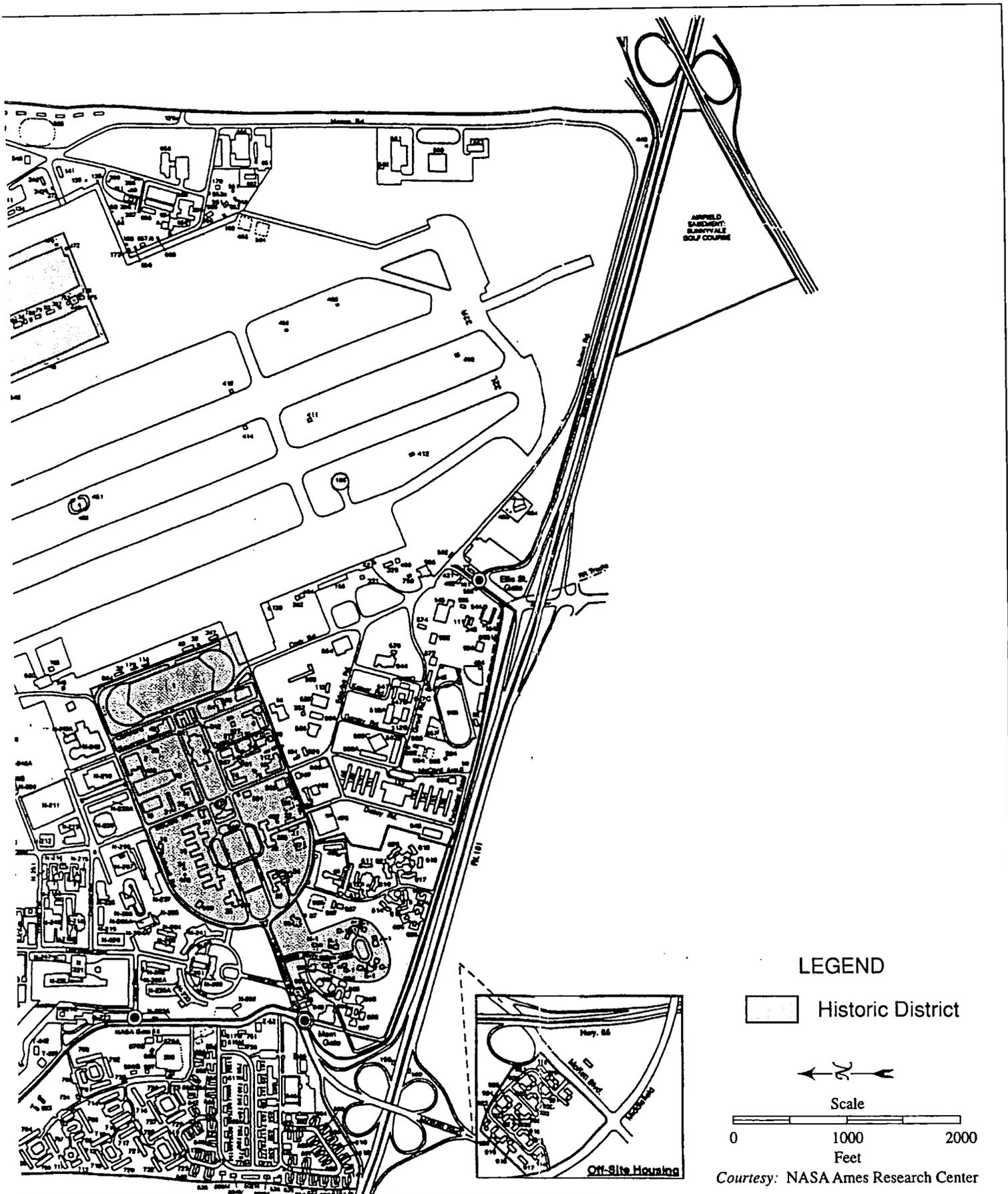
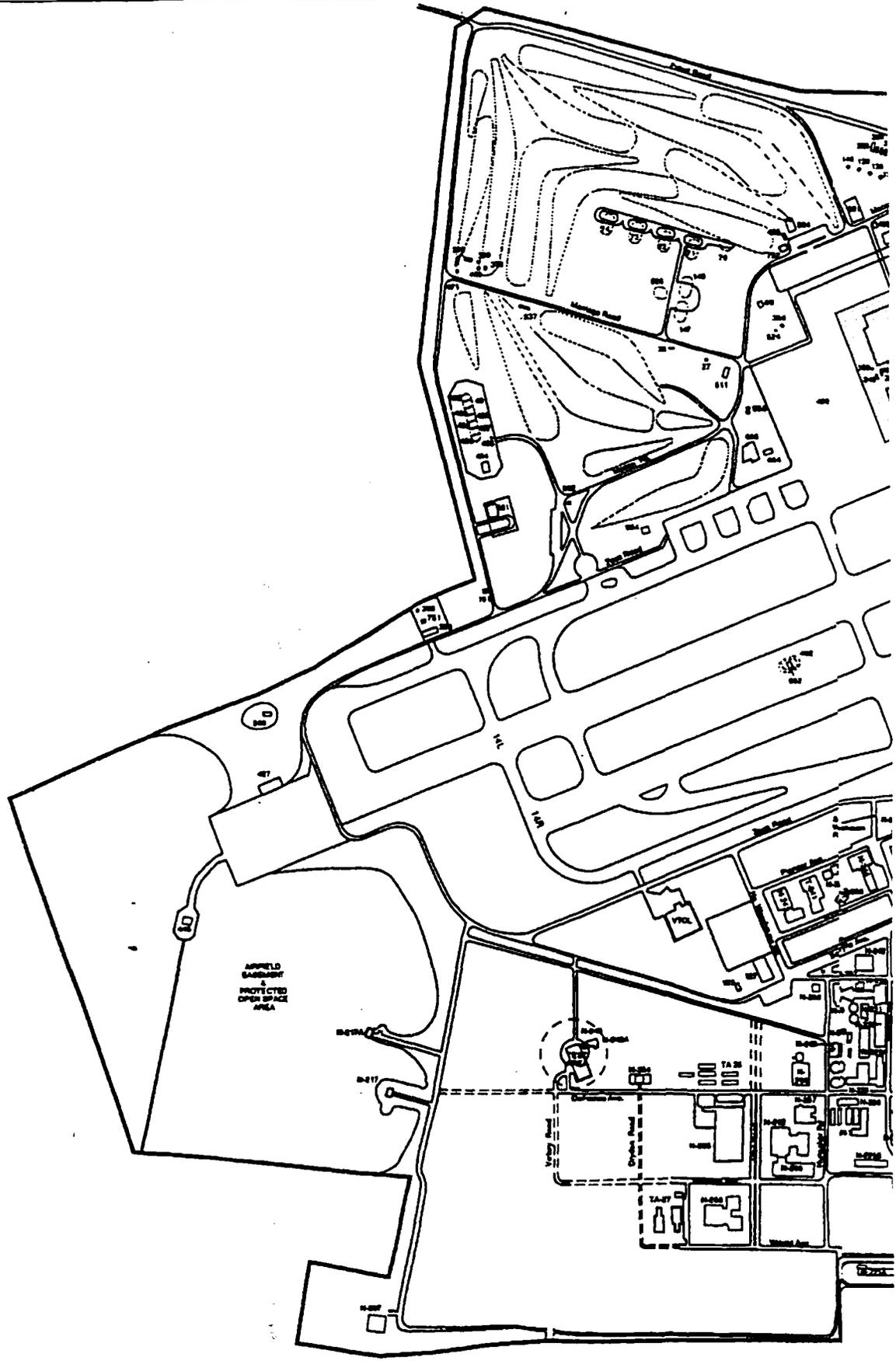
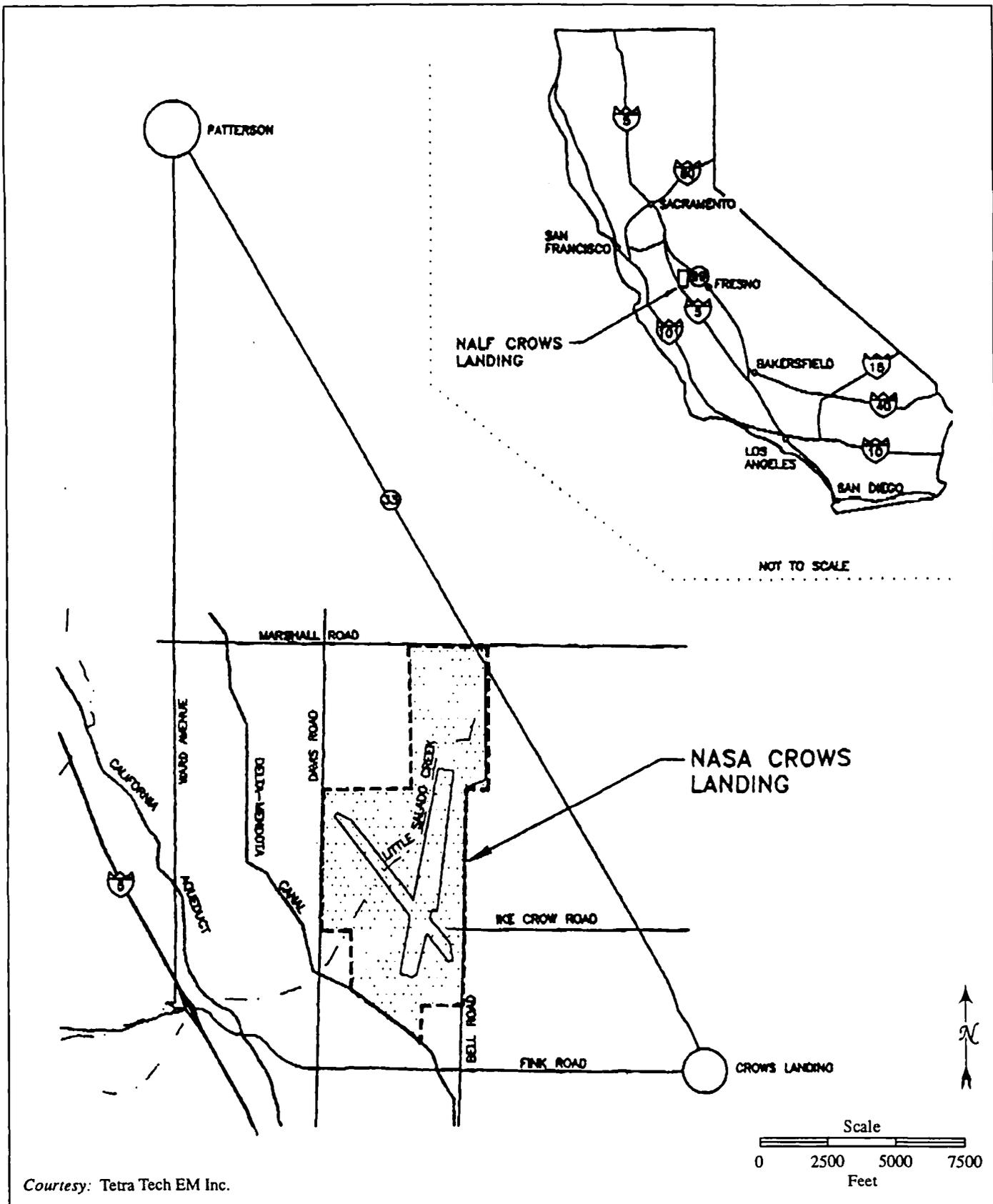


Figure 1-2. Moffett Federal Airfield Buildings and Structures





Courtesy: Tetra Tech EM Inc.

