Department of Defense
Legacy Resource Management Program

14-739

Vietnam War: Helicopter Training and Use on US Military Installations Vietnam Historic Context Subtheme

Jayne Aaron, LEED AP, Architectural Historian
Steven Christopher Baker, PhD, Historian

February 2016

EXECUTIVE SUMMARY

Buildings, structures, and sites related to the buildup for and sustained fighting in the Vietnam War are turning 50 years old. Recently, an overarching historic context was developed that provides a broad historic overview from 1962 through 1975, highlighting the Vietnam War-influenced construction that created facilities on many installations (Hartman et al. 2014).

The overarching context provides common ground for understanding the need for construction on military installations in support of the conflict in Vietnam. It also identified several thematic areas related to stateside construction in support of the war effort under which significance can be defined. This report is tiered from the overarching context, addresses the role of helicopters in the Vietnam War, identifies specific installations and resource types associated with helicopter use during the Vietnam War, and provides a context to evaluate the historical significance of these resources.

Although the military had helicopters prior to 1962, the war in Vietnam is known as the "Helicopter War" because of the extensive use of helicopters in the combat arenas and the subsequent important changes in technology during these years. The Vietnam War resulted in the construction of helicopter-related buildings, structures, and sites on US military installations to support training and the war. The National Historic Preservation Act of 1966, as amended, requires federal agencies to inventory and evaluate their cultural resources, usually as they near 50 years of age. These helicopter-related structures are about to turn 50, and there is currently no existing historic context describing the development, construction, and use of Vietnam War helicopter-related facilities.

This report provides context and typology for Vietnam War (1962–1975) helicopter-related resources on Department of Defense (DoD) installations in the United States. This is not a study of helicopters themselves, but rather, an analysis of the development and use of rotary-wing aircraft during the war. There is only limited discussion of the technical aspects of various helicopters used in Vietnam. Military action in Vietnam is addressed in general terms only to fortify the overall context describing the use of helicopters in the war and how their increased use affected DoD installations in the United States.

This report can be used to develop detailed research that will lead to identification and evaluation of Vietnam War helicopter-related facilities at DoD military installations in the United States. This report's historic context provides military cultural resources professionals with a common understanding for determining the historical significance of Vietnam War helicopter-related facilities, greatly increasing efficiency and cost-savings for this necessary effort.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

APPENDIXES

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 INTRODUCTION

The Department of Defense Legacy Resource Management Program (DoD Legacy Program) was created in 1990 to assist the military branches in their cultural and natural resource protection and enhancement efforts with as little impact as possible to the agency's mission of military preparedness. The DoD Legacy Program is guided by the principles of stewardship or protection of irreplaceable resources, leadership of the Department of Defense (DoD) as the leader in resource protection, and partnership with outside DoD entities to access the knowledge and skill sets of others. The DoD Legacy Program's general areas of emphasis are:

- The DoD Legacy Program implements an interdisciplinary approach to resource stewardship that takes advantage of the similarities among DoD's natural and cultural resource plans. Often, the same person is responsible for managing both natural and cultural resource plans on an installation. Legacy strives to take advantage of this by sharing management methodologies and techniques across natural and cultural resource initiatives.
- The DoD Legacy Program promotes understanding and appreciation for natural and cultural resources by encouraging greater awareness and involvement by both the US military agencies and the public.
- The DoD Legacy Program incorporates an ecosystem approach that assists the Department of Defense in maintaining biological diversity and the sustainable use of land and water resources for missions and other uses.
- Additionally, the DoD Legacy Program works to achieve common goals and objectives by applying resource management initiatives in broad regional areas.
- Finally, the DoD Legacy Program pursues the identification of innovative new technologies that enable more efficient and effective management.

Each year, the DoD Legacy Program develops a more specific list of areas of interest, which is usually derived from ongoing or anticipated natural and cultural resource management challenges within the DoD. These specific areas of emphasis, however, reflect the DoD Legacy Program's broad areas of interest. To be funded, a project must produce a product that can be useful across DoD branches and/or in a large geographic region. This particular project spans all the DoD branches and can be used across the nation.

1.1 OVERARCHING VIETNAM WAR CONTEXT

The DoD and its individual services must comply with the National Historic Preservation Act of 1966, as amended (NHPA), by identifying and managing historic properties that are part of their assets. In an effort to help with this requirement, the US Army Construction Engineering Research Laboratories (USACERL) directed a study of DoD Vietnam War resources, many of which are about to turn 50 years old. The resulting report, which was approved in December 2014, is an overview study of construction on DoD military installations in the United States from 1962 through 1975.

The report was developed as an overview document from which more detailed historic contexts and other documents can be developed. This programmatic approach will ultimately lead to the efficient and cost-

effective identification and evaluation of Vietnam War facilities at DoD military installations in the United States.

The report identifies several significant thematic areas (subthemes) related to construction in support of the war. These include ground training, air training, special warfare, schools, housing, medical facilities, and logistics facilities.

This project contributes to the broad Vietnam War context by addressing air training. More specifically, this study addresses the use of helicopters during the Vietnam War and provides a framework for identifying and evaluating rotary-wing aircraft resources at DoD installations. This context addresses several helicopter-related themes, including training, research and development, maintenance, and deployment.

This historic context focuses on the history of helicopters in the military during the Vietnam War, but is intended to be a companion to other contexts that address Vietnam and/or the history of aviation in the military in a considerably more holistic sense. Specific Vietnam War subcontexts will include ground training, air training, housing, counterinsurgency warfare training, medical facilities, and logistical facilities. Currently, the subcontext for ground combat training is also being developed; other subcontext have yet to be written. Historic context on aviation can be found at http://www.denix.osd.mil/references /DoD.cfm.

This report is intended to provide a basis from which to evaluate DoD helicopter resources related to the Vietnam War. When evaluating rotary-wing resources, the information contained in this document should be augmented with specific installation historic contexts to make an accurate and justified argument regarding historic significance. Specific branch aviation histories can provide the context within which individual and interrelated resources may be evaluated.

Installation or branch cultural resource managers can use the helicopter training installations and unit lists in appendixes F and G to determine if they might have Vietnam War historic resources related to helicopters. The appendixes, however, should not be considered exhaustive. Some helicopter units were active during the period of the Vietnam War, but did not serve in the Vietnam War, while other units may have served in supporting roles or trained and did not deploy.

While the objective of this context is to provide substantially more helicopter-specific information than Hartman, Enscore, and Smith's 2014 report, it is not exhaustive. Rather, the intent of the discussion below is to be representative, not definitive.

1.2 PURPOSE AND METHODOLOGY

The purpose of this effort was to research and develop a historic context of military helicopters during the Vietnam War. The report also provides context and typology of Vietnam War (1962–1975) helicopter resources on DoD installations in the United States. This is not a study of helicopters themselves, but rather, an analysis of the development and use of rotary-wing aircraft during the war. There is only limited discussion of the technical aspects of various helicopters used in Vietnam. Moreover, this report is not a detailed history of military engagements and important battles. Military action is only addressed in somewhat general terms to fortify the overall context describing the use of helicopters in the war and how their increased use affected DoD installations in the United States.

Research and site visits were pivotal to the development of the historic context for the use and development of Vietnam War helicopter operations in the DoD. Researchers accessed primary and

secondary sources and, where applicable, visited sites with helicopters-related properties at several locations. They visited the National Archives and Records Administration (NARA) Archives I (Military Reference Branch); NARA, Archives II (Cartography and Architectural Records Branch); USACERL Technical Library; University of Colorado libraries; Patuxent River Naval Air Station (NAS); Fort Benning Donovan Library; Marine Corps Base Pendleton MCCS Library; Quantico Base Library; National Naval Aviation Museum; and the Flying Leatherneck Aviation Museum. Online sources of information were also consulted.

The development of the Vietnam War historic context was supported and facilitated through the assistance of several individuals. A number of individuals provided additional support to the project by assisting with data requests, site visits, and providing reports and resources related to Vietnam War helicopter use in the DoD. They also provided general guidance and installation-specific information.

- Ellen R. Hartman, Engineer Research and Development Center (ERDC) / Construction Engineering Research Laboratories (CERL)
- Susan I. Enscore, ERDC/CERL
- Adam D. Smith, ERDC/CERL
- Michael A. Smolek, Patuxent River Naval Air Station
- Joe Carbonaro, Patuxent River Naval Air Station
- Catherine (Kate) Roberts, Marine Corps Base Quantico
- Sherry Frear, Marine Corps Headquarters
- Diane Walsh, Marine Corps Air Station Camp Pendleton
- Mark Johnson, Marine Corps Air Station Camp Pendleton
- Robert Hellman, Marine Corps Base Camp Pendleton
- Carrie Williams, Pensacola Naval Air Station
- Susanne Perry, Fort Benning
- Ed Howard, Fort Benning
- Dr. Christopher Hamilton, Fort Benning
- David Stieghan, Fort Benning
- Sgt. Maj. Mike Zacker (retired), Flying Leatherneck Aviation Museum

1.3 HOW THIS REPORT IS ORGANIZED

This report is presented in five chapters. Chapter 1 provides the introduction and methodology used to prepare this report. Chapter 2 provides a summary of the Vietnam War, and a summary of helicopter use by each of the military service installations during the beginning, middle, and end of the Vietnam War. Chapter 3 provides a context for helicopter use during the Vietnam War at US installations. Chapter 4 provides a description of the types of resources that would be associated with helicopter use during the war on US installations and an overview of evaluating resources under the National Historic Preservation Act with descriptions of evaluation criteria and integrity. Chapter 5 contains selected references. The appendixes comprise previously prepared surveys for reference and a list of helicopter units deployed to Vietnam.

THIS PAGE INTENTIONALLY LEFT BLANK

2.0 SHORT HISTORY OF THE VIETNAM WAR

[Portions of this summary are adapted from Ellen R. Hartman, Susan I. Enscore, and Adam D. Smith, "Vietnam on the Homefront*:* How DoD Installations Adapted, 1962–1975," Department of Defense Legacy Resource Management Program, Report ERDC/CERL TR-14-7, December 2014.]

The Vietnam War was a conflict that played a significant role in American foreign policy during much of the Cold War. However, the foundation of the unrest in Vietnam (a French possession since the 1800s) were laid during World War II and driven by a legacy of European colonialism and the exigencies of Cold War politics.

Source: Harry S. Truman Library, Independence, Missouri (photographer: Abbie Rowe)

FIGURE 2-1. PRESIDENT TRUMAN OBSERVING HELICOPTERS DURING WAR GAMES, QUANTICO, VIRGINIA, 1950

Indochina (Vietnam, Laos, Cambodia) was not a major stage during World War II, but the region fell to the German-sympathizing Vichy French government during the war. A local resistance movement known as the Viet Minh quickly rose in defiance of the Vichy. The group, led by a Vietnamese nationalist named Ho Chi Minh, gained the support of China, the Soviet Union, and the United States. The Viet Minh defied the French in Indochina until the Vichy government in France fell to the Allies in 1944. Japan filled the void left by the French and briefly occupied Vietnam between 1944 and August 1945.

The defeat of Japan and the end of World War II resulted in a power vacuum in Vietnam. Ho Chi Minh subsequently declared Vietnamese independence and established the Democratic Republic of Vietnam.

He asked the United States to recognize the newly independent country. American leaders, however, were uncomfortable with Ho Chi Minh's nationalism and his political ideology, which was largely influenced by communism. This was a prescient position. Even though the Soviet Union was an American ally during the war, the specter of communism, real or imagined, came to dominate Cold War foreign policy in the late 1940s.

Meantime, leaders from the United States, Britain, and the Soviet Union met in Potsdam, Germany, to shape the post-war world. The Potsdam Conference did not serve Ho Chi Minh's interests. Instead of acknowledging a Vietnam free of colonial control, the world leaders decided that Indochina still belonged to France, a country that was not strong enough to regain control of the region on its own. Instead, China and Britain removed the Japanese from southern and northern Vietnam, respectively.

A French colonial government took control of Vietnam by 1946, but prior to their arrival, the Viet Minh held elections in which they won several seats in northern and central Vietnam. In an effort to consolidate their rule, the French drove the Viet Minh out of the more urbanized areas of Vietnam. This action triggered the First Indochina War, a guerilla campaign against French occupation. The war pivoted on a north/south axis, with the Viet Minh, who had a solid foothold in the north, maintaining control of the central and northern portions of the country and the French holding on to power in the southern part of the country.

The Cold War stakes of the First Indochina War became considerably more significant when the newly established Communist government in China recognized the Viet Minh as the legitimate government of Vietnam. American policymakers looked gravely upon these developments. They viewed the world through an overarching policy called containment, which was based on the contention that US foreign policy and aid should strenuously prevent the spread of Communism. As a result, the United States began assisting the French in their fight against the Viet Minh. President Eisenhower, pragmatically, chose to send military supplies but not combat troops. The First Indochina War continued for another four years until the French suffered a final defeat at the battle of Dien Bien Phu, which ended colonial rule in Vietnam.

The 1954 Geneva Accords codified France's withdrawal from Indochina, but did not mark the end of Western influence in Vietnam's governance. The accords were negotiated among the United States, Soviet Union, China, France, and Britain. There were no Vietnamese representatives. The accords created three countries in Indochina: Vietnam, Cambodia, and Laos. Vietnam was temporarily divided along the 17th parallel. The Viet Minh were placed in control of the north while an anti-Communist government under Prime Minister Ngo Dinh Diem was installed in the south until nationwide elections could be held, as stipulated under the Geneva Accords.[1]

Subsequently, the Viet Minh held elections in the north and won by significant margins. The situation in the south was markedly different. Prime Minister Diem cancelled elections in 1955 because he was afraid the Viet Minh would win convincingly. The United States agreed.[2] To make matters worse, Diem became increasingly authoritarian. He proclaimed himself president of the Republic of Vietnam in October 1955. While he had little influence in the north, Diem's regime was oppressive and anti-democratic in the south.

Nonetheless, the United States Military Assistance Advisory Group (MAAG) began training South Vietnamese soldiers in 1955. The US Air Force (USAF) advisory role began even earlier. Beginning in 1951, the USAF provided a small number of Air Force advisors to support the South Vietnamese Air

[1] "Final Declaration of the Geneva Conference on Restoring Peace in Indochina, July 12, 1954," in *The Department of State Bulletin*, Vol. XXXI, No. 788 (August 2, 1954): 164.

[2] Walter LaFeber, *America, Russia, and the Cold War, 1945–2002* (New York, NY: McGraw Hill, 2002): 170.

Force. No doubt, training played a major role in the American advisory era in Vietnam. Most training occurred in Vietnam, but by 1961, 1,000 South Vietnamese soldiers received training in the United States each year.[3]

By 1956, a Communist-influenced insurgency escalated in the countryside. Known as the Viet Cong, the rebels complicated US policy in the region, where a second foreign policy idea was at play, in addition to containment. US policy makers espoused a theory called the Domino Theory, which argued that if the west did not take a stand, Communism would spread from country to country like toppling dominos. South Vietnam was ground zero in this scenario. If South Vietnam fell to Communism; then Laos would be next; then Cambodia, followed by Thailand, Malaysia, Indonesia, Burma, and so forth.

The United States, while not comfortable with Diem's anti-democratic rule, considered him an ally in their fight against Communism. By 1958, a full-scale civil war was raging in South Vietnam. The opposition to Diem received encouragement and support from North Vietnam, which, by 1959, was providing supplies and troop support to the Viet Cong.

The US support of South Vietnam continued. There were 900 advisors in Indochina at the end of the 1950s. The US financial and material commitments to Vietnam ran into the billions of dollars. Rotary-wing aircraft first arrived in Vietnam in March 1958 when the United States provided Sikorsky H-19 helicopters to the South Vietnamese Air Force.

John Fitzgerald Kennedy was elected president in 1961. While he did not want to commit the United States to a full-scale war in Vietnam, he was steadfast in his opposition to Communism. As a result, the American advisory and support role grew dramatically under his administration. He initially increased support for Diem's regime and sent additional troops to Vietnam, including US Army and Marine Corps helicopter units. The helicopters supported US Army Special Forces troops and the Vietnamese Army. The USAF role also increased, with the first permanent units arriving in the fall of 1961. The US Navy provided critical troop transport and increased their presence in the Gulf of Tonkin. There were over 11,000 US troops in Vietnam by the end of 1962.[4] While ostensibly there to train troops and protect villages, the soldiers found themselves involved in border surveillance, control measures, and guerilla incursions. The US involvement in Vietnam increased perceptibly in the first two years of President Kennedy's administration.

Meanwhile, events were increasingly out of control in South Vietnam. The intractability and oppression of President Diem's administration was becoming untenable by 1963. He rebuffed US demands that he hold elections. Worse, he lost any support he previously had in South Vietnam. This was graphically displayed to the world on June 11, 1963, when Thich Quang Duc, a Buddhist monk, set himself on fire at a busy Saigon intersection. The self-immolation, which attracted the attention of the world, was a direct protest to Diem's anti-democratic policies and the war that was raging in the countryside.

By the fall of 1963, President Kennedy realized that as long as Diem was in power, South Vietnam could not put down the insurgency. In November 1963, the president approved a plan to have the Central Intelligence Agency (CIA) overthrow the South Vietnamese government. The orchestrated overthrow coincided with an actual coup. Diem and his brother were arrested and assassinated. Three weeks later, President John F. Kennedy was assassinated.

[3] Ronald H. Spector. *Advice and Support: The Early Years of the United States Army in Vietnam 1941–1960* (Washington, DC: United States Army Center for Military History, 1983): 239.

[4] Joel D. Meyerson, *Images of a Lengthy War: The United States Army in Vietnam,* (Washington, DC: United States Army Center for Military History, 1986): 69.

The fall of Diem resulted in considerable instability. From November 1963 to June 1965, The South Vietnamese government was a revolving door. Five administrations came and went between November 1963 and June 1965 until Lt. Gen. Nguyen Van Thieu and Air Vice Marshal Nguyen Cao Ky came to power. Thieu remained president until the fall of Saigon in 1975. The years of instability, however, undermined South Vietnam's ability to counteract the Communist insurgency. The Viet Cong attracted substantial support in South Vietnam and assistance, both in troops and supplies, from the Viet Minh who saw the instability as an opportunity to overthrow the South Vietnamese government.

Lyndon Baines Johnson was immediately sworn in as president of the United States upon John F. Kennedy's assassination on November 22, 1963. Initially, President Johnson was not interested in expanding US involvement in Vietnam. In fact, the crisis in Southeast Asia took a backseat to his domestic agenda, which included civil rights legislation and an ambitious package of domestic policies and laws known as the "Great Society."

At the same time, President Johnson did not want US policy and actions in Vietnam to fail. After all, the United States had spent nearly a decade supporting the South Vietnamese government in the fight against the Viet Cong and, by proxy, the Viet Minh. More importantly, he did not want the 14,000 Americans who were in the region to lose their stand against the spread of Communism.

Source: Lyndon Baines Johnson Presidential Library, Austin, Texas (photographer: Yochi R. Okamoto)

FIGURE 2-2. PRESIDENT JOHNSON VIEWS HELICOPTERS IN FLIGHT: FORT CAMPBELL KENTUCKY, JULY 23, 1966

Military leadership, foreshadowing increased US involvement in Southeast Asia, expanded personnel strength and further integrated the technology and equipment needed to fight a war in Vietnam. Helicopters played an important role in these developments. For example, the US Marine Corps improved their amphibious lift capacity with the commission of new amphibious transport and assault ships. The ships were designed specifically for vertical (helicopter) assault.

President Johnson increased the number of advisors and other military personnel in Vietnam to 16,000 by early summer 1964, but domestic matters occupied most of his energy until August when the war in Southeast Asia forcefully became the priority.

Three North Vietnamese patrol boats fired on the US destroyer *Maddox* in the Gulf of Tonkin on August 2, 1964. The US Navy retaliated and fended off the attack. The details of the confrontation are debated. At the time, the United States claimed the US Navy vessel was on routine patrols in international waters, but other sources have since suggested that the USS *Maddox* was supporting South Vietnamese troops who were raiding North Vietnamese ports.[5] Regardless of the details, the event, which came to be known as the "Gulf of Tonkin Incident," marked a significant shift in the Vietnam War.

President Johnson ordered air strikes on North Vietnamese bases and critical infrastructure. The retaliation strikes ordered by Johnson destroyed or damaged 25 patrol boats and 90% of the oil storage facilities at Viet Minh. This strategy eventually became a cornerstone of the air war in Vietnam.

The most important outcome of the Gulf of Tonkin Incident, however, was the August 7 passage of the Gulf of Tonkin Resolution by the US Congress. The resolution gave the president broad authority to prosecute the war in Vietnam by allowing him to take "all necessary measures" to defend US and allied forces and to "prevent further aggression."[6]

Johnson did not immediately use his new war-making powers in any comprehensive or aggressive way. He was, after all, running for reelection as the peace candidate in opposition to Barry Goldwater. President Johnson was re-elected in November 1964, and the war in Vietnam became a priority. President Johnson and his advisors began to initiate a forceful military response. Johnson removed all restrictions on US military involvement, allowing US personnel to directly engage in combat without the guise of training or advising the South Vietnamese.

In February 1965, Johnson approved a sustained aerial bombing of North Vietnam. The campaign was known as *Operation Rolling Thunder*. US Air Force, Navy, and Marine Corps aircraft dropped hundreds of tons of bombs on North Vietnam nearly every day from early March 1965 to early November 1968. Johnson hoped the bombings would bring North Vietnam to the negotiating table.

The president began committing combat troops to Vietnam in the spring of 1965 when he deployed US Marine Corps and Army combat troops to Da Nang and Saigon, respectively. Helicopter units accompanied both the US Army and Marine Corps deployments. US Navy vessels transported the troops, who were tasked with the defense of airbases. The deployments brought the US presence in Vietnam to over 50,000. The United States first major ground offensive occurred in August 1965, when the US Marine Corps, in cooperation with the South Vietnamese Army, launched an airmobile and amphibious assault on Viet Cong forces near Chu Lai.

[5] LaFeber, *America, Russia, and the Cold War 1945–2002*, 252–253.

[6] "Gulf of Tonkin Resolution," Public Law 88-408, 88th Congress, August 7, 1964.

Johnson continued increasing troop strength in Vietnam throughout the summer and fall of 1965. US military presence had increased to 175,000 by the end of 1965. This included major Army divisions and units such as the 1st Cavalry Division, 1st Brigade, 101st Airborne Division, and 1st Infantry Division. The US Marine Corps Expeditionary Force accounted for nearly 20,000 troops in Vietnam by the end of 1965. Large deployments continued through the peak years of the war (1965–1968). Deployments in 1966 increased troop levels in Vietnam to 385,000.

It became clear to military leadership that the Vietnam War required more aggressive enlistment than the existing annual average of just over 55,000. The Vietnam War required an annual enlistment of nearly one million. Initially, military planners attempted to meet the shortfall through recruitment. Recruitment was successful for all branches except the US Army, which was not able to fill the personnel gap and thus, resorted to the draft. The draft calls during July to December 1966 averaged 34,000 a month. Draft calls continued until 1973.

No doubt, 1966 was an active year in Vietnam—the US military was now committed to defeating the enemy in direct action. There were no longer any illusions about the United States merely providing training and logistical and material support to the South Vietnamese. US ground forces participated in more than 550 battalion-size or larger operations during 1966. US military aircraft flew almost 300,000 sorties in 1966. Ground forces also participated in more than 160 joint operations with allies. As the war in Vietnam intensified in 1966, the US Marine units were conducting several hundred small unit actions during each 24-hour period. These operations, which were designed to find and isolate the Viet Cong, were successful. Within a year, the US Marine Corps was able to gain control of almost 1,200 square miles of Vietnamese territory.

Active campaigns continued through 1967. There were nearly 490,000 US troops in Vietnam at the end of 1967. Over 260,000 of these soldiers were Marines and another 28,000 were Navy seamen.

Early 1968 brought two major battles. First, the Khe Sanh Combat Base, a garrison of 6,000 US Marines and South Vietnamese Rangers, which came under attack from North Vietnamese forces in late 1967, was completely isolated by the beginning of 1968. President Johnson and General William Westmoreland were determined to hold the base at all costs. This precipitated one of the longest and bloodiest battles of the war. The base remained under siege for 77 days until mid-April 1968. Khe Sanh eventually fell to the North Vietnamese in July 1968.

The other major conflict, known as the Tet Offensive, was a surprise attack on South Vietnamese targets by North Vietnamese troops. The operation, which occurred on January 30, 1968, was a simultaneous assault on more than 100 South Vietnamese cities and military installations. US, South Vietnamese, and other allied troops eventually repelled the attacks, but the offensive was a public relations disaster. President Johnson and other leaders had been telling the American public that the end of the war was in sight and that the North Vietnamese were on the defensive. The Tet Offensive appeared to belie this contention. Support for the war, which was already unpopular, eroded further.

The military reaction to the Tet Offensive was to deploy more soldiers to Vietnam. General Earle Wheeler traveled to Vietnam after the offensive to assess conditions in the country. He was convinced that there were not enough troops in Vietnam to effectively fight the war. Therefore, the general requested deployment of 206,000 additional US troops. There were already nearly 500,000 soldiers in Vietnam and the American public was not supportive of increasing that number by nearly 50%. President Johnson denied General Wheeler's request. Instead, he authorized a comparatively small increase of about 13,000 troops. The president also began scaling back *Operation Rolling Thunder*.

Khe Sanh and the Tet Offensive captured the public's attention and convinced many that Vietnam was a never-ending quagmire. Military leaders, however, were planning for the US exit from Vietnam. Their most pressing concern was still preservation of an independent South Vietnam and they knew that the only way this could occur was if they provided modern equipment and professional training to the South Vietnamese military. A defined withdrawal plan, however, was elusive.

Meanwhile, President Johnson decided not to run for reelection in 1968. His successor, President Richard Milhous Nixon, announced a new plan called "Vietnamization" in the spring of 1969. Essentially, the plan consisted of a concomitant rapid withdrawal from Vietnam and strengthening of South Vietnamese defense capabilities. The latter would be achieved through training and the provision of military equipment. Some US units literally left Vietnam without their vehicles and aircraft, which was ceremoniously donated to the South Vietnamese military.

The military was at peak troop strength of 543,482 when President Nixon implemented Vietnamization. Drawdowns were rapid. Troop levels were down to 250,000 by 1970. Stand-downs continued over the next couple of years, reducing US forces to only 24,000 US soldiers in Vietnam at the end of 1972.

Vietnamization coincided with increased hostilities in Vietnam and a widening of the war. President Nixon approved secret bombings of Cambodia and Laos in 1970. Both countries provided support to North Vietnamese troops. The United States also took part in a ground incursion in Cambodia in the summer of 1970 and supported a South Vietnamese incursion in Laos in February 1971. President Nixon also ordered the mining of North Vietnam's Haiphong Harbor in 1972 to prevent the arrival of supplies from the Soviets and Chinese. US minesweepers cleared the harbor of mines in February 1973.

The United States and North Vietnam agreed to a ceasefire in January 1973, and the last US combat troops left Vietnamese soil in March 1973. The US military remained in the region, but reverted to its training and advisory role.[7] The US exit from Vietnam resulted in greater instability. President Nixon warned the North Vietnamese that the US military would return if the Viet Minh broke the ceasefire. However, in June 1973, the Senate passed the Case-Church amendment prohibiting further intervention in Vietnam.

President Nixon was soon consumed by his own downfall as the Watergate scandal broke. Richard Nixon resigned in August 1974. His replacement, Gerald Ford, was greeted with continued crisis in Cambodia and Vietnam.

Cambodia's long-running civil war was at a critical point in early 1975. The US-supported Khmer Republic was on the verge of collapse as the Communist Khmer Rouge solidified control over most of the country. The Khmer Republic only held Phnom Penh and its fall was imminent. The US military, therefore, conducted a helicopter-based evacuation of US citizens and refugees from Phnom Penh on April 12, 1975.

Meanwhile, the North Vietnamese and Viet Cong had launched an offensive in early 1975, while Saigon was also on the verge of collapse in April 1975. Just as they had done in Cambodia, the United States implemented an existing evacuation plan on April 29 and April 30, 1975. Much larger than the Cambodian evacuation, the Vietnamese operation provided transport for over 1,300 Americans and nearly 6,000 Vietnamese (and other foreign) evacuees from the country. The evacuation provided a graphic end to the Vietnam War as US helicopters lifted civilians off the roof of the US embassy in Vietnam.

[7] Meyerson, *Images of a Lengthy War*, 183.

One final clash occurred in May 1975 when the Khmer Rouge Navy seized a US container ship (the SS *Mayaguez*). US Navy, Marine Corps, and Air Force units launched a rescue operation. They met heavy resistance from the Khmer Rouge who damaged or destroyed most of the helicopters used in the rescue. The US Marine Corps suffered significant casualties during the operation, which ultimately resulted in the release of the SS *Mayaguez* and crew.

The Vietnam War and related military actions finally ended in the summer of 1975—over two decades since the United States began providing support to the French colonial government in their fight against a nationalist indigenous uprising. The war was a turning point for Americans and the US military. It was a conflict that occurred on a complicated stage, which pushed technological change and forced the military to continually innovate. It was also an increasingly unpopular war that reshaped the manner in which US civilians viewed warfare. They became increasingly distrustful of their government and military leadership.

The war was also a quintessential cold war conflict in which US policymakers viewed anything branded as Communist, whether real or imagined, as a fundamental threat. Some threats were grave; others were illusory. There is no doubt that Communism shaped the war in Vietnam. It is also true that Vietnam was finally unified as a single country in the spring of 1975 under a generally popular Communist regime. The country was also finally free of the divisions established by foreign governments. Vietnam, which had been colonized by Europeans since the 19th century, was finally independent, albeit not on the terms the United States would have liked.

2.1 SUMMARY OF MILITARY HELICOPTER USE PRIOR TO 1960

The Vietnam War is often viewed as a watershed for the acceptance and development of the helicopter as an important component of the US military arsenal. The war in Southeast Asia, however, does not mark the beginning of the military's interest in rotary-wing aircraft. Military helicopter development, testing, and implementation began two decades before the first helicopter squadrons arrived in Vietnam. The first use of a helicopter in a combat situation occurred near the end of World War II.

2.1.1 US Army

The helicopter slowly became a cornerstone of US Army combat operations. Military leadership understood the potential value of rotary-wing aircraft as early as World War II. The US Army began ordering and testing Sikorsky helicopters in 1942. Two years later, in late April 1944, a Sikorsky R-4 was used to rescue 21 soldiers from the 1st Air Commando Group. The tests and use of the helicopters revealed the usefulness of the aircraft, as well as its fragility. This led to the deployment of the 1st Aircraft Repair Unit (floating) to the Pacific in January 1945. Additional floating repair units were established later in the year. This was the result of more combat units receiving helicopters, mostly for rescue and reconnaissance operations. It was during this period that the first Army helicopter squadron (1st Helicopter Squadron), was established. Formed in April 1944, the squadron was deployed to the China-Burma-India Theater to take part in combat missions between February and May 1945. The squadron was deactivated in November 1945 and disbanded three years later.[8]

[8] Patsy Robertson, "U.S. Air Force Fact Sheet, 1st Helicopter Squadron," no date, accessed March 13, 2015, available at http://www.afhra.af.mil/factsheets/factsheet.asp?id=9709. "The 1st Helicopter Squadron was re-established as an Air Force unit in 1969. The unit provides airlift for the Executive Branch, high ranking dignitaries, and distinguished visitors.

Helicopter development continued in the interwar years, but the first real test of rotary-wing aircraft in combat situations occurred during the Korean War. The US Army deployed four helicopter detachments (assigned to the 8th Army) to Korea in 1950. The helicopters (Hiller H-23s and Bell H013s) were used primarily for medical evacuations. The small helicopters, which flew in support of the MASH (Mobile Army Surgical Hospital) units, only had room for one pilot and external baskets for evacuees. Nonetheless, they proved indispensable in the rugged terrain of Korea where traditional truck ambulances had limited usefulness. Army leadership signaled an even greater role for the helicopter when they deployed a helicopter transport squadron (actually two companies) to Korea in the final months of the conflict.[9]

The Army continued developing helicopter tactics after the Korean War. An experimental group known colloquially as "Sky Cavalry" and "Vanderpools Fools" began experimenting with armed helicopters in 1955. The experiments and field tests, which were conducted during off-duty hours, were unpredictable and often spectacular. However, trial and error did lead to some tangible success. Army leadership expanded the unit and officially recognized it as the 7292nd Aerial Combat Reconnaissance Company (Provisional) in March 1958.[10]

The Army Aircraft Requirements Board, established in 1960, reinforced the importance of the helicopter. Also known as the Rogers Board, the board recommended the procurement of the Bell UH-1 helicopter, which became the most versatile helicopter in US Army history. The UH-1 was ubiquitous in the Vietnam War. The Rogers Board also included General Hamilton H. Howze, who chaired another influential board, the Tactical Mobility Requirement Board (also known as the Howze Board) a year later.[11] The board studied the tactical use of helicopters in the Army and released its recommendations in August 1962, in the emerging years of Army helicopter use in Vietnam. The Howze Board is discussed in more detail below.

By the eve of active participation in the Vietnam War, the US Army had embraced the helicopter—using the units for transport, medical, training, and testing missions. Army leadership also played a significant role in the early development of helicopters through the recommendations of the Rogers and Howze Boards.

2.1.2 US Marine Corps

The US Marine Corps was the first branch of the military to see the helicopter as an important transport vehicle. Marine Corps leadership understood that the rotary-wing aircraft could be valuable beyond their use as rescue and reconnaissance aircraft. Specifically, they saw helicopters as a potentially valuable tool for troop transport. To this end, the first Marine helicopter squadron, Marine Helicopter Experimental Squadron 1 (HMX-1), was established in December 1947. Based at Quantico, Virginia, the squadron was tasked with a research and design mission to determine and refine the use of helicopters for amphibious assault.[12]

[9] Walter J. Boyne, *How The Helicopter Changed Modern Warfare* (Gretna, LA: Pelican Publishing Company, Inc., 2011), 61; Simon Dunstan, *Vietnam Choppers: Helicopters in Battle, 1950–1975* (Osceola WI: Osprey Publishing Ltd., 2003) 9,11.

[10] J. A. Stockfisch, *The 1962 Howze Board and Army Combat* Developments (Santa Monica, CA: RAND 1994) 9–11; Dunstan, *Vietnam Choppers*, 16; Boyne, *How The Helicopter Changed Modern Warfare,* 114.

[11] Boyne, *How The Helicopter Changed Modern Warfare*, 114, 115.

[12] Ibid., 58.

The Marines (HMX-1) received their first helicopters (two Sikorsky H03Ss) in February 1948. Fragile and small, the helicopters were far from the dynamic workhorses they became over the ensuing decades. Nonetheless, the squadron went to work. They developed helicopter-based landing operations and, by November 1948, developed the world's first manual on helicopter use in amphibious landings. The manual was subsequently used by the US Army to develop their helicopter operational manual.[13]

The Marine Corps helicopter squadrons entered the Korean War in August 1950 when Marine Observation Squadron (VMO) 6 arrived with four Sikorsky H03S-1s to perform reconnaissance, as well as a variety of other missions. In fact, a H03S-1 performed the first Marine medical evacuation in the war. Marine Corps helicopters went on to transport nearly 10,000 injured soldiers during the Korean War. VMO-6 was responsible for over 7,000 of these evacuations.[14]

Marine Transport Helicopter Squadron (HMR) 161, which was formed at MCAS El Toro in January 1951, arrived in Korea in the fall of 1951 with 15 Sikorsky HSR-1s. Larger than the HO3S-1s, the HSR-1s were better suited to the operational needs of combat. The helicopters could carry seven equipped soldiers, cargo, or injured soldiers into and out of combat zones. HMR-161 played a pivotal support role in the Koran War. HMR crews flew over 18,500 flights during the war. They transported 60,000 soldiers and delivered over 7,500,000 pounds of cargo. HMR-161 also evacuated nearly 2,750 casualties.[15]

The post–Korean War period was characterized by the continued development of Marine Corps helicopter aviation. On the eve of the Marine Corps active entry into the Vietnam War, they had a stable of 343 helicopters spread across the globe in transport (heavy, medium, light) and observation squadrons.

2.1.3 US Navy

US Navy leadership was considerably less optimistic than the Marine Corps and Army about the utility of helicopters. Nonetheless, a helicopter training school was briefly established at Floyd Bennett Field in 1944. The school trained several pilots and tested helicopters, proving their usefulness in antisubmarine warfare and open-water rescue. The Navy, however, was still not interested in embracing the helicopter, and it took another two years before helicopter testing and evaluation recommenced. A helicopter test squadron (VX-3) was established in 1946. One of the squadron's evaluations consisted of assigning helicopters to Atlantic Fleet exercises in 1947. The helicopters excelled and even performed six rescues during the exercises. Navy leaders were impressed enough to incorporate helicopters into the Navy's operational framework. VX-3 was decommissioned and converted to two utility squadrons (HU-1 and HU-2) in April 1948. HU-1, was stationed at NAS Miramar, and HU-2 was based at NAS Lakehurst. A training Squadron HTU-1 was established at NAS Pensacola in 1950.[16]

[13] William R. Fails, *Marines and Helicopters, 1962–1973* (Washington, DC: History and Museums Division, US Marine Corps 1978) 2; Boyne, *How The Helicopter Changed Modern Warfare,* 58.

[14] Boyne, *How The Helicopter Changed Modern Warfare*, 62, 63, 64.

[15] Gary W. Parker, *A History of Marine Medium Helicopter Squadron 161* (Washington, DC: History and Museums Division, US Marine Corps 1978) 1–3; Boyne, *How The Helicopter Changed Modern Warfare,* 64.

[16] Douglas Smith, ed. *One Hundred Years of U.S. Navy Air Power* (Annapolis, MD: Naval Institute Press 2010) 222, 227–230.

Source: Helen Roller Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 2-3. NAVY HELICOPTERS IN FLIGHT, VIETNAM, UNKNOWN DATE

US Navy helicopters from HU-1 were deployed to the Korean War aboard aircraft carriers (including the USS *Valley Forge* and USS *Philippine Sea*) and warships (including the USS *St. Paul* and USS *Helena*). They were initially used for rescue operations, but as the war continued, the roles of Navy rotary-wing aircraft expanded to include reconnaissance, spotting, and, eventually, minesweeping. These roles would form the foundation of Navy helicopter operations during the Vietnam War.

2.1.4 US Air Force

Established as an independent branch from the US Army Air Force in 1947, the Air Force inherited its first helicopter squadron—Air Rescue Service (ARS/ARRS)—from the Army. The Air Rescue Service, established by the Army in 1946, became an Air Force squadron in 1947.

The 3rd ARS entered the Korean War in July 1950 with nine Sikorsky H-5s. The helicopters were designated for search and rescue missions, but were almost immediately put to use for medical evacuation. By the end of the year, there were 14 3rd ARS H-5s performing medical evacuations almost exclusively. The Air Rescue Service received two H-19s in 1951 and began using them in conjunction with the H-5s. ARS helicopters had evacuated nearly 10,000 injured people by the end of the war. The H-19s served well into the Vietnam War.

The Air Force focused on the development and refinement of fixed-wing aircraft and associated tactics in the post–Korean War era. Air Force leadership saw a limited role for helicopters. Nonetheless, new helicopter units were established in the years after the war. The 22nd Helicopter Squadron, a transport unit, was established in 1953. The 22nd based on Goose Island, Labrador, supported installations of the Air Defense Early Warning System (DEW line) until it was deactivated in 1959. The Air Force established similar transport squadrons in Japan and Europe in the 1950s. All were deactivated by 1960.[17] The 3rd Air Rescue Group was disbanded in 1957, but reactivated during the Vietnam War to oversee all Air Force rescue operations in the Vietnam region.

2.2 US MILITARY HELICOPTERS IN VIETNAM

Rotary-wing aircraft first arrived in Vietnam in March 1958 when the United States, in their advisory and support role, delivered a few Sikorsky H-19 helicopters to the South Vietnamese Air Force.[18] The aircraft preceded the arrival of US helicopter units and aviators by three years. The first US helicopter units to arrive in South Vietnam were with the US Army. Marine Corps and Air Force helicopter units followed a short time later. Dedicated Navy helicopter units did not arrive in Vietnam in the early part of the war (1961–1964), but Navy helicopters and pilots were aboard many of the ships of the Navy's 7th fleet in the early years of the war. All branches of the military increased their use of helicopters after the dramatic increase in US involvement in the Vietnam War beginning in 1965. The aircraft proved indispensable and continued to be used throughout the war. The use of helicopters by each branch of the military is addressed in more detail below.

2.2.1 US Army

2.2.1.1 Early War (1961–1964)

Army helicopter use in Vietnam began mysteriously. Two helicopter units, the 8th and 57th Transportation Companies (Light), were informed on November 1, 1961, that they were being deployed. However, they were not told where they were going.[19] The soldiers, based at Fort Lewis, Washington, and Fort Bragg, North Carolina, were, in fact, about to go to South Vietnam to assist in the support and advisory functions that the United States had been involved in since 1950.

The deployment was the result of a realization by the Kennedy administration that the terrain and infrastructure of Vietnam severely restricted traditional means of transportation. Meanwhile, planners became convinced that US-piloted transport helicopters could provide decisive assistance to South Vietnamese soldiers fighting the Viet Cong.[20]

The soldiers of the 8th and 57th Transportation Companies (Light) transported their helicopters and equipment from their home bases to Stockton, California, and departed for South Vietnam aboard the USNS *Core* on November 21, 1961. The transportation companies arrived in Saigon 21 days later, where they reported for duty at Saigon International Airport. The units flew their first mission on December 23,

[17] USAF Helicopter Pilots Association, "History of USAF Helicopter Units," no date, accessed March 18, 2015, available at //usafhpa.org/histunits.html.

[18] Boyne, *How The Helicopter Changed Modern Warfare*, 121; Chris Bishop, *Bell UH-1 Huey "Slicks" 1962–1973* (Onalaska, WI: Osprey Publishing 2003) 47.

[19] Dunstan, *Vietnam Choppers*, 18.

[20] David Tyler, "The Leverage of Technology: The Evolution of Armed Helicopters in Vietnam," *Military Review* (July–August 2003) 32.

1961, when 30 H-21 helicopters departed the Saigon airport to deliver South Vietnamese soldiers to strategic locations in the countryside. It was immediately clear that the Vietnam missions were not going to be simple transports. The helicopters came under small arms fire immediately after leaving the Saigon International Airport. According to a unit history, the helicopters had to land in "an almost impossible zone," with "perpendicular rows of pineapple fields deep in mud and water." The danger of the operations was further reinforced when they lost a helicopter on their very first mission in Vietnam.[21]

The complexities of operating in the jungle and the utility of the helicopter in the Vietnamese landscape was reinforced in early January when the Army helicopters successfully delivered to over 1,000 Vietnamese troops in a muddy "hole in the jungle" that was "no more than 300 yards by 150 yards" and surrounded by "towering jungle trees." The helicopters continued a busy transport schedule. In the first six months of deployment, the pilots of the 57th Transportation Company flew 4,583 hours, assisting the 8th Transportation Company with the transport of 133,464-ton miles of cargo and 51,353 Vietnamese troops to strategic areas.[22]

The 57th Transportation Company became the 120th Aviation Company in June 1963, 18 months after arriving in Vietnam. The company remained in Vietnam until 1972. The 8th Transportation Company became the 117th Aviation Company in June 1963.

The first Army Helicopter Medical Evacuation Company, the 57th Medical Detachment (helicopter ambulance) arrived in South Vietnam in April 1962 with five UH-1 helicopters. These were the first Army UH-1s in Vietnam. The detachment, normally based at Fort Meade, Maryland, set up operations at Nha Trang. Initially, the helicopters operated outside combat zones in support of US military advisors. They were banned from transporting ill or injured Vietnamese soldiers or civilians. This limited mission was unworkable as the medics felt obliged to assist Vietnamese who requested their services. Unlike the transport units, which were busy from the moment they arrived, the medical detachment was little used in its first months in Vietnam. Three months into their deployment, the helicopters only transported 12 US advisors and 14 Vietnamese.[23] To exacerbate the situation they were grounded in November and December 1962.

Finally, in January 1963, the 57th Medical Detachment moved to Saigon with one operable helicopter. Still grounded, they waited until March 1963 for new helicopters. A month later, the detachment was divided into two units and moved to Pleiku and Qui Nhon.[24] Shortly thereafter, the 57th adopted their call sign "Dust Off." The utility of helicopter medical evacuations was becoming more apparent—as the year progressed the Dust Off crews found their services requested more often. No doubt, the Dust Off helicopters' workload increased steadily throughout the early period of the Vietnam War (to 1965). Historians Peter Dorland and James Nanney describe the period from 1962 through 1964 as one of development in which the helicopter ambulance crews learned how to operate under the conditions that Vietnam presented while also proving their value.[25] In this way, their experiences were not considerably different than those of other US helicopter units serving in Vietnam in the early part of the war.

[21] Battalion History – 57th Transportation Company, no date, Folder 13, Box 01, Vietnam Helicopter Pilots Association (VHPA) Collection: Unit Histories – Transportation and Maintenance Units, the Vietnam Center and Archive, Texas Tech University, accessed January 23, 2015, at <http://www.vietnam.ttu.edu/virtualarchive/items.php?item=3110113004>.

[22] Battalion History – 57th Transportation Company.

[23] Peter Dorland and James Nanney, *Dust Off: Army Aeromedical Evacuation in Vietnam* (Washington, DC, US Army Center for Military History 2008) 24, 25.

[24] The 57th Medical Detachment moved to Soc Trang, an airstrip used by the Japanese during World War II and most recently occupied by the US Marine Corps (discussed below) in 1964.

[25] Dorland and Nanney, *Dust Off,* 29, 30, 41.

US Army helicopters were becoming more common in Vietnam after 1962. The Medical Detachment was one of five US Army helicopter units that arrived in Vietnam in 1962 and 1963. The other helicopter units were transportation units. These were the 93rd Transportation Company, the 33rd Transportation Company, the 81st Transportation Company, and the 114th Air Mobile Company.

The 93rd Transportation Company (Light Helicopter) arrived in Da Nang on January 25, 1962, and was operational with its H-21s on February 1. Based at Fort Devens, Massachusetts, when in the United States, the 93rd provided transportation for South Vietnamese troops and equipment in the mountainous northern portion of the Republic of South Vietnam. They also provided logistical support for US Army Special Forces operating in South Vietnam.[26]

The 93rd relocated to Soc Trang Airport in the Mekong Delta in September 1962. The transportation and logistical support missions continued. The unit flew over 1,000 hours in the month of December 1962. The 93rd was designated the 121st Aviation Company (Air Mobile Light) on June 25, 1963, but the company's personnel, duty station, mission, and equipment was unchanged.[27] The unit's H-21 helicopters were replaced by UH-1Ds in 1964. The UH-1D (a version of the venerable Bell UH-1 "Huey") was specifically designed to meet the needs of troops in Vietnam. The helicopter held more cargo and had more range and power than earlier versions. The aircraft could also be armed with various configurations of weapons. The 121st Aviation Company flew the UH-1 until 1970, when they left Soc Trang for their eventual return to the United States.

The 81st and 33rd Transportation Companies arrived in Vietnam in the fall of 1962. The companies were based at Fort Sill, Oklahoma, and Fort Ord, California, when in the United States. The 33rd was deactivated and designated the 118th Assault Helicopter Company in the summer of 1963. The 118th was the first assault helicopter company in Vietnam. Initially, the airmen flew into combat situations in unarmed H-21s. Pilots and crew merely used their sidearms for assault. The 118th finally received armed UH-1Bs in September 1963. The 81st, activated at Pleiku, also arrived in Vietnam with H-21s, but received UH-1D helicopters less than a year after their arrival at Pleiku—the Army had completely transitioned from CH-21s to UH-1s by late June 1964.[28]

The 114th Air Mobile Company, based at Fort Knox, Kentucky, arrived in Vinh Long, Republic of South Vietnam, on May 10, 1963. Two months later, the 114th briefly moved to Soc Tang with the 93rd Transportation Company. The 114th returned to Vinh Long and remained at the Mekong Delta airfield until 1972.[29]

The initial deployment of the Transportation Companies coincided with a period in which US Army officials were re-evaluating the role of aircraft in war. The Tactical Mobility Requirement Board, headed by General Hamilton H. Howze, began evaluating the role of the helicopter in tactical situations in 1961.

[26] Unit History, Delta Aviation Battalion (Provisional) U.S. Army Support Command – History of the 121st Aviation Company Formerly the 93rd Transportation Company for 1963, no date, Folder 05, Box 01, U.S. Army Aviation Museum Volunteer Archivists Collection, the Vietnam Center and Archive, Texas Tech University.

[27] Unit History, Delta Aviation Battalion (Provisional).

[28] 118th Assault Helicopter Company – Thunderbirds, no date, Folder 13, Box 06, Vietnam Helicopter Pilots Association (VHPA) Collection: Unit Histories – 1st Aviation Brigade, The Vietnam Center and Archive, Texas Tech University; History of the 119th Assault Helicopter Company, no date, Folder 16, Box 06, Vietnam Helicopter Pilots Association (VHPA) Collection: Unit Histories – 1st Aviation Brigade, the Vietnam Center and Archive, Texas Tech University. The 81st was designated the 119th Aviation Company (Air Mobile Light) in June 1963.

[29] Publication, U.S. Army – History of the 114th Assault Helicopter Company and Attached Units, 1966, Undated, Folder 01, Bud Harton Collection, the Vietnam Center and Archive, Texas Tech University.

Known colloquially as the Howze Board, the advisory group released its recommendations in August 1962.[30]

The board's report concluded that helicopters should be widely integrated into the structure of US Army units. Indeed, Howze and his associates argued that rotary-wing aircraft should replace many surface vehicles. To adequately expand the use of helicopters, the Howze Board noted that the Army's helicopter stockpile should expand from under 5,000 to over 8,000 within five years. The helicopters would allow the reduction of surface vehicles by 66%.[31]

Expanding the use of helicopters, however, was not just a matter of having more rotary-wing aircraft. The Howze Board proposed the establishment of several helicopter-based units, including an air assault division, air combat brigade, corps aviation brigade, army aviation brigade, airmobile corps artillery, air transport brigade, special warfare aviation brigade, and air ambulance battalions. Moreover, the board recommended that helicopters be integrated into other units.[32]

The Howze Board recommended the development of helicopters designed specifically for assault. Previously, helicopters, most notably the UH-1, were designed as transport aircraft, which were retrofitted with armor, arms, and other equipment. Essentially, the Howze Board stressed that helicopters should be designed with specific roles in mind. This led to the eventual development of assault helicopters such as the AH-1 Cobra.

Finally, the board resulted in the establishment of two new test units—the 11th Air Assault Division (test) and 10th Air Transport Division (test). The units, formed in 1963, were based at Fort Benning, Georgia. They conducted numerous field exercises testing the utility of helicopters in wide-ranging combat situations. The evaluations led to the development of techniques and tactics that were eventually widely adopted by the Army. Many of the methodologies developed by the test units are still in use such as night vision operations, forward refueling systems, and armed helicopter support for special forces operations.[33]

Significant evaluation and testing was occurring in the United States in the early 1960s, but all branches of the military, including the Army, were also interested in evaluating aircraft and related equipment in South Vietnam. The region was viewed as an ideal location to conduct testing in a demanding environment. To this end, the Army established Army Concepts Testing in Vietnam (ACTV) in 1962. Evaluators tested the Mohawk and Caribou aircraft and armed helicopters in conjunction with their combat and special forces operations.[34]

Much of the development and testing of US Army armaments occurred at the behest of the Utility Tactical Transport Helicopter Company (UTTHCO), which began testing various strategies for arming the helicopters in Okinawa and Thailand in the summer of 1962, before the company arrived in Vietnam (Tan Son Nhut) in early October 1962. Initial experiments were conducted using the UH-1As. The soldiers designed a makeshift system in which rocket launchers and machine guns could be affixed to the

[30] Stanley S. McGowan, *Helicopters: An Illustrated History of Their Impact* (Santa Barbara, CA: ABC-CLIO 2005) 97, 98; Tyler, "The Leverage of Technology," 32, 33.

[31] Stockfisch, *The 1962 Howze Board*, 22, 24.

[32] Ibid., 1, 18–22.

[33] Stockfisch, *The 1962 Howze Board*, 26; Department of the Army, "The Airmobile Division," DA-PAM 360-216, November 30, 1965; Boyne, *How The Helicopter Changed Modern Warfare*, 115, 116. See also Billy L. Odneal, "Raid Type Operations Via Helicopter Airmobile Force," *United States Army Aviation Digest*, Vol. 8, No. 9 (September 1962), 3–8; William P. Griffin, "Army Aviation in Support of Counter-Guerilla Operations," *United States Army Aviation Digest*, Vol. 8, No. 9 (September 1962), 9–14.

[34] Jacob Van Staaveren, "USAF Plans and Policies in South Vietnam, 1961–1963," (USAF Historical Division Liaison Office, 1965) 52, available at http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB248/.

helicopters. This was not an ideal arrangement, but had to suffice until a specifically designed armed helicopter became available. This limitation was addressed in November when the UTTHCO received 11 UH-1Bs. The new helicopters represented several improvements over the UH-1As. Perhaps the most important new feature was the addition of a "universal mount" behind and below each cargo door. The mount allowed the Army to attach various advanced weapons (machine guns and missile launchers) to the helicopters in a wide range of configurations. The UH-1Bs also incorporated "bungee" slings for the door gunners M-60 machine guns. The UTTHCO tested the helicopters in combat situations for several months, while providing escorts for the transports of the 33rd, 57th, and 93rd.[35] UTTHCO also introduced a Marine Corps helicopter operational procedure to the Army. Known as "Eagle Flight," the procedure was essentially an armed escort. The transport helicopters were guided by a command and control helicopter and flanked by several armed Hueys. The UTTHCO's evaluations and innovations provided direction for the further development of armed helicopter combat procedures during the Vietnam War and beyond.

Research and development of armed helicopters and techniques was advanced enough by 1964 that the Army deployed or activated helicopter units with assault capabilities. The UTTHCO was designated the 68th Assault Helicopter Company in August 1964. Their personnel and equipment were unchanged. The helicopter company's mission became less centered on testing and development and more focused on armed combat support for South Vietnamese troops and their US advisors. The 13th Aviation Battalion was activated at Fort Bragg in September 1964. The helicopter battalion arrived at Can Tho in South Vietnam in early October. Two more Army helicopter units from the 501st and 502nd Aviation Battalions arrived in Vietnam in December 1964. They were based at Bien Hoa and Vinh Long. All the helicopter units flew armed UH-1s in support of airmobile transport companies.[36]

The early years of US Army helicopter use in Vietnam was limited to logistical and troop support, but it quickly became clear that the Howze Board and other military planners concluded rotary-wing aircraft were well-suited for operations in Vietnam. Units at Da Nang, Pleiku, Soc Trang, and Vinh Long supplemented the initial H-21 helicopters that arrived in Saigon in 1961. Moreover, the realities of fighting in Vietnam gave credence to the assertions that helicopter design needed to evolve to adapt to the conditions and missions the Vietnam War presented. This was first addressed when the Army provided armed Bell UH-1s to units serving in Vietnam. By 1964, the army had 325 aircraft in Vietnam. Most of these were helicopters.[37]

2.2.1.2 Middle of War (1965–1968)

The first US Army combat troops (3,500 members of the 173rd Airborne Brigade) arrived in Vietnam in early May 1965, approximately two months after the arrival of Marine Corps troops and helicopter squadrons in Da Nang. The Army troops, stationed at Bien Hoa Air Base near Saigon, were tasked with the security of the airfields at Bien Hoa and Vung Tau. The narrowly defined defense mission did not last long. The 173rd participated in a massive airlift operation in late June 1965. Seventy-seven Army troop transport helicopters penetrated a contested area north of Saigon to deliver nine battalions of US, Australian, and South Vietnamese soldiers to the combat zone. The helicopters returned two days later to extract the soldiers after completion of their mission. Similar operations became a staple of helicopter crews of the 173rd.[38]

[35] Dunstan, *Vietnam Choppers* 26, 27.

[36] Ibid., 33.

[37] Van Staaveren, "USAF Plans and Policies," 104.

[38] John J. Tolson, *Airmobility: 1961–1971* (Washington, DC: Department of the Army 1999) 64; Dunstan, *Vietnam Choppers*, 33, 34.

US involvement in Vietnam increased dramatically in late July 1965 when President Lyndon B. Johnson announced that he would send 44 combat battalions to Southeast Asia, which increased the military presence in Vietnam to 125,000 soldiers. The expansion of US involvement resulted in the reorganization of the 11th Air Assault Division (test), which had been testing helicopter strategy and technology at Fort Benning. The test division became the 1st Cavalry Division (airmobile), the first major Army formation specifically trained and tasked with airmobile warfare, in July 1965.[39]

Source: Douglas Pike Photograph Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 2-4. 1ST CAVALRY DIVISION ON A TACTICAL OPERATION WITH THE AIRBORNE BRIGADE SOUTHWEST OF PLEIKU, 1965

Known as Air Cav, the division was immediately deployed to Vietnam. An advance group arrived at An Khe in late August 1965 and set about establishing an outpost in South Vietnam. This was no small task. First, an adequate airbase was whittled out of contested territory in a combat zone. Second, the extensive resources of the 1st Cavalry were transported to An Khe. This was not a small contingent of soldiers and equipment. The Air Cav force consisted of 15,787 personnel, 1,600 vehicles, and 470 aircraft (including 435 helicopters).[40]

The 1st Cavalry had little time to settle in. Three regiments of the North Vietnamese Army attacked a South Vietnamese Army and US Special Forces camp at Plei Me, about 25 miles southwest of Pleiku. The 1st Calvary was ordered to support Plei Me when it became apparent that the encamped soldiers were

[39] Dunstan, *Vietnam Choppers*, 34.

[40] Dunstan, *Vietnam Choppers*, 34; Boyne, *How The Helicopter Changed Modern Warfare*, 128.

unable to repulse the attack. Known as the Battle of Ia Drang Valley, the engagement lasted 35 days. Air Cav helicopters provided critical airlift support to soldiers on the ground. They flew 54,000 sorties in the process of delivering over 13,000 tons of supplies and transporting over 73,000 troops. In addition to their transport role, the helicopter crews scoured the jungle for enemy encampments, one of which they discovered and destroyed on November 1. The battle was a watershed in the war because it stemmed the North Vietnamese advancements in South Vietnam. This enabled South Vietnamese and US troops, supported by Air Cav helicopters to adopt a counter-offensive posture that drove back North Vietnamese forces throughout the country.[41] On a more fundamental level, the battle of Ia Drang Valley reinforced the fact that helicopters were indispensable to successful combat operations in Vietnam. The 1st Cavalry alone flew almost 978,000 sorties and had 36 helicopters shot down in 1967. It also became clear that there were not enough helicopters or aircrews available to meet the needs of the soldiers fighting in Vietnam. Air Cav helicopters included UH-1Bs, UH-1Ds, CH-47s, CH-54 "flying cranes," and light observation helicopters (LOH).

The CH-54 Flying Cranes were a heavy transport helicopter that could lift 20,000 pounds via an external winch. The helicopter had no significant internal cargo space. All loads were transported externally. Four CH-54s were deployed with the Air Cav in 1965. The helicopters were used to lift and transport equipment that was beyond the payload capacity of other rotary-wing aircraft. The list of large equipment transported by the Flying Cranes included bulldozers and other heavy construction equipment, large weapons like 15 MM howitzers, and damaged aircraft. The CH-54 was also used for logistical supply because it could carry more cargo than other aircraft. Partly due to the fact that the Sky Cranes were very expensive, the helicopters rarely flew into contested territory. Nonetheless, they provided important support.[42]

The CH-47 Chinook, a new heavy-lift helicopter in the Army's arsenal with the capability to lift tremendous loads, eventually supplanted the C-54 Sky Crane. The Chinook, which could lift 10,000 pounds, did not have the external lift capacity of the CH-54, but it did have the ability to transport troops and material in its watertight cabin. Moreover, it was more capable as a combat area helicopter.[43]

The first CH-47s arrived in Vietnam with the 1st Cavalry in October 1965. More CH-47s arrived a month later when the 147th Aviation Company arrived at Vung Tau from Fort Benning. The CH-47s of both Air Cav and the 147th Aviation Company were exceptionally active during their first two years in Vietnam. The helicopter crews flew 238,000 sorties (over 88,000 flying hours) transporting 671,000 passengers and 610,000 tons of cargo. The Chinooks also retrieved over 1,300 downed aircraft. The 147th helicopters provided direct support to the 1st Infantry Division. The CH-47 became the primary helicopter for the movement of artillery units. The Chinooks could transport a complete 105 MM howitzer battery (soldiers, weapons, and ammunition) in as few as 11 sorties. Vietnam also predicated the innovative use of the CH-47 as a de facto bomber. Crews dropped over 30,000 pounds of riot agents (contained in drums) on Viet Cong fortifications from the helicopters. They also used the C-47 to drop napalm on enemy installations.[44]

[41] Dunstan, *Vietnam Choppers*, 36; Boyne, *How The Helicopter Changed Modern Warfare*, 129; Tolson, *Airmobility*, 74–83.

[42] Dunstan, *Vietnam Choppers*, 85, 86.

[43] John C. Geary, "The Chinook: Advanced Battlefield Mobility Vehicle," *United States Army Aviation Digest*, Vol. 8, No. 8 (August 1962), 3, 4.

[44] Tolson, *Airmobility*, 141, 142; Dunstan, *Vietnam Choppers*, 75–81.

Source: US Information Agency: National Archives at College Park

FIGURE 2-5. US ARMY'S 1ST CAVALRY DIVISION (AIRMOBILE) SKY CRANE CH-54A HELICOPTER

The large helicopters were indispensable for the establishment of fire support bases, which were typically established in one day. Helicopter crews flew engineer squads and their clearing equipment (chainsaws, explosives, etc.) to remote jungle locations with no landing zones. The squads cleared a landing pad for the helicopter, which would then deliver more engineers and supplies. Once the landing zone was large enough, the Chinook crew lowered bulldozers and other large equipment for the construction of trenches and foxholes for the infantry soldiers. The helicopters also transported artillery to the fire support bases. Ideally, the base was defensible and capable of providing support for infantry units.[45]

[45] Tolson, *Airmobility*, 141, 142; Dunstan, *Vietnam Choppers*, 75–81.

Source: Douglas Pike Photograph Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 2-6. CHINOOK TRANSPORTING A DAMAGED HUEY TO THE MAINTENANCE AREA

The 1st Cavalry tested and used a unique CH-47 model known as the "Go-Go Bird," or flying tank. The helicopter was a brutish, heavily armed aircraft. It had twin 20 MM Gatling guns, 40 MM grenade launchers, .50-caliber machine guns, and other ordnance. Over 2,500 pounds of additional armor protected the aircraft's vital components and crew. The helicopter was controversial and never fully integrated into Army operations. Only four of the aircraft were produced. All were lost within two years. Three fell victim to hostile action and one suffered operational failures. Many observers considered the flying tank too big and clumsy for combat operations. Soldiers on the ground, however, appreciated the helicopter's ability to "make the enemy disappear."[46]

[46] Tolson, *Airmobility*, 142; Dunstan, *Vietnam Choppers*, 107, 111.

The LOH aircraft were originally the OH-13S and OH-23G, but were soon replaced by the Cayuse OH-6. Regardless of the specific helicopter, the LOH aircraft became extremely important in Vietnam. The light, highly maneuverable helicopters were used for scouting. Typical scouting missions consisted of two LOH aircraft flying in tandem. One flew low enough to observe the terrain while the other remained at altitude to provide cover and navigation and to act as a radio relay. The scout teams were able to provide information to ground troops and direct airstrikes.[47] The information gained by LOH crews was also used by Air Cav UH-1 troop transports, which could quickly insert an infantry force to exploit a situation. The LOH aircraft sometimes worked in tandem with the attack helicopters, which both provided protection and a means to quickly capitalize on actionable intelligence observed by the LOH crew.

The, LOHs, CH-54s, and CH-47s played a pivotal role in Vietnam, but the UH-1 Huey was the cornerstone of the US Army's helicopter war. Initially introduced in 1959, the helicopter came to the forefront of Army operations by 1962. The Huey filled a wide variety of combat service support roles in Vietnam. The most traditional role for the helicopters was transport and resupply, but their adaptability allowed the Army to use the Hueys for several purposes. For example, the UH-1s were used as airborne command and control centers. These helicopters were fitted with advanced radio equipment to enable communication between the command group and aircrews. Some Hueys, known as PSYWAR (psychological warfare) helicopters, distributed leaflets throughout the country. The helicopters were also fitted with loudspeakers to transmit propaganda and messages promising amnesty to Viet Cong who surrendered.[48]

Helicopter maintenance was extremely taxing. While the stated maintenance goal was one hour maintenance for every hour of flight time, the reality was much different. In 1966, mechanics spent approximately 10 hours maintaining helicopters for every hour of flight time.[49] These conditions were only expected to worsen as more helicopters arrived in Vietnam. Army leadership explored various options, but initially only addressed the maintenance problems at the headquarters level, leaving the day-to-day maintenance burdens unchanged.

Some relief did come in the form of the 1st Transportation Corps (TC) Battalion, a component of the 34th General Support Group. The 1st TC Battalion, the Army's only ship-based maintenance unit, arrived in Cam Ranh Bay aboard the *Corpus Christi Bay* in April 1966 before relocating to Qui Nhon to be nearer to the 1st Cavalry, the unit they primarily supported. The maintenance ship had 370 Army maintenance personnel and 130 civilian sailors onboard. The *Corpus Christi Bay* crew could perform all levels of helicopter maintenance and repair while on the ship. They also had an extensive library of engineering drawings and images on microfilm that they could transmit to US bases in Vietnam via closed-circuit television.[50] Still, the bulk of maintenance was undertaken by small crews at various outposts in South Vietnam.

Medical evacuation was another area in which the UH-1s revolutionized the manner in which the US Army operated in combat zones. Helicopter-borne medical evacuation (medevac) was first performed during World War II when the Army used rotary-wing aircraft to transport wounded soldiers out of Burma and the Philippines. However, the helicopter was not systematically applied to medical evacuation until the Korean War, when all branches of the military began using helicopters for medevac.[51] As

[47] Bell Helicopter Corporation, "Light Observation Aircraft Study, 1965–1970," no date, Advanced Design Concept Report Number D247-099-001, 1-2; Dunstan, *Vietnam Choppers*, 126.

[48] Dunstan, *Vietnam Choppers*, 51.

[49] Tolson, *Airmobility*, 89.

[50] Ibid., 91.

[51] Dorland and Nanney, *Dust Off*, 9, 11.

discussed above, the use of Army helicopters for medical evacuation started slowly in Vietnam, but was well accepted by 1965.

US Army leadership knew that the increased deployment of US soldiers to Vietnam after the Gulf of Tonkin incident would result in additional casualties. Therefore, they established a second helicopter ambulance unit to accompany the 57th Medical Detachment (helicopter ambulance) that was already in Vietnam. A short time later, the surgeon general approved the establishment of five additional helicopter ambulance detachments for potential deployment to Southeast Asia. The 82nd Medical Detachment (helicopter ambulance), based at Fort Sam Houston, Texas, was subsequently alerted to prepare for deployment to Vietnam on October 1, 1964. The detachment, with their five UH-1B helicopters arrived in Vietnam in mid-October and was operational at Soc Trang on November 7, 1964.[52] The first US combat units arrived four months later.