Figure 1-3. Project Location, NASA Crows Landing Flight Facility

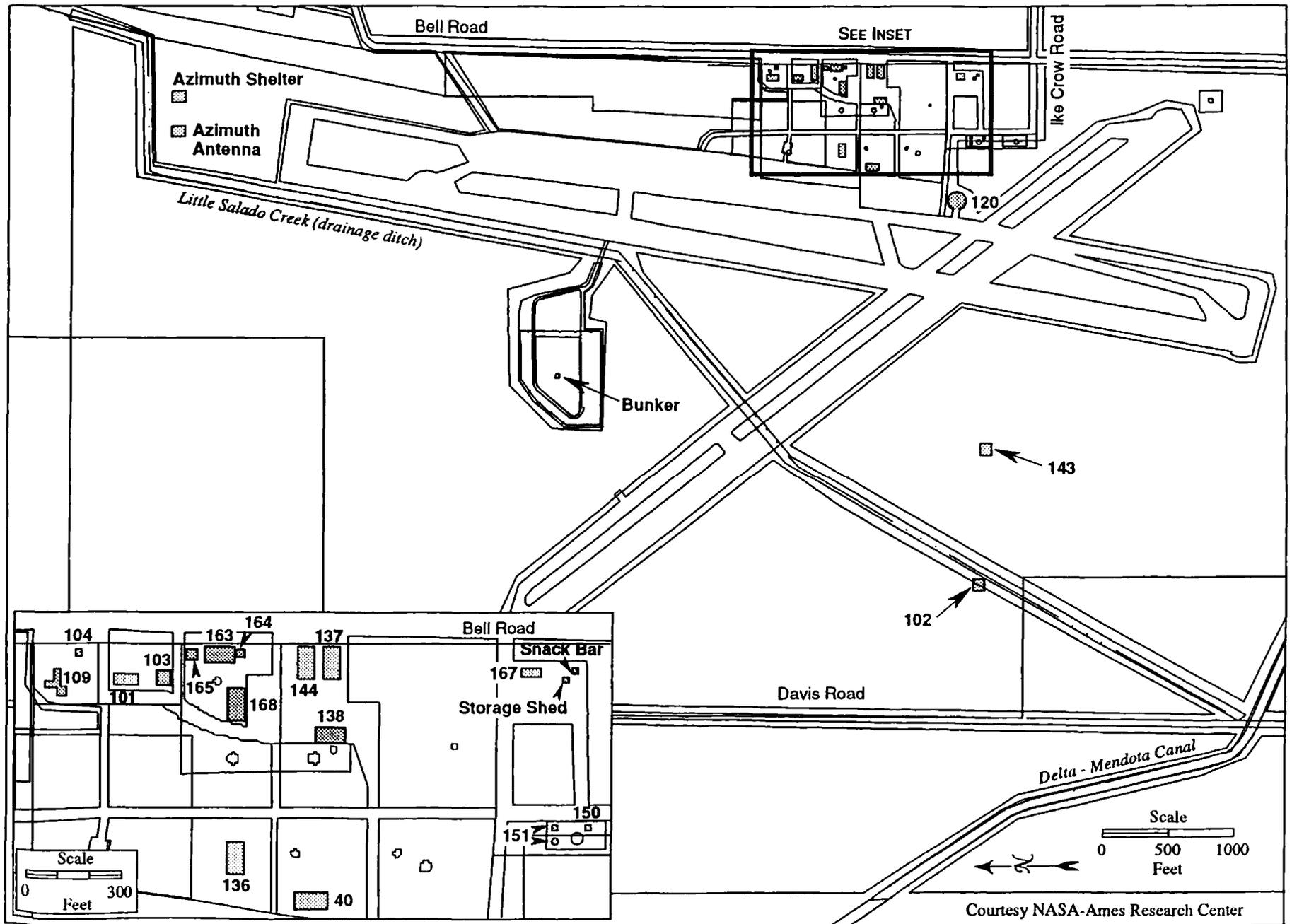


Figure 1-4. NASA Crows Landing Flight Facility Buildings and Structures

Courtesy NASA-Ames Research Center

2.0 BACKGROUND RESEARCH AND METHODS

2.1 BACKGROUND RESEARCH

In 1991 a survey of historic buildings dating from 1930 to 1946 was conducted at MFA and NASA Crows Landing by Bonnie Bamberg (Urban Programmers 1991). Forty-three buildings dating from this period were found eligible for the NRHP as the Shenandoah Plaza district; in 1994 the Shenandoah Plaza National Historic District was listed on the NRHP (see Figure 1-2 for the boundaries of the district). Twenty-five of these NRHP buildings are within the boundary of MFA. An additional 21 buildings dating to the Cold War era are within the Historic District boundaries, but were considered non-contributing because they were less than 50 years old. To date there has been no Cold War-era architectural survey nor have Cold War-era contexts been developed for MFA or NASA Crows Landing.

2.2 METHODS

2.2.1 Research Objectives

The prime objective of this survey was to determine the significance of Cold War-era facilities at MFA and NASA Crows Landing. The types of resources examined included hangars, flight control buildings, classrooms, parachute buildings, warehouses, vehicle maintenance shops, fuel storage tanks, munitions storage, line maintenance shelters, sentry houses, gas stations, administrative offices, dormitories, exchange and recreation buildings, engine repair shops, water supply buildings, a wharf, and hazardous storage buildings.

2.2.2 Archival Research

Archival research on these facilities was performed to establish contexts for Cold War-era activities at MFA and NASA Crows Landing within which to analyze the significance of the historic resources for NRHP eligibility. Research was performed at the Public Affairs archival records vault in Building 17, at the Moffett Field Historical Society in Hangar 1, and the civil engineering files in Building 683. Additionally interviews were conducted with W. Carl Honaker, NASA Moffett Liaison Office; James Anderson, Defense Fuel Office; Rocci Caringello, Facilities Manager, Naval Air Reserve Santa Clara; Kathleen O'Connor, Archivist, National Archives and Records Administration, Pacific Region, San Bruno; and John Pedersen, Commander, United States Navy, for information on the various Cold War-era missions at

MFA and NASA Crows Landing. Further research was undertaken at the National Archives and Records Administration, Pacific Region, San Bruno, California.

The Real Property Inventory forms for MFA and NASA Crows Landing facilities were examined for information on date of construction, square footage, previous and present use, and alterations.

2.2.3 Field Inventory

Field investigation and research for the survey was conducted between February and April 1998 by SAIC historian/architectural historian Alexandra C. Cole. On-site analysis of buildings included for each resource an architectural description, an investigation of construction materials, alterations, present use, assessment of integrity, and photography of each facility. Facilities were then evaluated for significance, based on NRHP criteria listed in section 2.2.4 following.

2.2.4 National Register Criteria

The NRHP criteria, found in 36 CFR 60.4 of the National Historic Preservation Act, are as follows:

“The quality of significance is present in districts, sites, buildings, structures and objects that:

- A. Are associated with events that have made a significant contribution to the broad patterns of history; or
- B. Are associated with the lives of people significant in the past; or
- C. Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic value; or represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. Have yielded, or may be likely to yield, information important in prehistory or history.”

To be listed in or considered eligible for the NRHP, a cultural resource must meet at least one of the above criteria and must also possess integrity of location, design, setting, materials, workmanship feeling, and association. Integrity is defined as the authenticity of a property's historic identity, as evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric occupation or use. If a resource retains the physical characteristics it possessed in the past, it has the capacity to convey information about a culture or people, historical patterns, or architectural or engineering design or technology.

Sites or structures that may not be considered individually significant may be considered eligible for listing on the NRHP as a district. According to the NRHP, a district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects historically or aesthetically united by plan or physical development.

Generally cultural resources must be at least 50 years old to be evaluated for NRHP eligibility. However, according to NRHP criterion G if a resource is of *exceptional* significance it may be considered for the NRHP (36 CFR 60.4, Criterion G). Additional guidance for evaluating exceptional significance for facilities that have achieved significance within the last 50 years is found in the National Park Service *National Register Bulletin 22: Guidelines for Evaluating and Nominating Properties That Have Achieved Significance Within the Last Fifty Years*.

In keeping with the above mandate, the United States Navy issued a Cultural Resources Program Note to guide cultural resource managers in determining the significance of Cold War-era resources (U.S. Department of the Navy 1994). This Note referenced the NRHP criterion for measuring significance of resources not yet 50 years old, that they must be of *exceptional* importance to a community, a state, a region, or the nation to be considered eligible for the NRHP.

In addition to the Navy's Program Note, more specific guidance for evaluating buildings or structures dating to the Cold War period is found in the Air Force's *Interim Guidelines* (Green 1993). These *Guidelines* contain criteria, modeled on those for the NRHP, designed to facilitate the evaluation of Cold War resources (all of which are less than 50 years old and most of which do not yet have a context established). These criteria, used as the basis for the evaluation of the relatively recent resources, are as follows:

[The quality of significance is present in] Buildings, structures, objects, sites, or districts that possess *exceptional* value or quality in illustrating the Cold War heritage of the United States, that possess a high degree of integrity of location, design, setting, materials, workmanship, feeling and association, and:

That are directly associated with events that have made a significant contribution to, and are directly identified with, or that outstandingly represent, the broad national pattern of U.S. Cold War history and from which an understanding and appreciation of those patterns may be gained; or

That are associated directly and importantly with the lives or persons *nationally significant* in the Cold War history of the United States; or

That represent some great idea or ideal of the American people (e.g., "Peace through Strength"); or

That embody the distinguishing characteristics of an architectural, engineering, technological, or scientific type specimen *exceptionally valuable* for a study of a period, style, method, or technique of construction, or that represent a significant, distinctive, and *exceptional* entity whose components may lack individual distinction (Green 1993).