The arrival of combat units in 1965 resulted in a concomitant increase in helicopter ambulance units. The 283rd Medical Detachment (helicopter ambulance) arrived in Saigon from Fort Lewis, Washington, in September 1965. The 254th Medical Detachment (helicopter ambulance) arrived in Vietnam from Fort Carson, Colorado, in November 1965, but it took another three months before the detachment's equipment arrived. In the meantime, the pilots worked with the 283rd and 57th Medical Detachments. The 254th finally became operational at Long Binh on February 1, 1966. Unlike the other medical detachments, the 254th was primarily assigned to support the 173rd Airborne (but not under the command of the 173rd). All other medical detachments (helicopter ambulance) supported all Allied troops.[53]

A new type of helicopter evacuation unit, the Air Ambulance Platoon, was organized in 1965. The platoon was a larger organization than the detachment. Unlike the medical detachments, which served under medical commands, the Air Ambulance Platoon was assigned to the 1st Calvary (Airmobile). The unit, which arrived in Vietnam in August 1965 with 12 helicopters, was more operationally diverse than the helicopter medical detachments in Vietnam. The platoon's crews, who supported 1st Cavalry operations, could provide medical evacuation to soldiers, but they were also able to rescue downed pilots. Eight of the platoon's helicopters were dedicated to medical evacuation, while four were used for crash rescue. Another difference is that the 1st Calvary used the call sign "Medevac" instead of "Dust Off."[54]

An even larger helicopter medical evacuation unit, the 498th Medical Company, arrived in Saigon from Fort Sam Houston in September 1965. The medical company, which consisted of four platoons, had 25 UH-1Ds. Once in Vietnam, the 498th was divided between Nha Trang (one platoon, headquarters, and maintenance), Qui Nhon (1.5 platoons), and Pleiku (1.5 platoons). This model was elaborated on a few months later when the 57th, 82nd, 254th, and 283rd Medical Detachments (helicopter ambulance) were consolidated into the 436th Medical Company. [55]

The US Army had 67 medical evacuation helicopters in Vietnam in early 1967, but military leaders felt that the number was woefully inadequate. After all, there were 450,000 soldiers serving in the Vietnam War. Army leadership argued that they needed nearly twice as many (120) medical helicopters at their disposal throughout South Vietnam. The helicopters were not immediately forthcoming. The Army employed stopgap measures in an attempt to alleviate the medical helicopter shortage. First, the medical

[52] Dorland and Nanney, *Dust Off*, 39.

[53] Statement of Service – 254th Medical Detachment, no date, Folder 17, Box 01, Vietnam Helicopter Pilots Association (VHPA) Collection: Unit Histories – Medical Units, The Vietnam Center and Archive, Texas Tech University; Dorland and Nanney, *Dust Off*, 49.

[54] Dorland and Nanney, *Dust Off*, 44, 45.

[55] Ibid., 51, 53.

units received utility helicopters that they could use under duress. On the other hand, the Army began designating some airmobile assault helicopters as medical evacuation helicopters. The helicopters carried medevac crews but these solutions were far from ideal.[56]

Eventually, the Army deployed an additional medical company. The 45th Medical Company, based at Fort Bragg, was ordered to Vietnam in May 1967. The medial company, which was flying obsolete H-19s, replaced their old aircraft with 25 new UH-1Hs before they left the United States. The medical company became active in Vietnam during September 1967 after arriving at Long Binh.[57]

Additional helicopter ambulance companies and detachments arrived throughout the rest of 1967 and early 1968, a period of aggressive military build-up in Vietnam that was punctuated by some of the fiercest fighting of the war including the Tet Offensive and battle of Khe San. These units included the 54th Medical Detachment (from Fort Lewis, Washington), the 159th Medical Detachment (from Fort Riley, Kansas), and the 571st Medical Detachment (from Fort Meade, Maryland). Additional detachments arrived later in 1968. Helicopter evacuation deployments reached their peak by 1969 when 140 helicopters were stationed in various regions of South Vietnam.[58]

As with so many aspects of the Army's helicopter war in Vietnam, the backbone of the Medevac and Dust Off units was the UH-1[59], initially an aircraft that was only marginally capable of performing the requisite duties of medical evacuation. The UH-1B that the first Dust Off units used in Vietnam was underpowered and minimal. It could only carry a crew and two patients at one time. Like all other aspects of the war, the challenges that manifested themselves in Vietnam spawned innovation. The UH-1B was replaced by the UH-1D, a larger helicopter with more lift that could carry up to nine patients and crew. The new helicopter was still limited in the northern highlands where terrain and climate undermined the aircraft's power. Finally, the Army introduced the much more powerful UH-1H in 1967. The difference in power was remarkable. The maximum load a UH-1D could typically hoist[60] in the highlands was 184 pounds. Under identical circumstances, the UH-1H could hoist 1,063 pounds. This enabled the new helicopters to more effectively transport casualties from combat zones in fewer trips. The value of the UH-1H was clear and by the end of January 1968, when all medical evacuation units had transitioned to the UH-1H. The UH-1Ds were still used for troop transport and other purposes, but their days as medical evacuation aircraft had passed.[61]

Other US Army helicopter units replicated the aggregation of medical evacuation units through the middle of the war. A surge in deployments and an accompanying increase in Army rotary-wing aircraft in Vietnam marked 1966. Total US troop strength in Vietnam was 300,000 by the summer of 1966. Troop strength grew to 485,000 in 1967 and peaked to nearly 500,000 in 1968. This, of course, resulted in the increased use of helicopters. By the end of 1966, there were over 1,500 Army helicopters operating in Vietnam. The ubiquity of US Army helicopters in Vietnam was such that they became symbolic of US

[56] Dorland and Nanney, *Dust Off*, 55.

[57] Ibid., 56.

[58] Ibid., 2, 116.

[59] The Medical Evacuation helicopters were typically unarmed throughout the war to save weight.

[60] The development of the hoist itself was another innovation created by necessity. Much of Vietnam's terrain (jungle, rugged mountains, and marsh) made the retrieval of wounded soldiers problematic because helicopters often were unable to land near the soldiers. This resulted in logistical problems and medical challenges on the ground as troops moved injured soldiers to helicopter landing zones. Research to address this problem began at Fort Bragg in 1962. Eventually, Bell Helicopters and the Breeze Corporation developed a winch-driven rescue hoist that could be attached to the UH-1s. The hoists were tested at Fort Sam Houston and delivered to troops in Vietnam in 1966. Dorland and Nanney, *Dust Off*, 71.

[61] Dorland and Nanney, *Dust Off*, 69.

involvement in Southeast Asia. Helicopters were deployed over the entire country—not just in the aviation companies based at air bases.

Each infantry division had its own integrated aviation battalion. This led to confusion as the war intensified. Therefore, by May 23, 1966, the 1st Aviation Brigade was established as an overarching command organization supporting the infantry helicopter battalions. The 1st Aviation Brigade established standards for training, maintenance, safety, supply, and operations. The brigade did not command individual aviation units. That responsibility still fell to the ground commander, which allowed considerable operational flexibility while ensuring that the overarching brigade missions were followed. The 1st Aviation Brigade was incredibly busy in its first year. The brigade airlifted more than five million troops and flew nearly three million sorties in 1967. These trends continued and intensified in early 1968 with the fierce fighting at Khe San and the Tet Offensive. The 1st Brigade was one of the largest formations in Vietnam by the middle of 1968, with over 25,000 men in almost 100 separate aviation units under its command. The brigade had 4,320 aircraft under its control.[62]

The 1st Brigade also expanded into training and testing in 1967. They established helicopter pilot and crew schools for Thai, South Korean, and South Vietnamese aviators. The schools also served US and Australian personnel. In addition, the brigade supervised the New Equipment Training Teams. These teams consisted of technical experts who arrived in Vietnam with each new piece of equipment. The experts were expected to facilitate the in-country testing and introduction of new complex systems to soldiers in Vietnam. For example, a team arrived in September 1967 with the first six Bell AH-1G Cobras. Working with pilots from the 334th Assault Helicopter Company, they identified and resolved design and maintenance problems. The team also traveled with the helicopters to units that would eventually adopt the aircraft to familiarize pilots with the new helicopters and determine operational and tactical changes that the Cobras might require.[63]

The AH-1G Cobra represented a major technological milestone in helicopter development. It was the first helicopter designed from the ground up as an attack helicopter (hence the AH instead of UH). The Cobra was based on the UH-1 design, but incorporated many new features, including a seating arrangement that put the gunner and pilot behind each other. This allowed the development of a much narrower, aerodynamic body that permitted speeds up to 190 knots. This helicopter was also more maneuverable than its predecessors. Finally, the Cobra featured a specifically designed variable armament platform, rather than the retrofitted or mounted platforms that were used on previous versions of the UH-1.[64]

The year 1968 also witnessed a major reorganization of the Army's 101st Airborne. The 1st Brigade of the 101st arrived in Vietnam in 1965, but the remaining components did not arrive from Fort Campbell, Kentucky, until late 1967. Less than seven months after their arrival, the 101st Airborne was designated the 101st Air Calvary Division. The complete conversion from an airborne to airmobile division took a few months.[65]

The US Army helicopter quickly outgrew its original intent as a troop mover. The exigencies of combat revealed the incredible utility of the helicopter as a combat support tool. Helicopters certainly transported troops and materials into combat, but that was just the beginning of their expansive role in the Vietnam War. Once the soldiers were on the ground, helicopters provided observation support, command and control, direct fire support, resupply, medical evacuation, reinforcement, and withdrawal. Moreover, as

[62] Dunstan, *Vietnam Choppers*, 38; Tolson, *Airmobility*, 198, 202.

[63] Tolson, *Airmobility*, 204.

[64] Dunstan, *Vietnam Choppers*, 111, 112.

[65] Tolson, *Airmobility*, 197.

discussed above, the decision to move ground soldiers into the area was likely based on intelligence gathered by helicopters, such as the LOH aircraft.[66]

2.2.1.3 End of War (1969–1975)

The tide of the Vietnam War began to shift by 1969. Many of the North Vietnamese troops withdrew into Laos and Cambodia, leaving small mobile units in Vietnam. Instead of attacking large swaths of the country as the North Vietnamese Army had done previously, most visibly with the Tet Offensive, these small units used guerilla warfare to attack specific targets. Meanwhile, President Richard Nixon began a phased withdrawal of over 100,000 US troops during the summer of 1969. Some helicopter units were included in these drawdowns, but generally, US Army aviation continued operating at high levels in Vietnam after 1969.

The United States and the Allies began concerted operations in Cambodia in the summer of 1970. Simon Dunstan describes the incursion into Cambodia, which began on May 1, 1970, as a "classic example of airmobility." Air Cav Cobras and LOH aircraft crossed into Cambodia in advance of troops. The collected intelligence and fired-on targets of opportunity. Airmobile assaults continued as ground troops crossed the border. The ground troops were transported and supported by the venerable Huey's. Meanwhile, Air Cav heavy-lift helicopters established temporary fire support bases in Cambodia. The operation lasted until June 29 when the last US troops (an Air Cav LOH and Cobra) crossed back into Vietnam.[67]

Another major operation known as Lam Son 719, was undertaken in Laos in February 1971. Unlike the Cambodia mission, no US ground troops or advisors were involved. Under Lam Son 719, South Vietnamese ground troops planned to destroy North Vietnamese bases along the Ho Chi Minh Trail in Laos. US support was limited to tactical air support and artillery support from fire support bases in South Vietnam. Under the command of the 101st Airborne, 659 US helicopters (airmobile) were committed to the mission. The largest helicopter combat assault of the war took place on March 6 when 120 Hueys from the 223rd Combat Aviation Battalion transported the 2nd Regiment, 1st Infantry Battalion of the South Vietnamese Army into Laos. The Hueys were escorted on the 50-mile journey by dozens of Cobras and other tactical aircraft. Most helicopter operations during Lam Son 719 were much less robust. Resupply and evacuation sorties typically consisted of single helicopters, with gunship escort when possible. This is not to say that the helicopters were inactive. Rotary-wing aircraft from the 101st Aviation Group flew over 204,000 sorties in extremely hostile conditions in less than two months—68% of the helicopters used in Laos suffered damage.[68]

Medical evacuation helicopters were in high demand during the Cambodian and Laotian missions. Their mission was essentially unchanged. The pilots and crews flew into combat zones to recover and evacuate casualties. The 1st Cavalry Air Ambulance Platoon flew over 1,700 missions during the two-month-long Cambodian campaign. In the process, they transported nearly 2,700 patients. The 159th Medical Detachment assisted the Air Ambulance Platoon by backhauling patients to hospitals in Saigon. The 571st, 236th, and 237th Medical Detachments and 498th Medical Company played a pivotal role in the 1971 winter campaign in Laos. They flew 1,400 missions and evacuated 4,200 patients during the two-month operation.[69]

[66] Dunstan, *Vietnam Choppers*, 44.

[67] Ibid., 41.

[68] Ibid., 42.

[69] Dorland and Nanney, *Dust Off*, 102, 106, 107, 113.

The drawdown that began in 1969 affected the Dust Off mission by supplementing their traditional evacuation role with the responsibility to provide training for South Vietnamese pilots and crews. Commanders were cognizant of the fact that the removal of helicopter-based medical evacuation capabilities would severely hamper operations of the South Vietnamese military because the Vietnamese Air Force had no rotary-wing medevac capabilities. There was a concerted effort to institute a training program in the spring of 1969. The hope was that Vietnamese Air Force pilots and crews would be attached to US Dust Off units. Regrettably, the program floundered for two years until the 57th and 82nd Medical Detachments implemented a training program in March 1971. The program grew quickly. Eighty-three Vietnamese Dust Off pilots, 21 crew chiefs, and 24 medical corpsmen were providing medical evacuations in South Vietnam by January 1972.[70]

Troop drawdowns dramatically affected helicopter units after Lam Son 719. Most of the 1st Cavalry stood down on March 26, 1971. Only the 3rd Brigade remained active in Vietnam. The rest of the 1st Cavalry left Vietnam for Fort Hood, Texas, on May 5. The 3rd Brigade left Vietnam just over a year later in June 1972. Similar stand downs occurred in the 1st Aviation Brigade. The brigade had about 24,000 troops and 3,200 aircraft in Vietnam in mid-1971. A year later, there were 5,000 1st Aviation Brigade troops and 984 associated aircraft in Vietnam. The Vietnam War officially ended in late January 1973, and the last of the 1st Aviation Brigade units left Southeast Asia for Fort Rucker, Alabama, in March 1973. Their exit marked the end of US Army combat aviation in Vietnam.[71]

Like other helicopter units, medical resources slowly stood down after 1969. As described above, 1970 and 1971 continued to be active years for medical evacuation helicopters. The first drawdowns occurred in early 1972 as the Vietnamese Air Force took on a greater role in Dust Off missions. The 57th, 159th, 237th, 247th, and 571st Medical Detachments and the 1st Cavalry Air Ambulance Platoon were the only units operating in Vietnam by the beginning of 1972. This was just the beginning. The Air Ambulance Platoon left Vietnam in June 1972. By early 1973, all the helicopter medical detachments, except the 57th, were gone. The 57th Medical Detachment, the first Dust Off unit to arrive in Vietnam, was the last to leave at the end of March 1973.[72]

2.2.2 US Marine Corps

2.2.2.1 Early War (1961–1964)

Like the US Army, the helicopter played a new crucial role in the manner in which the US Marine Corps operated in Vietnam. This is emphatically clear when one considers the fact that the first major Marine squadron committed to battle in Vietnam was a helicopter squadron and one of the last to leave was also a helicopter squadron.

The United States was still officially serving in an advisory role in Vietnam in early 1962 when Major General Charles G. Timmes, chief of the US military advisory group in Vietnam, suggested that a small number of Marine Corps helicopter pilots could serve short (60–90 day) rotations in Vietnam with the Army squadrons that were already working in the country. Marine Corps leadership pointed out that such a plan was inefficient and, perhaps, unworkable because the Army and Marine Corps flew different aircraft. In essence, the Marine pilots would spend a considerable amount of time learning to fly the

[70] Dorland and Nanney, *Dust Off*, 99.

[71] "History of the 1st Cavalry Division: Vietnam War," 1996 (revised 2013), accessed March 3, 2015, available at http://www.first-team.us/tableaux/chapt_08/. James W. Williams, *A History of Army Aviation: From its Beginnings to the War on Terror* (Lincoln, NE: U.S. Army Aviation Museum Foundation 2005) 167, 170.

[72] Dorland and Nanney, *Dust Off*, 113, 114.

Army's H-21s. Major General Carson A. Roberts, commander of the Marine Corps Pacific Aviation fleet, recommended that instead of just sending a few pilots, an entire squadron should be sent to Vietnam to replace one of the Army helicopter companies already serving in the country. The Marine Corps squadron's UH-34s, moreover, would be more adept than the Army's H-21s in high-altitude environments such as the mountainous northern portion of the Republic of Vietnam (South Vietnam).[73]

The Army continued to pursue their preference in which Marine pilots would serve as part of Army helicopter companies. In fact, they were campaigning for the addition of another Army helicopter unit, with selected Marine pilots participating, to the Vietnam advisory group in the spring of 1962. The Joint Chiefs of Staff, however, decided on March 19, 1962, that the addition of a new Army unit was logistically less desirable than assigning a Marine Corps helicopter squadron to serve in Vietnam. After all, two squadrons, Marine Medium Helicopter Squadron (HMM)-262 and HMM-362 were already in the region.[74]

Marine Corps leadership ultimately chose the HMM-362, based out of MCAS Tustin, as the first Marine helicopter squadron to serve in Vietnam. Preparations began April 1, 1962. Within 10 days, the pilots, mechanics, and other personnel of HMM-362 were onboard the USS *Princeton* with their arsenal of 24 UH-34s and a few fixed-wing aircraft. The squadron's ultimate destination was a location at sea off the mouth of the Mekong River from which the squadron would transport supplies to a World War II-era airfield called Soc Trang where the Marine Corps helicopter squadrons based their operations from 1962 until 1964. The squadrons moved to Da Nang Air Base in 1964, where they remained until the end of the operation in 1965.[75]

Operation Shufly, the Marine's first helicopter mission in Vietnam, predated the arrival of US combat troops who were not deployed until early 1965. US military personnel were, however, serving as advisors and to the South Vietnamese and the United States was providing logistical support. *Operation Shufly* supported both these missions. Helicopters provided a wide range of services to US advisors and South Vietnamese combat troops who were fighting the Viet Cong in a guerilla war. Marine aviators offered reconnaissance, assault support, medical evacuation, offensive air support, troop lift, and resupply for the combat troops. Their first mission occurred on April 22 when the US Marine Corps and Army helicopter pilots flew 339 Vietnamese troops into an area of suspected Viet Cong guerilla activity. Sixteen HMM-362 helicopters embarked on their first mission without US Army assistance on April 24. The Marines transported 591 Vietnamese troops onto a battle zone among a series of canals. While no Marines suffered casualties, one helicopter was damaged by gunfire.[76] The damage forced the HU-34 to return to Soc Trang with a ruptured oil line.

The experience revealed that the helicopters needed more armor in vulnerable places. The first few months of experience in Vietnam revealed that several other refinements were needed for Marine helicopters used in combat situations. These included aircraft armaments, modified landing pads compatible with the mud that was often present in Vietnam, and improved steps to provide an easier entry and exit from the helicopters.[77] The deficiencies were all eventually addressed during *Operation Shufly* in the midst of mission activities.

[73] Fails, *Marines and Helicopters*, 28.

[74] Ibid., 29.

[75] Ibid., 31, 32.

[76] Shufly Messages, April 1, 1962, Folder 067, U.S. Marine Corps History Division Vietnam War Documents Collection, the Vietnam Center and Archive, Texas Tech University. accessed February 12, 2015, available at http://www.vietnam.ttu.edu/virtualarchive/items.php?item=1201067185.

[77] Fails, *Marines and Helicopters*, 33.

US Marine Corp, US Army, and South Vietnamese pilots participated in an airlift on July 18, 1962, that was the largest operation of its kind to date. Forty-one helicopters (18 Marine Corps, 12 Army, and 11 Vietnamese Air Force) transported a large contingent of Vietnamese troops to an area north of Saigon. Marine Corps pilots participated in the first night troop landing a few days later.[78]

HMM-163 relieved HMM-362 at Soc Trang until August 1, 1962. HMM-163 spent about a month at Soc Trang before *Operation Shufly* was relocated to Da Nang, a region markedly different than the Mekong Delta. Where the delta was characterized by relatively flat topography, rugged mountains punctuated the Da Nang region. HMM-163 left Vietnam in mid-January 1963. *Operation Shufly* continued under the following squadrons: HMM-162 (January–June 1963 and July–October 1964) HMM-261 (June 1963–October 1963), HMM-361 (October 1963–February 1964), HMM-364 (February 1964–July 1964), HMM-365 (October 1964–December 1964).[79] All the squadrons flew H-34s and, when in the United States, were based at MCAS Tustin (HMM-162, HMM-362, HMM-361, HMM-364), and MCAS New River in Jacksonville, North Carolina (HMM-163, HMM-365).

Sadly, the first helicopter crew death occurred on March 10, 1963, when an H-34 flown by Major Lenny Demko and Major Dave Webster crashed during a rescue operation in the mountainous region outside Da Nang. Major Webster died and three crew members were injured in the incident. The Marine Corps did not lose a helicopter to enemy actions until April 27, 1963, over a year after the operation began. Tragedy struck in October 1963 when two HMM-361 helicopters collided on a search and rescue mission. Nine Marines and three sailors died in the accident.[80]

While combat support missions were typical during *Operation Shufly*, the Marines also delivered humanitarian aid. Marine Corps helicopters flew supplies to isolated Vietnamese villages, such as Binh Hung, that were inaccessible by roads. The Marine Corps airmen also participated in rescue operations after Typhoon Kate devastated the Vietnamese coast. Helicopters from HMM-365 in Da Nang and a carrier-based helicopter of HMM-162 rescued thousands of Vietnamese villagers threatened by flooding rivers and inundated rice paddies.[81]

The mission providing operational and logistical support to the Vietnamese and US advisors remained the same throughout the history of *Operation Shufly*, but was expanded in 1964 to include training for Vietnamese H-34 pilots. It was expected that, once training was complete, the Marine Corps helicopters would be turned over to the Vietnamese Air Force. Members of HMM-364, who arrived at Da Nang on February 1, 1963, undertook the training mission. Training began three weeks later and proceeded quickly and continued into early 1965 when combat commitments took precedence over training.

Helicopter technology evolved continually throughout *Operation Shufly*. As discussed above, much of the innovation was a direct result of lessons learned during deployment. The move to Da Nang also facilitated technological change precipitated by the landscape. The topography and climate already challenged the lift capabilities of the H-34s.

Two predominant technological problems became apparent during *Operation Shufly*. As mentioned above, the helicopters were vulnerable to damage from small arms fire. The Marine Corps had not

[78] Chet Decker, "Operation Shufly," *Leatherneck* (April 2002), 39.

[79] "Operation Shufly Commemoration," no date, accessed February 20, 2015, available at https://www.mca-marines.org/gazette/operation-shufly-commemoration; Fails, *Marines and Helicopters,* 79.

[80] "Official Squadron History 1961–1970," no date, accessed February 20, 2015, available at http://www.hmm-162.com/History/hist/History/histsquadron61.htm; Decker, "Operation Shufly," 38.

[81] Fails, *Marines and Helicopters*, 80.

previously considered using the helicopter in situations where they would be in proximity to enemy fire. The early experience in Vietnam belied this notion and it became clear that the helicopters needed to be retrofitted with armor plates. The plates, however, had to be light enough to not impede lift. The Marine Corps began fabricating armor plate kits for the H-34s in the summer of 1962. The plates, which weighed between 160 and 200 pounds, were continuously refined throughout *Operation Shufly*.[82]

The second technological problem was that Marine Corps helicopters were initially unarmed. The only defensive capabilities the aircraft had were from the crew chief and co-pilot who were armed with machine guns. The hostility of the combat zones into which the helicopters flew predicated the installation of mounted M-60s in the doors on the left side of the H-34s by the fall of 1962. Less than two years later, an additional M-60 was added to the right side of the helicopters.[83]

The solutions were helpful, but not ideal. The armor undermined the performance of the helicopters. Moreover, the aircraft were still falling victim to enemy fire. The mounted machine guns, while better than the hand-held weapons the Marines began *Operation Shufly* with, were insufficient in the escalating conflict. These realities reinvigorated the belief that the Marine Corps needed to develop an attack helicopter that could more effectively operate under hostile conditions. The attack helicopter concept was in the early stages of discussion when *Operation Shufly* ended in December 1964. The helicopter pilots and support crews who had spent three years directly supporting South Vietnamese soldiers and US advisors soon found themselves entering a new phase of involvement in the Vietnam War in which US ground troops played a significant role.

There is no doubt that the Marine Corps squadrons that participated in *Operation Shufly* provided indispensable support to soldiers fighting the Viet Cong. Moreover, the importance of *Operation Shufly* to the development of Marine helicopter aviation cannot be understated. The airmen identified technological limitations in the helicopters and flight suits that were addressed through mechanical innovation. They also developed tactical practices that were used in future operations, including the use of dedicated escort aircraft, airborne command and control, and the development of an airborne reserve force. Years later, the commandant of the Marine Corps lauded the efforts and contributions of the airmen who participated in *Operation Shufly* who he called "pioneers in the history of Marine Aviation." He noted that the HMM squadrons that participated in the operation "paved the way for other Marine helicopter squadrons to further develop many of the tactics, techniques, and procedures in use by Marine aviation units today."[84]

2.2.2.2 Middle of War (1965–1968)

Operation Shufly was replaced by Marine Unit Vietnam as the US involvement in the war intensified. After three years in a support and advisory role, US troops mission would change to that of combat. The first US ground troops explicitly deployed for combat missions in Vietnam were US Marines.

The escalation of US military involvement in the Vietnam War was most dramatically symbolized by the deployment of ground troops to South Vietnam in 1965. It became clear to US military leaders that the airfields and naval facilities the US military was using were under threat from Viet Cong and North Vietnamese units. This was especially apparent in the northern part of South Vietnam. President Johnson, therefore, ordered the deployment of 3,500 Marines to Da Nang. The deployment, which was authorized

[82] Fails, *Marines and Helicopters*, 82.

[83] Ibid., 82.

[84] General James F. Amos, US Marine Corps, "A Message from the Commandant of the Marine Corps," no date, Folder 01, Box 01, Harry R. Mills Collection, the Vietnam Center and Archive, Texas Tech University.

on February 26, 1965, consisted of two Marine landing teams, a medium helicopter squadron (HMM-163), and headquarters elements of the 9th Marine Expeditionary Brigade. The soldiers, which were the first US combat troops deployed to the war in Southeast Asia, were initially tasked with the protection of US interests in Vietnam. They arrived in Da Nang in March 1965.[85]

Marine Observation Squadron (VMO) 2 accompanied the 9th Marine Expeditionary Brigade. The observation squadron performed a diversity of combat missions, including evacuation, visual reconnaissance, armed escort for the HMM transports, artillery spotting, and pathfinder assistance. The helicopters also served as airborne tactical air controllers for fixed-wing aircraft. Noncombat missions primarily consisted of liaison services for field commanders and visiting dignitaries. The VMO squadron flew the UH-1E, a new Marine version of the venerable Huey helicopter. The UH-1E, the Marine Corps first armed helicopter, was typically equipped with four side-mounted M60C machine guns and two bomb racks with 2.75-inch rocket pods.[86] The arming of helicopters represents an important evolution of their use in combat zones. All helicopter development and testing for both the Marine Corps and Navy occurred at Patuxent Naval Air Station in Maryland.

Escalation continued from the initial landing of the 9th Marine Expeditionary Brigade. HMM-161 was deployed from Kaneohe to Phu Bai, 40 miles north of Da Nang, on June 12, 1965. Shortly thereafter, HMM-261 arrived at Da Nang from New River on June 21. Meanwhile, HMM-361 was en route from Santa Ana to Futenma, Japan, before eventually arriving in Vietnam.[87] The HMM squadrons continued their transport mission in much the same manner as they did during *Operation Shufly*. The squadrons were still flying the UH-34s in 1965.

President Johnson's decision, in the summer of 1965, to commit more troops to Vietnam resulted in the deployment of additional Marine Corps helicopter squadrons. The USS *Princeton* left Long Beach, California, for Southeast Asia on August 11, 1965. The ship was laden with helicopters. HMM-362, HMM-363, and HMM-364 were onboard. Each squadron had 24 UH-34s. There was also a Marine Observation Squadron (VMO-6) on the ship with its 27 UH-1Es. Finally, an additional six CH-37s and crews assigned to the Headquarters and Maintenance Squadron were onboard. The ship arrived at Da Nang in early September.[88]

Marine Corps helicopters played a significant role in many major battles. For example, helicopters from HMM-163 and VMO-2 participated in the Battle of A Shau Valley in early 1966. The US Army Special Forces had several encampments along the South Vietnam-Laotian border from which they monitored the movements of North Vietnamese attempting to cross into South Vietnam from Laos. One of these camps in the A Shau Valley came under attack at 2:00 a.m. on March 9. Two US and eight South Vietnamese soldiers died in the attack, 60 more soldiers (30 American and 30 South Vietnamese) were injured. The Army called for Marine Corps and Chinese Nung reinforcements, medevac, and airstrikes, but weather conditions precluded any immediate action. Sporadic fighting, with limited air support, continued through the day and intensified in the early morning of March 10 when the Viet Cong attacked the encampment again. This time they breeched the walls of the fortification. US Special Forces and Nung volunteers fought off the attackers, but were now confined to the northern portion of their compound. Air support finally became more regular by mid-morning on March 10, although still undermined by weather

[85] Edward J. Marolda and G. Wesley Pryce III, *A Short History of the United States Navy and the Southeast Asian Conflict: 1950–1975* (Washington, DC: Navy Historical Center Department of the Navy 1984) 26.

[86] VMO-2 In Action [Command Chronology], 1965–1966, Folder 069, US Marine Corps History Division Vietnam War Documents Collection, the Vietnam Center and Archive, Texas Tech University; Dunstan, *Vietnam Choppers*, 180, 181; Boyne, *How The Helicopter Changed Modern Warfare,* 134, 135.

[87] Parker, *A History of Marine Medium Helicopter Squadron 161*, 21, 22; Fails, *Marines and Helicopters*, 92.

[88] Fails, *Marines and Helicopters,* 92; VMO-2 In Action [Command Chronology], 1965–1966.

conditions. Meanwhile, conditions were becoming desperate on the ground. The 380-man encampment could not withstand the attacks from three regiments of Viet Cong, and by the evening of March 10 evacuated A Shau. Helicopters from HMM-163 and VMO-2 dispatched to the battle to airlift survivors and casualties from the valley in deteriorating weather. The Marines transported 17 (5 dead and 12 wounded) US Special Forces and 172 Vietnamese to safety. The mission was not without tragedy. One of the HMM-163 helicopters crashed during the operation and all four crewmen were listed as missing in action.[89] This was the first of many daring rescues in which Marine helicopter crews participated.

Another helicopter squadron (HMM-164) arrived in Vietnam in March 1966. The squadron, most recently based at MCAS El Toro, arrived at the Marble Mountain Air Facility with 27 new CH-46 "Sea Knight" helicopters. These helicopters represented a significant evolution in helicopter technology. Unlike the piston-powered UH-34s, the CH-46s were turbine powered. The turbine engines represented a major advance in performance over the piston engines—they were significantly lighter and more powerful. These positive improvements in power-to-weight meant that the helicopters had additional lift.[90]

As was the case with the arrival of the UH-34s during *Operation Shufly*, unexpected problems arose with the CH-46 helicopters. When flying close to the ground, the large rotor blades whipped up debris, which was drawn into the aircraft engines causing damage. The fine abrasive dust in Vietnam also damaged rotor blades and entered fuel lines causing erratic performance. Necessary modifications reduced the performance of the CH-46 helicopters. Additional armor was installed to protect pilots and vulnerable helicopter components, and the helicopters were retrofitted with armaments. The modifications, coupled with the environmental challenges of Vietnam, reduced the airlift capacity of the helicopters. The UH-34 remained the primary troop lift helicopter throughout 1966.[91]

Even with their limitations, the CH-46s were rapidly replacing the UH-34s by 1966. HMM-265 arrived at Marble Mountain from Norfolk, Virginia, in May 1966. The squadron had 22 CH-46 helicopters. There were two more CH-46 squadrons at Ky Ha, near Chu Lai, by the end of 1966. HMM-165 arrived from MCAS Santa Ana in September and HMM-262 arrived from MCAS New River in December. The CH-46 squadrons did not supplant the UH-34 squadrons, which continued to operate in Vietnam. The CH-34s were initially much more dependable than the CH-46s, which were grounded twice in 1966 and 1967.

The Marine Corps did not have a reasonable heavy-lift helicopter in the early part of the war. The CH-37 "Deuce," a heavy-lift helicopter, was introduced in 1957, but had always been problematic. It never met the expectations of Marine Corps planners who hoped it would become a cornerstone of vertical troop and material lift for massive amphibious landings. The six CH-37s that arrived in Vietnam with the Headquarters and Maintenance Squadron were not acceptable for such missions, but they did find a role in Vietnam for the retrieval of downed helicopters. A Deuce performed the first helio-lift of a downed aircraft in a tactical situation on September 15, 1965, when a CH-37 retrieved a disabled Marine helicopter from an area near Chu Lai and carried it back to the airfield. This became a standard role for the notoriously temperamental CH-37s, until they were replaced by a new helicopter.[92]

The development of a new Sikorsky heavy-lift helicopter became a major objective for the Marine Corps and Navy in the early 1960s. The testing and modification of the Sikorsky CH-53 "Sea Stallion" for use in Vietnam became a major priority at Patuxent River NAS in 1966. The CH-53 was designed as an

[89] Kenneth Sams, "The Fall of A Shau: Project CHECO Report," April 18, 1966, accessed February 12, 2015, available from the National Museum of the Air Force, http://www.nationalmuseum.af.mil/shared/media/document/AFD-060629-001.pdf.

[90] Fails, *Marines and Helicopters*, 42.

[91] Dunstan, *Vietnam Choppers*, 180, 181.

[92] Fails, *Marines and Helicopters*, 97.

assault transport helicopter capable of carrying cargo and troops. The helicopter had a seating potential for 38 soldiers and their equipment. The chopper, when modified for medevac, could hold 24 litters and seats for medics. The real value of the helicopter to the Marines, however, was that it could lift 20,000 pounds with its external cargo hook, which allowed the use of the aircraft for retrieval of downed or damaged equipment. Lessons learned from the deployment of the CH-46 helicopters resulted in modifications to the CH-53 that included the addition of integrated protective armor and dust filters.[93]

The CH-53 was ready for use in Vietnam by the end of 1966 and Detachment Alpha from the Marine Heavy Lift Helicopter (HMH) Squadron 463 arrived at Marble Mountain (from MCAS Santa Ana) in January 1967 with six CH-53As. The usefulness of the CH-53 quickly became apparent. Military historian, Simon Dunstan, describes a typical Marine Corps CH-53 mission as one that combined all the capabilities in which the helicopter carried "a disabled UH-34 externally, a transmission for it and its crew internally, together with a wounded medical evacuation patient, several passengers, and hundreds of pounds of cargo." HMH-463 was operating 36 CH-53As in Vietnam by the end of 1967. During their first year of use, the Sea Stallions retrieved more than 300 downed helicopters, and between May and December transported nearly 75% of Marine Corps cargo and personnel.[94]

By 1967, the Marine Corps were using helicopters for five general-type missions. Choppers provided the tactical airlift of troops, insertion and retrieval of reconnaissance teams, supply, recovery of downed aircraft, and, most perilous, search and rescue/medical evacuation. Except for heavy lift, there was no clear mission demarcation between various aircraft and squadrons. Typically, whoever or whatever helicopter was available at any given time was used.

Marine helicopters played a pivotal role in the battle of Khe Sanh (a week-long North Vietnamese assault on a garrison of 6,000 Marines and South Vietnamese Rangers at Khe Sanh Combat Base). The assault began in late 1967 and the base was completely cut off by the beginning of 1968. All supplies had to be airlifted onto the base by helicopters, including the CH-46s of HMM-364 and HMM-262. This was not without cost. The Marines continued providing airlift support until the Army's 1st Cavalry (Airmobile) relieved them on April 6, 1968. Khe Sanh was a dramatic portion of a busy year for Marine Corps helicopters. Air crews flew 639,194 sorties during 1968, which was almost twice as many as they flew the year before (388,000).[95] HMM-362, the first Marine Corps helicopter squadron to serve in Vietnam (*Operation Shufly*), left the country in October 1968. The squadron was based on the USS *Okinawa* until the spring of 1969 when they returned to the United States (MCAS New River) and were redesigned HMH-362.[96]

[93] Dunstan, *Vietnam Choppers*, 184; Fails, *Marines and Helicopters*, 97.

[94] Dunstan, *Vietnam Choppers*, 185, 186.

[95] Ibid., 190, 192.

[96] USMC Combat Helicopter Pilots Association, "Order of Battle," no date, accessed March 13, 2015, available at http://www.popasmoke.com/vw-order-of-battle.

Source: Glenn Helm Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 2-7. NAVY UH-1B GUNSHIP

2.2.2.3 End of War (1969–1975)

The Marine Corps' 270 Helicopters were concentrated in three areas at the beginning of 1969. Marine Light Helicopter Squadron (HML)-167, HMM-164, HMM-165, HMM-364, HMM-263, HMH-463, and VMO-2 were all based at the Marble Mountain Air Facility. HML-167, which was commissioned at Marble Mountain in April 1968, was the newest of the squadrons. The Marine Corps helicopter resources at Marble Mountain Air Facility consisted of the UH-1E, CH-46A, CH-46D, and CH-53A. Another four helicopter squadrons were based at Phu Bai Airfield. They included one heavy (HMH-452), one light (HML-367), and two medium (HMM-265 and HMM-363) squadrons. HML-367 was commissioned in Vietnam in March 1968. HMH-462 arrived in Vietnam in August 1968 from their home base MCAS Santa Ana. The Phu Bai squadrons flew the UH-1E, CH-53A, CH-46D, and CH-34D. Finally, three squadrons, HMM-262, HMM-161, and VMO-6, were concentrated at Quang Tri. Like the rest of the Marine Corps squadrons, they flew UH-1Es, CH-46As, and CH-46Ds.[97]

[97] Charles R. Smith, *U.S. Marines in Vietnam: High Mobility and Stand Down 1969* (Washington, DC: History and Museum Division Headquarters, U.S. Marine Corps, 1988) 220; Parker, *A History of Marine Medium Helicopter Squadron 161*, 31.

The advancement of Marine Corps helicopter technology continued in 1969 as it had since *Operation Shufly*. This was most vividly demonstrated when the Marine Corps finally received their first assault helicopters when VMO-6 acquired four AH-1G Cobras in April 1969. VMO-2 briefly flew the Cobras before transitioning to OV-10A Bronco fixed-wing aircraft by the end of the year. The HML-367 adopted the Cobras in 1969. The squadrons were flying 21 of the helicopters by December 1969. The Cobras replaced the UH-1Es flown by the squadrons before acquiring the new aircraft. The Cobras were used in two general ways—serving as escorts for medical evacuation, search and rescue, and reconnaissance missions; and strike and fire suppression missions.[98]

President Nixon's troop drawdowns began affecting the Marine Corps helicopter squadrons in August 1969 when HMM-165 left Vietnam for Twentynine Palms, California. Another withdrawal occurred in October when VMO-6 and HMH-462 left Vietnam for Okinawa. HMM-363 also left Vietnam in late 1969 and returned to the United States. The drawdowns resulted in reassignments concentrating most Marine Corps helicopter units at Marble Mountain Air Facility, Quang Nam Province (southeast of Da Nang Air Base) by December 1969. The only exceptions were HMH-361,[99] HMM-161, HMM-262, and HML-167 located at Phu Bai. The force reduction did not significantly reduce the number of Marine Corps helicopters, with 217 USMC helicopters remaining in Vietnam until 1970. Twenty-eight of the aircraft were the newly acquired AH-1G Cobras, but the most common helicopter by far was the CH-46D, the cornerstone of Marine Corps transport operations. The reduction in troops did not mean the helicopter crews were idle—flying nearly 548,000 sorties in 1969. The transport squadrons carried 895,000 troops and 115,000 tons of equipment into and out of combat areas.[100]

Marine Corps rotary-wing assets were not used in the Cambodian incursion. Rather, they were focused on the continuing role as combat troop support. The helicopter squadrons flew almost 31,000 sorties in January 1970. These sorties included troop transport, cargo lift, gunship, and command and control missions for US Marines and South Vietnamese and Korean Marines. Except for a temporary increase during the summer, helicopter sorties averaged about 30,000 per month for much of the year.[101] Helicopter use began to drop off, however, by the end of the year when monthly sorties dropped below 25,000. This trend continued into 1971.

The majority of Marine Corps troops redeployed out of Vietnam in 1970 and 1971. This resulted in a reduced need for helicopter support, which led to the redeployment of helicopter squadrons to locations outside Vietnam. The process began slowly. In January 1970, there were nine Marine Corps helicopter squadrons in Vietnam. This, however, was short-lived. HMH-361 left Vietnam for MCAS Santa Ana in February 1970, leaving only one heavy-lift squadron (HMH-463) in Vietnam. HMM-161 stood down in July 1970 and returned to the United States (MCAS Santa Ana) in August. There was a hiatus in redeployments until the spring of 1971 when the drawdown of troops increased considerably. HMM-364, one of the first Marine Corps helicopter squadrons to serve in Vietnam (during *Operation Shufly*), was decommissioned in Vietnam on March 22, 1971. Another medium-lift squadron (HMM-263) left Vietnam for Quantico, Virginia, in April 1971. The squadron arrived in Vietnam from Santa Ana in January 1969, but had previously served in Southeast Asia from 1965 to 1967. One month later, there was a wholesale redeployment of Marine Corps helicopter squadrons. HMH-463 and HMM-262 transferred to Kaneohe Bay, Hawaii, in May. HMM-262 and HML-167 also left Vietnam in May for MCAS New

[98] Smith, *U.S. Marines 1969*, 227.

[99] HMH-361 was the redesignated version of HMM-361, which had previously served in Vietnam (1965–1968). HMH-361 arrived in Vietnam from New River, North Carolina, in August 1969.

[100] Graham A. Cosmas and Terrence P. Murray, *U.S. Marines in Vietnam: Vietnamization and Redeployment 1970–1971* (Washington, DC: History and Museum Division Headquarters, U.S. Marine Corps, 1986) 288; Smith, *U.S. Marines 1969, 223,* 239.

[101] Cosmas and Terrence P. Murray, *U.S. Marines in Vietnam 1970–1971*, 291, 292.

River, North Carolina. The last Marine Corps helicopter squadron in Vietnam (HML-367) left for Okinawa, Japan, in June 1971.[102]

The troop drawdowns occurred in the midst of the last major Marine Corps helicopter combat operation. Two US Marine Corps helicopter squadrons (HMH-463 and HML-367) provided significant support to troops participating in Lam Son 719 in early 1971. The heavy-lift CH-53s transported everything from bulldozers and howitzers to ammunition and supplies for firebases in Laos. HML-367 Cobras and AH-1J Sea Cobras provided indispensable gunship escorts for the transport helicopters. The Marine Corps helicopters flew deeper and deeper into Laos as the campaign wore on into early March 1971. Ultimately, HMH-463 helicopters flew nearly 3,000 sorties during Lam Son 719. They delivered over 6,500 tons of cargo and transported 2,500 passengers. Marine Corps Cobras flew 1,900 escort sorties. These figures are rather modest compared to the US Army's 46,000 sorties flown during Lam Son; however, the Army had hundreds of helicopters at its disposal. HMH-463 and HML-367 had less than 50 helicopters. More important than the numbers of sorties flown is the fact that the CH-53s provided a heavy-lift capability that the Army did not have at the time.[103]

Marine Corps helicopters returned to Southeast Asia in the spring of 1972. There were three ship-based helicopter squadrons in the Gulf of Tonkin by May 1972. HMM-164 and HMM-165 was aboard the Navy amphibious assault ships USS *Okinawa* and USS *Tripoli*. The squadrons had an assortment of transport helicopters, including the UH-1E, CH-53D, and CH-46D. A detachment of HML-376s was also based on the USS *Tripoli*. The squadrons supported search and rescue and combat operations off the coast of Vietnam. Finally, HMA-369 (Marine Attack Helicopter Squadron) was based on the USS *Denver* an amphibious transport dock. The newly commissioned squadron, which flew the AH-1J Sea Cobras, patrolled the Gulf of Tonkin near North Vietnam to intercept shipments to North Vietnam from China and the Soviet Union.[104] These operations continued until January 1973.

Although the Vietnam War officially ended in early 1973, Marine Corps helicopter squadrons remained active in the Gulf of Tonkin. Several squadrons took part in *Operation End Sweep* between January and July 1973. The operation, which was dictated by the Paris Peace Accords, was an effort to remove or neutralize the thousands of mines that the US Navy and Marine Corps had placed in North Vietnamese harbors in 1972. Detachments from HMH-463, HMH-462, HMM-164, and HMM-165 assisted Navy minesweepers during the operation.[105]

Marine Corps helicopters left the Vietnam area after *Operation End Sweep*, only to return one last time in early 1975 when they took part in two evacuation operations: *Operation Eagle Pull* and *Operation Frequent Wind*.

Cambodia's long-running civil war reached a critical point in early 1975. The US-supported Khmer Republic was on the verge of collapse. Indeed, the Khmer Rouge controlled most of the country. The last Khmer Republic stronghold (Phnom Penh) was completely isolated. The United States, therefore, initiated *Operation Eagle Pull*. Preparations began in January 1975. Several Marine Corps helicopter squadrons (HMM-164, HMM-165, HMH-462, HMH-463, HML-367, HMA-369) arrived in Southeast Asia aboard the four Navy ships (USS *Okinawa*, USS *Hancock*, USS *Dubuque, and* USS *Denver)* in

[102] Parker, *A History of Marine Medium Helicopter Squadron 161*, 36; "Order of Battle" http://www.popasmoke.com/vw-order-of-battle. Accessed March 13, 2015.

[103] Cosmas and Terrence P. Murray, *U.S. Marines in Vietnam 1970–1971*, 202–205.

[104] Charles D Melson and Curtis G. Arnold, *U.S. Marines in Vietnam: The War That Would Not End 1971–1973* (Washington, DC: History and Museum Division Headquarters, U.S. Marine Corps 1991) 30; "Order of Battle."

[105] Operation End Sweep, February 7, 1973, Folder 15, Box 08, Glenn Helm Collection, the Vietnam Center and Archive, Texas Tech University; Melson and Arnold, *U.S. Marines in Vietnam 1971–1973*, 237.

April 1975. Once in position, they began a helicopter-based evacuation of US citizens and refugees from Phnom Penh. Helicopters from HMH-462 and HMH-463 began flying into Phnom Penh in the early morning hours of April 12, 1975. The operation only lasted about five hours, but the air crews evacuated 590 people (146 Americans and 444 Cambodians).[106]

Operation Eagle Pull served as a prelude to a larger, more complex evacuation operation just a few weeks later. South Vietnam was in a similar situation as Cambodia. The North Vietnamese and Viet Cong launched an ambitious offensive in early 1975. They quickly and relatively easily advanced to the edge of Saigon. This led to instability and the South Vietnamese government was on the verge of collapse in late April. As a result, the United States implemented an existing evacuation plan known as *Operation Frequent Wind*, on April 29 and 30, 1975. Essentially, an embassy evacuation mission, *Operation Frequent Wind*, quickly became a larger operation as South Vietnamese, clamoring for escape from Saigon, overwhelmed Marine Corps helicopters from HMM-165, HMM-164, HMH-462, and HMH-463. As a result, the operation expanded to include refugees. In the end, the US military helicopters ferried over 1,300 Americans and nearly 6,000 Vietnamese (and other foreign) evacuees.[107] *Operation Frequent Wind* dramatically marked the end of US involvement in Vietnam. Helicopters landing on the embassy roof provide an indelible graphic conclusion to the war (figure 2-8).

2.2.3 US Navy

2.2.3.1 Early War (1961–1964)

US Navy aviation had a limited role in the early part of the Vietnam War. Conversely, Navy ships assigned to the 7th Fleet played a pivotal role in bringing US aircraft to South Vietnam. This is especially true for helicopters. The Navy ships transported helicopters and their crew throughout the war. The USNS *Core* transported CH-21 helicopters and men of the US Army's 8th and 57th Transportation Companies up the Mekong River toward Saigon in December 1961 for the beginning of Operation *Chopper. One* month later, the USNS *Card* delivered US Army aviators and helicopters to Da Nang. The deployment of the Marine Corps to Soc Trang was facilitated by the USS *Princeton*.[108]

The USS *Princeton* was a World War II-era Essex Class aircraft carrier that was converted into an amphibious assault ship (helicopter) (LPH) in 1959. While the ship, in its original configuration, had an adequate landing zone for helicopters, it underwent some limited modifications, including the removal of most guns and radar and the expansion of storage and berthing space. Three other Essex Class aircraft carriers were similarly modified and converted to amphibious assault ships in the late 1950s and early 1960s. Of these, the USS *Valley Forge* and USS *Boxer* participated in the Vietnam War—the fourth ship, USS *Thetis Bay*, did not.[109]

[106] George R. Dunham and David A. Quinlan, *U.S. Marines in Vietnam: The Bitter End 1973–1975* (Washington, DC: History and Museum Division Headquarters, U.S. Marine Corps 1990) 106, 120, 121.

[107] Dunham and Quinlan, *US Marines in Vietnam: 1973–1975*, 178–202.

[108] Edward J. Marolda, *The Approaching Storm: Conflict in Asia 1945–1965* (Washington, DC: Government Printing Office 2009) 54.

[109] "LPH-4: Boxer Class," no date, accessed March 19, 2015, available at http://www.globalsecurity.org/military/systems/ship/lph-4.htm.

Source: usnews.com

FIGURE 2-8. FALL OF SAIGON

Helicopters operated from the destroyers and aircraft carriers of the US 7th Fleet. Divisions of Helicopter Squadron 1 (HU-1) were assigned to various ships patrolling the waters off Vietnam, including the USS *Kitty Hawk,* USS *Oriskany,* USS *Bon Homme Richard,* and USS *Ticonderoga.* They flew various helicopters, including the UH-46, UH-2A, and SH-3. The airmen, based at NAS Miramar when in the United States, performed search and rescue operations, transport, observation, and other duties in support of naval operations. Navy helicopters also evacuated US noncombatants from Saigon in November 1963 when the political unrest erupted in that city after the overthrow of the Diem government.[110] However, complete Navy helicopter squadrons were not deployed in the early part of the Vietnam War.

2.2.3.2 Middle of War (1965–1968)

Navy helicopters were well-integrated into the operations of the US 7th Fleet by 1965. This integration continued as they filled important support roles during the middle of the Vietnam War. As was the case prior to 1965, ship-based helicopters provided search and rescue services. This became more important after 1965 when Navy pilots were operating more overtly in enemy territory where, if an aircraft crashed, the danger of capture was significant. Helicopters retrieved pilots from both the sea and enemy territory. Navy helicopters also continued to transport ammunition and supplies from ships to the troops. Finally, the helicopters transported Marine Corps soldiers.

[110] USN 1963–1975 Order of Battle for Carrier Forces in WESTPAC/VIETNAM – Carrier Deployments by year, Undated, Folder 01, Bud Harton Collection, the Vietnam Center and Archive, Texas Tech University; Edward J. Marolda and G. Wesley Pryce III, *A Short History of the United States Navy and the Southeast Asian Conflict: 1950–1975* (Washington, DC: Navy Historical Center Department of the Navy, 1984) 15.

Source: US Information Agency: National Archives at College Park (photographer unknown)

FIGURE 2-9. MOMENTS BEFORE THE US FLAG WAS REPLACED BY THE VIETNAMESE FLAG, VIETNAMESE AIR FORCE CREWMEN LINE UP BEFORE ONE OF THE 62 UH-1 "HUEY" HELICOPTERS TURNED OVER TO THEM NOVEMBER 4, 1970, ALONG WITH COMMAND OF SOC TRANG AIRFIELD

The Navy's landing platform helicopter (LPH) class ships served a pivotal role as both seaborne helicopter bases and transport vessels for squadrons that were based in South Vietnam. Initially, the converted Essex Class aircraft carriers performed these duties. The first purposely built amphibious assault ship (helicopter) was the USS *Iwo Jima*. Commissioned in 1961, the ship first served in Southeast Asia in 1965 when it transported the components of the Army's 173rd Airborne Brigade to Vietnam. The ship also helped facilitate the deployment of the Army's 1st Cavalry later in the year. Three more newly constructed LPH class vessels served in Vietnam. These were the USS *Okinawa,* USS *Tripoli*, and USS *New Orleans.*

The US 7th Fleet continued operations in the Gulf of Tonkin and nearby waters after the escalation of the Vietnam War. The Fleet's cruiser and destroyer units bombarded enemy watercraft and North Vietnamese targets ashore. The ships also provided naval gunfire support to allied forces in South Vietnam. The escalation of the war resulted in an intensification of the air war. The fixed-wing aircraft of the Navy's Attack Carrier Striking Force (Task Force 77) played a significant role. The Task Force, which operated outside South Vietnam, conducted bombing campaigns in Laos and North Vietnam.[111]

Helicopters played a major support role in Task Force 77 operations. Three antisubmarine squadrons, the HS-1 (based at NAS Key West), HS-6 (based at NAS Imperial Beach), and HS-4 (based at NAS Imperial Beach) were pressed into service in 1965 to perform search and rescue (SAR) operations. The squadrons were organized into two SAR units (as part of the existing HU-1) based in the northern and southern ends of the Gulf of Tonkin. These units supplemented existing carrier-based SAR capabilities. Each SAR base consisted of two destroyers equipped with specially modified UH-2 Seasprite helicopters. The helicopters had self-sealing fuel tanks, machine guns, and armor to facilitate rescue operations in enemy territory. Carriers operating throughout the Vietnam region also had armed and armored rescue helicopters, including SH-1A Sea Kings and unconfigured UH-2s, onboard.[112]

The Navy SAR units were very effective. Between June 1964 and November 1968, they recovered 458 of the 912 air crewmen downed at sea or inland in North Vietnam and Laos. Seaborne rescues typically occurred within 30 minutes of the crash. Inland rescues were more complicated and typically took longer.

[111] Marolda and Pryce III, *A Short History of the United States Navy*, 27.

[112] Ibid., 29, 30.

The rescues were not without considerable risk. Twenty-six rescuers were injured, killed, or captured in the process of retrieving downed airmen.[113]

A second group, activated in 1965 (the Amphibious Force – Task Force 76), began conducting amphibious landings. Marine units attached to Task Force 76 used Navy helicopters to land on beaches and to search for Viet Cong guerillas in South Vietnam. These missions continued throughout the war. Task Force 76, however, would undertake its most visible mission in April 1975 when they evacuated thousands of people from Saigon after the city fell to the North Vietnamese.

Source: Brigadier General Edwin H. Simmons Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 2-10. MARINES DASH TO THEIR HELICOPTERS ABOARD THE AMPHIBIOUS ASSAULT SHIP USS *IWO JIMA* BEFORE TAKING OFF FOR THEIR PART OF AN AIR-SEA LANDING ON A BEACH IN VIETNAM

The establishment of Task Force 77 and Task Force 76 illustrates the increasing complexity of the war and the escalation of US involvement in Vietnam. These trends resulted in the reorganization of HU-1. The squadron, which was designated Helicopter Combat Support Squadron 1 (HC-1) in 1965, initially had a broad range of duties. Detachments supported aircraft carriers and logistics support ships and conducted SAR, minesweeping, and helicopter gunship operations. It quickly became clear that the diverse range of missions was becoming unwieldy for a single squadron so HC-1 was divided into

[113] Marolda and Pryce III, *A Short History of the United States Navy*, 30.

separate squadrons. HC-1 retained its traditional mission performing open-water search and rescue services from aircraft carriers. Detachments performing overland search and rescue and minesweeping operations were organized into Helicopter Combat Support Squadron 7 (HC-7) in September 1967. Search and rescue missions were the cornerstone of HC-7 operations.

The squadron used UH-2As for these missions at the beginning of their deployment, but transitioned to HH-2Cs and HH-3s as the conflict progressed. The latter helicopters reflect a combat-driven evolution of Navy rotary-wing aircraft. The newer helicopters had better armaments, armor, and more power than the venerable UH-2s. In addition to harrowing search and rescue missions, HC-7 operated in other innovative capacities. They used specially modified H-3 Sea King helicopters to conduct minesweeping operations off the Vietnamese coast. The squadron also participated in combat support missions. In this capacity, they experimented with UH-46As and refined a technique known as vertical replenishment in which helicopters were used to quickly transfer cargo between ships. Vertical replenishment allowed ships to sustain extended operations at sea.[114]

The Navy did not limit their activities to the sea. Navy leadership established the River Patrol Force (Task Force 116) on December 18, 1965. Task Force 116 crews arrived in Vietnam from San Diego in March 1965. They were organized into River Patrol Squadron 5. The primary mission of the river patrol squadron was to participate in *Operation Game Warden*, an effort to keep the Mekong Delta waterways out of Viet Cong control. The squadron consisted of five divisions, each with their own support ship (LST). The ships were modified to provide a floating base for the river patrol unit and a helicopter detachment.[115]

Helicopters played a pivotal role in *Operation Game Warden*. Initially, the Army deployed two detachments of UH-1B Iroquois helicopters and their crew to support river patrol missions. This arrangement lasted until August 1966, when elements of HC-1 assumed patrol support duties. This arrangement lasted until April 1967, when four detachments of HC-1 were organized into Helicopter Attack (Light) Squadron 3 (HAL-3). The squadron, equipped with 25 UH-1B gunships acquired from the Army performed aerial fire support, observation, and medical evacuation missions in support of *Operation Game Warden*. They also performed interdiction missions in an attempt to stem the flow of arms across the Cambodian border. The helicopter squadron, which was divided into two detachments, had 421 men by September 1968.[116]

2.2.3.3 End of War (1969–1975)

The last years of the Vietnam War represented considerable continuity for the Navy's helicopter squadrons. HAL-3 continued focusing their operations in the Mekong Delta region in support of US Navy forces in the area. However, the squadron's capabilities and responsibilities expanded in 1969 and 1970. First, they assumed additional responsibilities. In addition to aerial fire support, observation, and medical evacuation, they began performing liaison, transport, and courier duties. The squadron also benefited from the Army's adoption of new aircraft. They received more UH-1Bs in 1969 after Army units adopted the Cobra. They also received two limited-production Hueys in 1970 (the UH-1L and the HH-1K). By the end of 1970, the squadron had 35 helicopters (27 UH-1Bs, 2 UH-1Cs, 4 UH-1Ls, 2 HH-1Ks) at their disposal.[117] The growth of the squadron resulted in its reorganization into nine detachments.

[114] Smith, ed. *US Navy Air Power* 233, 234.

[115] Marolda and Pryce III, *A Short History of the United States Navy*, 50, 51.

[116] Smith, ed. *US Navy Air Power*, 234; Marolda and Pryce III, *A Short History of the United States Navy*, 51, 52.

[117] Dunstan, *Vietnam Choppers*, 160.

HAL-3 helicopters were busy in 1970 and 1971. The helicopters served as airborne command posts, supported Navy SEAL operations, delivered cargo, provided general logistical support, and gunship escort. Their activities were not limited to the delta. Detachments from the squadron also participated in the Cambodian incursion in May and June 1970. The Navy helicopter crews also increased their support of South Vietnamese troops in 1970. Vietnamese interpreters often flew with Navy crews.[118]

It was clear by 1971, that the US presence in Vietnam was coming to an end and, like other branches of the military, the Navy wanted to ensure that its helicopter capabilities would be passed on to the South Vietnamese. To this end, Vietnamese Air Force personnel were officially assigned to HAL-3 detachments as trainees. The hope was that the Vietnamese Air Force could continue the HAL-3 missions using the bases and aircraft provided by the United States after the squadron was decommissioned in January 1972.[119]

The ship-based SAR units (HC-7) were also affected by drawdowns that began in 1969. Two detachments of HC-7 were deactivated in 1970. Nine more detachments ended their Vietnam War duties in 1971. The last of the Navy's ship-based SAR units, Detachment 110, remained active until 1975. The detachment continued to support ship-based operations in the Gulf of Tonkin.[120]

The US Navy established a new helicopter squadron at Norfolk NAS in 1971. Helicopter Mine Countermeasures Squadron (HM)-12 was the first airborne global quick response mine countermeasures team. HM-12 was equipped and prepared to travel to any place on the globe within a few hours' notice. The air crews flew specially modified CH-53As that towed minesweeping devices (Mark 105 Magnetic Hydrofoil Sled, Mark 104 Acoustic Device, and other devices) that were able to neutralize mines from a safe distance. HM-12 was deployed to Southeast Asia for *Operation End Sweep* in November 1972. HM-12 helicopters and crews began minesweeping operations in North Vietnamese waters in February 1973.[121] HM-12 and the Marine Corps helicopter squadrons assisting the minesweeping effort spent 2,000 hours towing minesweeping devices in the five months of *Operation End Sweep*. HM-12 returned to its home base at Norfolk, Virginia, after the conclusion of *Operation End Sweep* in July 1973.

Operation End Sweep was the last Vietnam War mission that included Navy helicopters. The Navy's Task Force 76 provided naval support for *Operation Eagle Pull* and *Operation Frequent Wind*. However, no Navy helicopters took part in the actual evacuations.

2.2.4 US Air Force

2.2.4.1 Early War (1961–1964)

Direct USAF participation in the Vietnam region began in 1961. Air Force leadership ordered the establishment of a new squadron, the 4400th Combat Crew Training Squadron, on April 14, 1961. Code named Jungle Jim, the squadron was tasked with covertly training South Vietnamese aviators using World War II-era fixed-wing aircraft (C-47, B-26, T-28). Initially, there were plans to use helicopters, but

[118] Ibid., 161, 162.

[119] No Author, "Helicopter Attack (Light) Squadron-3: The Sea Wolves: Past . . . Present . . . Future. . . ?," December 1, 1971, accessed March 17, 2015, available at http://www.seawolf.org/history/pastpresentfuture.pdf.

[120] Mark Morgan "Launch: The Story of HC-7/CSAR, Orphans of the 7th Fleet," *The Hook* (Summer 1988) 34, 37.

[121] Operation End Sweep, February 7, 1973, Folder 15, Box 08, Glenn Helm Collection, the Vietnam Center and Archive, Texas Tech University.

ultimately this component fell to the US Army and Marine Corps. Nonetheless, the Jungle Jim Squadron used their experience in Vietnam to develop improved techniques for escort helicopters to carry Vietnamese troops.[122]

The squadron, which did not have a combat mission, was deployed in October 1961. Their aircraft were painted to match the insignia of the South Vietnamese Air Force and the airmen wore simple uniforms and carried nothing that might identify them as Americans. The airmen entered South Vietnam under the pretense of providing aid to flooded villages in the Mekong Delta. Once in Vietnam, they were expressly ordered to keep a low profile and avoid the press.

Known as *Operation Farm Gate*, the Jungle Jim Squadron's activities in South Vietnam were supposed to be confined to training the South Vietnamese Air Force. It quickly became apparent, however, that the Vietnamese Air Force was overwhelmed, and the airmen found themselves flying into combat situations before the end of 1962. It was during this period that the US Air Force began using napalm against insurgents.[123]

Another Air Force unit, 2d ADVON (advanced echelon) was deployed to Vietnam and established at Tan Son Nhut Airport near Saigon in the fall of 1961. They supported *Operation Farm Gate* by providing reconnaissance and collecting intelligence, again under the guise of humanitarian relief on the Mekong Delta. Moreover, a contingent of five men arrived at Tan Son Nhut Airport where they established Detachment 3 (Pacific Air Rescue Center) a command and control center for search and rescue operations for downed aircraft in Southeast Asia. The detachment was hamstrung by the fact that there were no dedicated search and rescue units in Southeast Asia. When called upon, they had to cobble together available resources from the US Army, Air Force, Marine Corps, and South Vietnamese Air Force.[124]

The US Air Force presence increased in January when two new squadrons arrived at Tan Son Nhut. The first, nicknamed Mule Train, consisted of 16 C-123 TAC transport aircraft and 123 men who performed airlift operations for US Special Forces, air dropped supplies, and trained South Vietnamese airmen. The second squadron was composed of 69 men and six C-123s. Known as Ranch Hand, the unit was tasked with the application of defoliants to open up the jungle canopy. Finally, the Air Force sent SC-47s to Tan Son Nhut. The aircraft were equipped with loudspeakers and the capability of spreading leaflets for psychological operations and were sent to Tan Son Nhut from Pope Air Force Base near Fayetteville, North Carolina.[125] Additional aircraft and airmen were deployed throughout 1962 and 1963 as hostilities increased.

Most Air Force activity and infrastructure was concentrated at Tan Son Nhut Airfield, but facilities were established in other parts of South Vietnam to support the Vietnamese military and other branches of the US military. For example, the Air Force established Air Support Operations facilities at Da Nang, Pleiku, Can Tho, and Saigon. Radar stations were established at Da Nang and Tan Son Nhut. Finally, the Air Force installed communication equipment at Saigon, Nha Trang, Pleiku, and Da Nang.[126] These outposts became important centers of activity for helicopters operating in Vietnam throughout the war.

[122] Jacob Van Staaveren, "USAF Plans and Policies in South Vietnam, 1961–1963," (USAF Historical Division Liaison Office 1965) 11, 14, 34. Accessed February 4, 2015, available at http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB248/.

[123] William W. Womyer, *Air Power in Three* Wars (Washington, DC: Government Printing Office, no date) 10; Van Staaveren, "USAF Plans and Policies," 34.

[124] Russell G. Ochs, "The Evolution of USAF Search and Rescue in Southeast Asia," (Maxwell Air Force Base, AL) 4, accessed February 5, 2015, available at http://rotorheadsrus.us/documents/Ochs-7366-4.pdf; Van Staaveren, "USAF Plans and Policies," 18.

[125] Van Staaveren, "USAF Plans and Policies," 18, 19.

[126] Van Staaveren, "USAF Plans and Policies," 20, 21.

Operation Farm Gate was disbanded in June 1963 and the 1st Air Commando Squadron was established in its place, with detachments at Bien Hoa Airfield, Pleiku Airfield, and Soc Trang. The expansion of US Air Force Operations in Vietnam was evident by the number of USAF aircraft deployed to South Vietnam (from 35 in 1961 to 117 by the end of 1963).[127]

The Air Force's first helicopter operations in Vietnam began in early 1963 when the 917th Field Training Detachment (based at Stead Air Force Base, Reno, Nevada, when in the United States) began training South Vietnamese helicopter pilots and mechanics at Tan Son Nhut in January. The training mission lasted 15 months, during which the detachment trained 98 pilots and 102 mechanics.[128] The 917th used H-19B and H-34 helicopters.

The first deployment of an Air Force helicopter unit in an operational capacity, as opposed to a training mission, was a search and rescue unit authorized in May 1964. The establishment of the SAR unit was the result of a long-standing conflict between the Air Force and Army. Essentially, Army leadership was opposed to any expansion of Air Force activity in Vietnam, especially in relation to helicopters. Air Force leaders, on the other hand, were convinced that the Army did not have the capabilities to provide adequate search and rescue support for downed pilots. Army planners argued that search and rescue capabilities were easily integrated into existing Army helicopter operations. Sadly, the Joint Chiefs of Staff did not support the establishment of the Air Force SAR unit until several lives were lost during botched rescue attempts. This is ironic because the Air Force SAR units had already proven themselves in the Korean War.[129]

A temporary SAR unit arrived in Bien Hoa Air Base with three HH-34Fs in August before the arrival of a permanent SAR unit (Detachment 4, Pacific Air Rescue Center) arrived in South Vietnam in late October. Detachment 4 was fully operational in early November. The unit consisted of 86 men and six HH-43B helicopters. The detachment was based at Bien Hoa and Da Nang Air Fields. When in the United States, the unit was based at Eglin Air Force Base in Florida. The HH-34s were modified for the combat environment they expected to encounter in Vietnam. Modifications included a more powerful engine, larger fuel tanks, titanium armor plates, additional radios, and a forest penetrator (a newly designed apparatus that allowed quicker recoveries, especially in situations where there were multiple survivors).[130]

The Air Force, like the Army, established their own aircraft testing program in South Vietnam, Joint Operational Evaluation Group (JOEG/V). The Air Force program predated the Army's ACTV by several months. A major component of the JOEG/V was oversight and evaluation of the results of US Army, Navy, Marine Corps, and Air Force testing programs with joint service implications. The Joint Operational Evaluation Group also conducted its own aircraft testing, tactics, ordnance, and support equipment in collaboration with testing conducted at Eglin Air Force Base.[131] JOEG/V did not conduct their own helicopter tests in Vietnam (their aircraft research focused on fixed-wing airplanes).

The Army and Air Force quickly found themselves at odds over the testing and evaluation of aircraft in Vietnam. One area of contention was the testing of armed helicopters. Air Force evaluators, in a purely academic sense, questioned the veracity of the Army research program's results. Essentially, they

[127] Ibid., 104.

[128] USAF Historical Division, "USAF Plans and Policies in South Vietnam and Laos," (USAF Historical Division Liaison Office 1965), 64.

[129] Earl H. Tilford Jr. *Setup: What the Air Force Did in Vietnam and Why* (Maxwell Air Force Base, AL: Air University Press, 1991) 69.