Within the Cold War context, *exceptional* importance in a resource is measured by the type and significance of the Cold War mission with which it is associated. Unlike World War II resources that were built quickly on standardized plans within the space of a few years and are easily recognizable, Cold War facilities are varied, ranging from rocket launch complexes to research laboratories to nuclear reactors, to missile testing sites. These resources are measured not primarily for their architectural merit, but for their association with a Cold War activity important to the United States. Only such facilities that were created or used for a specific important Cold War mission would be considered of *exceptional* importance. The definition of *exceptional* excludes typical support buildings and structures found at any Naval facility, such as administrative buildings, storehouses and maintenance shops, barracks, heating and sewage treatment plants, dormitories and family housing, hospitals, motor pools, and recreation buildings.

3.0 HISTORIC CONTEXT

The historic context for MFA and NASA Crows Landing is presented in three phases: Early 20th Century, World War II, and Cold War-era. NRHP procedures require that general historic contexts be developed within which to evaluate specific historic resources. Such contexts are designed to explain the role of the resources in relationship to historic trends, drawing on specific facts about the resources and their surrounding community. Within this context specific resources are analyzed for significance through a comparison of these resources with other properties of the same period and type (National Park Service 1991a:49).

3.1 EARLY TWENTIETH CENTURY

In 1926 the Navy decided to build two lighter-than-air (LTA) rigid dirigibles, the *USS Macon* and the *USS Akron*, to serve as war-time scouting airships. Needing a West Coast base to house one of the airships, the Navy looked to Camp Kearney in San Diego. To encourage its location in northern rather than southern California, the northern California counties of San Francisco, Santa Clara, San Mateo, and Alameda raised \$476,600 and purchased 1,000 acres of the 1,700-acre Ynigo Ranch between Mountain View and Sunnyvale, and then offered the site to the Navy. President Herbert Hoover, familiar with the area as a Stanford graduate, selected the Mountain View property and authorized a bill accepting the site for one dollar and appropriating \$5 million for construction of the new base.

Shortly before the commissioning of the new base in 1933, the *USS Akron* was destroyed in a New Jersey storm, killing most of the crew as well as an observer, Rear Admiral William A. Moffett, USN, Chief of the Navy Bureau of Aeronautics and a major advocate of naval aviation. As a result, the new base, called Sunnyvale Naval Air Station (NAS) named its landing field for Moffett. The *USS Macon* arrived at Sunnyvale in October 1933. It was used to patrol the Pacific Ocean, scouting ships of the Pacific fleet. It was outfitted with small Sparrowhawk fighter planes that were stored in an interior hangar bay, from which they were launched and recovered. The *USS Macon's* tenure at Sunnyvale was short-lived. In February 1935 it went down in the sea off Point Sur. No further rigid dirigibles were constructed (*Moffett Field 60th Anniversary*, 1993; *Disestablishment Ceremony for NAS Moffett Field* 1994).

With the loss of the *USS Macon*, President F. D. Roosevelt recommended that no further money be spent on dirigibles. The Department of the Navy considered using Sunnyvale NAS for

squadrons from the aircraft carrier *Saratoga*, but decided against the idea. The field was reassigned to the U.S. Army Air Corps in October 1935, and renamed the Moffett Field Army Air Corps Base. The base became home to the 82nd Army Observation and the 9th Air Base Material squadrons with ten observation planes, one hundred officers, and 1,000 enlisted men. In 1938 five pursuit squadrons from the 19th and 20th Air Groups were stationed at Moffett, raising the population to 300 officers and 5000 enlisted men. Two years later, Moffett became the Army Air Corps west coast training center for Army pilots (Coletta 1985:322; *Moffett Field 60th Anniversary*, 1993; *Disestablishment Ceremony for NAS Moffett Field* 1994).

3.2 WORLD WAR II ERA

With the attack on Pearl Harbor by the Japanese in 1941, the United States military realized that the West Coast did not have the proper aircraft for patrolling the Pacific for submarines and mines. By January 1942, a number of Navy personnel gathered LTA aircraft, men, and materials at Moffett and established the LTA squadron ZP-32. It carried out the first LTA patrol of the Pacific Coast in World War II. As a result of this activity, by April 1942 Moffett was returned to the Navy and recommissioned as U.S. Naval Air Station Sunnyvale, renamed almost immediately Naval Air Station, Moffett Field.

In October 1942, a lighter-than-air aviation cadet program was begun, and the Army's barracks were remodeled and used as classrooms. By November 1942 the Assembly and Repair Department was established to build four L-type training blimps and assemble K-type blimps shipped from Goodyear to Moffett Field. Two new hangars, #2 and #3, were constructed to house these training blimps. Trainees first qualified as pilots of hot air balloons before graduating to the blimps. Hangar One was an all-weather training facility for these balloons. Each blimp carried from seven to nine crewmembers and was armed with depth bombs. It also contained carrier pigeons for sending messages. The mission of these blimps was to patrol the Pacific Coast, searching for enemy ships or mines. They also reported schools of fish to the local fishermen in San Francisco and Monterey (*Disestablishment Ceremony for NAS Moffett Field* 1933-1994; "Command History. Twelfth Naval District...", 1929-1958).

In 1942 the Navy designated Moffett Field a joint LTA and heavier-than-air (HTA) facility. By 1943 the HTA activities increased markedly. Moffett Field supported the HTA units operating with the Fleet Air Units of the Twelfth Naval District, housing advance base training units and patrol bomber training squadrons. By 1944 the last blimp was sent to Moffett Field, and the

final training class was conducted. In 1945 the airship squadron was deactivated, and in 1947 the last blimp at Moffett Field was deflated, ending the LTA mission at Moffett Field ("Command History. Twelfth Naval District..." 1929-1958).

In January 1945, Moffett Field was designated as a major Overhaul and Repair Base, and Naval Air Transport heavy maintenance and training activities were transferred there while the HTA fleet units moved out. At this time a large construction project was undertaken to improve runways to handle usage by the Naval Air Transport Service (NATS) R-4D and R-5D transport planes. By November 1945 Naval Air Transport Squadron 44 began operations at Moffett Field ("Command History. Twelfth Naval District..." 1929-1958).

3.2 COLD WAR ERA (1946-1989)

3.2.1 General History of the Cold War

The period immediately following World War II marked the creation of the concept of the Iron Curtain and the Cold War. The Cold War, first coined as a term in 1947, was the phrase used to describe the tension and hostile relations between the United States and the Soviet Union that arose following World War II, and turned into a world-wide struggle between democracy and Communism, carried out through economic pressure, the nuclear arms race, and secret military activities. The beginning date of the Cold War has generally been determined to be 1946, when British Prime Minister Winston Churchill declared in a speech delivered at Fulton, Missouri that "an iron curtain is drawn upon [the Russian] Front," and the end, 1989, when the Berlin Wall was dismantled (U.S. Department of Defense 1991:). The battle was played out using nuclear weapons developed after the war.

The Cold War arose out of ideological conflict and the development of the atomic bomb and nuclear power in the early 1940s by the United States. The development of nuclear power led to the American bombing of Hiroshima and Nagasaki and the ending of World War II. In the first few post-war years, the United States held a monopoly on atomic energy and the production of nuclear weapons. In 1946, the Atomic Energy Commission was established with the directive to develop both military and peacetime uses for the newly-discovered nuclear energy. Through the influence of Enrico Fermi, who had worked on the original bomb, the priority turned towards the development of uranium and other raw materials for weapons

production and the manufacture of bombs, rather than for peacetime applications (Clarfield and Wiecek, pp. 113, 121).

This trend toward military rather than peacetime uses of nuclear energy came about in part because of the change in the political climate during the years from 1945 to 1950, at which time the stance of the United States towards the Soviet Union, its World War II ally, hardened into enmity. Through a series of events in the Soviet Union in 1948-49 – such as the detonation of its first atomic bomb, its blockade of Berlin, and its alliance with neighboring China – the United States came to believe that the Soviets were planning both to claim the world for Communism and to eradicate the United States through a surprise nuclear attack (Clarfield and Wiecek 1984, p. 144). The United States in turn established a policy of containment that sought to block the expansion of Soviet influence around the world and provide economic aid to countries that were fighting Communism.

Political tension between the United States and the Soviet Union became heightened in the 1950s. Communism was a real fear, fueled by the Korean War, the investigations of the House Un-American Activities Committee, Senator Joseph McCarthy's hunt for alleged Communists, and the Julius and Ethel Rosenberg atomic espionage trial. Under President Eisenhower, Secretary of State John Foster Dulles developed a dual policy of deterrence through "massive retaliatory power" and containment of Soviet expansion through alliances with non-Communist countries. This policy resulted in the formation by the mid-1950s of the North American Treaty Organization (NATO), the Southeast Asia Treaty Organization (SEATO), and the Baghdad Pact. This loose association linked allies from whose territory retaliatory attack against the Soviet Union could be made if necessary. In response the Soviet Union organized the eastern European Communist countries into the Warsaw Pact. The years 1956 and 1957 saw the invasion of Hungary by the Soviets and the invasion of Egypt by France and Great Britain with the threat of Soviet counter-invasion there (Weisberger 1984:154-74).

The mission of the Department of Defense (DoD) during this Cold War era was to deter a general nuclear war through a massive buildup of a nuclear arsenal and reliance upon a nuclear triad of land-based missiles, air-based manned bombers, and sea-based Trident submarines under the command of the Navy and the Air Force. The policy of deterrence, in which U.S. bombers armed with nuclear warheads were maintained on alert 24 hours a day, maintained essentially a nuclear stalemate for almost 35 years.

Additionally, DoD required the maintenance of sufficient troops and ships to fight non-nuclear battles in global hot-spots caused by the constant tensions of the United States pushing against Soviet expansion, particularly in the areas that had been divided after World War II, such as China-Taiwan, West Germany-East Germany, and later North and South Korea and North and South Vietnam. DoD determined that it was necessary to be able to fight a “war and a half,” one in Europe and one elsewhere. Particularly in southeast Asia and Latin America, U.S. policy makers were fearful of the domino effect; if one country in the area were allowed to fall under Communist influence, it would automatically topple the remaining countries into the Communist camp. The United States, therefore, was prepared to send troops to ensure that governments upholding the democratic ideal were maintained in power or in some cases reinstated.

3.2.2 History of the Navy in the Cold War

The role of the Navy within this larger context was to maintain an ideological and military presence on the seas. As the “arm of American foreign policy,” the Navy’s conventional forces – ships, submarines, and aircraft supplied with nuclear weapons – were deployed around the world wherever necessary to contain Communism worldwide. Its mission was two-fold. As part of the strategic nuclear deterrence triad, it maintained Polaris submarines off the Soviet coastlines. It also maintained P-3 Orion antisubmarine warfare aircraft on alert patrolling the Atlantic and Pacific Oceans. Beyond the mission of nuclear deterrence, the Navy also was called upon to support the United States presence in worldwide crisis areas that did not lend themselves to nuclear solutions. Navy attack carriers were used in over 255 crises, as air cover for amphibious landings, close air support, blockades, evacuations, and munitions transport. Carriers were sent to Korea (1950-53), the Formosa Straits (1954-55, 1958), Suez (1956), Jordan (1957), Lebanon (1958), the Congo (1960), the Dominican Republic (1961), Cuba (1962), Thailand (1962), Vietnam (1965-73), the Falkland Islands, Grenada (1983), Libya (1986), and Panama (1989) (Lehman 1987:95, 131; Isenberg 1993:165, 249).