[130] Earl H. Tilford Jr. *Crosswinds: The Air Force Setup in Vietnam* (College Station, TX, Texas A & M University Press 2009) 48; USAF Historical Division, "USAF Plans and Policies," 22; Ochs, "USAF Search and Rescue," 10.

[131] Van Staaveren, "USAF Plans and Policies," 50, 51.

questioned the integrity of the research design. In a more practical sense, the reviewers expressed concern about what they saw as an effort to overstress the helicopter's utility in combat situations. In the view of the Air Force, rotary-wing aircraft were too vulnerable to ground fire).[132]

This, however, was not an assertion on the part of the Air Force that armed helicopters were not useful. JOEG researchers in Vietnam felt strongly that armed helicopters were indispensable for counter-insurgency missions. Air Force officers in Washington, DC, were less optimistic. They continued to support the use of transport helicopters, but did not see the benefit of armed helicopters.[133]

2.2.4.2 Middle of War (1965–1968)

The United States adopted an air war strategy called *Operation Rolling Thunder* in March 1965. Under *Rolling Thunder*, the US Air Force, Navy, and South Vietnamese Air Force pilots executed a sustained bombardment of North Vietnamese targets. The mission, which lasted until early November 1968, was more congruent with Air Force capabilities and training than the counterinsurgency missions airmen participated in prior to 1965.[134]

Partly as a reaction to the increasing demands for search and rescue and that helicopter detachments located at various bases were not operating as efficiently as military leaders hoped, the Air Force reorganized the Vietnam SAR units into the 38th Air Rescue Squadron in July 1965. The 38th ARS, which included detachments at Bien Hoa, Da Nang, and Pleiku, was based at Tan San Nhut. All SAR detachments in Vietnam were placed under the umbrella of the 38th Air Rescue Squad (ARS). Additional SAR detachments were based in Thailand.[135]

Operation Rolling Thunder missions relied on fixed-wing aircraft, but helicopters played a pivotal support role. The North Vietnamese air defenses shot down one of about every 40 airplanes that flew over the Hanoi and Haiphong regions. Air Force helicopters were used to minimize the threat of death and capture after the strike aircraft were shot down. Rescue helicopters orbited northern Laos or the Gulf of Tonkin during bombing runs. The helicopters, air-refuelable Sikorsky HH-3s and HH-53s were directed into recue situations by an airborne HC-130 command post that also served as a refueling aircraft.[136]

The USAF leadership had always been apprehensive about adopting helicopters as a multi-dimensional combat support tool. This was a significantly different perspective than the Army leaders who viewed the helicopter as an indispensable, malleable tool for combat operations. These conflicting views were codified in a 1966 agreement between the Army and Air Force. The Air Force officially abandoned any interest in rotary-wing aircraft for intra-theater movement, fire support, or supply of Army forces. The Army officially adopted these roles. The Air Force only retained helicopters for SAR. In return, the Army relinquished their fixed-wing aircraft.[137] The only exception to this agreement was the deployment of two Special Operations Squadrons by the Air Force during the height of the war.

[132] Ibid., 53, 54.

[133] Ibid., 54.

[134] Earl H. Tilford Jr., *Setup,* 71.

[135] Ochs, "USAF Search and Rescue," 8; Dunstan, *Vietnam Choppers,* 64.

[136] Earl H. Tilford Jr., *Setup,* 131.

[137] Boyne, *How The Helicopter Changed Modern Warfare*, 133; Tolson, *Airmobility*, 106.

USAF SAR operations expanded in 1966. The 38th ARS was reorganized as the 3rd Aerospace Rescue and Recovery Group, but retained the same functions. An additional Search and Rescue Squadron, the 37th Aerospace Rescue and Recovery Squadron (ARRS), was established in Da Nang. The 37th ARRS transitioned from fixed-wing aircraft to helicopters in 1967. They adopted the HH-3 and became the only Air Force unit to exclusively use rotary-wing aircraft in Vietnam.[138]

The Sikorsky HH-3s, which were superior to the HH-43s, overcame some of the most troublesome limitations of the HH-43s. For example the HH-43s did not have a gun platform. Crew members were forced to use small arms to suppress enemy fire in combat situations. The helicopters also had limited range. The rotor blades presented a particular problem. They were made of laminated layers of wood, which the humidity and rain of Vietnam caused rotor damage and delamination. Finally, the visibility of brightly painted rescue helicopters was useful in peacetime, but dangerous in combat. The HH-3 was a SAR version of the CH-3 cargo helicopter. The new helicopters had a much longer range than the HH-43s. This capability was achieved through the addition of two external fuel tanks. Fuel, however, was only one way the HH-3 extended the potential range of USAF rescue missions. The external fuel tanks could be dropped, thereby reducing the weight of the helicopters and extending their range. The range of HH-3s was further extended when they gained air refueling capability in 1967. These improvements not only increased the range of the helicopters, but also transformed the manner in which the squadron operated. The helicopters remained airborne during bombing runs, allowing much quicker rescues in the event of a downed plane. The SAR crews strove to reach pilots and crew within 15 minutes of a crash.[139]

The aircraft flown by the various SAR squadrons affected their missions. The 38th Aerospace Rescue and Recovery Squadron, which still flew the HH-43s, focused their efforts on firefighting and rescue in South Vietnam.[140] The adoption of the HH-3s allowed the 37th ARRS to conduct the majority of their rescues in Laos, North Vietnam, and the Gulf of Tonkin. Even though the HH-3s were more suited for use in hostile territory than the HH-43s, they had one significant limitation. The helicopters were initially unarmed, which was not remedied until February 1967 when the helicopters were equipped with two M-60 machine guns. USAF SAR squadrons were extremely effective in both South Vietnam and North Vietnam. They conducted 1,288 rescues between 1964 and 1968. Over 400 of the rescued were combat aircrew members. Search and rescue equipment and tactics evolved in Vietnam from a small, emergent program to an efficient and innovative operation. By 1967, there was a 40% chance that a SAR crew would successfully retrieve a pilot downed in Southeast Asia.[141]

The only non-SAR Air Force helicopter units were two special operations squadrons deployed to Vietnam in 1965 and 1967. The USAF deployed the 20th Helicopter Squadron from Eglin Air Force Base to Vietnam in early 1965. The squadron, which was renamed the 20th Special Operations Squadron (SOS) in 1968, arrived at Tan San Nhut with 14 HH-3s in February (1965) to provide transport support for the Air Force and other military branches. Eight of the squadron's helicopters were temporarily moved to Da Nang in December 1965 to support Marine Corps operations. The entire squadron relocated to Nha Trang in March 1966 to support the Army's 101st Airborne. The 20th Helicopter's transport missions were often not typical. For example, their role in support of the 101st Airborne consisted of ferrying howitzers to the mountaintops in the mornings and retrieving them in the evening (to prevent them from falling into the hands of the Viet Cong). The helicopters, most of which were transferred to Thailand in June 1966, also flew covert missions into Laos, North Vietnam, southern China, and

[138] Ochs, "USAF Search and Rescue," 9.

[139] Ochs, "USAF Search and Rescue," 13; Dunstan, *Vietnam Choppers*, 167, 168.

[140] Ochs, "USAF Search and Rescue," 11.

[141] Ochs, "USAF Search and Rescue," 14, 23; Simon Dunstan provides additional rescue figures. He writes that USAF SAR crews rescued 980 aircrew and 1,059 other individuals during the period spanning 1966–1970. Dunstan, *Vietnam Choppers*, 172.

eventually Cambodia. Helicopter crews supported special operations units working in these areas. The squadron began supplementing their HH-3s with Bell UH-1 Hueys in 1967.[142]

Another USAF helicopter unit was deployed to Vietnam in 1967. The 21st Helicopter Squadron (renamed the 21st Special Operations Squadron (SOS) in 1968) arrived in Southeast Asia from Shaw Air Force Base located in South Carolina in September 1967. The squadron's primary mission was the disruption of the Ho Chi Minh Trail with the installation of sensors and delivery of road watch teams. The 21st Special Operations Squadron absorbed the 20th Special Operations Squadron in 1969 and adopted the 20th's missions.[143] While most missions were combat related, the USAF helicopter squadron also assisted with rescues, provided humanitarian aid, and supported construction projects.

2.2.4.3 End of War (1969–1975)

The troop redeployments affecting other branches of the military after 1969, also affected the Air Force helicopter squadrons. Elements of the 38th ARRS were either disbanded or began redeploying in late 1969. The process began with Detachment 10 of the 38th ARRS, which was deactivated in December 1969. The squadron shrunk considerably over the next two years until it was deactivated on July 1, 1971. The 37th ARRS was deactivated at Da Nang at the end of November 1972. Two detachments of the 40th ARRS, a rescue squadron based in Thailand, deployed to Vietnam to fill the void left by the absence of the 37th ARRS and 38th ARRS. Detachment 14 of the 40th ARRS arrived at Tan Son Nhut Air Base in August 1972; Detachment 7 deployed to Da Nang in November. The rescue detachments remained in Vietnam until 1973.[144]

Air Force helicopter operations, which were never particularly robust when compared to the Army or Marine Corps, were clearly waning in the last years of the Vietnam War. While their numbers dwindled, the importance of their operations did not. The 21st Special Operations Squadron and 40th ARRS, were aboard the USS *Midway* for *Operation Eagle Pull* and *Operation Frequent Wind*. The 21st SOS airlifted evacuees from Cambodia and Vietnam. The 40th ARRS provided support, but did not participate in the evacuations.

The Air Force helicopter squadrons participated in one final mission before they left Vietnam. The Khmer Rouge Navy seized a US container ship (the SS *Mayaguez*) on May 12, 1975. President Gerald Ford considered the seizure an act of piracy and ordered rescue operations, which began on May 15. CH-3s from the 21st SOS and HH-53s from the 40th ARRS began transporting a Marine assault force to a location near the SS *Mayaguez*. The helicopters also provided combat search and rescue and assault support. The Khmer Rouge presented strong resistance making the rescue attempt difficult and costly. Thirteen of the 15 helicopters used in the operation were either destroyed (4) or damaged (9).[145] This was the last combat action the Air Force helicopter squadrons saw before they were deactivated. The last two USAF Vietnam War helicopter contingents (the 40th ARRS and 21st SOS) were deactivated in July and September 1975, respectively.

[142] Phillip D Chinnery, *Air Commando: Inside the Air Force Special Operations Command* (New York, NY: St. Martin's Press, 1994) 123, 124, 129.

[143] Ibid., 129.

[144] Earl H. Tilford Jr. *Search and Rescue in Southeast Asia* (Washington, DC, Office of Air Force History, US Air Force, 1980), 96, 112–115.

[145] Earl H. Tilford Jr. *Search and Rescue in Southeast Asia* (Washington, DC, Office of Air Force History, US Air Force, 1980), 154.

THIS PAGE INTENTIONALLY LEFT BLANK

3.0 ON THE HOME FRONT

The combination of weapons and modern rotary-wing aircraft resulted in new technology and combat strategies that gave the US military an enormous advantage in combat warfare. No other war has seen the use of so many different types of helicopters in battle. Ultimately, 18 types of helicopters were flown by US aviators between 1964 and 1973. This war brought US weaponry into the realm of high technology, particularly the armed combat helicopters. The first helicopter gunship, designed from the ground up, made its appearance in Vietnam.

According to Sgt. Maj. Mike Zacker (retired), the war exposed weaknesses in the helicopter platform. The military was constantly adapting equipment and refining tactics for condition of the war. Helicopters were used for infiltration, extraction, reconnaissance, search and rescue, minesweeping, special operations, and medical evacuation.[146]

To support the use and advancement of helicopters, equipment, and tactics during the Vietnam War, the US military provided pilot and mechanic training, ground troop training, research and development, and transportation to the battlefield.

Helicopters were integrated into aviation and airborne unites, special operations units, transportation units, and medical units. Special operations, logistics (transportation), and medical are additional subthemes that are recommended for separate development and are not addressed in this subtheme. Helicopter units that served in the Vietnam War are listed in appendix G.

3.1 US ARMY

When the US Air Force became independent from the Army in 1947, it received jurisdiction over all Army aircraft except those aircraft considered "organic" to Army ground units. All installations devoted solely to aviation functions were transferred to the USAF. The Army retained airfields associated with Army ground forces training such as Henry Post Army Air Field at Fort Sill, Oklahoma, and Cairns Army Air Field at Fort Rucker, Alabama. The Air Force, however, maintained responsibility for primary helicopter flight training during the Korean War. Training occurred at San Marcos, Texas (named San Marcos Air Force Base in 1951 and changed to Gary Air Force Base in 1953). After Army pilots received their wings, additional helicopter training occurred at Fort Sill, Oklahoma.[147]

During the Korean War, the Army Aviation School was headquartered at Fort Sill. Helicopter pilots who trained at Fort Sill provided medical evacuation and other services in Korea. The Army training program expanded with the use of fixed-wing and rotary-wing aircraft for observation, reconnaissance, intelligence, and medical evacuation. The Army Ground Forces Air Training School at Fort Sill was renamed the US Army Aviation School. In 1951, the school was expanded to include a warrant officer training program.

After the Korean War, General James Maurice Gavin (Army Chief of Research and Development at the time) wanted a much more mobile and aggressive force, thereby calling for the integration of the armored forces with the airborne forces. He saw, as the Marine Corps already had, that any military in modern

[146] Personal communication (January 27, 2015) with Sgt. Maj. Mike Zacker (ret.), Flying Leatherneck Aviation Museum. Served four tours in Vietnam as a helicopter avionic technician in the US Marine Corps.

[147] David F. Winkler, DoD Legacy Project 95-10092; *Training To Fight: Training and Education During the Cold War*, July 1997.

warfare would have to use a well-dispersed defensive system to guard against nuclear attacks. This meant that US military forces would need to rapidly concentrate their attack. This could be done with assault transport, light utility planes, helicopters, and convertiplanes. These new, highly mobile vehicles were intended to airlift soldiers armed with automatic weapons, anti-tank weapons, and lightweight reconnaissance vehicles.[148]

In 1954, an expanding aircraft inventory created a demand for Army pilots. The Army relocated the Army Aviation School from Fort Sill to Fort Rucker, Alabama. Camp Rucker, in southern Alabama, was closed after the end of World War II, and was reactivated during the Korean War and was placed in mothball status again in 1954. However, the closure only lasted two months.[149]

Ozark Army Airfield at Fort Rucker had three 5,000-foot runways and the space to accommodate helicopter pads. The Aviation Test Section, which was responsible for testing new aircraft and applications, was based at Fort Rucker. In addition, the Transportation Corps and the Signal Corps moved their testing activities to Fort Rucker. During the late 1950s, Shell and Lowe Army Airfields at Fort Rucker were also converted to rotary-wing training fields.[150]

In 1956, the Air Force relinquished the mission of training Army pilots and the Army established a primary flight school at Fort Wolters, Texas. Fort Wolters, which served as a World War II Army induction and replacement center, was declared surplus in 1946. The post was reactivated in 1951 and designated as Wolters Air Force Base to serve as a training base for the newly established Aviation Engineering Force. The base reverted to Army control in 1956 and Fort Wolters assumed the mission as a primary helicopter school. During the 1960s, numerous helicopter pilots who went on to serve in the Vietnam War were trained at Fort Wolters.[151]

Flight training for pilots began at Fort Wolters, Texas, and continued at Fort Rucker, Alabama, or Fort Steward, Georgia. The training essentially entailed five segments. Basic training consisted of simply learning to hover, takeoff, and land a helicopter. In the next phase, pilots learned how to land and take off from a confined area, how to land on a pinnacle, and cross-country navigation. At Fort Rucker and Fort Steward (and Fort Wolters in the early days), pilots received basic instrument training, essentially how to maintain the helicopter right side up solely through the use of instruments. Next, student pilots were transitioned into the UH-1 Huey helicopter, which became not only the workhorse, but also the symbol of the Vietnam War. Finally, students were taught aviation tactics. The flight program lasted a total of nine months. When a student was not flying, they were in class studying aircraft maintenance, proper preflight techniques, military tactics, how to call in artillery fire, first aid, navigation, safety considerations, flight characteristics of the aircraft, and much more[152].

Fort Rucker Commander General Hutton took it upon himself to test the concept of an armed anti-tank helicopter. Hutton charged the Armed Helicopter Task Force, directed by Col. Jay D. Vanderpool, to assemble their own version of an armed Bell H-13. They did so by salvaging parts from junkyards and begging for others from the manufacturers. The work had to be done in secrecy to avoid an Air Force assertion that it was in violation of existing agreements on roles and missions.[153]

[148] Walter J. Boyne, 2011, *How The Helicopter Changed Modern Warfare*, 112.

[149] Winkler, DoD Legacy Project 95-10092; *Training To Fight: Training and Education During the Cold War*, July 1997.

[150] Kathryn M. Kuranda, 2002, *Historic Context for Army Fixed-Wing Airfields, 1903–1989*. R. Christopher Goodwin & Associates, Inc., Frederick, MD. For U.S. Army Environmental Center, Aberdeen Proving Ground, MD.

[151] Winkler, DoD Legacy Project 95-10092; *Training To Fight: Training and Education During the Cold War*, July 1997.

[152] History of the 134th Aviation Company (Assault Helicopter, http://www.134thahc.com/History.htm).

[153] In 1963, the Army Tactical Mobility Requirements Board (the Howze Board) emphasized the requirement for a tank-killing air-to-surface missile, and more importantly, the development of helicopters specifically designed for the assault and attack tasks.

During the late 1950s, with the advent of advanced helicopter models, tactics were developed at Fort Rucker to take advantage of the aircraft's versatility. The first demonstration of Sky Cavalry took place in July 1957. To support the air infantry, helicopters were armed. The field demonstrations and Secretary McNamara's encouragement created enthusiasm for the armed helicopter and assured backing from the top. It was also recognized by leaders that the new weapon required specialized training and doctrine. The Army Aircraft Requirements Board was established on January 15, 1960, under the direction of Lt. Gen. Gordon B. Rogers.[154]

The board recommended procurement of the turbine-powered Bell UH-1 helicopter. This was a giant step that resulted in the provision of the most numerous and most suitable helicopters in Army history. The board also recommended acquisition of a fixed-wing transport that later became known as the de Havilland (Canada) C-7A Caribou. The Bell helicopter became the heart of the Army force, serving in quantity for decades to come. The Caribou, as a bargaining chip, was ultimately transferred to the Air Force in exchange for virtually unlimited development of the helicopter as a close air support and assault weapon. In 1963, the Army Tactical Mobility Requirements Board (the Howe Board) recommended the creation of two new types of units—an airmobile division and an air transport brigade.[155]

On January 7, 1963, an initial plan was issued for the organization, training, and testing of an air assault division and an air transport brigade at Fort Benning, The 11th Air Assault Division (Test) ultimately had 3,023 personnel, including 191 officers and 187 warrant officers. However, it only had 154 aircraft, of which, 129 were rotary-wing.[156]

The combined results of these tests and the operations in Vietnam led to the establishment of the iconic 1st Cavalry Division (Airmobility), uniting the resources of the Second Infantry Division and the 11th Air Assault Division (Test). There was a concerted effort to obtain the necessary personnel and equipment, but an advance party arrived in the Republic of Vietnam on August 25, 1965.[157]

US Army ground troops entered Vietnam in May 1965 to find themselves fighting a different kind of war than that for which they had been trained. However, they did not enter blindly. For years, large numbers if Army officers and noncommissioned officers (NCOs) had been serving as advisors with the ARNV. They already knew that it was a war without front lines—a war of ambushes and small unit actions—and that infantry units would have to rely largely on foot movement on difficult terrain and that helicopters would play a key role.[158] Observation fixed-wing aircraft continued to fly during Vietnam, but were soon replaced by light helicopters. The Army developed attack helicopters and large cargo helicopters to meet their tactical requirements of support and logistics.[159]

The challenges presented by Vietnam and emerging aviation technology also influenced how the Army trained, equipped, and deployed its forces. Ground troops were trained for deployment to Vietnam. In Fort Jackson, for example, a village named Bau Bang was built to prepare soldiers destined to fight in

Previously, all armor, arms, and equipment had been bolted-on additions, largely scavenged from salvage yards. Boyne, *How The Helicopter Changed Modern Warfare*, 115.

[154] Boyne, *How The Helicopter Changed Modern Warfare*, 114.

[155] Ibid., 115, 116.

[156] Ibid., 126.

[157] Ibid., 126.

[158] Gordon L. Rottman, 2008, *The US Army in the Vietnam War 1965–1973*, Osprey Publishing, MD.

[159] Kuranda, *Historic Context for Army Fixed-wing Airfields, 1903–1989*.

Southeast Asia. These soldiers also trained with armored personnel carriers and helicopters that were entering the inventory.[160]

Changes in Army doctrine during the 1960s stepped up the tempo at Fort Rucker. With the advent of the Air Cavalry Division and their deployment during the Vietnam War, pilot training increased dramatically. Nonofficers were offered the opportunity to fly. In addition to other missions, helicopters were also being used for rapid transport and the light helicopters replaced fixed-wing aircraft for observation.[161] With the acquisition of thousands of helicopters, Army aviation grew significantly. At the end of the 1960s, the Army operated about 10,500 aircraft.[162]

The Army maintained that the aircraft were used in an "organic" way for tactical logistical support. The Army and USAF reached an agreement in 1966. The USAF assumed control of the Caribou and Buffalo aircraft, and in return, the Army was free to develop and use helicopters for intra-theater movement, fire support, and supply.[163]

Selected training duties assigned to the Aviation School at Fort Rucker, Alabama, were delegated to other installations in 1966 in response to the increased demand for aviators. Warrant officer training and basic helicopter training were relocated to Fort Wolters, Texas. Advanced helicopter training was conducted at Fort Rucker, Alabama.[164] With helicopters performing numerous missions over the skies of South Vietnam, thousands of soldiers received aviation maintenance training at Fort Rucker, Alabama, to keep the helicopter armada flying. Appendix F includes a list of helicopter installations in the United States and appendix G includes a list of helicopter units. A separate subtheme context is being developed for troop training.

With the US withdrawal from Southeast Asia, helicopter training was consolidated at Fort Rucker, Alabama, and the Army announced closure of Fort Wolters in 1973.[165]

3.2 US MARINE CORPS

After World War II and the detonation of two atomic bombs in Japan, questions arose regarding whether or not the use of nuclear weapons would invalidate the Marine Corps' amphibious warfare doctrine. (Training to Fight). Lt. Gen. Roy S. Geiger, then commanding general of all Marine forces in the Pacific, observed the nuclear test at Bikini Lagoon in 1946. He wrote a letter stating "It is quite evident that a small number of atomic weapons could destroy an expeditionary force as now organized, embarked, and landed." General Geiger urged the commandant to "consider this a very serious and urgent matter" and that the Marine Corps "use its most competent officers in finding a solution to develop the technique of conducting amphibious operations in the Atomic Age."[166]

At Quantico, Virginia, during the post-war period, Marines worked to develop a doctrine that would solve the atomic vulnerability. The revolutionary solution they developed became known as vertical

[160] Winkler, DoD Legacy Project 95-10092; *Training To Fight: Training and Education During the Cold War*, July 1997.

[161] Kuranda, *Historic Context for Army Fixed-wing Airfields, 1903–1989*.

[162] Winkler, DoD Legacy Project 95-10092; *Training To Fight: Training and Education During the Cold War*, July 1997.

[163] Kuranda, *Historic Context for Army Fixed-wing Airfields, 1903–1989*., 60.

[164] Ibid., 61.

[165] Winkler, DoD Legacy Project 95-10092; *Training To Fight: Training and Education During the Cold War*, July 1997.

[166] Boyne, *How The Helicopter Changed Modern Warfare*, 38.

envelopment. With the introduction of the helicopter, technology played a key role in making the doctrine possible. The first Marine helicopter squadron (HMX-1) was established at the Marine Corps base Quantico, Virginia, on December 1, 1947, with Col. Edward C. Dyer as its commanding officer. The squadron was intended to carry out General Vandergrift's goal of proving that the helicopter could provide Marines with an amphibious assault capability in the atomic area.[167] Two Sikorsky HO3S-1 helicopters arrived for squadron use on February 9, 1948, and began the movement toward extensive use of the choppers for military use. In May 1948, HMX-l demonstrated the capability to move Marines ashore from ships.[168]

The components of vertical assault included the following concepts:

1. Helicopter transportability of all assault elements of the landing force.
2. Embarkation of the landing force in fast amphibious ships designed for rapid unloading by helicopter.
3. Isolation of objective areas through the sudden and concentrated destruction of enemy air and ground forces capable of opposing the landing attack.
4. The use of helicopter assault forces for the ship-to-shore movement and seizure of widely dispersed inland objectives.
5. General use of helicopters in subsequent tactical operations ashore.[169]

By November 1948, the Marines had developed the world's first manual on helicopter use in amphibious landings (MCS publication of Phib-31, Amphibious Operations—Employment of Helicopters—Tentative).[170] The manual was subsequently used as a basis for Army helicopter operations.[171]

HMX-1 conducted a series of operations and training to simulate a ship-to-shore assault landing against an enemy defending the beaches. It was conducted at Onslow Beach, Camp Lejeune, North Carolina.[172]

Marine helicopters entered the Korean War on August 2, 1950.[173] Korea was the combat proving ground for the military helicopter. Entire Marine Corps infantry companies and battalions could be transferred to the front lines and could also be resupplied by helicopters.

The Navy recommissioned the USS *Thetis Bay* in the 1950s as the world's first helicopter assault aircraft carrier. The ship could take the full ship's complement of 1,000 combat-equipped Marines and a helicopter squadron out to sea. This union of sea and air power marked the beginning of a joint effort on the part of the Navy and the Marine Corps to further develop and refine doctrine, tactics, and procedures of vertical envelopment.[174] This resulted in an active program beginning with the conversion of light carriers to amphibious assault ships (LPHs), and then the development of designs for LPHs from the keel up. The first of the latter, USS *Iwo Jima,* was at sea for trials on September 5, 1961. The *Iwo Jima* was

[167] Boyne, *How The Helicopter Changed Modern Warfare*, 58.

[168] Winkler, DoD Legacy Project 95-10092; *Training To Fight: Training and Education During the Cold War*, July 1997.

[169] MCAS Camp Pendleton History, provided by Diane Walsh.

[170] Clifford, Lt. Col. Kenneth J., *Progress and Purpose: A Development of the United States Marine Corps 1900–1970*, 1973, 77.

[171] Boyne, *How The Helicopter Changed Modern Warfare*, 58.

[172] Lt. Col. Kenneth J. Clifford, 1973, 78.

[173] Boyne, *How The Helicopter Changed Modern Warfare*, 62, 63.

[174] MCAS Camp Pendleton History provided by Diane Walsh.

followed by a succession of similar vessels through the 1960s, which led to further design developments and improvements (see section 3.3.2).

Between the end of the Korean War and the escalation of the Vietnam War, the Marine Corps sought to create larger and more versatile helicopters. Based on the success of helicopters in Korea, the Marines decided to concentrate on the concept of vertical envelopment to address military issues in Vietnam.

In spite of the New Look strategy emphasizing massive retaliation, Communist threats aimed at Japan, South Korea, Indochina, and Taiwan kept Marines focused on Western Pacific contingencies. In 1956, a board met to review Marine Corps roles and missions. Marine Corps doctrine regarding amphibious warfare and vertical envelopment were declared sound. However, plans having Marines confronting Soviet forces on nuclear battlefields were deemed unrealistic. Instead, a more likely scenario pitted Marines against forces of Communist proxy states away from Europe. Consequently, the Marines reorganized to meet this contingency. Heavy armor was shed in favor of increased air mobility. During the following decade, the new doctrine ideally suited the Marines for combat in Southeast Asia.[175]

For Marine aviation, this period between the Korean War and the major involvement of the United States in Vietnam in 1965 was characterized mainly by research and development. New aircraft in Marine aviation reflected the tremendous effects of technological advances during the period leading up to the Vietnam War.

With the earlier establishment of the HRS series as the first significant step in building a Marine Corps helicopter transport capability, two additional developments took place in the mid-1950s. The first was a medium helicopter (the HUS series) with greatly increased capability. The second was the first design of a heavy helicopter (the HR2S-1). The HUS became the principal vehicle in the rotary-wing lift capability of the Marine Corps. The HRS was programmed for a major part of the lift capability but, because of shortfalls in its performance parameters, the overall numbers were reduced.

A Landing Force War Game Group was established at Quantico in 1961 to "develop objective methodology for the war gaming of amphibious operations." The group, in conducting war games "acts" out the landing force aspects of amphibious operations. It simulates a military operation using rules, data, and procedures designed to depict an actual or assumed real life situation.[176]

3.2.1 Research and Development During the War

As discussed in chapter 2, *Operation Shufly*, the Marine's first helicopter mission in Vietnam, resulted in many helicopter advancements. Vertol Corporation designed a kit to be fitted in the aircraft that would allow the crew chief and a gunner to operate either a .50 caliber heavy machine gun or the familiar M-60. The company proposed that it manufacture and install the kits in the first 54 aircraft. The project would be completed in July at a cost of $2,995,000. The schedule was such that some of the modifications would have to be completed onboard ship on the way to Vietnam—others would be finished after they arrived at Marble Mountain.[177]

The Marine Corps was not satisfied with the offer. The overhaul and repair facilities operated by the Navy and Marine Corps were requested to undertake a program to expedite installation. Following inspection of

[175] Winkler, DoD July 1997, 124.

[176] Clifford, 1973, 108.

[177] Lt. Col. William R. Fails, *Marines and Helicopters 1962–1973*, 1978, 33.

the trial installation at Quantico, the Navy overhaul and repairs at Cherry Point, North Island, and Jacksonville manufactured the kits and Marine Corps Air Facility Santa Ana and New River installed these kits. At least 16 kits were to be ready in March. The total cost of all 54 was $805,000. Two gun mounts were installed. One was on the left side of the aircraft in an emergency exit door opening immediately behind the cockpit. The other was on the right side, in a window to the rear of the side passenger door.[178]

By 1966, reports indicated that the white sand of Vietnam was also proving deadly. The sand was eroding the compressor blades to the extent that they could not pump in sufficient air to the burning chambers. The rotor blades were experiencing the same abrasive treatment. Finally, the sand and dust were finding their way into the fuel system, causing erratic operation of the engines. The situation became so serious that on July 21, all CH-46s were grounded and were "to be flown only for heavy lift capability and/or emergency situations." Immediately, the Naval Air Systems Command and Vertol Corporation began accelerating fabrication and shipping of engine and fuel filters.[179]

Since April 13, 1963, Marine helicopters had been escorted by Army UH-1B gunships. Six aircraft from the Utility Tactical Company permanently based in Da Nang and armed with four forward-firing 7.62 mm M-60 machine guns and 16 2.75-inch aerial rockets (FEAR), escorted the UH-34s "on all troop carrying missions and on all missions into known Viet Cong infested areas." By late summer 1964, even this escort was not sufficient protection. On August 17, General Greene directed the Marine Corps Landing Force Development Center and HMX-1 to begin work on an armament kit for the UH-34. Less than two weeks later, the first test firing had been completed. The kit, or TK-1 (Temporary Kit-1) as it was known, consisted of two pods for rockets and two M-60 machine guns. The weapons were mounted on a platform bolted above the landing gear struts. One pod, containing 18 2.75-inch rockets, was installed on each side of the helicopter. The machine guns were on the right side above the rockets.[180]

The entire installation, including 1,000 rounds of ammunition, weighed just over 1,000 pounds. The conclusion was that the kit on a UH-34 could adequately provide fire support similar to that presently available in Vietnam. The TK-1 (temporary kit) was a simple, readily installed modification that could be manufactured easily by most aircraft maintenance men. The Station Operations and Engineering Squadron at Quantico was to fabricate sufficient numbers for shipment to use in *Operation Shufly*.[181]

Even before the first UH-1E was delivered to the Marine Corps, suggestions had been made to equip it as an armed helicopter. The actual design was to be the responsibility of HMX-1 at Quantico. It had just completed the fabrication of the TK-1 for the UH-34 and had gained experience in modifying guns to fire on helicopters.

The kits, dubbed TK-2, were assembled by the Overhaul and Repair Activity, Jacksonville, Florida, under the technical direction of HMX-1 and the Marine Corps Landing Force Development Center. A total of 15 were made. Test firing at NAS Patuxent River revealed only minor problems. The most serious was that the expended cartridge links ejected from the left guns could endanger the tail rotor. (The same problem was one of the reasons the UH-34 had no guns on the left side.) The guns were slightly repositioned and later deflector plates were added.[182]

[178] Fails, 1978, 101.

[179] Ibid., 100.

[180] Ibid., 87.

[181] Ibid., 87.

[182] Ibid., 89.

On January 15, 1965, the completed armament sets were shipped to VMO-6 at Camp Pendleton. Once installed on the UH-lEs, they were an immediate success and kits for an additional 33 aircraft were requested. Simultaneously with the development of this TK-2, HMX-1 was experimenting with other kits. Two General Electric .50 caliber SM-14 gun pods were evaluated; however, the added weight made the heavier machine guns suitable only for specialized missions.

Also tested were two Stoner 63 machine gun pods on temporary loan from the US Air Force. The installation proved unsatisfactory for the UH-1E. In addition to the rockets and machine guns mounted on the sides of the helicopter, tests were conducted on a rotating turret mounted below the nose of the aircraft. The Emerson Electric TAT-101 turret contained two M-60 machine guns and could be aimed and controlled by the pilot. Beginning in April 1967, UH-lEs were modified to incorporate the turret. A total of 94 kits were purchased. By April 1972, other armament conversions were available that were more suited for the task, and the TAT-101 was removed from those aircraft in which they were installed.[183]

3.2.2 Training Groups

Until 1958, the Marine Corps had been authorized post-graduate flight training groups with squadrons for fighters (VMFT), attack aircraft (VMAT), and specialized instrument instruction (VMIT). With cutbacks in the Marine Corps, the groups had to be disbanded and by 1965 the individual squadrons had been whittled down until just two remained, one on each coast. On July 28, 1965, President Lyndon B. Johnson announced to the American people that US forces in Vietnam would be almost doubled to 125,000 men and that additional reinforcements would be sent, if needed. Following the president's speech, the Joint Chiefs of Staff ordered the deployment of MAG-36 from Santa Ana to Vietnam.[184] The remnants of the helicopter group were assigned to Marine Wing Service Group 37 with headquarters at the nearby MCAS El Toro. In 1965, General McCutcheon convinced Secretary McNamara to accept two helicopter post-graduate flight training groups.