The Navy early on began to develop new nuclear weapons to be launched from nuclear-powered carriers. Various guided missiles, such as the Regulus I and II, were developed at the Naval Ordnance Laboratory in White Oak, Maryland, and tested at the Naval Ordnance Test Station at China Lake, in the Mojave Desert of California. Initially these weapons were designed to be launched from carriers and cruisers. However, their use of liquid fuel made use

on ships too dangerous. Between 1955 and 1960 the Special Projects Office of the Navy secretly developed a strategic weapon, the Polaris, a solid fuel missile designed to be launched from a submarine. It was tested at the Naval Ordnance Test Station on San Clemente Island and ultimately placed on 41 Polaris submarines that patrolled Soviet waters (Isenberg 1993:291-302; 657-681).

In spite of this extensive mission given to the Navy during the Cold War period, its budget was often in jeopardy, as federal attention and dollars went to support Air Force bombers and missiles. The land mass of Europe and the Soviet Union, rather than the oceans, was the predominant focus of the United States' Cold War strategic policy. In the immediate post-war years the fleet was reduced to half the size it had been in 1945; many of the battleships were mothballed, and Naval facilities were closed (Lehman 1987: 95). A brief return of Navy ships to active duty came during the Korean War, where the aircraft carriers proved valuable protecting American troops.

However, from the 1950s through the 1970s, the Navy complained it had to "do more with less" as it continually was asked to respond to crises world-wide (Lehman 1987:95; 122-131). In the post-Vietnam era, between 1973 and 1980, an anti-defense Congress cut the Navy budget by 20 per cent, and the fleet was reduced from 950 ships to 479. During the Carter administration the Navy's mission was downgraded to "naval supply" rather than offense, and it became not a two-ocean force but one that would be moved from the Atlantic to the Pacific as needed. As a result a number of naval bases were closed (Lehman 1987:95-98, 117, 382).

Henry Kissinger, head of the National Security Council (NSC), alarmed by the decline of the fleet, commissioned the NSC to study the role of naval forces in national defense. This study recommended rebuilding the Navy to 600 ships to provide for adequate national security to combat the expansion of the Soviet Fleet and its presence in the Pacific Ocean. It was not until Ronald Reagan's presidency, however, that the idea of a 600-ship Navy became a reality. During his tenure the Navy added 120 ships, and in a policy of strategic home-porting, spread them out to reduce the vulnerability of the fleet to attack. An expanded battleship surface-action group was homeported in Long Beach, San Francisco, and Pearl Harbor. The new strategy was to emphasize the strength of the Third Fleet, which guarded Alaskan and Canadian oil interests in the Bering Sea, and the Seventh Fleet, which protected U.S. interests in the western Pacific Ocean (Lehman 1987:183, 402).

By 1991 a series of world-wide events, such as the fall of the Berlin Wall in 1989 and the break-up of the U.S.S.R. with its subsequent dissolution of the Warsaw Pact in 1991, reduced the Cold War threat. In that year President Bush ordered all bombers, tankers, and submarines to be taken off alert, and DoD began to reconsider the size and nature of its military forces.

As a result of this reconsideration, DoD cut its military forces by 25 per cent. To support this down-sizing, proposals were drawn up to close a number of military bases that were considered unnecessary. The Defense Base Closure and Realignment Commission was established by Public Law 101-510, Title XXIX, in 1990, to choose those installations to be closed (*Defense Base Closure and Realignment Commission Report to the President*, 1991).

3.2.3. History of Moffett Field in the Cold War Era (1946-1989)

1946-1963 – Naval Air Transport Service, Jet Base

During the years from 1945 to 1949 Moffett Field continued to support the Naval Air Transport Service (NATS) operations. In 1948 the designation of Helicopter Overhaul and Repair Base was added. By 1949, the mission changed once again to supporting the Military Air Transport Service. Air Transport Squadron Three (VR-3) arrived in 1949 as the first Military Air Transport Service squadron, transferred from NAS Patuxent River, Maryland. It was joined by Squadron VR-5 in 1950, transferred from Seattle, Washington. Moffett Field became the largest Naval Air Transport base on the West Coast (*Moffett Field 60th Anniversary*, 1993; Command History. Twelfth Naval District...," 1929-1958).

When the Korean War broke out in 1950, Moffett Field became a jet base, serving as the home base for jet carrier squadrons assigned to Navy aircraft carriers. Composite Squadron Three flew F-3D Skynight aircraft, the first night jet fighter based at Moffett Field. Additionally Fleet Aircraft Service squadrons, FASRON 8 and 10, were commissioned at Moffett. In 1953 Moffett Field became a Navy Master Jet Station, home to the F3D Skynight, F2H-1 and F2H-2 Banshee aircraft, and was designated the first of nine all-weather naval air stations (Coletta 1985:323; *Moffett Field 60th Anniversary*, 1993).

To support the approximately 300 jet aircraft stationed at Moffett Field, including first-line fighters and heavy transports, a number of new facilities were constructed, including a modern fueling system consisting of a fuel pier, pipeline, fuel storage tanks, and a fuel truck dispensing office, as well as new dormitories, an operations building with control tower, a machine shop,

aircraft maintenance shop, vehicle shed, engine X-ray building, parachute loft, and a number of line maintenance shelters and ammunition storage for day use. This was the largest expansion since World War II ("Command History. Twelfth Naval District..." 1929- 1958).

During the period from 1950 to 1958, Moffett Field served as a training center, with 20 squadrons conducting their training at the Field, and as headquarters for Commander Naval Air Transport Wing, Pacific; Air Transport Squadrons SEVEN and EIGHT; Carrier Air Groups NINETEEN, FIFTEEN, and TWENTY ONE; Fleet Aircraft Service Squadron TEN; Attack Squadron ONE HUNDRED TWENTY FIVE; Fighter Squadron ONE HUNDRED TWENTY FOUR; and Naval Air Mobile Trainer Detachment. Military Air Transport Squadrons SEVEN and EIGHT also maintained their R7V Super Constellations at Moffett Field ("Command History. Twelfth Naval District..." 1929-1958). The supersonic aircraft F-11F Tiger and the F-8U Crusader arrived at Moffett in 1957. The main mission of Moffett at this time was for testing new aircraft and jet operations (*Moffett Field 60th Anniversary, 1993; Disestablishment Ceremony for NAS Moffett Field 1994*).

In 1961 Moffett Field became a carrier attack squadron training center. In 1962 Moffett Field aircraft took part in Exercise SPADEFORK, a national logistics air defense training exercise to test emergency plans under nuclear warfare conditions ("Command History. Twelfth Naval District..." 1960).

As the number of jet planes using Moffett Field increased, the surrounding residential area also became increasingly developed. One of the jet missions was to practice low-altitude landing approaches to a simulated aircraft carrier deck painted on the runway. Because of congestion, it was difficult to carry out this mission at Moffett Field, and therefore this activity was transferred to NASA Crows Landing, in 1954.

NASA Crows Landing had been commissioned in 1943 as Naval Auxiliary Air Station (NAAS) Crows Landing, with similar facilities in Arcata, Santa Rosa, Vernalis, Watsonville, and Hollister. It was used as a training field for the Fleet Air Units of the United States Navy's Twelfth Naval District during World War II. The Bureau of Aeronautics determined its layout and construction. At the height of use, it housed 345 officers and over 2,000 enlisted men. By 1946 the base was deactivated ("Command History. Twelfth Naval District..." 1929-1958"; *Chemical Waste Management, Inc., 1994*).

It was reactivated by the Navy in 1950 for use during the Korean War as Naval Auxiliary Landing Field (NALF); its mission was to provide an airfield for refueling aircraft for field carrier landing practice and/or rearming the aircraft for ordnance training. Additionally it provided minimal barracks and mess facilities, air traffic control, communications, crash and rescue, aircraft refueling, and security facilities. \$2,695,000 was appropriated for additional construction, including the extension of the runway and the addition of a control tower, transformer vault, radio tower and radio receiver (1953), a portable Mirror Landing system (1954), aviation fuel facilities (1958), a tactical air navigation (TACAN) facility (1959), steel sheds for public works, storage, and transportation activities (1958-9), simulated carrier decks and deck lights on the runways, as well as arresting gear, to provide a replica of night conditions (1962). Control of NASA Crows Landing alternated between Moffett Field and NAS Alameda during the early 1950s, until it was transferred to Moffett Field in 1954. Beginning in 1955, in response to the emphasis on night Fleet Carrier landing practice for fighter squadrons, Crows Landing operated 12 hours a day. The highest activity took place in 1960, when mirror landing practice took place 20 hours per day ("Command History. Twelfth Naval District...", 1929-1958; "Command History. Twelfth Naval District...", 1960).

The Navy constructed a more isolated Naval Air Station at Lemoore, California, in 1961, and the jet mission was transferred from Moffett Field to Lemoore. Activity at NASA Crows Landing began to slow down once NAS Lemoore became established, although the facility was still used for jet landing practice. By 1965 activity at Crows Landing had diminished to the extent that the enlisted men were reduced from 50 to 33, and the civilian labor force was reduced. The administration building was closed and the fire house was redesignated as the administration building. The mess hall and barracks were closed in 1963 and demolished in 1965 ("Command History. Twelfth Naval District...", 1963; "Command History. Twelfth Naval District...", 1965).

1962-1989 – P-3 Orion Antisubmarine Warfare Aircraft Base

When the jet mission was removed from Moffett Field in 1962, there was speculation that the station would be decommissioned. However, that same year the U. S. Navy announced that Moffett Field had been chosen as the West Coast base for the Navy's new ASW patrol aircraft, the P-3 Orion. This new mission provided Moffett Field with a significant Cold War role, one that remained until the base closure in 1994. The mission arose from the need of the U.S. Navy

to provide a deterrent to the Soviet patrol and cruise missile submarines, armed with weapons directed at key U.S. cities and industries and at Air Force bomber bases.

The Soviets routinely deployed submarines to patrol the Atlantic and Pacific Oceans. Generally speaking there were between two and ten Soviet strategic missile submarines on station within range of their targets in the Atlantic and Pacific at any given time, including the Yankee and Delta and Typhoon classes. The submarines patrolling the Atlantic were homeported at Murmansk, above Finland, while those patrolling the Pacific Ocean were stationed at Vladivostok, above North Korea, and Petropavlosk, on the Kamchatka Peninsula in Siberia. The latter port, housing 75 percent of the Pacific Fleet submarines, including the Delta and Yankee classes, was the closest port to the United States and therefore of strategic interest for U. S. defense (Arkin and Fieldhouse 1985: 44-6, 118, 259).