At Santa Ana, on January 20, 1966, the first of the Marine helicopter training groups (MHTG-30) was commissioned. Colonel Russell R. Riley, the fifth Marine to be designated a helicopter pilot, was commanding officer. At the same time, a team of Marines was assembled to not only support the training squadrons, but also assist in training the technicians who were destined to maintain the aircraft in the tactical squadrons. The total personnel of the group consisted of six officers and four enlisted men. Initially, the buildup was slow, but by April 1, the group was ready to inaugurate post-graduate flight training, and Marine Medium Helicopter Training (HMMT) Squadron 301 was commissioned. It had been hoped that the unit could be equipped with CH-46s, but the buildup in Vietnam had priority and there were no aircraft available.[185]

The training syllabus for the helicopter pilot newly graduated from Ellyson provided about 75 hours of flight time. This included initial familiarization, formation flying—which was not taught at Pensacola—flight with the aircraft at or near maximum weight and additional instrument training. The post-graduate instruction required a minimum of 90 days. The first of the students began on April 13, and by the end of June, 12 had completed the course and were rated as combat-capable co-pilots. During the same period, on May 11, a subunit of H&MS-30, which conducted post-graduate flight training in the UH-IE at Camp

[183] Fails, 1978, 90.

[184] Ibid., 146.

[185] Ibid., 146.

Pendleton, was added to the group. A second training squadron (HMMT-302) was activated on November 1. Sufficient CH-46s were made available to equip this unit.[186]

A month and a half later, on December 15, the H&MS-30 subunit at Camp Pendleton was redesignated VMO-5 and became a full-fledged training squadron as part of MHTG-30. By the end of 1966, the training group could offer post-graduate flight training in the UH-34 series, the CH-46, and the UH-1E. Equally vital, it offered courses of instruction to mechanics, crew chiefs, and technicians in the maintenance and repair of all three different models of helicopters. The requirements exceeded resources and only two helicopter training squadrons were formed. It was not until June 30, 1969, the last day of fiscal year 1969, that MHTG-40 was commissioned at New River.[187]

The "heavy" training squadron (HMHT-401) was commissioned, but neither aircraft nor Marines were available to be assigned so it was held at "zero" strength until January 12, 1970. The number of mechanics and technicians to be trained created the need for another organization. This subunit of H&MS-40 controlled and monitored all of the training of the crew members.[188]

Unlike its sister training group at Santa Ana, which had been in old buildings, MHTG-40 moved into a brand new, $10 million complex, specifically designed for post-graduate training. There was a classroom building, new hangars, and administrative spaces, warehouses, and shops. The group had its own barracks and dining hall. Flight operations began August 21 with the arrival of a CH-46D, which was assigned to HMMT-402. This aircraft was followed on January 29, 1970, with the acceptance of a CH-53 by HMHT-401. By the end of June, 20 CH-46D and 4 CH-53s were in use. At the same time, HMMT-301 at Santa Ana, was redesignated a "heavy" training squadron and replaced its UH-34s with CH-53s.[189]

In addition to the post-graduate flight and maintenance training, the groups conducted several specialized schools. Courses of instruction on instrument flight were offered. Helicopter pilots who had not recently—or who had never—flown the UH-1E, CH-46, or CH-53 received refresher training. Another school trained crew chiefs and mechanics on the operation of the machine guns firing from the aircraft.

Technical training was spread among various Marine Corps installations. At Quantico, the Aviation Technical School trained mechanics for the new helicopters. Marines continued to keep their training infrastructure costs low by sending Marines to other service schools. At Fort Rucker, the Army trained Marine helicopter pilots.[190] The trend of Marines using other service technical training facilities was maintained throughout the Cold War.

3.2.3 Squadrons at the Beginning of the War

The military situation in South Vietnam had deteriorated seriously in the last half of 1961, and an expanded program of US support was recommended to the president. The role of the Marine Corps at this time was confined to furnishing advisors, members of joint staffs, and specialized communications personnel. The US Army was to supply most of the increased effort—including helicopters. By

[186] Fails, 1978, 147.

[187] Ibid., 147.

[188] Ibid., 147.

[189] Ibid., 147.

[190] Winkler, DoD, July 1997, 158.

December, the first two of three planned helicopter companies had been committed. The third Army helicopter company arrived early the following year.[191]

One recommendation was to augment Army squadrons with Marine Corps pilots. Another recommendation was that an entire Marine Corps squadron be sent to the area to replace one of the Army companies. This recommendation was approved by the Joint Chiefs of Staff on March 19, with a target date of April 15 for the squadron to be in place. The Marine Corps had two squadrons nearby (HMM-261 and HMM-362); the two transport squadrons of MAG-16 were temporarily in the Philippine Islands.

Planning began immediately for the HMM-362 as the squadron to go and planning began for what would become known as *Operation Shufly*. The Marines were sent to Soc Trang Airfield, Shufly's first operating base in the Mekong Delta. The Marines quickly learned many vital lessons in helicopter operations and tactics.[192]

The Marine Corps continued to adopt the helicopter as a natural element of its power. By 1962, the Marine Corps had 341 helicopters of all types. Over half of them, a total of 196, were assigned to Aircraft, Fleet Marine Force, Pacific (AirFMFPac). Marine Aircraft Group (MAG) 16, with 64 helicopters, was based at the Marine Corps Air Facility, Futenma, Okinawa. The newest of all Marine helicopter fields, Futenma had been built by Navy construction battalions and opened in 1960. MAG 16 had Headquarters and Maintenance Squadron (H&MS) 16 and the Marine Air Base Squadron (MABS) 16; it had three tactical squadrons: Marine Observation Squadron (VMO) 2 and two light transport squadrons (HMRL-261 and -362).

The only helicopter squadron in AirFMFPac not part of a helicopter group was HMRL-161 at Kaneohe, Hawaii. It was attached to what was otherwise an exclusively fixed-wing group, MAG-13, and with 16 helicopters provided the vertical lift capability for the 1st Marine Brigade.[193]

On the west coast of the United States, about 25 miles south of Los Angeles at Marine Corps Air Station Santa Ana, was another unit of Air-FMFPac. MAG-36 consisted of a H&MS and a MABS, four light transport squadrons (HMRLs-163, -361, -363, and -364), and one medium transport squadron (HMRM-462), for a total of 105 helicopters. Forty miles farther south at Marine Corps Air Facility, Camp Pendleton, VMO-6 had 11 more, plus a complement of fixed-wing observation aircraft.

Fleet Marine Force, Atlantic had concentrated all its helicopter capability at Marine Corps Air Facility, New River, North Carolina, at the edge of the Camp Lejeune complex. There, under MAG-26, were a H&MS and MABS, VMO-1, HMRLs-162, -262, -263, and -264, and HMRM-461 for an aggregate of 108 helicopters.

One helicopter squadron, not a part of the Fleet Marine Force, was Marine Helicopter Squadron (HMX) 1 at MCAS Quantico, Virginia. It had a dual mission. Its historic role in the Marine Corps, ever since it was commissioned in December 1947, had been the development of helicopter tactics, techniques, and equipment for the landing force operation. Beginning in September 1957, however, it had added another assignment—that of providing special helicopter flights to high-ranking officials in the federal government. This became known as "the Presidential Mission." To accomplish both of these tasks, HMX-1 was assigned a total of 26 helicopters representing five different types.[194]

[191] Fails, 1978, 28.

[192] Ibid., 28.

[193] Ibid., 2.

[194] Ibid., 2.

Finally, 11 obsolete helicopters were assigned to fixed-wing air stations to act as search and rescue aircraft in the event of an emergency.

3.3 US NAVY

3.3.1 Navy Helicopter Pilot Training

The US Navy saw the value of the helicopter as a "plane guard" rescue craft aboard aircraft carriers. It also began to supplant scout planes for traditional observation work.[195] During the Korean War, the Navy adopted Army transport model and equipped hospital ships with helicopter pads.[196] In addition to search and rescue, the primary purpose of naval helicopters has been submarine hunting and over-the-horizon targeting. Helicopters hunting submarines can hover and lower a large sonar into the water using a winch and cable. They are far more mobile than a ship and are invulnerable to the submarine they are hunting. Helicopters equipped with radar are also used to detect targets that a ship's sensors cannot see because they are over the horizon. They relay this data to the ship and can also guide ship-launched missiles to their targets. This has helped change the role of surface warships from defensive platforms used to protect aircraft carriers, to offensive platforms capable of attacking other ships at long range. In addition, helicopters have proven their utility at clearing mines. By towing large sleds along the water, the helicopter can stay away from any potentially harmful mines.

Navy helicopter training began in 1943 with the Navy's purchase of its first helicopter, the HNS. The training site was Floyd Bennett Field, Brooklyn, New York. In 1950, operations were moved to NAS Lakehurst, New Jersey, with the onset of the Korean War. The demand for fleet helicopter detachments increased dramatically. In that year, HT-8 was originally established as Helicopter Training Unit (HTU-1), flying the HTL from Ellyson Field, Pensacola, Florida.[197]

Geography, topography, and climate were also factors considered in site location. Changing contingencies during the Cold War required troops be prepared to fight in temperate, tropical, desert, and arctic environments. However, because southern climates permitted year-round training, there was a proclivity to operate training facilities, especially for aviation, in the sun belt. The Navy conducted much of its primary flight training in the Pensacola, Florida, and Corpus Christi, Texas, areas.[198]

3.3.2 Navy Helicopter Transport

Early helicopters had a limited range. The Marine Corps turned to the Navy's proven method of moving aircraft by sea (Marines and Helicopters 1962). One of the Robert E. Hogaboom board's recommendations was for the introduction of the LPH, the helicopter carrier ship. This led to the conversion of four veteran aircraft carriers: the *Thetis Bay, Boxer, Princeton,* and *Valley Forge,* to accommodate helicopters.[199]

[195] Boyne, *How The Helicopter Changed Modern Warfare*, 58.

[196] Kuranda, *Historic Context for Army Fixed-wing Airfields, 1903–1989.*

[197] Lt. Commander Jim O'Keefe, "Rotary-Wing Pipeline," date unknown.

[198] Winkler, DoD, July 1997.

[199] Boyne, *How The Helicopter Changed Modern Warfare*, 134.

Source: US Army Aviation Museum Volunteer Archivists Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 3-1. 1ST CAVALRY HOOKS ARRIVE IN VIETNAM (CH-47 HELICOPTERS, TAIL NUMBERS 63-7915, 64-13107, 64-13140) ON DECK OF SHIP FOR AMPHIBIOUS OPERATIONS

In 1962, four ships were available from which a helicopter-borne assault could be launched. All had been converted from other types. The USS *Thetis Bay* was the first of these conversions. The ship was launched April 16, 1944, as CVE 90, an escort carrier. After service in World War II, the carrier went into mothballs, along with much of the rest of the fleet. After conversion to a helicopter assault ship in 1956, the ship became, for a short time, CVAH 1 (carrier, assault, helicopter) and finally LPH 6. The *Thetis Bay* arrived at Long Beach (new home port) on September 20. There, helicopter teams from Marine Corps Test Unit No. 1, Camp Pendleton, demonstrated landing and take-off techniques. *Thetis Bay* participated in amphibious training exercises off the California coast before deploying to the Far East on July 10, 1957, returning to Long Beach on December 11, 1957, and resuming local operations. On May 28, 1959, the ship's designation was changed to LPH 6 (amphibious assault ship). In May 1960, *Thetis Bay* participated in a practice night assault landing at Camp Pendleton during which the helicopters carried 1,300 troops and 33 tons of cargo to the objective area. This was the first large-scale night landing of ground forces by carrier-based helicopters. The *Thetis Bay* deployed to the western Pacific in the spring of 1961. After the assault ship returned to Long Beach, it was transferred to the Atlantic Fleet and arrived at the new home port at Norfolk in early December 1961.[200]

On January 30, 1959, the USS *Boxer* was re-commissioned as LPH 4. It was followed in April by the USS *Princeton* (LPH 5) and after some delay, the USS *Valley Forge* (LPH 8). These ships were all of the "*Essex*" class, the first-line attack aircraft carriers of the Pacific campaign in World War II. Weighing in

[200] NavSource Online: Service Ship Photo Archive, available at http://www.navsource.org/archives/09/41/4105.htm, accessed April 2015.

at the 38,000-ton class, they were nearly four times larger than the *Thetis Bay* with a total length of 888 feet with a flight deck almost as long, providing the necessary space for a number of helicopters to load and take off simultaneously. Each new LPH had accommodations for 171 Marine officers and 1,701 men, including those necessary for the helicopters. Each also officially required over 1,500 sailors compared to 598 on the *Teddy Bear*.[201]

The USS *Princeton* (LPH-5) first appeared in Vietnam in 1962 and returned for combat deployments through the 1960s. The USS *Princeton* recovered the Apollo 10 space capsule in 1969 and served as LPH-5 for more than 10 years until being decommissioned on January 30, 1970.[202]

The USS *Valley Forge* served in various campaigns in Vietnam from October 1965 until September 1969. The ship was decommissioned and struck from the Naval Register on January 15, 1970, and was sold for scrap October 29, 1971.[203]

3.3.3 Iwo Jima Class – Amphibious Assault Ships

The first ships to be designed and built from the keel up as an amphibious assault ship, was the Navy's *Iwo Jima*-class of amphibious assault ships (helicopter). These ships had a length of 592 feet with a 94-foot beam and 105-foot flight deck. There were accommodations for 2,157 troops, including officers, enlisted, and Marine detachment, and 25 helicopters. Seven ships were built. The USS *Guadalcanal* (LPH-7) and USS *Guam* (LPH-9) did not serve in the Vietnam War.[204]

USS *Iwo Jima* (LPH-2) was the first ship to be designed and built from the keel up as an amphibious assault ship. The *Iwo Jima* was the lead ship of the Navy's Iwo Jima-class of amphibious assault ships (helicopter *Iwo Jima* received tons of supplies and scores of Army helicopters, tanker trucks, and vehicles in the hangar and flight deck spaces). Nearly 1,000 troops were boarded for the western transit, which began on April 12, 1965. The US *Iwo Jima* served in Vietnam during the second half of the 1960s, providing helicopter support ashore, including defense perimeter patrol, as well as a support center for laundry, showers, fresh provisions, store, and mail service. USS *Iwo Jima* was decommissioned on July 14, 1993, stricken from the Navy Register on September 24, 1993, and sold for scrap on December 18, 1995.[205]

The USS *Okinawa* (LPH-3) was commissioned on April 14, 1962, in Pennsylvania, and home ported in Norfolk, Virginia, before being transferred to the Pacific Fleet and moved to a new home port in San Diego in 1967. From April 1967 until 1972, the USS *Okinawa* was involved in campaigns of the Vietnam War. The *Okinawa* was decommissioned on December 27, 1972, and sunk as a floating target in a ship-sinking exercise in 2002 (USS Okinawa (LPH-3).[206]

USS *Tripoli* (LPH-10), built in 1965, was home ported in San Diego. On May 1, 1967, began the first of three deployments to Vietnam ending in 1973. During the 1967 deployment, *Tripoli* participated in eight

[201] Lt. Col. Keith B. McCutcheon, *Marines and Helicopters 1962–1973*; History and Museum Division Headquarters, US Marine Corps, Washington, DC, 1978.

[202] NavSource Online: Service Ship Photo Archive, available at http://www.navsource.org/archives/09/41/4105.htm, accessed March 2015.

[203] Ibid.

[204] Ibid.

[205] USS *Iwo Jima*, available at http://navysite.de/lph/lph2.htm, accessed March 2015.

[206] Available at http://www.militaryfactory.com/ships, accessed April 2015.

amphibious operations, all conducted along the coast of the I Corps tactical zone in the northernmost part of South Vietnam. In addition to being a support ship for surface forces, the *Tripoli* also served as a medical facility for the immediate evacuation and treatment of wounded personnel. USS *Tripoli* earned nine campaign stars for Vietnam service.[207] The USS *Tripoli* was decommissioned and stricken from the Navy Register on September 15, 1995, and spent the following years laid up at Mare Island Naval Shipyard, Vallejo, California. In December 2006, the *Tripoli* was towed to Pearl Harbor, Hawaii, to serve as a launch platform with the ballistic missile defense program. As of September 6, 2014, the *Tripoli* was berthed at Pier 80 in San Francisco, California.[208]

Source: Brigadier General Edwin H. Simmons Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 3-2. FOUR SEA KNIGHTS OF MARINE MEDIUM HELICOPTER SQUADRON 265 RETURN TO THE USS *TRIPOLI* FOLLOWING THE COMPLETION OF MORNING RESUPPLY AND MEDEVAC MISSIONS

[207] Available at http://www.navsource.org/archives/10/11/1110.htm, accessed April 2015.

[208] Available at http://navysite.de/lph/lph10.htm, accessed April 2015.

USS *New Orleans* (LPH-11) was laid down on March 1, 1966, at the Philadelphia Naval Shipyard in Philadelphia, Pennsylvania. The *New Orleans* was launched in February 1968, commissioned on November 16, 1968, and first appeared in the western Pacific in August 1969 as flagship for Amphibious Ready Group Bravo. The ship's first deployment to Vietnam began in August 1969 and terminated in March 1970. The last deployment of the *New Orleans* ended in 1973. The USS *New Orleans* earned five campaign stars for Vietnam War service and was decommissioned on October 1, 1997. The ship was sunk as a target as part of Exercise RIMPAC 2010 on July 10, 2010.[209]

The USS *Inchon* (LPH-12) was built in Mississippi and commissioned on June 20, 1970. USS *Inchon* was the last of the Iwo Jima class. Originally assigned to the Atlantic Amphibious Force, USS *Inchon* participated in one campaign during the Vietnam War—the ceasefire from November 1972 to March 1973. USS *Inchon* was converted to a Mine Countermeasures Command and Support Ship (MCS-12) in 1996. As MCS-12, the *Inchon* carried Sea Stallion Helicopters that swept for mines and was decommissioned in 2002 and sunk in 2004.[210]

3.4 US AIR FORCE

Helicopter pilot training sites were moved back and forth over the years, from base to base and service to service. The Army Air Forces Training Command (AAFTC) initiated helicopter training at Freeman Field, Indiana, in June 1944. Six months later, AAFTC moved pilot training to Chanute Field, Illinois, to consolidate the flying training operation with helicopter mechanic training. Helicopter pilot training remained at Chanute Field until June 1, 1945, when it was transferred to Sheppard Field, Texas. A year later, on May 31, 1946, it was moved to San Marcos Field, Texas.[211]

In the years following World War II, helicopter pilot training slowed to a trickle. Army ground forces had a small contingent of helicopter pilots, but training for any additional pilots stopped altogether in July 1946. When the Air Force became a separate service in September 1947, it reestablished helicopter training for the Army and collocated it with Air Force training at San Marcos. There it remained until March 1, 1949, when Air Training Command (ATC) moved the course to James Connally Air Force Base, Waco, Texas.[212]

The Korean War generated more than a ten-fold increase in Army helicopter pilot requirements. Because San Marcos had access to a number of small auxiliary fields and was in the midst of rough terrain approximating that of Korea; Air Training Command decided to return helicopter training to San Marcos Field. At the same time, since the majority of pilots in training were Army students, the Army made a bid to assume its own helicopter training so it could tailor the course to better suit its requirements. However, responsibility for providing that training remained with the Air Force throughout the war. It was not until 1956 that the Department of Defense gave the Army approval to train helicopter pilots. To accommodate the transfer of training to the Army—the Air Force also gave the Army two Texas bases—Camp Wolters in July 1956 and Edward Gary Air Force Base (formerly San Marcos) in December 1956.[213]

[209] Available at http://www.navsource.org/archives/10/11/1111.htm, accessed March 2015.

[210] Available at http://www.navsource.org/archives/10/11/1112.htm, accessed March 2015.

[211] Thomas A. Manning Command Historian, Dr Bruce A. Ashcroft, Richard H. Emmons, Ann K. Hussey, Dr Joseph L. Mason, *History of Air Education and Training Command 1942–2002*; Office of History and Research Headquarters, Air Education and Training Command Randolph Air Force Base, Texas, 2005.

[212] Manning et al., *History of Air Education and Training Command 1942–2002*.

[213] Ibid.

The Air Force relocated its helicopter pilot training program to Randolph Air Force Base, San Antonio, Texas. The ATC helicopter mechanic courses transferred from Edward Gary Air Force Base to Sheppard Air Force Base.

By the end of 1957, ATC basing structure had changed considerably as the result of tactical commitments, decreased student load, and fund shortages. The Air Force transferred tanker and bomber training to Strategic Air Command and fighter training to Tactical Air Command. ATC found itself with a much smaller advanced flying training program consisting of interceptor, helicopter, survival training, weapons controller instruction, jet qualification, and flight surgeon indoctrination training.[214]

At Randolph Air Force Base, helicopter pilot trainers had divided the helicopter course into three stages: H-13s, H-19s, and H-21s. In January 1958, ATC added a fourth phase (operational flying at Stead Air Force Base) using the H-19. At the same time, ATC proposed to the air staff that all helicopter pilot training be moved to Stead Air Force Base in Nevada. Stead offered a variety of conditions, including desert, water, snow, mountains, and high altitude. Stead was also the site of the Air Force's survival school and the collocation of the schools presented opportunities for invaluable collateral training. If the move happened, Randolph could assume a jet flying mission. The air staff approved the move and on July 1, Air Training Command discontinued the Randolph school and, concurrently, established a new helicopter pilot school at Stead Air Force Base. The H-13s were retired to Davis-Monthan Air Force Base in Arizona, while all the H-19s and H-21s moved to Stead. The new school was collocated with the survival school.[215]

Stead Air Force Base provided ample facilities and an unencumbered airspace in which to operate the flying training mission. The base had also recently undergone a large building project of all new Capehart family housing.[216]

The pilots would undergo training in the H-19B and H-21B helicopters. The syllabus contained basic transition training and instruments as well as advanced operational techniques in a high altitude confined area and mountain operations. Most pilots would also attend the US Air Force Survival School in preparation for overseas assignments.[217]

The flying training would be conducted at Stead as well as an auxiliary air field, Sky Ranch, about 10 miles east of the base. A number of unprepared ridgetop and pinnacle landing zones at altitudes up to 8,100 feet MSL were on Peavine Mountain directly south of the base. A similar number of tree-lined spots were in Dog Valley, southwest of Peavine, to conduct confined area landing and takeoff procedures. The area north of Stead to Pyramid Lake was used for instrument training.[218]

The first students to complete helicopter pilot training were rated fixed-wing pilots. In fact, all pilots undergoing helicopter pilot training since 1944 had previously been rated pilots. In 1965, students were entered into helicopter pilot training having received approximately 120 hours in T-28s but had not received their wings. They would receive their wings upon graduation from helicopter training.[219]

[214] Manning et al., *History of Air Education and Training Command 1942–2002*.

[215] Ibid.

[216] Kyron Hall, Unit Historian, available at http://usafhpa.com/2013/08/03/3638th-flying-training-squadron-stead-afb-nevada-1958-65/, accessed February 2015.

[217] Ibid.

[218] Ibid.

[219] Ibid.

The 3638th Flying Training Squadron (helicopter) trained not only Air Force pilots but also many from foreign countries. At least a dozen countries, including Japan, Argentina, Pakistan, India, France, Bolivia, and China (Taiwan), sent pilots to basic helicopter pilot training as well as instructor pilot upgrading. There was an exchange program with England's Royal Air Force and the Royal Australian Air Force (RAAF) for a two-year tour by the exchange pilots. Two US Marine pilots flying H-34s were given a short course in high-altitude mountain flying techniques. Four RAAF helicopter pilots also received several hours of mountain indoctrination on their way from UH-1 training at Fort Rucker and returning to Australia to fly their own Hueys. From 1958 through 1965, the helicopter school trained over 1,252 US Air Force and 384 foreign helicopter pilots.[220]

Beginning on April 19, 1960, the helicopter training program at Stead added a new program of instruction. The school taught helicopter pilots and firefighters to operate fire-suppression equipment using the H-43B.[221]

In 1964, Defense Secretary McNamara ("Mac the Knife") made the announcement that Stead Air Force Base was to be closed and the helicopter school would be relocated. Among the bases discussed were Hill Air Force Base, Utah; Sheppard Air Force Base, Texas; and Kirtland Air Force Base, New Mexico. The USAF helicopter school moved to Sheppard in late 1965. Ironically, the school was moved to Hill Air Force Base in 1971 and to Kirtland in 1976 where USAF Advanced Helicopter Training is still being conducted.[222]

Air Training Command activated the 3637th Flying Training Squadron (helicopter) at Sheppard on October 1 and assigned it to the Sheppard Technical Training Center. Then in December, with activation of the 3630th Flying Training Wing, ATC reassigned the squadron from the center to the wing. With the coming closure of Stead Air Force Base in 1966, the squadron would assume helicopter training at Sheppard. The survival training transferred to Fairchild Air Force Base in Washington. Activated on March 1, 1966, to assume survival training at Fairchild was the 3636th Combat Crew Training Group (Survival).[223]

From the beginning, the Air Force had restricted entry into helicopter training to those who were already rated pilots. This approach meant a helicopter student pilot spent 17 months in flight training. That changed in July 1964 when the Air Force instituted the Undergraduate Pilot Training (UPT) (helicopter) program, which consisted of 26 weeks of instruction in T-28 fixed-wing aircraft and 21 weeks in H-19 and H-21 helicopters. This UPT helicopter program remained in effect until July 1967 when the Air Force again decided that all helicopter students had to be graduates of the standard undergraduate pilot training program. As the war in Vietnam dragged on, it became clear that the Army had assumed the dominant role in the employment of helicopters. In December 1969, the Department of Defense directed the Air Force and Navy to abandon their practice of requiring helicopter pilots to have first completed fixed-wing UPT. As it so frequently did, the Navy went its own way. The Army agreed to provide undergraduate helicopter pilot training for the Air Force in a two-phase program; the first phase would be at Fort Wolters, Texas; Fort Rucker, Alabama, would conduct the second phase. Students received their wings

[220] Kyron Hall, Unit Historian, available at http://usafhpa.com/2013/08/03/3638th-flying-training-squadron-stead-afb-nevada-1958–65/, accessed February 2015.

[221] Manning et al., *History of Air Education and Training Command 1942–2002*.

[222] Kyron Hall, Unit Historian, available at http://usafhpa.com/2013/08/03/3638th-flying-training-squadron-stead-afb-nevada-1958–65/, accessed February 2015.

[223] Manning et al., *History of Air Education and Training Command 1942–2002*.

upon completion of training at Fort Rucker. The first Air Force students entered the Army portion of this training on October 11, 1970.[224]

In 1973, the Army closed Fort Wolters and consolidated both phases of helicopter pilot training at Fort Rucker. For the next several years, in addition to undergraduate student pilots, the Air Force sent first assignment instructor pilots, other instructor pilots, and recent UPT graduates with banked assignments through the Army's rotary-wing qualification course to meet its modest requirements.[225]

Since the Army now provided all undergraduate helicopter pilot training, the Air Force chose to consolidate all helicopter combat crew training at Hill Air Force Base, Utah, under the control of the Military Airlift Command (MAC), the primary end-user of all Air Force helicopter pilots. The transfer from ATC to MAC was completed on June 30, 1971.[226]

3.4.1 Mid-Air Retrieval System

Mid-air retrieval is a technique used in atmospheric reentry when the reentering vehicle is incapable of a satisfactory unassisted landing. The vehicle is slowed by means of parachutes, and then a specially equipped aircraft matches the vehicle's trajectory and catches it in mid-air. This risky technique is only used when other forms of landing are infeasible. Successful mid-air retrieval requires correct operation of the retrieving aircraft, favorable atmospheric conditions, and successful execution of a complicated maneuver, in addition to correct operation of the vehicle itself. Helicopters are the optimal aircraft for these operations due to their maneuverability.

All American Engineering Company (AAE) and Sikorsky Aircraft Corporation had demonstrated the feasibility of using helicopters for mid-air recovery in 1959.[227] The first successful mission use of mid-air recovery was on August 19, 1960, when a C-119 recovered film from the Corona mission code-named Discoverer 14.

The early 1960s-era Corona reconnaissance satellite returned delicate film capsules to Earth that required mid-air retrieval by a JC-130 Hercules and HC-130 airlifter. Also during the early 1960s, several losses of U-2 reconnaissance planes over the USSR, China, and Cuba forced Americans to find ways of learning more about Soviet S-172/SA-2 SAM systems. The development of unmanned drones became the wave of the future in gathering intelligence information without putting manned aircraft in jeopardy.

This was the first successful recovery of film from an orbiting satellite and the first aerial recovery of an object returning from Earth orbit. An H-43 from Holloman Air Force Base, New Mexico, was fitted with a system designed to perform mid-air recovery of test packages and in 1961 made the first ever mid-air recovery of a parachute-borne object by a US Air Force helicopter.[228] The success of this project led eventually to the USAF CH-3 Mid-Air Recovery Systems (MARS) that performed hundreds of mid-air recoveries of reconnaissance remotely piloted vehicles during the Vietnam War. Photo reconnaissance drones used USAF C-130s as launch vehicles and CH-3 and CH-53 helicopters as recovery vehicles.

[224] Manning et al., *History of Air Education and Training Command 1942–2002.*.

[225] Ibid.

[226] Ibid.

[227] Available at http://rotorheadsrus.us/documents/524.html, accessed February 2015.

[228] Ibid.

- Various units were involved in the MARS operations in testing vehicles and recovery:
  - The 6593rd Test Squadron (6594th Test Group) began in 1958 in Hawaii.
  - The 350th Strategic Recon Squadron operated from Da Nang, SVN from 1967–1968.
  - The 6514th Test Squadron at Hill Air Force Base, Utah, 1971.
  - The 432nd Tactical Drone Group, Davis-Monthan Air Force Base in 1976.

With the advent of unmanned drones, such as the Predator, that are able to take off and land on runways, the need for helicopters for retrieval has been negated.[229]

3.4.2 Training the Vietnamese

The helicopter section of the Vietnam Air Force (VNAF) was experiencing a critical pilot shortage in late 1962. Under the Military Assistance Program (MAP) a total of 48 helicopters (H-19 and H-34) were projected for the VNAF by July 1, 1964. To accomplish the task of training VNAF personnel, the USAF either brought the Vietnamese to the continental United States or sent Americans to Vietnam to train the Vietnamese in their own country. There were advantages to conducting training in the continental United States including exposing foreign students to democratic ideals and the "American way of life." By 1962, due to the deteriorating military situation, the political and cultural advantages of training in the United States had to be sacrificed for the greater efficiency of "in-country" training.[230]

On September 8, 1962, the Commander in Chief, Pacific (CINCPAC) sent a message to HQ USAF requesting that "all feasible steps" be taken to alleviate the current pilot shortage of the Vietnam Air Force. To expedite this training program, CINCPAC asked HQ USAF to get an ATC team "on the road without delay." An ATC survey team visited Vietnam from September 23 to October 7, 1962, to study the various possible ways of training VNAF helicopter pilots in that country. They recommended a field training detachment (FTD) be established in Vietnam to provide helicopter pilot and mechanic training. They believed this was the only way to "eliminate the need for USAF Forces serving in any air combat counterinsurgency operations."[231]

Instructors were taken from Stead and other ATC units to begin VNAF helicopter pilot training in H-19B helicopters. On June 17, 1963, the Air Training Command transferred responsibility for FTD 917-S from Sheppard to the 3635th Flying Training Group (Advanced) at Stead Air Force Base, Nevada. After graduating its first class of helicopter pilots and while beginning to train its second class, the FTD also undertook to train a class of helicopter mechanics. The first mechanics class began on July 1, 1963, with 30 Vietnamese students.[232] The Air Training Command also deployed several field training detachments to Vietnam. One of these, FTD 917H, trained helicopter pilots and mechanics at Tan Son Nhut Air Base in Saigon during 1963 and 1964.[233]

Once US redeployment began in earnest, the training and buildup of the South Vietnam Air Force also took on a new importance. While the Army retained jurisdiction over helicopters within its sphere. In the South Vietnam government defense organization these critical machines were controlled by the Air Force. Thus, after 1969, the rapid buildup of the Air Force's rotary-wing arm necessitated close coordination

[229] Available at http://usafhpa.com/2012/09/05/mid-air-retrieval-system-mars; accessed February 2015.

[230] Available at http://usafhpa.com/2013/08/03/917th-ftd-tan-son-nhut-ab-saigon-svn-1963–1964/; accessed February 2015.

[231] Ibid.

[232] Ibid.

[233] Manning et al., *History of Air Education and Training Command 1942–2002*.

between CONUS training schedules, US Army aviation redeployments, equipment turnover procedures, and US Air Force advisory teams. In many cases, Vietnamese Air Force pilots and mechanics served long apprentice periods with Army aviation companies before their own squadrons were finally activated. Again, the result was impressive. In 1968, the Air Force possessed about 75 outmoded rotary-wing aircraft (H-34s) organized into five squadrons. By the end of 1972, the Air Force boasted some 500 new helicopters in 18 squadrons, one of the largest, costliest, and most modern helicopter fleets in the world.[234]

Both US Army and US Air Force CONUS installations were used extensively to train Vietnamese Air Force pilots. This practice made it necessary for all prospective pilots to receive extensive language training. English language training for all Vietnamese helicopter pilots was finally completed on schedule with the last group leaving for the United States in April 1971. CONUS helicopter pilot training was scheduled for completion in July 1972.[235]

At the time, a total of 1,642 pilots would have been trained including 341 who would have received instrument qualification training. The total Vietnamese Air Force offshore pilot training requirement, including helicopter, fixed-wing, and high-performance aircraft, was 3,334. During 1971, 1,007 students departed for offshore training while the remainder were scheduled to depart for the continental United States by May 1972 for 18 months of training. Completion date for the major portion of the offshore pilot program was September 1973.[236]

[234] Manning et al., *History of Air Education and Training Command 1942–2002*.

[235] Ibid.

[236] Ibid.

4.0 APPLICATION OF THE SUBCONTEXT IN THE IDENTIFICATION AND EVALUATION OF HISTORIC RESOURCES

This chapter presents how to apply this historic subcontext in the identification and evaluation of historic resources. The latter portion of this chapter describes the property types on US military installations associated with helicopter use during the Vietnam War. The selection of these property types was based on research and field investigations. Field data were collected at Fort Benning, Marine Corps Air Station, Camp Pendleton, Marine Corps Base Quantico, Patuxent River Naval Air Station, and Pensacola Naval Air Station (see appendixes A–E). The purpose of the site visits was to identify real property associated with helicopter use.