Initially the range of the missiles was such that Soviet submarines were required to patrol waters fairly close to the U.S. coast. As weapons became more sophisticated and long-range, however, it was possible to launch attacks on U.S. targets from Soviet ballistic missile submarines stationed as far away as their home ports (Miller 1982:11). In the 1980s the Soviet Yankee class submarines patrolled approximately 1,500 to 2,000 miles off the West Coast. Closer in were the Soviet Victor class attack submarines that gathered intelligence on U.S. shipping and spied on American submarine bases, particularly that at Bangor, Washington (Hubner 1983).

When Soviet submarines left their homeports to patrol the open seas, they traveled through "choke points," narrow straits between land masses. To track the voyages and positions of these Soviet submarines traveling through the straits, the United States in 1952 established a sound surveillance system (SOSUS), a "worldwide string of underwater listening posts," located at these choke points. The Atlantic SOSUS, monitoring submarines exiting Murmansk, crossed the Greenland, Iceland, United Kingdom (GIUK) gap. The Pacific SOSUS, monitoring submarines exiting Vladivostok and Petropavlovsk, crossed from the Aleutian Islands to Japan and from Japan to South Korea. SOSUS was installed as well along the U.S. continental shelf and around the islands of the Azores and Hawaii (see Figure 3-1) ("The High Stakes Business of Antisub Warfare." 1978; Kelly 1978:79)

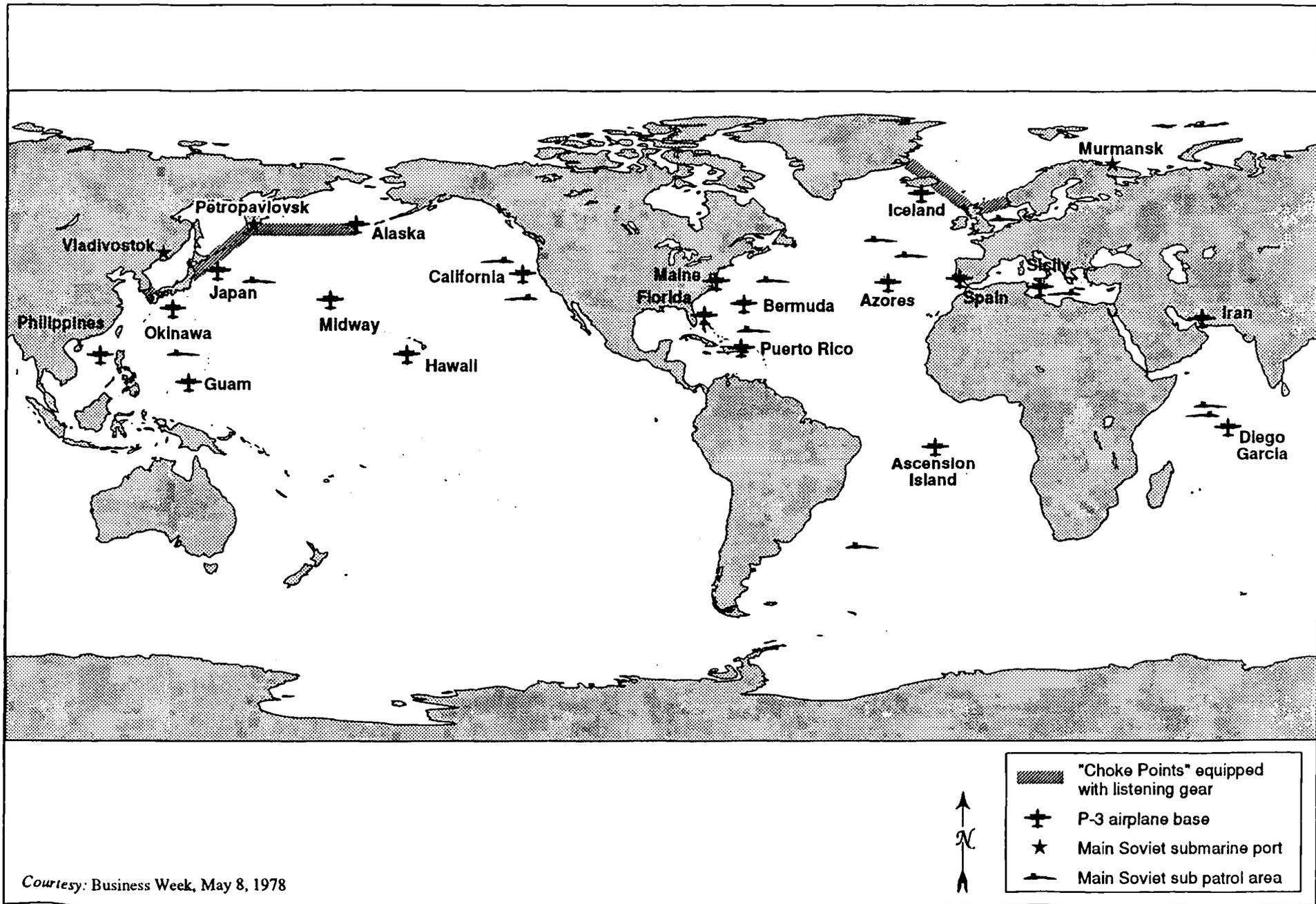


Figure 3-1. P-3 Orion Antisubmarine Warfare System

SOSUS, developed by Western Electric Company, consisted of a string of large cylinders containing hydrophones, that were grouped on the ocean floor. Each hydrophone, floating in oil within the cylinder, monitored a particular frequency band, picking up the ocean's sounds. These hydrophones were connected by cables to 20 land stations. Sounds were digitized and relayed by cables from the hydrophones to one of the stations, where computers sorted the sounds for submarines and their locations. Once this information was acquired, it was sent by code to the fleet headquarters at Norfolk, Virginia, which in turn transmitted the information to U.S. submarine-hunting submarines or to the P-3 aircraft ("The High Stakes Business of Antisub Warfare." 1978). Initially located by SOSUS as they traveled through these choke points, the Soviet submarines then continued to be tracked by U.S. anti-submarine submarines, always in position near the choke points ("The High-Stakes Business of Antisub Warfare." 1978; "The Enemy Offshore." 1985).

From the 1950s to the 1980s the Soviet Union developed and refined three types of submarines: attack, cruise missile, and strategic ballistic missile. The attack submarines, carrying antiship and antisubmarine torpedoes, and used for patrol and reconnaissance missions, included the diesel-powered Whiskey, Zulu, Romeo, Foxtrot and Tango classes and the nuclear-powered November, Victor and Alfa classes (SSN). The cruise missile submarines, carrying antiship guided cruise missiles, included the diesel-powered Juliett class and the nuclear-powered Echo, Charlie, and Oscar classes (SSGN). The strategic ballistic missile submarines, carrying nuclear-tipped submarine-launched ballistic missiles (SLBM), included the Zulu V, Golf, Hotel, Yankee, Delta, and Typhoon classes (SSBM) (U. S. Department of Defense [1983]: 9, 45-47, 57-60; Miller 1982).

In the 1960s the United States developed the Lafayette class ballistic missile submarine that carried 16 Polaris solid fuel missiles. These could be launched submerged and had a range of 1,380 miles. Between 1969 and 1978 the Lafayette class was converted to carry Poseidon C-3 missiles with a range of 2,800 miles. In 1982 the Ohio class was developed, specifically to carry 24 Trident missiles with a range of 3,800 miles (Miller 1982:8-9). However, as early as the 1950s the number of Soviet submarines had proliferated to such a degree that the U. S. Navy realized that it could not match the Soviet Navy submarine for submarine. Rather, it decided to support a smaller U.S. submarine fleet by developing a new aircraft designed to perform the tasks of tracking and, if necessary, intercepting and destroying Soviet submarines (Zimmerman 1969).

As a result, in 1957 the U.S. Navy issued a directive, Type Specification No. 146, to American aircraft companies to develop a new land-based ASW plane. The ASW aircraft in use by the Navy since 1945 was Lockheed's P-2V Neptune aircraft, which had undergone numerous modifications over the years and had reached the limits of its growth ("Orion the Hunter..." 1982:4). The Navy was looking for an aircraft that was bigger, could go farther and faster, be able to stay on location longer, and carry more men, electronic equipment, and weapons than the P-2V Neptune. Lockheed won the competition in 1958, using the airframe of their existing prop-jet commercial aircraft, the Electra, as the basis for their new aircraft, named Orion after the Greek god of the hunt. It was seven feet shorter than the Electra, with a five-pane windshield, eyebrow windows, a bomb bay, sonobuoy chutes, "bug eye" observation posts on the fuselage, and a Magnetic Anomaly Detector (MAD) fiberglass tail that used electromagnetism to locate submerged metallic objects. It could be equipped with depth charges, torpedoes, wing-mounted rockets, bombs, mines, or special weapons (Lockheed-California Company, n.d; Thomas [1969]; Miller 1982: 140-2).

In 1962, after numerous tests, the Navy assigned the first P-3 Orion aircraft to squadrons VP-8 and VP-44, stationed at Patuxent River Naval Air Training Center (NATC) in Maryland. The squadrons used the aircraft to carry out traditional ASW aircraft missions such as coastal surveillance, patrolling at low altitudes for long periods of time; offshore patrol and general surveillance at higher altitudes; and contact investigation, investigating unknown submarines. (Lockheed-California Company n.d). They were deployed to the Azores and Bermuda during the Cuban missile crisis ("Orion Milestones," 1982:6).

Moffett Field was chosen as the West Coast training and operational base for P-3 Orion ASW activities because it was close to the fleet in San Francisco Bay area, close to the coast, and close enough to the Soviet submarines patrolling Pacific waters to be able to monitor them. In 1963 Moffett Field "assumed full P-3A aircraft support capability" and Lockheed established an office at Moffett Field to provide contractor support service (W. Carl Honaker, personal communication; "Command History. Twelfth Naval District..." 1963). In 1964 the Navy's ASW organization was commissioned, and Moffett Field was given a Commander Fleet Air Wings Pacific to provide administrative command and training of all patrol squadrons in the Pacific. The following year the Commander was also titled Commander Fleet Air Moffett with jurisdiction for the operations of Moffett Field and operational control of the squadrons home-

based at Moffett (*Commander, Patrol Wings, U.S. Pacific Fleet. Change of Command Ceremony* 1990).