Once resources have been identified, evaluation of a property involves two steps. First, the property will be assessed against eligibility criteria for listing on the National Register of Historic Places (national register); then it must be assessed for its integrity. The following national register publications are useful guides when evaluating Vietnam War helicopter resources:

1. How to Apply National Register Criteria for Evaluation
2. Guidelines for Completing National Register for Historic Places Forms
3. Researching a Historic Property
4. Guidelines for Evaluating and Documenting Historic Aviation Properties
5. Guidelines for Evaluating and Documenting Historic Properties that Have Achieved Significance Within the Last 50 Years

These guides maybe found at: http://www.cr.nps.gov/nr/publications/index.htm.

4.1 NATIONAL HISTORIC PRESERVATION ACT

The National Historic Preservation Act (NHPA) is the centerpiece of federal legislation protecting cultural resources. In the act, Congress states that the federal government will "provide leadership in the preservation of the prehistoric and historic resources of the United States," including resources that are federally owned, administered, or controlled. The National Historic Preservation Act requires the Department of Defense to identify its significant resources, evaluate them for national register eligibility, and plan for the protection of the listed or eligible historic properties.

The National Historic Preservation Act established the National Register of Historic Places. The national register is a list of buildings, structures, objects, sites, and districts that have demonstrated significance to US history, architecture, archaeology, engineering, and/or culture. The national register is maintained by the Secretary of the Interior and is managed by the National Park Service Keeper of the Register. Regulations for listing a property on the national register were developed by the Department of the Interior and are found in 36 *Code of Federal Regulations* (CFR) Part 60. The National Historic Preservation Act requires that federal agencies identify historically significant properties that are eligible for listing on the national register.

Section 106 of the National Historic Preservation Act requires the federal government to take into account the effects of its actions on historic properties prior to implementation of the action. For US military installations, this requirement applies to all proposed actions on federal lands and any proposed activities

that are federally supported or funded. Consultation with the state historic preservation office (SHPO) and/or the Advisory Council on Historic Preservation (ACHP) is a critical step in this process. Activities on lands held by an American Indian tribe with a designated tribal historic preservation officer (THPO) must be coordinated with this official. If an undertaking on federal lands may affect properties having historic value to a federally recognized American Indian tribe, such tribe shall be afforded the opportunity to participate as consulting parties during the consultation process defined in 36 CFR 800.

Section 110 of the National Historic Preservation Act requires federal agencies to locate, inventory, and identify all properties under their ownership or control that may qualify for the national register. It also requires that the agencies manage and protect historic properties. The Federal Agency Preservation Assistance Program provides assistance to federal agencies in meeting section 110 historic preservation responsibilities.

Section 106 compliance can also be accomplished using agreed-upon streamlined methods and agreement documents such as programmatic agreements. The agreements, which are developed among federal agencies, the Advisory Council on Historic Properties, and state historic preservation offices to provide efficient section 106 compliance guidance for specified historic properties and/or undertakings.

Failure to take into account the effects of an undertaking on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such effects, can result in formal notification from the Advisory Council to the head of the federal agency of foreclosure of the ACHP opportunity to comment on the undertaking pursuant to the National Historic Preservation Act. A notice of foreclosure can be used by litigants against the federal agency in a manner that can halt or delay critical activities or programs.

The National Historic Preservation Act requires the Department of Defense to identify its significant resources, evaluate them for national register eligibility, and plan for the protection of the listed or eligible historic properties. The Vietnam War overview historic context "Vietnam and the Home Front: How DoD Installations Adapted, 1962–1975" and this subcontext are designed to assist professionals in the field of cultural resources in identifying significant US military Vietnam War helicopter use-related properties that may be present on military installations state-side. Criteria for evaluating these properties, once identified, are provided in section 4.3.

4.2 IDENTIFICATION OF HISTORIC PROPERTIES AND METHODOLOGY UNDER THIS SUBCONTEXT

The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (48 *Federal Register* 44716) outline the process for the identification of historic properties. The process includes developing a research design, conducting a review of archival literature, completing a field survey, and analyzing the results of the literature review and field survey.

Those conducting the identification and evaluation of historic properties must meet professional qualifications established by the Secretary of the Interior. The qualifications are divided into five subject areas: History, Archeology, Architectural History, Architecture, and Historic Architecture.

The minimum professional qualifications in history and architectural history are: a graduate degree in history/architectural history or a bachelor's degree in history/architectural history and at least two years of full-time experience in research, writing, teaching, interpretation, or other demonstrable professional activity with an academic institution, historic organization or agency, museum, or other professional

institution; or substantial contribution through research and publication to the body of scholarly knowledge in the field of history/architectural history.

The minimum professional qualifications in archeology are a graduate degree in archeology or anthropology and at least one year of full-time professional experience or equivalent specialized training in archeological research, administration, or management; at least four months of supervised field and analytic experience in general North American archeology and demonstrated ability to carry research to completion.

The minimum professional qualifications in architecture are a professional degree in architecture plus at least two years of full-time experience in architecture or a state license to practice architecture. The minimum professional qualifications in historic architecture are a professional degree in architecture or a state license to practice architecture plus at least one year of graduate study in architectural preservation, American architectural history, preservation planning, or closely related field; or at least one year of full-time professional experience on historic preservation projects.

A research design should define the purpose and objectives of the survey as well as the methodologies that will be employed to achieve the objectives. Most often, as stated above, surveys to identify historic properties are undertaken in compliance with section 106 of the National Historic Preservation Act, which requires federal agencies to take into account the effect of its actions on historic properties and to mitigate adverse effects. Another driver for performing inventories is section 110 of the National Historic Preservation Act that requires agencies to identify historic properties and manage them in the interest of the public. This requires the establishment of a baseline of known historic properties that must be kept updated, which is then used to develop a management plan for the properties. Depending on the driver, identification could be limited to a single property in compliance with a limited section 106 action, or it may incorporate an entire installation in compliance with section 110.

After the objective and scope of identification has been defined, a methodology should be developed to ensure that the identification meets the goals and also makes the best use of time and fiscal resources to guarantee the information obtained from the identification is as comprehensive as possible in anticipation of future actions that may be required. The methodology should include how to determine dates for original construction and all alterations, repairs, and additions; construction techniques and materials; history of property function; and the history of surrounding properties. These types of information are essential to place a resource within a specific historic context for the property and determining the property's historic significance and integrity.

Historic properties are identified primarily through a combination of literature and archival record reviews and field surveys. Record reviews are conducted using real property records, historic maps and aerial photographs, blueprints and construction drawings, other archival records, and sometimes oral histories. Generally, major command headquarters, installation real property managers and departments of public works, installation historians, and one or more branches of the National Archives and Records Administration (NARA) keep these types of records. Other sources of information for resources and installation history related to helicopters are local newspaper archives, archives at academic institutions (especially The Vietnam Center and Archive, Texas Tech University), historical societies, websites, and libraries. Previous installation and unit histories may also contain information valuable to understanding the use and history of a building or site in relation to Vietnam War rotary-wing aircraft.

Field surveys should be undertaken with care to gather as much information as possible as efficiently as possible. Contemporary aerial photographs can be consulted before going into the field and used as a guide to map current features of the property and identify elements that have been added or removed. Using a current aerial photograph also could reduce field mapping time. Photographs should be taken of

all elements being inventoried. These photographs should be keyed on the aerial photograph to ensure they can be properly labeled. Photographs should be taken of each building and property feature, including close-ups of unique and representative details. Even if the pictures are not used as part of an inventory report, they could be helpful to document a time line of the property's condition.

Meticulous notes should be taken during a field survey. Oftentimes, database forms or applets can be created and loaded onto data collectors (including most submeter GPS units) to standardize data collection. In this manner, data can then be linked to geospatial databases creating a useful management tool for both cultural resource managers and for facility managers who may need to know, on a moment's notice, if a property or a specific element of a property is eligible for the national register.

4.3 CHOOSING THE CORRECT HISTORIC CONTEXT

The broader overview context contained in *Vietnam and the Home Front: How DoD Installations Adapted, 1962–1975*, can be preliminarily used in determining which properties may be significant on an individual installation by the cultural resources manager; however, the follow-on subcontexts will provide the specifics necessary for determinations of eligibility at the installation level.

Recommendations in *Vietnam and the Home Front: How DoD Installations Adapted, 1962–1975* include the development of additional subthemes for the Vietnam War. The subthemes include ground training, air training, housing, counterinsurgency warfare training, housing, medical facilities, and logistical facilities. Subthemes for each of these thematic areas should be developed to include an in-depth historic context, determination of associated property types, and character-defining features. Every thematic area may not be equally applicable to each branch of the Armed Services. Currently, the subtheme *Vietnam War-Era Ground Combat Training and Associated Facilities* is also being developed.

Association with helicopters at an installation does not automatically imply a relationship to the Vietnam War. For example, the US Navy trained helicopter pilots for observing Soviet submarines and search and rescue capabilities outside the Vietnam War theater. Facilities constructed between 1962 and 1975 could be associated with another aspect of the Cold War, or simply to modernize aging installation facilities and infrastructure. In other cases, facilities were built previously and may have served an important role during the Vietnam War but may have significance to more than one context. For example, at Patuxent River Naval Air Station, Hangar 111, constructed as a seaplane hangar in 1944, served as the headquarters of the rotary-wing section during the Vietnam War. Hangar 110**,** also constructed as a seaplane hangar in 1944, was used by the rotary-wing section, as well. Hangars 110 and 111 are part of the Flight Test Historic District at Patuxent River NAS and have not been evaluated for Vietnam War significance (see appendix D). In such cases, the resources, upon evaluation, may be significant under more than one context.

At Marine Corps Base Quantico (see appendix C), many of the important events associated with helicopters preceded the Vietnam War.

4.4 APPLYING NATIONAL REGISTER CRITERIA FOR EVALUATION

The Secretary of the Interior has developed the National Register Criteria for Evaluation (36 CFR Part 60.4) to assist in the evaluation of properties eligible for inclusion in the national register. The National Park Service has published guidance for applying the criteria in *National Register Bulletin 15*: *How to Apply the National Register Criteria for Evaluation* (NPS 1991). To qualify for the national register, a

property must have significance and retain historic integrity. Significance for US military Vietnam War helicopter-related historic properties can be ascertained through chapters 2 and 3 of this subcontext.

To be listed on, or considered eligible for listing on the national register, a cultural resource must meet at least one of the four criteria that follow:

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

In addition to meeting at least one of the above criteria, a historic property must 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 it possessed in the past and its capacity to convey information about a culture or group of people, a historic pattern, or a specific type of architectural or engineering design or technology.

4.4.1 Criterion A: Association with Events

The first criterion recognizes properties associated with single events such as the evacuation of the US embassy in Saigon, or with a pattern of events, repeated activities, or historic trends such as innovations in new military strategies, testing, and training. The event or trends, however, must clearly be important within the associated history.

The US involvement in the Vietnam War comprised a complex series of political, military, diplomatic, and economic events and programs that affected the lives of millions of people in the United States and Asia. The Vietnam War was an event that made significant contributions to the broad patterns of US history; however, because the Vietnam War occurred during the Cold War-era (1947–1989), not all military properties related to helicopters constructed from 1961 to 1975 are significant under this subcontext. The historic property(ies) being considered must have an important and specific association with helicopter use in Vietnam. During the Cold War, helicopters were also used, for example, to track Soviet submarines.

Military properties associated with helicopter use during the Vietnam War for pilot and troop training, developing and testing equipment (research and development), testing fighting strategies, troop movement and transport, and logistics are likely to fall under this criterion. Properties generally related to units that participated in the Vietnam War would also likely be evaluated under this criterion. To determine if a property is significant within subcontext under criterion A:

1. Determine the nature of the property, including date of construction, type of construction, dates and purposes of modifications, and function(s) from time of construction to the end of the Vietnam War (1975).
2. Determine if the property is associated specifically with Vietnam War helicopter use and missions, events, or trends.
3. Evaluate the property's history as to whether it is associated with the Vietnam War in a significant way.

4.4.2 Criterion B: Association with Significant People

Properties may be listed in the national register for their association with the lives of significant people. The individual in question must have made contributions to history that can be specifically documented and that were important within history. This criterion may be applicable, but to only a small portion of buildings or structures, as the history focuses on events and on design and construction rather than on individuals. However, background research on a particular installation or building may indicate that it is associated with an individual who made an important contribution to helicopter use in the Vietnam War trends or specific events. To determine if a property is significant within this subcontext under criterion B:

1. Determine the importance of the individual.
2. Determine the length and nature of the person's association with the property.
3. Determine if the person is individually significant within history.
4. Determine if the property is associated with the time period during which the individual made significant contributions to history.
5. Compare the property to other properties associated with the individual to determine if the property in question best represents the individual's most significant contribution.

Refer to *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons* (National Park Service) for more information.

4.4.3 Criterion C: Design/Construction

To be eligible for listing on the national register under criterion C, properties must meet at least one of four requirements: (1) embody distinctive characteristics of a type, period, or method of construction; (2) represent the work of a master; (3) possess high artistic value; or (4) represent a significant and distinguishable entity whose components may lack individual distinction. Vietnam War helicopter use-related resources are most likely to be eligible under the first or fourth of these requirements.

National Register Bulletin 15 defines distinctive characteristics as "the physical features or traits that commonly recur" in properties; type, period, or method of construction is defined as "the certain way properties are related to one another by cultural tradition or function, by dates of construction or style, or by choice or availability of materials and technology." Properties are eligible for listing on the national register if they are important examples, within history, of design and construction of a particular time. This component of criterion C can apply to buildings, structures, objects, or districts.

"Significant and distinguishable entities" refers to historic properties that contain a collection of components that may lack individual distinction, but form a significant and distinguishable whole. This portion of criterion C applies only to districts.

Military properties associated with troop and pilot training, development of tactics and strategies, housed separated helicopter units, research and development, and transport may fall under this criterion (and may also fall under criterion A). To determine if a property is significant as an important example of distinctive characteristics of a building type or as a significant and distinguishable district:

1. Determine the nature of the property, including date of construction, type of construction, major modifications (dates and purpose) historic appearance, and functions during the period of significance.
2. Determine the distinctive characteristics of the property type represented by the property in question.
3. Compare the property with other examples of the property type and determine if it possesses the distinctive characteristics of a specific building type construction.
4. Evaluate the property's design and construction to determine if it is an important example of building type construction.

4.4.4 Criterion D: Information Potential

Properties may be listed on the national register if they have yielded, or may be likely to yield, information important in prehistory or history. Two requirements must be met for a property to meet criterion D: (1) the property must have, or have had, information to contribute to the understanding of history or prehistory, and (2) the information must be considered important. This criterion generally applies to archaeological sites. In a few cases, it can apply to buildings, structures, and objects if the property itself is the principal source of information and the information is important. For example, a building that displays a unique structural system or unusual use of materials and where the building itself is the main source of information (i.e., no construction drawings or other historic records) might be considered under criterion D. Properties significant within this subcontext would rarely be eligible under criterion D.

4.4.5 Integrity

A historic property determined to be significant under the criteria for evaluation for the national register must possess integrity. Integrity is the ability of a property to convey its significance through retention of the property's essential physical characteristics from its period of significance. The National Register Criteria for Evaluation lists seven aspects of integrity. A property eligible for the national register must possess several of these aspects. The assessments of a property's integrity are rooted in its significance. The reason why a property is important should be established first, then the qualities necessary to convey that significance can be identified. *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation* defines the seven aspects of integrity as the following:

1. **Location:** the place where the cultural resource was constructed or the place where the historic event occurred.
2. **Design:** the combination of elements that create the form, plan, space, structure, and style of a cultural resource.
3. **Setting**: the physical environment of a cultural resource.
4. **Materials:** the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a cultural resource.
5. **Workmanship:** the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
6. **Feeling:** a property's expression of the aesthetic or historic sense of a particular period of time.
7. **Association:** the direct link between an important historic event or person and a cultural resource.

National Register Bulletin 15 describes the following steps in assessing historical integrity:

1. Determine the essential physical features that must be present for a property to represent its significance.
2. Determine whether the essential physical features are sufficiently visible to convey significance.
3. Compare the property with similar properties if the physical features necessary to convey significance are not well-defined.
4. Determine, based on the property's significance, which aspects of integrity are particularly important to the property in question and if they are intact.

For properties significant for their association with helicopter use during the Vietnam war on US military installations, they must retain the key physical features associated with these themes. Properties significant for their design and construction must retain the physical features that are the essential elements of the aspects of the building type construction that the property represents.

In cases of active military installations, buildings are more likely to have been modified to extend their useful life. These modifications generally include adapting buildings for new communication systems or equipment, mission and staff changes, and changes in military assets such as new aircraft models. These integrity issues will be critical in the evaluation process of significant resources.

To qualify for listing as a historic district, the majority of the properties in the district associated with the history must possess integrity and a sufficient number of properties must be retained from the period of significance to represent that significance. The relationship among the district's components, i.e., massing, arrangement of buildings, and installation plan must be substantially unchanged since the period of significance.

4.4.6 Criterion Considerations

Certain kinds of properties are not usually considered for listing on the national register, including:

1. religious properties (criteria consideration A)
2. moved properties (criteria consideration B)
3. birthplaces or graves (criteria consideration C)
4. cemeteries (criteria consideration D)
5. reconstructed properties (criteria consideration E)
6. commemorative properties (criteria consideration F)
7. properties that have achieved significance within the last 50 years (criteria consideration G)

These properties can be eligible for listing only if they meet special requirements called "criteria considerations." A property must meet one or more of the four criteria for evaluation (A through D discussed in previous sections) and also possess integrity of materials and design before it can be considered under the various criteria considerations. Three of these criteria considerations may be applicable to US military properties; moved properties (criterion consideration B), commemorative properties (criteria consideration F), and properties that have achieved significance within the last 50 years (criteria consideration G).

A property removed from its original or historically significant location can be eligible if it is significant primarily for architectural value or if it is the surviving property most importantly associated with a historic person or event. Properties that are moveable by their nature, such as a ship or rail car, do not need to meet this criterion consideration.

Commemorative properties are designed or constructed after the occurrence of an important historic event or after the life of an important person. They are not directly associated with the event or with the person's productive life, but serve as evidence of a later generation's assessment of the past. The significance comes from their value as cultural expressions at the date of their creation. Therefore, a commemorative property generally must be over 50 years old and must possess significance based on its own value, not on the value of the event or person being memorialized. A commemorative marker erected in the past by a cultural group at the site of an event in its history would not meet this criterion if the marker were significant only for association with the event and it had not become significant itself through tradition.

Properties less than 50 years old are normally excluded from the national register to allow time to develop sufficient historical perspective. However, under criteria consideration G, a property may be eligible for the national register if it possesses "exceptional importance" or significance. Vietnam War resources span from 1961 through 1975, so could have been built 55 years ago (at this writing), or as recently as 41 years ago. Buildings constructed before 1961 could have significance during the latter part of the Vietnam War. Criteria consideration G (properties that have achieved significance within the last 50 years) applies to buildings and structures that are less than 50 years old at the time of evaluation. This criterion also includes buildings that were constructed more than 50 years ago and that continue to achieve significance into a period less than 50 years ago has noncontiguous periods of significance, one of which is less than 50 years ago or had no significance until a period less than 50 years ago. For buildings, structures, objects, sites, or districts that have achieved significance within the last 50 years, only those of "exceptional importance" can be considered eligible for nomination to the national register, and the finding of "exceptional importance" must be made within the specific history associated with the property. National Park Service publication *How to Evaluate and Nominate Potential National Register Properties That Have Achieved Significance Within the Last 50 Years* further describes criteria consideration G.

Properties evaluated under criteria consideration G that do not qualify for exceptional importance must be reevaluated when they reach 50 years of age under national register criteria A through D.

4.5 SIGNIFICANCE

To qualify for the national register, a cultural resource must be significant, meaning that it must represent a significant part of US history, architecture, archaeology, engineering, or culture. A resource may possess significance on the local, state, or national level. The significance of a cultural resource can be determined only when it is evaluated within its history. As outlined in *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*, the following steps are taken to evaluate a cultural resource within its history:

- Identify what the property represents: the theme(s), geographical limits, and chronological period that provide a perspective from which to evaluate the property's significance.
- Determine how the theme of the history is significant to the local area, the state, or the nation.
- Determine the property type and whether it is important in illustrating the history.

- Determine how the property represents the history through specific associations, architectural or engineering values, or information potential (the national register criteria for evaluation).
- Determine what physical features the property must possess in order for it to reflect the significance of the history.

A cultural resource may be significant within more than one area of history. In such cases, all areas of history should be identified. However, significance within only one area is required. If a cultural resource is determined to possess sufficient significance to qualify for the national register, the level of integrity of those features necessary to convey the resource's significance must then be examined.

This subcontext identified seven themes for helicopter use in support of the Vietnam War Cold War. The themes are (1) troop training, (2) pilot training, (3) mechanics training, (4) development of tactics and strategies, (5) areas of an installation where helicopter units were separated from the rest of the installation (housing, training, etc.), (6) research and development, and (7) transport.

4.6 PROPERTY CLASSIFICATIONS

Significant properties are classified as buildings, sites, districts, structures, or objects. Sites or structures that may not be considered individually significant may be considered eligible for listing on the national register as part of a historic district. The classifications are defined as:

- A building such as a house, barn, church, hotel, or similar construction is created principally to shelter any form of human activity. "Building" may also be used to refer to a historically and functionally related unit such as a courthouse and jail or a house and barn.

- The term "structure" is used to distinguish from buildings those functional constructions made usually for purposes other than creating human shelter.

- The term "object" is used to distinguish from buildings and structures those constructions that are primarily artistic in nature or are relatively small in scale and simply constructed. Although it may be movable, by nature or design, an object is associated with a specific setting or environment.

- A site is the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archaeological value regardless of the value of any existing structure.

- A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development.

4.6.1 Individual Eligibility vs. Historic District

While helicopter installations, as a class of resources, may be significant, not every structure associated with helicopter training and use during the Vietnam War is eligible for listing on the National Register of Historic Places. The framework established by the historic context for helicopters focuses on the role of helicopters during the Vietnam War to assess its significance and the significance of its component

resources. In general, helicopter-related facilities should first be evaluated as potential districts. Airfields were constructed as discrete entities in which individual elements historically contributed to the operation of the overall field.

For component structures and buildings to be individually eligible for listing on the national register with the context of Vietnam War helicopters, they should individually embody a significant event associated with the development of helicopter tactics, training, or research and development; or represent an example of a type or method of construction or engineering, or the important work of a significant architect. Infrastructure and support buildings typically are not individually eligible.

For example, at Marine Corps Air Station Camp Pendleton, upgrades and buildings were added to the air station to support the increased activities due to the Vietnam War (see appendix B). Improvements included new runway lighting, increased apron access, and aircraft parking apron, acquiring a capability for instrument landings, and approach lighting. Electrical, communication, sewer, fire suppression, ordnance build-up area, and water systems were upgraded or installed. A new aircraft maintenance hangar was constructed, as well as a series of shops, classrooms, and storage buildings were added. The air station has not been evaluated for Vietnam War significance; however, it is likely that none of these buildings would be individually eligible, but could represent a district.

4.6.2 Individual Properties

Individual properties are those whose physical attributes singularly represent or embody the Vietnam War helicopter subtheme. While individual properties need not be unique, they must have integrity and cannot be part of a multiple-property grouping.

For properties that are less than 50 years old to be individually eligible for listing on the national register, they should:

- Clearly and explicitly reflect the important helicopter mission of the installation. An example might be the landing zones, hover areas, and stage fields.
- Be regarded as symbolic of the installation or of an aspect of the mission. Simulators and mock ups may be examples.
- Represent particularly significant examples of a type or method of construction or an important technological advancement.

Infrastructure and support buildings are not typically individually eligible unless they were: (1) the site of a particular event, (2) directly associated with a significant individual, or (3) of exceptional note as an example of architectural or engineering design.

4.6.3 Multiple Properties

Multiple properties are the same property type, have physical characteristics that exemplify an important Vietnam War helicopter subtheme, and are extant at multiple locations. Examples would include properties such as training sites, firing ranges, test sites, and classrooms. Nationwide studies are generally needed to identify multiple properties associated with the history. Until a nationwide study is completed, properties should be considered for individual listing. Individual listing is unnecessary if: (1) the property

is the only surviving example of a property type that is important within the history, or (2) the property distinctly has the characteristics necessary to represent the history.

4.6.4 Historic Districts with Elements Less Than 50 Years Old

Properties less than 50 years old may be integral parts of a district when there is sufficient perspective to consider the properties as historic. This consideration is accomplished by demonstrating that: (1) the district's period of significance is justified as a discrete period with a defined beginning and end, (2) the character of the district's historic resources is clearly defined and assessed, (3) specific resources in the district are demonstrated to date from that discrete era, and (4) the majority of district properties are over 50 years old. In these instances, it is unnecessary to prove exceptional importance of either the district or of the less than 50-year-old properties.

Exceptional importance still must be demonstrated for districts where the majority of properties or the major period of significance is less than 50 years old, and for less than 50-year-old properties that are nominated individually. Some historic districts represent events or trends that began more than 50 years ago. Frequently, construction of buildings continued into the less than 50-year period, with the later resources resulting in representation of the continuation of the event. In instances where these later buildings make up only a small part of the district and reflect the architectural and/or historic significance of the district they can be considered integral parts of the district (and contributing resources) without showing exceptional importance of either the district or the less than 50-year-old buildings.

An exceptional historic district is one comprised principally of structures less than 50 years of age that are integral to understanding the unique aspects of the district's mission or association. Structures that clearly contribute to this understanding would be considered contributing elements to the district. Structures that only tangentially or marginally contribute would not be considered contributing members unless they qualify under the standard national register criteria. Since the Vietnam War and corresponding construction span a period of time that stretches from 55 to 41 years ago, there may be districts that will fall into this category.

4.6.5 One-of-a-Kind Properties

These are properties whose character-defining features singularly embody the helicopter subtheme and that are the only known property of its type. Singularity alone does not impart exceptional importance if the property is less than 50 years old. Vietnam War helicopter properties that are singular must be compared against other property types within the same theme to determine if they are truly exceptional. Although unique properties can never be precisely compared quantitatively, a qualitative comparison must take place to protect the exclusivity of the term "exceptional."

The phrase "exceptional importance" may be applied to the extraordinary importance of an event or to an entire category of resources so fragile that survivors of any age are unusual. Properties listed that had attained significance in less than 50 years include, for example, the launch pad at Cape Canaveral from which astronauts first traveled to the moon. Properties less than 50 years old that qualify as exceptional because the entire category of resources is fragile. An example of a fragile resource is a traditional sailing canoe in the Trust Territory of the Pacific Islands, where because of rapid deterioration of materials, no working Micronesian canoes exist that are more than 20 years old.

4.6.6 Properties Significant Within More Than One Area of History

Properties may possess significance within multiple areas of history. For instance, a building may be individually significant to Vietnam War helicopter history because of its design characteristics, and may also be part of a district related to a particular mission of an installation. Military installations should be evaluated holistically, with attention to their interrelated historic associations over time. When evaluating the significance of a military property, the period of significance should be defined based on the range of important associations over time. In districts, buildings may illustrate various dates of construction, architectural design, and historical associations. A single building may be associated with several periods of history; for example, a building may have played a vital role in both the Vietnam and Korean Wars. Significance within one historic period is sufficient for the property to meet the national register criteria for evaluation. However, all areas of significance should be identified to have a comprehensive picture of the property's importance. For properties constructed during the period of the Vietnam War (1961–1975), other Vietnam War subtheme reports should be referenced (on www.denix.osd.mil as available).

4.7 PROPERTY TYPES ASSOCIATED WITH HELICOPTER USE DURING THE VIETNAM WAR ON US MILITARY INSTALLATIONS

Training was required for a large number of military personnel to fly and maintain helicopters. Large influxes of military personnel to these installations during the war resulted in the need for buildings and structures to support helicopter training and logistics. The property type selected for inclusion illustrates building structure types directly related to helicopter use on US military installations during the Vietnam War. Building types also include structures, fields, landing zones, and support buildings. Buildings and structures did not necessarily need to be constructed during the Vietnam War period (1962–1975); they may have been previously constructed and repurposed for the Vietnam War.

Many of the buildings were constructed using standard designs and not necessarily unique to a helicopter mission. For example, if a helicopter unit was stationed in a separate area of a base, the housing and support buildings (mess, offices, etc.) may have been similar in design to other housing built around the same time (see appendixes A and E). Therefore, providing a description of the buildings is not informative to the subtheme. The installations visited during the site visits had undergone major changes since the Vietnam War and most either had no extant resources or the buildings had been modified. The appendixes provide descriptions of buildings and structures associated with the installation's Vietnam War context. Also, helicopters do not require runways, but fixed-wing airfields were converted to heliports. Heliports may have runways, taxiways, and aprons. Most heliport hardscapes were paved due to impacts of dust.

The following provides a brief description of building, structure, and landscape features that are associated with seven areas of helicopter training and use on US installations during the Vietnam War. Individual properties need to be investigated at the installation level. Additionally, the omission of a property type in the following list does not automatically exclude it from potentially having significance under this subtheme.

1. Facilities that were constructed, underwent a major expansion, or were adapted and heavily used during 1962–1975 and were directly related to providing training to integrate helicopters with ground troops, aeromedical personnel, special ops troops, and the other military operations. These property types would include:

Buildings and indoor training areas that accommodated classrooms, battle labs, simulators, and mock ups. These buildings vary in size, shape, and design. These properties would not likely be individually eligible unless containing unique equipment. These properties would be more likely to be part of a district if the resources still have integrity.

Outdoor training areas including clearings or hardscapes for landing zones, hover areas, and stage fields, aerial firing ranges and targets, and tactical training sites (see figures 4-1 and 4-2). These training areas could contain mock villages or ship landing surfaces. The most elementary requirement for an airfield is an area for helicopters to take off and land. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

Source: Marine Corps Base Quantico

FIGURE 4-1. HERON LANDING ZONE, MARINE CORPS BASE QUANTICO, 1966

Source: Marine Corps Base Quantico

FIGURE 4-2. HERON LANDING ZONE, MARINE CORPS BASE QUANTICO, 1986

2. Facilities that were constructed, underwent a major expansion, or were adapted and heavily used during 1962–1975 and were directly related to helicopter pilot training. These resources include:

   Buildings and indoor training areas that accommodated classrooms, battle labs, simulators, and mock ups. These buildings vary in size, shape, and design. These properties would not likely be individually eligible unless containing unique equipment. These properties would be more likely to be part of a district if the resources still have integrity.

   Outdoor training areas including clearings or hardscapes for landing zones, hover areas, and stage fields, tactical instrument training course, aerial firing ranges and targets, tactical training sites, and pinnacle training areas. (A pinnacle is an area from which the surface drops away steeply on all sides. A ridgeline is a long area from which the surface drops away steeply on one or two sides, such as a bluff or precipice. The absence of obstacles does not necessarily lessen the difficulty of pinnacle or ridgeline operations. Updrafts, downdrafts, and turbulence, together with unsuitable terrain in which to make a forced landing, may still present extreme hazards.). These training areas could include ship landing surfaces. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

   Flightline resources in support of helicopter use, including aprons, tarmacs, helipads, operations buildings, hangars, fire stations, and control towers. The buildings vary in

size, shape, and design. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

Source: J. Aaron, 2014

FIGURE 4-3. FRYAR LANDING ZONE 2014, FORT BENNING

Source: Fort Benning

FIGURE 4-4. FRYAR LANDING ZONE, 1964, FORT BENNING

3. Facilities that were constructed, underwent a major expansion or were adapted and heavily used during 1962–1975, and were directly related to providing mechanics training:

   Buildings that accommodated classrooms, maintenance hangars, paint shop, storage, warehouses, fueling systems, wash racks, avionics shops. These buildings vary in size, shape, and design. These properties would not likely be individually eligible unless containing unique equipment. These properties would be more likely to be part of a district if the resources still have integrity.

   Flightline resources in support of helicopter use, including aprons, tarmacs, helipads, and other aircraft storage areas. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

Source: J. Aaron 2014

FIGURE 4-5. FORMER MAINTENANCE FACILITIES AND SHOPS, MARINE CORPS AIR STATION, CAMP PENDLETON

Source: Ft. Benning Cultural Resources Files

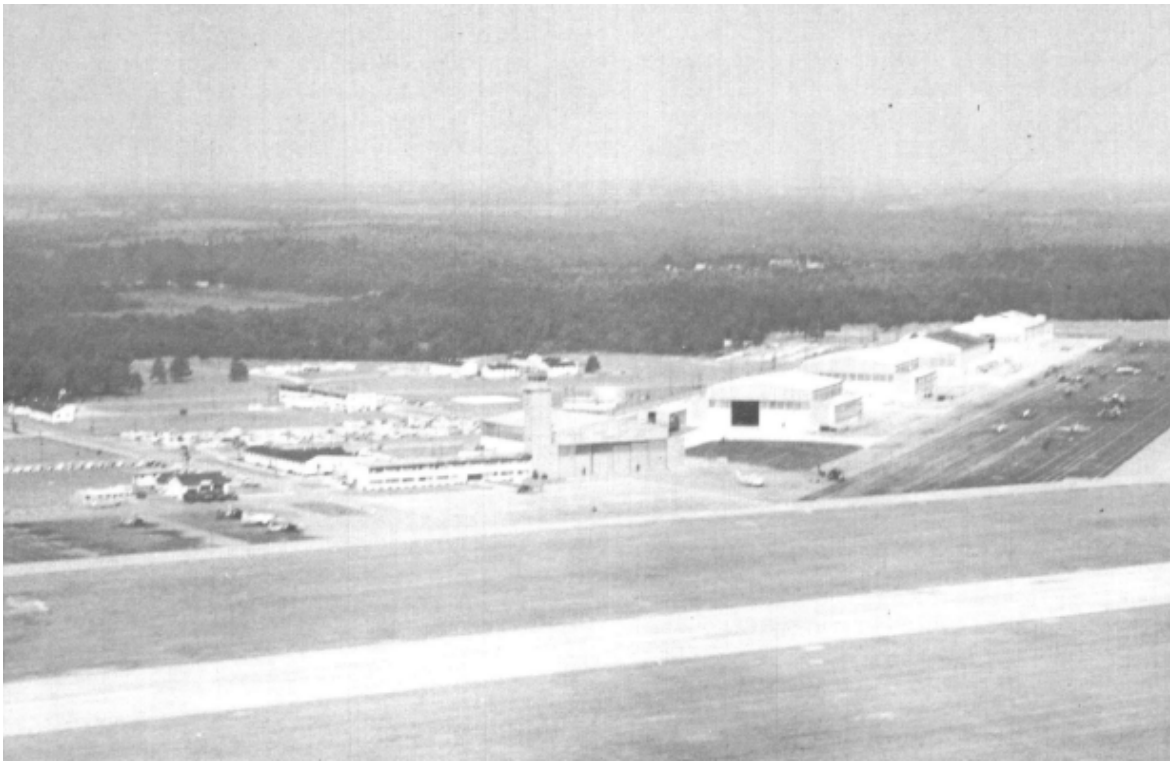
FIGURE 4-6. LAWSON ARMY AIRFIELD, FORT BENNING, 1971

4. Facilities that were constructed, underwent a major expansion, or were adapted and heavily used during 1962–1975 and were directly related to the development of helicopter use tactics and strategies:

   Buildings and indoor research and testing areas that accommodated classrooms, laboratories, simulators and mock ups, and fabrication shops. These buildings vary in size, shape and design. These properties would not likely be individually eligible unless containing unique equipment. These properties would be more likely to be part of a district if the resources still have integrity.