Three other training and operational bases for the P-3 mission were established by the U. S. Navy in 1963. An operations base connected with Moffett Field was established at Barbers Point, Hawaii. The East Coast operational and training base was located at NAS Jacksonville, Florida, with the operations base located at Brunswick, Maine. There were 24 patrol squadrons, 12 on the East Coast and 12 on the West Coast. Moffett Field had seven squadrons and Barbers Point five. These four bases supported a number of deployment stations. Moffett Field supported bases at NAS Adak, Alaska, in the Aleutian Islands; NAS Cubi Point and NAS Sangley Point, Republic of the Philippines; NAF Misawa and MCAS Iwakuni, Japan; NAF Kadena and NAF Naha, Okinawa; Diego Garcia, Indian Ocean; NAS Agana, Guam; and NAF Midway Island. NAS Jacksonville, Florida supported bases at Keflavik, Iceland; Sigonella, Sicily; Spain; the Azores; Bermuda; Ascension Island; and Puerto Rico ("History of Patrol Squadron...n.d."; "The High-Stakes Business of Antisub Warfare." 1978; W. Carl Honaker, personal communication, February 1998).

The first patrol squadron, VP-46, the Grey Knights, arrived at Moffett Field for this new ASW mission in 1963 and was the first squadron in the Pacific fleet to be equipped with the P-3A Orion. That same year patrol squadrons VP-19, Big Red, from NAS Alameda, and a detachment of VP-31, the Genies, a combat replacement patrol squadron based at NAS North Island, San Diego, were also transferred to Moffett Field (*Naval Air Station Moffett Field, California* 1975).

In 1964 VP-9, the Golden Eagles, was transferred from Whidby Island to Moffett Field, followed in 1965 by VP-47, the Golden Swordsmen, from NAS Alameda, in 1966 by VP-48, the Boomerangers, from NAS North Island in San Diego, in 1967 by VP-50, the Blue Dragons, from NAS North Island, and in 1968 by VP-40, the Fighting Marlins, from NAS North Island. A Reserve patrol squadron, VP-91, was added in 1970. Hangars 2 and 3 were divided into quarters, with each squadron assigned a maintenance bay.

By 1968 Moffett Field had received its full complement of seven squadrons, with eight aircraft to a squadron. An additional training squadron at Moffett Field, VP-31, had 24 aircraft. Each squadron had between 50 to 60 officers and 350 to 400 enlisted men. Every squadron would train in Hangar 1, then be deployed for a six-month tour of duty at forward bases in the Pacific

Ocean. Two to three squadrons were on deployment, with the remainder stationed in Hangars 2 or 3. Their maintenance bays rotated depending on which squadrons were at homeport (W. Carl Honaker, personal communication February 1998).

By 1967 the Commander at Moffett Field was additionally titled Commander Patrol Force Pacific with jurisdiction over 13 patrol squadrons and two patrol wings. In 1973 these three responsibilities were combined into Commander, Patrol Wings, U.S. Pacific Fleet (COMPATWINGSPAC). Under his control were 83 million square miles of ocean, including the Northern Pacific Ocean, Bering Sea, Chukchi Sea, Sea of Okhotsk, Sea of Japan, Yellow Sea, East China Sea, Philippine Sea, South China Sea, Andaman Sea, and the Indian Ocean, the Naval Air Stations at Adak, Alaska and Barbers Point, Hawaii, as well as the Naval Air Facility, Midway Island. (*Commander, Patrol Wings, U.S. Pacific Fleet. Change of Command Ceremony* 1990).

The squadrons patrolling the Pacific Ocean were trained at Moffett Field and then deployed to one of the above forward bases. A whole squadron would travel in cargo planes to these bases and would fly missions from there for six months, followed by a home stay for a year to eighteen months. During the home stay, the squadrons would continue training and fly active missions from Moffett Field.

The mission of the P-3 aircraft at Moffett Field and Barbers Point was to protect and control Northern Pacific sea lanes and to deploy strategic nuclear weapons as part of a triad of U. S. aircraft carriers and attack submarines, serving as a deterrent to the nuclear capabilities of the Soviet Fleet in the Pacific and Indian Oceans and the China Sea. To support this strategy, the U.S. Navy had its ships, submarines, and P-3 aircraft "forward deployed," at the bases listed above. The chief Pacific ASW base was at Adak, Alaska, where B-57 nuclear depth bombs were stored. P-3 aircraft regularly patrolled from the deployment bases, collecting information on the location and activities of Soviet submarines and ships. In case of war, P-3 aircraft could stage out of Canada, Hawaii, Midway Island, Misawa and Kadena, Japan, Cubi Point in the Philippines, and Guam, coordinating their efforts with U.S. attack submarines to destroy Soviet submarines. Various U. S. Naval exercises involving aircraft carriers, attack submarines, and P-3 aircraft were undertaken off the coast of Petropavlovsk as practice for setting up a barrier against Soviet submarines (Arkin and Fieldhouse 1985: 127).

One squadron was on ready alert duty for a month, with the job rotating among the squadrons. While on ready alert, a squadron was prepared to fly within one to four hours. During an active mission, a P-3 Orion aircraft with 12 crew members took off from Moffett Field. The crew included five officers and seven enlisted men. The officers were the three pilots (the aircraft commander pilot or Patrol Plane Commander, and the second and third pilots), and two naval flight officers, the Tactical Coordinator (TACCO) and the Navigator (NAVCOM). The enlisted men included two Acoustic Sensor Operators, who listened to the sonobuoys and sent their output to the TACCO; one Non-Acoustic Sensor Operator, who controlled the radar and infrared camera system, and later all Electronic Surveillance Measures (ESM) that picked up Soviet radar; two Flight Engineers, who monitored the aircraft's fuel and power systems; one In-Flight Technician, who was the fix-all man who could repair the computers and electronic equipment; and one Ordnance Specialist, who was in charge of loading the sonobuoys, smokes, and flares, as well as loading and unloading the practice torpedoes. Generally weapons were not carried on these flights. A typical mission would last 12 hours. To conserve fuel, when the aircraft was cruising on-site near the target it could turn off two of the engines (W. Carl Honaker, John Pedersen, personal communications, February 1998).

The crew would be cued to the general location of the target, called the SOSUS Probability Area (SPA), identified through SOSUS information delivered to the Tactical Support Center, building 301 (now 656). The mission was to identify the course, speed, and location of the Soviet submarine and classify it as to type. Once in the general vicinity of the target, the P-3 crew further refined the location of the target by dropping sonobuoys, acoustic listening buoys, in a variety of tactical patterns. (If the Soviet submarine was nuclear-powered, and therefore quieter than diesel-powered boats, the sonobuoys were laid more closely together to detect the submarine). From the sonobuoys hung hydrophones, waterproof microphones, with antennae that were dropped to different depths to detect the sounds of the submarines. These sonobuoys had one-watt UHF transmitters that sent information back to the aircraft's acoustic sensor stations (W. Carl Honaker, personal communication, February 1998; Geddes, n.d.)

The computer in the aircraft monitored the signals from each sonobuoy, and printed out the signals. The patterns of these signals provided the "signature" that allowed the tactical coordinator to determine what type of ship the sonobuoy had picked up. Every submarine type gave off distinctive motor sounds that could be identified. Within each type, individual



Courtesy: U.S. Navy

Figure 3-3. P-3 Orion Dropping Sonobuoy

submarines gave off unique sounds, such as that made by a chipped propeller, that identified it specifically. A library of signatures was stored on the computer for comparison. This information was transmitted to the Tactical Support Center at Moffett Field by data link. Other detection devices to complement the sonobuoy information, integrated into the aircraft's computer, included radar, Identification Friend or Foe (IFF), and ESM that pick up signals from electronic equipment on the submarine.

Triangulating from sonobuoys, the aircraft crew could locate the target within a few yards. Generally speaking, when tracking Soviet submarines in an active mission, the P-3 Orion aircraft remained at its cruising altitude of 20,000 feet to remain undetected. In a wartime situation, however the aircraft could drop to a height of 200 to 300 feet above the ocean, use its MAD to pinpoint the target precisely, and then drop a torpedo on the target. At other times, depending on the political situation, if the United States wished the Soviet submarines to know they were being tracked and had been located, they would fly low and drop active sonobuoys that would emit a sonar ping to indicate the submarine's location. The sound would indicate to the Soviets that they had been detected (John Pedersen, personal communication, February 1998).

In the initial years of the P-3 mission, the range of the ballistic missiles on Soviet submarines was sufficiently short that they were required to forward deploy to patrol areas between Hawaii and the United States coast. In later years, as the Soviet missiles became longer-ranged, it was not necessary for them to patrol so close to the American coast. It therefore became more difficult for the P-3 crews flying active missions from Moffett Field to get "on-top time", actual contact with a Soviet submarine. When such contact was made, other P-3 crews would fly to the target to get training on locating it as well (W. Carl Honaker, personal communication, June 1998).

To perform their ASW task effectively, the crew was required to work as a seamless unit. Numerous training flights were undertaken to test every phase of antisubmarine warfare, including search, localization, and the "kill" to provide opportunities for the crew to develop the required coordination. Qualifying exercises were completed to test every aspect of the crew's capabilities (Sawyer 1969). When a squadron was not on ready alert, it flew training missions, with the objective of locating and tracking a target. The target for these training missions was a United States' or a previously-briefed ally's ship or submarine. The general

location of this target was given to the crew through communication with the target. Once the target was located to within a few yards through information from the sonobuoys, the aircraft dropped to 200 to 300 feet above the ocean and used its MAD system to pinpoint the target's location. When the target was located, the sonarman reported contact by exclaiming "Madman". A simulated attack, consisting of an imaginary torpedo being launched by the computer, was then made on the target. Locational information was then stored as the aircraft left the area (Kelly 1978:80; Ciotti 1982:54; Zimmerman 1969:119; Atchison 1979:19-23).

The P-3 Orion crew also went on training missions to practice discharging torpedoes, using one of three restricted areas, one an instrumented range in the San Juan Islands north of Seattle, Washington; one at Barking Sands, Hawaii; and a third in the Bahamas. The crew dropped unarmed 500-pound torpedoes on a target sled. The torpedoes would signal that they had acquired the target, and that would signal a "hit" for the crew. (W. Carl Honaker, personal communication, February 1998).

Upgrades were constant over the lifetime of the P-3 Orion, bringing advanced electronic and communication systems. The original P-3A introduced in 1962, was followed by the P-3B in 1965 with improved turboprop engines, the addition of a radar altitude warning system, more sonobuoys, and the installation of the Bullpup missile guidance system. The P-3C, introduced in 1970, contained an advanced digital computer that integrated the operations of the aircraft's navigation, avionics, flight controls, and weapons systems. This IBM computer had twice the signal-processing capability of the analog computers found in the P-3A and B models. The upgraded computer made it possible for crew members to spend less time perusing charts and logs and more time making tactical decisions. The P-3C also included 385-400 black electronics boxes, compared to 180 on the A and B models, a more advanced sonobuoy system that could report the direction of recorded sound (DIFAR), an expanded number of sonobuoy chutes to 48, and a low-light-level television system for locating surface submarines at night by the moon or stars (Turner 1979: 107-108; Spaniel 1983; Zimmerman 1969: 224; Geddes, n.d.).

The P-3C Update I in 1975 added new avionics and an expanded computer memory. Update II in 1977 added an infrared detection system, a sonobuoy reference system, and the Harpoon anti-ship missile. The Update III in 1984, considered by Lockheed as "the biggest U. S. Navy P-3 development since the P-3C was introduced..." featured an advanced IBM *Proteus* acoustic signal processor (Turner 1979: 107-108; Spaniel 1983; Sweetman 1981:1661). The P-3 Orion

aircraft was initially white over insignia blue. In the mid-1960s the color was changed to white over gray, and in 1988 to all gray ("Command History. Twelfth Naval District...", 1989).

The types of ordnance available to the P-3 Orion over time included the Mark 46 and 50 lightweight homing torpedo, the Harpoon (AGM-84) air-to-surface anti-ship missile, the Maverick (AGM- 5) air-to-surface missile, the Bullpup air-to-surface missile, and B-57 nuclear depth bombs (U.S. Navy Fact File). The latter were stored at Concord Naval Weapons Station with a "contingency support" storage site at Moffett Field (Arkin and Fieldhouse 1985: 62, 176-178). The forward bomb bay could carry torpedoes, depth bombs, mines, and nuclear depth bombs. Up to ten exterior racks could be added to carry rockets, Bullpup air-to-surface missiles, Sidewinder air-to-air missiles, torpedoes, and mines (Geddes n.d.: 27).

Buildings at Moffett Field Associated with the P-3 Orion Mission

From 1963, to provide facilities for the ASW mission, a number of older World War II buildings near Hangars 1, 2, and 3 were remodeled. Hangar 1 was used by VP-31 as a training facility, with classrooms and parking for the squadron's 24 P-3 aircraft. Detachment One (DET ONE) of the Fleet Aviation Specialized Operational Training Group, Pacific Fleet (FASOTRAGRUPAC), was moved to Moffett Field from NAS Alameda in June 1963 to provide instruction in flying and maintenance of the P-3A. It also was located in Hangar 1. Over the years, to aid in instruction, training flight simulators as well as four Weapons System Training (WST) simulators, mock-ups of the fuselage to give realistic training to the aircraft's crew members, were constructed in Hangar 1 (W. Carl Honaker, personal communication, February 1998; *Naval Air Station Moffett Field, California* 1975). Hangars 2 and 3 were divided into quadrants, with each section being used as a maintenance bay by the rotating patrol squadrons at Moffett Field. As the squadrons rotated into a quadrant, they would paint their insignias on the exterior walls of the hangars for identification.

Building 669 (originally #49) was altered in 1963 to become part of a P-3 training school. It contained classrooms to teach about ordnance, fuel change, quick engine change, navigation, communications, radar, surface controls, IFF and LORAN navigational systems, as well as a projection room, conference room, and technical library. Building 655 (originally #124) was also remodeled to serve as a classroom, containing an instructor's study, spare parts storage, a technical library, and assembly and projection room as well as classrooms. The Naval Air Maintenance Training Detachment (NAMTRADET) 1012, was established at Moffett Field to

provide instruction (*Naval Air Station Moffett Field, California 1975*; Civil Engineering architectural drawings, building 683).

In 1969 building 654 (originally #513) was added between buildings 669 and 655 to serve as an additional aircraft systems training building, containing classrooms for instruction in communications, data processing, doppler, inertial navigation, LORAN and IFF, MAD, radar, sonar receiving and recording, Directional Frequency and Ranging (DIFAR), and electronic countermeasures (ECM) systems (Civil Engineering architectural drawing, building 683). These three buildings became known as "Orion University," with NAMTRADET 1012 headquartered in building 669. By 1975 an 83-course maintenance training curriculum was offered by "Orion University," with courses in airframes, avionics, electrical, jet propulsion and ordnance. NAMTRADET trained all the flight engineers and in-flight technicians for the Pacific Fleet P-3 squadrons. By 1978 Moffett Field was the West Coast P-3 Learning Center, training all ground crew for the West Coast and Hawaii (*Naval Air Station Moffett Field, California 1975*; "Command History. Twelfth Naval District...," 1978).

In 1965 the first facilities to be constructed specifically for the P-3 Orion mission were the Advanced Underwater Weapons (AUW) complex, consisting of a munitions maintenance building, sentry tower, and seven special weapons magazines (buildings 484-492). The munitions maintenance building contained a shop, engine clean room, mechanical and electrical equipment room, an office, bunk room, engine overhaul room and test and assembly area (Civil Engineering architectural drawings, building 683). The following year an "Initial Nuclear Weapons Acceptance Inspection" was completed, and the squadrons took part in Exercise Buttonhook, a large-scale ASW exercise ("Command History Twelfth Naval District...," 1966). In 1968 building 511, a guided missile integration facility, was constructed, where weapons components were assembled. In 1969 the AUW was certified on the use of the MK 46 Mod 1 torpedo ("Command History. Twelfth Naval District...," 1970).

In 1971 building 656 (originally #301 and #301A) was constructed as an addition to Building 300, and the complex became the communications center for the P-3 Orion mission. Building 300 was the administrative area. Building 301 was the Tactical Support Center. All classified information gathered from SOSUS came there, as well as P-3 Orion data concerning the location of Soviet submarines. Tactical briefings were held there. Building 301 A was the center for the

Antisubmarine Warfare Operations (ASWOC) Wing 10 (Civil Engineering architectural drawings, building 683).

In 1975 building 650 (originally #549), the Advanced Intermediate Maintenance Depot (AIMD) facility, was constructed, designed as an electronics repair and maintenance shop for the avionics component boxes found on the P-3 Orion. That same year building 561, a missile magazine, was constructed. The final facility constructed for the P-3 mission was building 653 (originally #586), built in 1983 for applied instruction in naval aviation maintenance. It contained classrooms and an ordnance bay, as well as administrative facilities (Civil Engineering architectural drawings, building 683).

The remainder of the buildings and structures at Moffett Federal Airfield constructed between 1946 and 1989 are considered support buildings, such as a generator, small storage buildings, toilets, exchange, bowling alley, gas stations, dormitories, administration, fuel office, incinerator, auto hobby, credit union, fire station, transformer, and hazardous materials facilities (see Table 4-1 for a listing of buildings).

NASA Crows Landing was also used by the P-3 Orion aircraft after 1974, when jurisdiction over the Station reverted from NAS Lemoore to Moffett Field. Touch-and-go operations were carried on there to relieve congestion at Moffett Field (Tetra Tech 1998: 3-8). All the buildings and structures at NASA Crows Landing are considered support buildings.

CANG Mission and Buildings

The 129th Rescue Wing of the California Air National Guard (CANG) with its 129th Rescue Wing, was transferred from Hayward Airport to Moffett Field in 1984. Part of Air Combat Command, its mission is combat and civilian search and rescue, using HC-130P tankers and HH-60 helicopters. It also supports the U. S. Customs Service and the Governor's office during state emergencies such as earthquakes, floods, and fires. It has deployed to foreign countries to aid in rescue, natural disaster relief, and construction projects. These missions are not considered of *exceptional* significance during the Cold War. CANG built a number of new buildings (651, 653, 679, 680, 681, 682, 683, 684, and 686) as well as taking over older buildings for their use (71-74, 111, 146, 484, 485, 486-492, 545, 561, 574, 650, 652, 655, 656, 657, 658, 662, 669, 992).

4.0 CONCLUSIONS

A total of 148 Cold War era facilities at Moffett Federal Airfield and NASA Crows Landing were examined during the course of the survey. Of these, none of them is significant according to NRHP criterion G. Although 20 buildings directly supported the Cold War era mission at Moffett Field of P-3 Orion ASW operations, none of these buildings reaches the level of *exceptional* significance required under Criterion G to make them eligible for the NRHP. The remaining 128 facilities at Moffett Federal Airfield and NASA Crows Landing are considered support buildings, that is, the type of resources that would be found at any military installation regardless of mission. By definition, because they are support buildings, they are not considered *exceptionally* significant Cold War properties and are therefore not considered eligible for listing on the NRHP. Twenty one of these support buildings were evaluated in 1991 as part of the Shenandoah Plaza study and were found to be ineligible for the NRHP because they were less than 50 years old (126, 133, 175, 346, 350, 367, 460, 478, 482, 498, 499, 509, 510, 527, 539, 540, 542, 566, 567, 569, 570). The three hangars associated with the P-3 Orion mission, Hangar 1 (1933), and Hangar 2 and 3 (1942) were previously evaluated in 1991 and are listed on the NRHP as contributing buildings to the Shenandoah Plaza National Historic District. A list of inventoried buildings and structures is presented in Tables 4-1 and 4-2. A list of buildings and structures associated with the P-3 Orion mission is presented in Table 4-3.

The P-3 Orion antisubmarine warfare mission was part of the larger Navy mission of deterrence against the threat of Soviet submarine missile attacks, and as such is significant under both Criteria A and G as an event that made a significant contribution to the broad patterns of history at the national level. There are 20 resources at Moffett Field associated with this mission. To be considered of *exceptional* significance these resources must have a direct association with the P-3 mission; must be constructed specifically for the P-3 mission, or if the resource is an earlier building retrofitted for the P-3 mission, must have modifications that clearly identify its Cold War mission; must have a unique architectural, engineering, or technological design that visually represents its direct role in the P-3 operations; and must retain integrity. For Cold War resources, integrity implies that the resource retains those specialized attributes that made it significant and thus is able to convey that Cold War significance to the viewer.

Table 4-1. Cold War Era Buildings at Moffett Federal Airfield

<i>Building Number</i>	<i>Historic Use</i>	<i>Year Constructed</i>	<i>National Register Eligible</i>
50	Communications	1958	No
93	Aircraft Welding Shop	1946	No
105	Transformer Vault	1947	No
106	Aircraft Compass Calibrate	1947	No
107	Administration	1948	No
109	Pool House	1948	No
126	Warehouse	1949	No
129	East Gate Sentry House	1949	No
133	Paint, Oil Storage	1950	No
134	Grease, Oil Storage	1951	No
137-138-139-140	Ready Fuel Storage Tanks	1952	No
141	Fuel Station	1952	No
142	Equipment Maintenance Shop	1952	No
143	High Explosives Magazine	1951	No
146	Public Works Garage	1952	No
147	High Explosives Magazine	1951	No
148	Barracks	1953	No
149	Barracks	1953	No
150	Barracks	1953	No
151	Barracks	1953	No
152	Enlisted Men's Diner	1953	No
153	Barracks	1953	No
154	Barracks	1953	No
155	Barracks	1953	No
158	Flight Operations	1954	No
161	Gas Station	1952	No
167	Fueling Pier	1953	No
175	Line Maintenance Shelter	1956	No
176	Line Maintenance Shelter	1956	No
184	Unknown	1955	No
191	Lift Station	1952	No
329	Receiver Building	1958	No
331	Unknown	1958	No
342	Unknown	1948	No
346/396	Line Maintenance Shelter	1950	No
348	POL Sampling, Testing	1950	No
350	Line Maintenance Shelter	1950	No
351	Line Maintenance Shelter	Unknown	No
359	Unknown	Unknown	No
360-361-362	Fuel Storage	1954	No
367	Unknown	1948	No
372	Bathroom	1952	No
376	Storage	Unknown	No
382	Line Operations Shelter	1950	No
390	Unknown	1948	No
395	Line Operations Shelter	1948	No

Table 4-1. Cold War Era Buildings at Moffett Federal Airfield

<i>Building Number</i>	<i>Historic Use</i>	<i>Year Constructed</i>	<i>National Register Eligible</i>
399	Storage	1956	No
400	Unknown	1958	No
402	Bus Stop	1957	No
409	Unknown	1946	No
446	TACAN	1986	No
454	Transmission Building	1960	No
455	Storage	1964	No
459	Unknown	Unknown	No
460	Unknown	1950	No
463	Communications Antenna	1960	No
464	Unknown	1964	No
471	Storage	1962	No
472	Air Frames Shop	1961	No
476	Exchange	1964	No
478	Stand-by Generator	1963	No
482	Painting, Washing Facility	1963	No
483	Unknown	1964	No
484	P-3 Munitions Maintenance Shop	1965	No
485	P-3 Sentry House	1965	No
486-492	P-3 Weapons Magazines	1965	No
498	Covered Storage	1965	No
499	Covered Storage	1966	No
502	Bathroom	1967	No
503	Gas Station	1966	No
509	Unknown	1968	No
510	Unknown	1967	No
511	P-3 Missile Integration Facility	1968	No
512 A, B, C	Barracks	1970	No
525	Bowling Alley	1970	No
526	Storage	1976	No
527	Unknown	1953	528
	High Explosives Magazine	1951	No
529	Exchange Warehouse	1970	No
533	Bathroom	1971	No
537	Bathroom	1973	No
539	Line Maintenance Shelter	1972	No
540	Line Maintenance Shelter	1972	No
541	Unknown	1973	No
542	Incinerator	1973	No
543	Craft Hobby Shop	1973	No
544	Auto Hobby Shop	1974	No
545	Fuel Farm Office	1973	No
547 B, C, D, E	Living Quarters	1974	No
552	Satellite Antenna	Unknown	No
554	Exchange	1975	No
555	Administration	1984	No
556	Credit Union	1979	No
561	P-3 Missile Magazine	1976	No

Table 4-1 Cold War Era Buildings at Moffett Federal Airfield

<i>Building Number</i>	<i>Historic Use</i>	<i>Year Constructed</i>	<i>National Register Eligible</i>
563	Generator	1977	No
566	Administration	1979	No
567	Warehouse	1978	No
569	Administration	1978	No
570	Unknown	1978	No
572	Handball Courts	1963	No
574	Oil, Tire Storage	1982	No
580	Fire Station	1983	No
581	Sign Board	1982	No
582	Sign Board	1982	No
583 A, B, C	Living Quarters	1985	No
591	Substation	1983	No
596	McDonalds Restaurant	1985	No
650	P-3 AIMD Avionics Shop	1975	No
651	Battery Lockers	1981	No
652	Aircraft Operations	1988	No
653	P-3 Applied Instruction	1984	No
654	P-3 Classroom	1969	No
655	P-3 Classroom	1945	No
656	P-3 Communications Center	1971	No
657	Line Operations	1955	No
658	Line Maintenance Shelter	1955	No
659	Ammunition Service Locker	1956	No
660	Ammunition Service Locker	1956	No
661	Line Operations Shelter	1956	No
669	P-3 Classroom	1943	No
679	Storage	1992	No
680	CANG Headquarters	1980	No
681	CANG Administration/Supply	1980	No
682	CANG Hazardous Storage	1980	No
683	CANG Civil Engineering Office	1980	No
684	CANG Equipment Storage	1984	No
686	Parachute and Dinghy Repair	1984	No
901	Liquid Oxygen Storage	Unknown	No
949	High Explosives Magazine	1956	No
950	Hazardous Materials Storage	1989	No
951 (251)	Unknown	1957	No
953	Fuel Storage Day Tank	1956	No
954	Fuel Truck Dispensing Office	1956	No
956	Parachute Loft	1957	No
956A	Unknown	Unknown	No
958	Vehicle Shed	1956	No
992	Unknown	1957	No

Table 4-2. Cold War Era Buildings at NASA Crows Landing Flight Facility

<i>Building Number</i>	<i>Historic Use</i>	<i>Year Constructed</i>	<i>National Register Eligible</i>
40	Pilot's Ready Room	1944	No
101	Control Tower	1953	No
102	Receiver Building	1953	No
103	Transformer Vault	1953	No
104	Radio Beacon Tower	1953	No
109	Administration/Fire Station	1957	No
120	Aircraft Compass Calibrate	1944	No
136	Aircraft Maintenance Shop	1958	No
137	Storage Supply/Electronics	1959	No
138	Transportation Building	1959	No
143	TACAN	1959	No
144	Public Works Shop	1959	No
150	Water Pump Station	1943	No
151	Pump House, Water Tank	1943	No
163	Swimming Pool	1960	No
164	Pool Shed	1960	No
165	Bath House	165	No
167	Medical Trailer	Unknown	No
168	Exchange, Club	1943	No
Bunker	Bunker	Unknown	No
Azimuth Antenna	Azimuth Antenna	Unknown	No
Azimuth Shelter	Azimuth Shelter	Unknown	No
Storage Shed	Storage Shed	Unknown	No
Snack Bar	Snack Bar	Unknown	No

Table 4-3. Buildings at Moffett Field Associated with the Cold War Era P-3 Orion Mission

<i>Building Number</i>	<i>Historic Use</i>	<i>Year Constructed</i>	<i>National Register Eligible</i>
1	Flight training	1933	Listed
2	P-3 maintenance	1942	Listed
3	P-3 maintenance	1942	Listed
484	P-3 AUW Munitions Maintenance Shop	1965	No
485	AUW Sentry House	1965	No
486-492	AUW Weapons Magazines	1965	No
511	Missile Integration Facility	1968	No
561	Torpedo Maintenance	1976	No
650	AIMD Avionics Shop	1975	No
653	Applied Instruction	1984	No
654	Classroom	1969	No
655	Classroom	1945	No
656	Technical Support Center	1971	No
669	Classroom	1943	No

The 20 buildings associated with the P-3 mission can be divided into several different property types for analysis of their significance:

Classrooms (1, 653, 654, 655, and 669). Buildings 1, 653, 654, 655, and 669, were classrooms used for P-3 training. Of these, 1, 655, and 669 were constructed before the Cold War and were retrofitted as classrooms. Building 1, the hangar, had four flight simulators added to it between 1970 and 1974 for training P-3 aircrew personnel. These flight simulators have been removed, and the hangar was not otherwise modified from its 1933 exterior to indicate the specific P-3 mission. It is therefore not considered of *exceptional* significance under Criterion G. (This hangar was previously evaluated in 1991 and is listed on the NRHP as a contributing building to the Shenandoah Plaza National Historic District). The World War II buildings 655 and 669 were not modified on the exterior in a way to indicate their function as P-3 classrooms. Building 654 was built as a classroom for the P-3 mission, without windows, and has been altered recently with windows. Building 653 is a standard post-Modern-style building. As a property type, these classrooms do not exhibit unique architectural or engineering features special to the P-3 mission, and therefore are not considered of *exceptional* significance. They are not considered eligible for listing on the NRHP under Criterion G.

Operations Buildings (2, 3, 650). Hangars 2 and 3 are World War II facilities used by rotating squadrons for maintenance and training, and were not modified with unique architectural or engineering features associated with the P-3 mission. They are therefore not of *exceptional* significance within the Cold War context. (However, these hangars were previously evaluated in 1991 and are listed on the NRHP as contributing buildings to the Shenandoah Plaza National Historic District). Building 650, the Avionics Shop, is of standard modern slab-wall construction without specialized features that would directly link it to the P-3 mission. It is therefore not considered of *exceptional* significance and is not eligible for listing on the NRHP under Criterion G.

Weapons Storage, Assembly, and Maintenance Facilities (484, 485, 486, 487, 488, 489, 490, 491, 492, 511, 561). Buildings 484, 485, 486, 487, 488, 489, 490, 491, and 492, the Advanced Underwater Weapons compound, was used to maintain and store the weapons inventory, such as the Mark 46 torpedoes, cluster bombs, and Bullpup or Harpoon air to surface missiles, for the P-3 mission. Although the complex has a direct relationship to the P-3 mission, its design is a standard Navy Bureau of Yards and Docks secure munitions complex without specialized

architectural or technological features that would make it of *exceptional* Cold War significance. Similarly, building 561, used for torpedo maintenance and day storage, was a standard munitions storage building without architectural or technological features that would make it of *exceptional* Cold War significance. Building 511, the integrated missile facility, although used to assemble the standard components of nose cone, body, and fins into the weapons such as bombs or Bullpup and Harpoon missiles, is a standard-issue Butler-type prefabricated building without architectural or technological features that would make it of *exceptional* Cold War significance. As a property type, these weapons storage, assembly, and maintenance buildings do not exhibit unique architectural or engineering features special to the P-3 mission, and therefore are not considered of *exceptional* significance. They are not considered eligible for listing on the NRHP under Criterion G.

Communications (656). Building 656 was the Tactical Support Center for the P-3 mission. It was built without windows, and served as the secure area where SOSUS information as well as messages from P-3 aircraft concerning submarine identification and location information was transmitted. It was the operations center for intelligence and tactical debriefing. This building, constructed in 1971, was directly related to the P-3 mission and was probably the most significant resource at Moffett Field in terms of its Cold War function. However its design was standard, and with the exception of its lack of windows and electronic equipment necessary to serve as the Tactical Support Center, did not exhibit unique architectural or engineering features special to the P-3 mission. All the P-3-era equipment has been removed and the building has been remodeled with windows and new doors for new use. The building is therefore not considered of *exceptional* significance. It is not considered eligible for listing on the NRHP under Criterion G.

5.0 SUMMARY AND MANAGEMENT RECOMMENDATIONS

5.1 SUMMARY

None of the Cold War-era resources at Moffett Federal Airfield or NASA Crows Landing Flight Facility are considered eligible for the NRHP under the criterion of *exceptional* national significance.

5.2 MANAGEMENT RECOMMENDATIONS

Because no eligible Cold War-era resources were identified at Moffett Federal Airfield or NASA Crows Landing Flight Facility, once the results of this survey have been accepted by the California SHPO, the Section 106 process is complete.

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