   Outdoor testing areas including clearings or hardscapes for landing zones, hover areas, and stage fields, tactical instrument training course, aerial firing ranges and targets, tactical training sites, and pinnacle training areas. These areas may include mock villages or vessels. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

   Flightline resources in support of helicopter use, including aprons, tarmacs, helipads, operations buildings, fire stations, control towers, avionic shops, paint shops, storage, fueling systems, and wash racks. The buildings vary in size, shape, and design. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.



Source: 1964 Historical Supplement, Fort Rucker

FIGURE 4-7. CAIRNS ARMY AIR FIELD, FORT RUCKER SHOWING HARDSCAPES AND HANGARS, 1964

Source: Stacey Griffin, PCI, 2003

FIGURE 4-8. ONLY ORIGINAL REMAINING BLOCK WITHIN KELLEY HILL CANTONMENT, LOOKING NORTH, FORT BENNING

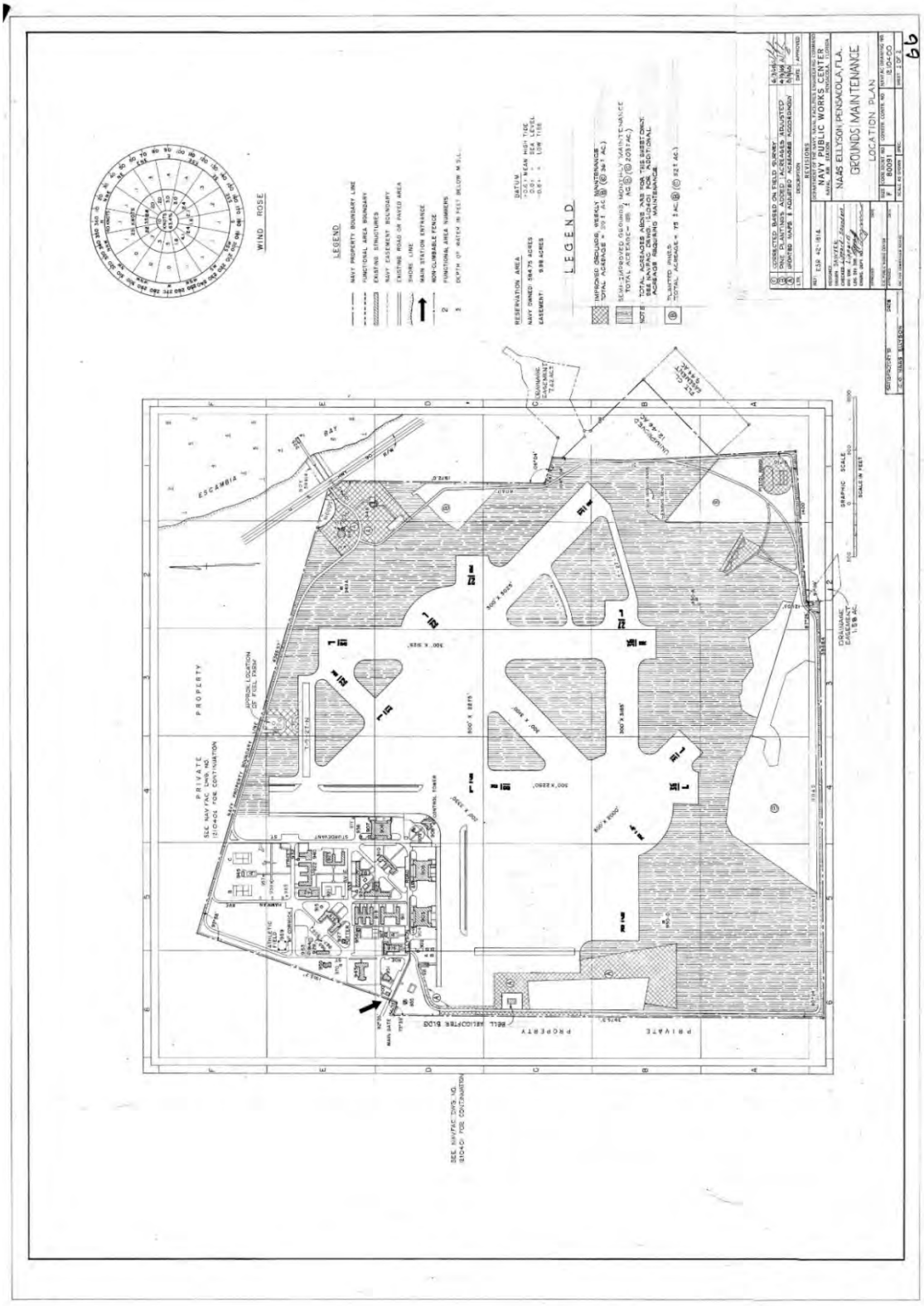
5. Facilities that were constructed, underwent a major expansion, or were adapted and heavily used during 1962–1975 and were directly related to helicopter installations or units that separated within an installation. These areas would include the training and maintenance areas as previously described, and also included housing and separated cantonment areas.

   Buildings and indoor research and testing areas that accommodated classrooms, laboratories, simulators and mock ups, and fabrication shops. These buildings vary in size, shape, and design. These properties would not likely be individually eligible unless containing unique equipment. These properties would be more likely to be part of a district if the resources still have integrity.

   Outdoor testing areas including clearings or hardscapes for landing zones, hover areas, and stage fields, tactical instrument training course, aerial firing ranges and targets, tactical training sites, and pinnacle training areas. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

   Flightline resources in support of helicopter use, including aprons, tarmacs, helipads, operations buildings, fire stations, control towers, avionic shops, paint shops, storage, fueling systems, and wash racks. The buildings vary in size, shape, and design. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

   Buildings and structures comprising a separated cantonment area, including barracks and other housing, mess halls, administration buildings, chapels, gymnasiums, branch exchanges, and branch clinics, and unit headquarters. These buildings vary in size, shape, and design.



Source: Naval Air Station Pensacola

FIGURE 4-9. ELLYSON FIELD, 1968

FIGURE 4-10. AN AERIAL VIEW OF THE OLD HELICOPTER PORT AT NORFOLK NAS, JANUARY 1, 1979

FIGURE 4-11. AN AERIAL VIEW OF THE HELICOPTER LANDING AREA AT NAS NORTH ISLAND, DECEMBER 28, 1976

Source: Fort Benning

FIGURE 4-12. KELLEY HILL, FORT BENNING, 1964

Source: Stacey Griffin, PCI, 2003

FIGURE 4-13. FORMER THEATER, NOW TRUSCOTT CENTER AUDITORIUM, BUILDING 09076 (1976), KELLEY HILL CANTONMENT, FORT BENNING, GEORGIA

Source: Flying Leatherneck Aviation Museum, J. Aaron, 2014

FIGURE 4-14. UH-1 (HUEY) HELICOPTER AND AH-1 COBRA

6. Facilities that were constructed, underwent a major expansion or were adapted and heavily used during 1962–1975 and were directly related to the research and development associated with helicopter use (arming helicopters, armoring, etc.).

   Buildings and indoor research and testing areas that accommodated classrooms, specialized testing and analysis facilities, laboratories, simulators and mock ups, and fabrication shops. These buildings vary in size, shape, and design. These properties would not likely be individually eligible unless containing unique equipment. These properties would be more likely to be part of a district if the resources still have integrity.

   Outdoor testing areas including clearings or hardscapes for landing zones, hover areas, and stage fields, tactical instrument training course, aerial firing ranges and targets, tactical training sites, and pinnacle training areas. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

   Flightline resources in support of helicopter use, including storage and maintenance hangars, aprons, tarmacs, helipads, operations buildings, fire stations, control towers, fabrication shops, avionic shops, paint shops, storage, fueling systems, and wash racks. These buildings vary in size, shape, and design. These properties would not likely be individually eligible. These properties would be more likely to be part of a district if the resources still have integrity.

Source: Patuxent River Naval Air Station

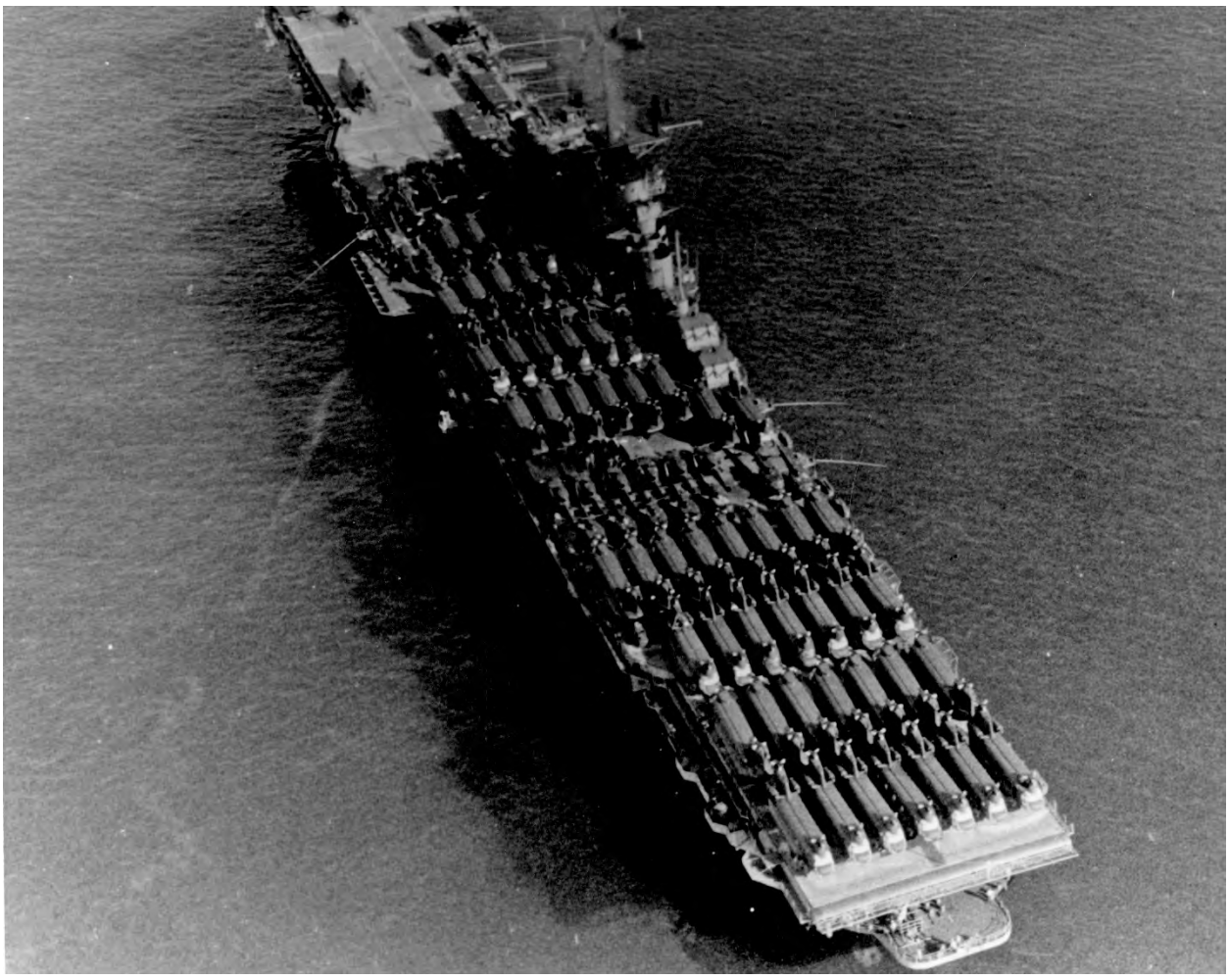
FIGURE 4-15. BUILDING 142, PATUXENT RIVER NAS. ARMAMENT TESTING PLAYED A SIGNIFICANT ROLE IN THE ROTARY-WING SECTION'S ACTIVITIES DURING THE VIETNAM WAR

7. Facilities that were constructed, underwent a major expansion, or were adapted and heavily used during 1962–1975 and were directly related to the transport of helicopters to and around Vietnam including transport vessels and planes and helicopter carriers.

   (Medical ships were equipped with helipads for faster transport of wounded from the battles. However, medical ships would be addressed under the subtheme for medical facilities as identified in *Vietnam and the Home Front: How DoD Installations Adapted, 1962–1975*.)

Source: Charles E. Rogers Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 4-16. VIETNAM – SEAWOLF IROQUOIS, MEKONG RIVER DELTA HAL-3, 1967



Source: US Army Aviation Museum Volunteer Archivists Collection, The Vietnam Center and Archive, Texas Tech University

FIGURE 4-17. CH-47 AND CH-54 HELICOPTERS – AMPHIBIOUS OPS ABOARD USS *BOXER*, 1965

Source: http://navysite.de/lph/lph10.htm

FIGURE 4-18. USS *TRIPOLI* (LPH-10)

5.0 SELECTED REFERENCES

American Society of Mechanical Engineers
1987 "National Historic Mechanical Engineering Landmark: McKinley Climactic Laboratory, Elgin Air Force Base, Florida." Available at https://www.asme.org/getmedia/703bba8d-f9ca-4d48-9d93-dd6f1a0b80d3/116-McKinley-Climatic-Laboratory-1944.aspx.

Bell Helicopter Corporation
n.d. "Light Observation Aircraft Study, 1965–1970," Advanced Design Concept Report Number D247-099-001.

Boyne, Walter J.
2011 *How The Helicopter Changed Modern Warfare*. Gretna, LA: Pelican Publishing Company, Inc.

Carbonaro, Joe
2014 "HX-21 Celebrates 65 Years since the establishment of the Rotary Wing Section at Patuxent River." Computer printout provided to author by Mr. Carbonaro, November 2014.

Casella, Richard M.
1999 "Maryland Historical Trust, Determination of Eligibility Form: Hangar 144 Patuxent River Naval Air Station" May 1999. On file at Naval Air Station Patuxent River, MD.

Chinnery, Phillip D.
1994 *Air Commando: Inside the Air Force Special Operations Command*. New York, NY: St. Martin's Press.

Clifford, Kenneth J.
1973 *Progress and Purpose: A Development of the United States Marine Corps 1900–1970*. History and Museums Division, US Marine Corps.

Cosmas, Graham A. and Terrence P. Murray
1986 *U.S. Marines in Vietnam: Vietnamization and Redeployment 1970–1971*. Washington, DC: History and Museum Division Headquarters, US Marine Corps.

Davis, V. W. Jr.
1949 Patuxent River Maryland, Flight Test Order 2-49, April 25, 1949. On file at Naval Air Station Patuxent River, MD.

Decker, Chet
2002 "Operation Shufly," *Leatherneck,* April 2002. 36–39.

Department of the Navy
2011 *Integrated Cultural Resources Management Plan* (2011–2016), Naval Air Station Patuxent River Maryland, 2011–2016. Washington, DC: Naval Facilities Engineering Command.

Dorland, Peter and James Nanney
2008 *Dust Off: Army Aeromedical Evacuation in Vietnam.* Washington DC: U.S. Army Center for Military History.

Drew, Linda C.
1999 *The History of Naval Air Station Patuxent River Maryland*. Patuxent River, MD: Patuxent River NAS.

Dunham, George R. and David A. Quinlan
1990 *U.S. Marines in Vietnam: The Bitter End 1973–1975.* Washington, DC: History and Museum Division Headquarters, US Marine Corps.

Dunstan, Simon
2003 *Vietnam Choppers: Helicopters in Battle, 1950–1975*. Osceola WI: Osprey Publishing Ltd.

Fails, William R.
1978 *Marines and Helicopters, 1962–1973.* Washington DC: History and Museums Division, US Marine Corps.

Geary, John C.
1962 "The Chinook: Advanced Battlefield Mobility Vehicle." *United States Army Aviation Digest*. Vol. 8, No. 8 (August 1962). 3–8.

Geneva Conference
1954 "Final Declaration of the Geneva Conference on Restoring Peace in Indochina, July 12, 1954," in *The Department of State Bulletin,* Vol. XXXI, No. 788 (August 2, 1954).

Griffin, William P.
1962 "Army Aviation in Support of Counterguerilla Operations." *United States Army Aviation Digest*. Vol. 8, No. 9 (September 1962). 9–14.

Hall, Kyron
2015 "3638th Flying Training Squadron (Stead AFB, Nevada) 1958–1965." Accessed February 2015 at: http://usafhpa.com/2013/08/03/3638th-flying-training-squadron-stead-afb-nevada-1958–65/.

Hartman, Ellen R., Susan I. Enscore, and Adam D. Smith
2014 "Vietnam on the Homefront*:* How DoD Installations Adapted, 1962–1975," Department of Defense Legacy Resource Management Program, Report ERDC/CERL TR-14-7, December 2014.

Kuranda, Kathryn M.
2002 *Historic Context for Army fixed Wing Airfields, 1903–1989*. R. Christopher Goodwin & Associates, Inc., Frederick, MD. For U.S. Army Environmental Center, Aberdeen Proving Ground, MD.

LaFeber, Walter
2002 *America, Russia, and the Cold War, 1945–2002*. New York, NY: McGraw Hill.

Manning, Thomas A., Bruce A. Ashcroft, PhD, Richard H. Emmons, Ann K. Hussey, Joseph L. Mason, PhD.
2005 *History of Air Education and Training Command 1942–2002*. Randolph Air Force Base, TX: Office of History and Research Headquarters, Air Education and Training Command.

Marolda, Edward J.
2009 *The Approaching Storm: Conflict in Asia 1945–1965*. Washington, DC: Government Printing Office.

Marolda, Edward J. and G. Wesley Pryce III
1984 *A Short History of the United States Navy and the Southeast Asian Conflict: 1950–1975*. Washington, DC: Navy Historical Center Department of the Navy.

Mayers, D. F.
1964 "Helicopter Testing at Patuxent River." *Naval Aviation News.* July 1964. 34–35.

McGowan, Stanley S.
Helicopters: An Illustrated History of Their Impact. Santa Barbara, CA: ABC-CLIO.

McCutcheon, Keith B.
1978 *Marines and Helicopters 1962–1973*. Washington, DC: History and Museum Division Headquarters, US Marine Corps.

Melson, Charles D. and Curtis G. Arnold
1991 *U.S. Marines in Vietnam: The War That Would Not End 1971–1973.* Washington, DC: History and Museum Division Headquarters, US Marine Corps.

Meyerson, Joel D.
1986 *Images of a Lengthy War: The United States Army in Vietnam.* Washington, DC: United States Army Center for Military History.

Morgan, Mark
1998 "Launch: The Story of HC-7/CSAR, Orphans of the 7th Fleet." *The Hook.* Summer 1998. 26–37.

National Archives and Records Administration (NARA) Archives II: College Park, MD.

NavSource Online: Service Ship Photo Archive "USNS Corpus Christi Bay." Accessed April 2015 at: http://www.navsource.org/archives/09/41/4105.htm.

"USS Tripoli." Accessed April 2015 at: http://www.navsource.org/archives/10/11/1110.htm.

"USS Inchon." Accessed March 2015 at: http://www.navsource.org/archives/10/11/1112.htm.

"USS New Orleans." Accessed March 2015 at: http://www.navsource.org/archives/10/11/1111.htm.

No Author
2015 "Helicopter Attack (Light) Squadron-3: The Sea Wolves: Past. . . Present. . . Future. . . ?" December 1, 1971. Accessed March 17, 2015, at: http://www.seawolf.org/history/pastpresentfuture.pdf.

No Author
2015 "History of the 1st Cavalry Division: Vietnam War," 1996 (revised 2013). Accessed March 3, 2015 at: http://www.first-team.us/tableaux/chapt_08/.

No Author
"LPH-4: Boxer Class." No date. Accessed March 19, 2015. Available at http://www.globalsecurity.org/military/systems/ship/lph-4.htm.

No Author
n.d. "MCAS Camp Pendleton History." Provided by Diane Walsh. On file at Marine Corps Base Pendleton, CA.

No Author
n.d. "Official Squadron History 1961–1970." Accessed February 20, 2015. Available at: http://www.hmm-162.com/History/hist/History/histsquadron61.htm.

No Author
n.d. "Operation Shufly Commemoration." Accessed February 20, 2015. Available at: https://www.mca-marines.org/gazette/operation-shufly-commemoration.

No Author
2015 "USS Iwo Jima." Accessed March 2015 at: http://navysite.de/lph/lph2.htm.

No Author
"USS Tripoli." Accessed April 2015 at: http://navysite.de/lph/lph10.htm.

No Author
2015 "Warships, Submarines and Watercraft of the World." Accessed April 2015 at: http://www.militaryfactory.com/ships.

Ochs, Russell G.
2015 "The Evolution of USAF Search and Rescue in Southeast Asia." Maxwell Air Force Base, AL. Accessed February 5, 2015. Available at: http://rotorheadsrus.us/documents/Ochs-7366-4.pdf.

O'Keefe, Jim
n.d. "Rotary-Wing Pipeline." In *Naval Aviation Training*. Washington DC: Government Printing Office.

Parker, Gary W.
1978 *A History of Marine Medium Helicopter Squadron 161*. Washington, DC: History and Museums Division, US Marine Corps.

Pendleton, Philip E. P, Richard M. Casella, and Martha H. Bowers
1999 *Historic Architectural Resources: Naval Air Station Patuxent River: Historic Contexts and Evaluation Criteria*. On file at Naval Air Station Patuxent River, MD.

Robertson, Patsy
n.d. "U.S. Air Force Fact Sheet," 1 Helicopter Squadron," Accessed March 13, 2015 at: http://www.afhra.af.mil/factsheets/factsheet.asp?id=9709.

Rottman, Gordon L.
2008 *The U.S. Army in the Vietnam War 1965–73*. Osceola WI: Osprey Publishing Ltd.

Sams, Kenneth
1966 "The Fall of A Shau: Project CHECO Report." April 18, 1966. Accessed February 12, 2015. Available from the National Museum of the Air Force, http://www.nationalmuseum.af.mil/shared/media/document/AFD-060629-001.pdf.

Sara, Timothy R. and Jesse Bergevin
2004 *Phase I Archaeological Survey of Approximately 3,250 Acres Aboard Patuxent River Naval Air Station, St. Mary's County, Maryland*. Contract Number ARCH-RP00071-03, Miscellaneous Reports of Investigations Number 293. On file at Naval Air Station Patuxent River, MD.

Smith, Charles R.
1988 *U.S. Marines in Vietnam: High Mobility and Stand Down 1969*. Washington, DC: History and Museum Division Headquarters, US Marine Corps.

Smith, Douglas, ed.
2010 *One Hundred Years of U.S. Navy Air Power* Annapolis, MD: Naval Institute Press.

Spector, Ronald H.
1983 *Advice and Support: The Early Years The U.S. Army in Vietnam 1941–1960*. Washington, DC: United States Army Center for Military History.

Stockfisch, J. A.
1994 *The 1962 Howze Board and Army Combat* Developments. Santa Monica, CA: RAND.

Sweeney, Marene Elizabeth
1999 "Growing Pains: The Effects of the Base Realignment and Closure Procedures on Lexington Park, Maryland." M.A. Thesis., New Mexico State University.

Tilford Jr., Earl H.
2009 *Crosswinds: The Air Force Setup in Vietnam*. College Station, TX, Texas A & M University Press.

1980 *Search and Rescue in Southeast Asia*. Washington, DC, Office of Air Force History, US Air Force, 1980.

1991 *Setup: What the Air Force Did in Vietnam and Why*. Maxwell Air Force Base, AL: Air University Press.

Tolson, John J.
1999 *Airmobility: 1961–1971*. Washington, DC: Department of the Army.

Trick, Larry
n.d. "RW Testing." On file at Naval Air Station Patuxent River, MD.

Tyler, David
2003 "The Leverage of Technology: The Evolution of Armed Helicopters in Vietnam." *Military Review*. July–August 2003, 32–37.

USMC Combat Helicopter Pilots Association
n.d. "Order of Battle," Accessed March 13, 2015. Available at: http://www.popasmoke.com/vw-order-of-battle.

USAF Helicopter Pilots Association
n.d. "917th FTD – Tan Son Nhut AB, Saigon, SVN 1963–1964. Accessed February 2015 at: http://usafhpa.com/2013/08/03/917th-ftd-tan-son-nhut-ab-saigon-svn-1963-1964/; Accessed February 2015.

n.d. "History of USAF Helicopter Units," Accessed March 18, 2015 at: http://usafhpa.org/histunits.html.

n.d. "Mid-Air Recovery System (MARS)." Accessed February 2015 at: http://usafhpa.com/2012/09/05/mid-air-retrieval-system-mars.

USAF Historical Division
1965 "USAF Plans and Policies in South Vietnam and Laos." Maxwell Air Force Base, AL: USAF Historical Division Liaison Office.

Valley, Bruce Leon
1975 "A Research Study of the Rotary Wing Test and Evaluation Segments at the Naval Air Test Center, Patuxent River, Maryland." M.A. Thesis. Naval Postgraduate School, Monterey CA.

Van Staaveren, Jacob Van
1965 "USAF Plans and Policies in South Vietnam, 1961–1963." USAF Historical Division Liaison Office. Available at: http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB248/.

Veazey, G. Robert
2002 "Huskie Memories." *Air Force Magazine*, July 2002. Accessed February 2015 at: http://rotorheadsrus.us/documents/524.html.

Vietnam Center and Archive (The)
Texas Tech University, Lubbock, TX.
Vietnam Helicopter Pilots Association (VHPA) Collection.
U.S. Army Aviation Museum Volunteer Archivists Collection.
Bud Harton Collection.
US Marine Corps History Division Vietnam War Documents Collection.
Harry R. Mills Collection.
Glenn Helm Collection.
Richard L. Clarkson Collection

Waldo, Frank
1911 "Measuring High Flights: How Science Comes to the Aid of Aviation," *Electrician and Mechanic*, Vol. 23, No. 5 (November 1911), 312–315.

Williams, James W.
2005 A History of Army Aviation: From its Beginnings to the War on Terror. Lincoln, NE: U.S. Army Aviation Museum Foundation.

Winkler, David F.
1997 *Training To Fight: Training and Education During the Cold War*. DoD Legacy Project 95-10092 for U.S. Army Environmental Center, Aberdeen Proving Ground, MD.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A:

FORT BENNING – KELLEY HILL CANTONMENT AIRMOBILITY

THIS PAGE INTENTIONALLY LEFT BLANK

The following context is taken almost verbatim from the *Historic Structures Survey and Cold War Evaluation of Kelley Hill Cantonment, Fort Benning Military Reservation*, Georgia Draft Final Panamerican Consultants, Inc., July 2003. The list of resources and conclusions is summarized from the same report.

Creating and Testing an Air Assault Division: Fort Benning's Role. On February 15, 1963, the 11th Air Assault Division (Test) and the 10th Air Transport Brigade were activated at Fort Benning, Georgia, the home of the infantry, to begin a bold new Army experiment, Air Assault. The initial wave of troops from Fort Bragg, Georgia; Fort Rucker, Alabama; Fort Sill, Oklahoma; Fort Huachuca, Arizona; and Fort Riley, Kansas, began to arrive and were located at Kelley Hill Cantonment, a newly opened area of Fort Benning east of the Main Post. The location at Kelley Hill in an isolated section of the installation was fortuitous since it forced the soldiers and officers to work together without distractions, thereby helping to create an unprecedented camaraderie.

When Fort Benning's weekly newspaper, *The Bayonet*, announced the location of the 11th Air Assault Division, it stated that the primary role of the Air Assault Division was to contribute to combat superiority on the ground by providing improved battlefield mobility for ground forces. This division was created to test the airmobility concept and tactics. Testing would be in the form of a series of war games conducted during the fall of 1964. There was no formal Army doctrine for air assault, there were no procedures for the organization of such units, but there was a deep Army desire to make the concept work, with no involvement from the Air Force regarding battlefield helicopters.

Brigadier General Harry W. O. Kinnard was selected to lead the 11th Air Assault Division during this critical period. Kinnard, a West Point graduate (class of 1936) and a much decorated veteran of World War II (1st Battalion, 501st Parachute Infantry Regiment later a division of the 101st Airborne), came to Fort Benning from Fort Campbell with more than 20 years of airborne experience. Kinnard was an excellent choice to lead this new division, as well as this new revolution in tactics. He was able to inspire his men, to trust their ideas, to seek their contributions, and to form a team so cohesive that the men of the 11th Air Assault Division and 10th Air Transportation Brigade almost universally regarded this period as one of the high points of their lives.

Kinnard was a true believer in the air assault concept as being the Army's next logical step. On many occasions he is quoted as saying, "Time was when we carried cavalry horses up to the front in trucks so as not to tire them. Then we stopped carrying the horses and simply used the trucks. Now in this stage, we are leaving behind the jeeps and trucks and seeing how far we can go by using aircraft."

Kinnard's division started small and eventually grew. Total troop strength for the 11th would eventually be approximately 14,500 soldiers; almost a third of Fort Benning's total soldier population of 48,000 in 1964. Additionally, the 10th Air Transportation Brigade, a vital component of the test, included 3,200 men. The "Sky Soldiers," as they were dubbed, became a significant component of Fort Benning's total training program.

This was one of the few times in Army history that a group of officers and men were pulled together with the job of developing and proving a concept with little in the way of approved doctrine, systems, equipment, methods of operations, and any of the vast documentation and regulations that normally prescribe the formation of new military organizations.

Kinnard handpicked his key personnel and gave them the widest latitude possible in accomplishing their particular portion of the task. Commanders at all levels were free to vigorously pursue any advancement of the airmobile concept as they saw it. To make it clear that he wanted to hear from the lowliest private,

Kinnard set up an "Idea Center" to ensure that any suggestion no matter how bold or radical would receive careful and detailed consideration.

The Idea Center was opened in late 1963 in the Harmony Church section of the post. By this time, the Air Assault Division had grown out of Kelley Hill Cantonment and was occupying areas in Sand Hill to the northwest and Harmony Church to the southeast. The Idea Center in Building 5306 was not just a suggestion box. This center operated under the command of Colonel Richard T. Knowles of the division artillery command. The center had its own drafting section, planning rooms, a panel of experts, and a main conference room. A specified process-flow was established. By early 1964, 19 new ideas were submitted that included everything from a mounted, portable flame thrower to a more accurate timing device for ejection seats.

Nor was the Idea Center just a morale booster or a pacifier for the men, it was a legitimate way for soldiers to contribute and work out a series of seemingly daunting problems. Introducing the idea of an organic air division into the infantry posed a number of challenges. Old ideas and training had to be abandoned, the infantry had to adjust to new methods of entering combat and new tactics and techniques of closing in on the enemy. The artillery man had to provide his proven support with new airmobile artillery and aerial rocket artillery. The aviation elements had to broaden their training to include much work in the nap-of-the-earth (ground flying), formation flying, night formations, jury-rigging weapons on Huey and Mohawk helicopters, and forward refueling. Support units had to consider airlifting everything from huge trucks to helicopter parts. It was a time of innovation on all levels.

The 11th Air Assault Division literally created airmobile operations as we know them today. Instant helipads, helicopter command centers, ultra-heavy lift capabilities, lightweight but fully equipped trucks and other support vehicles, and small, lightweight, all-terrain vehicles all evolved from the needs of air assault. Throughout this period, there was a continual cross-feed of people, information, equipment, and ideas between what was going on in Vietnam and what was happening at Fort Benning. Members of the 11th visited units in Vietnam and recruited returnees whenever possible. While all this innovation was occurring, the 11th continually trained for the ultimate war test scheduled for October/November 1964.

During the first year of organization and training, the 11th and its associated groups went through a number of small-scale war-gaming scenarios. In May 1964, the 11th had its first big field exercise, HAWK ASSAULT, at Fort Stewart, Georgia, against a live aggressor permitting both sides to employ their units without the restrictions of a fixed scenario. This exercise was designed primarily for non-commissioned officers and junior officers to learn the specifics of controlling small unit actions. Again, in July, the 11th entered into a series of new exercises called HAWK FLASH I, II, III. Every component of the air assault concept was tested at this time in preparation for the fall exercises that would determine if the Army had met its objectives in creating and training an air assault group.

The final testing scenario (AIR ASSAULT II) involved approximately 35,000 personnel and covered more than four million acres of land throughout North and South Carolina. The 82nd Airborne (augmented) served as the aggressor force. The AIR ASSAULT II exercise was a controlled field test where a test scenario of certain actions or events occurred at specific times. Sufficient control factors allowed adequate observation and evaluation of the exercise by the Army testing group, but did not prohibit maximum freedom of player action.

For four weeks, the test assault maneuvered throughout the Carolinas in offensive, defensive, and retrograde movements. The umpires were hard pressed to keep up with the tempo and the collection of hard data in the right spot became a concern. So much was happening over such a large area with so many enthusiastic units that control of the units was a constant problem. However, the test scenario remained

recognizable to both the umpires and the tested units. All of these challenges were further compounded by hundreds of distinguished guests who wanted to witness this critical testing period.

AIR ASSAULT II proved a smashing success. General Charles W. G. Rich, the Commanding General of the Infantry Center and test director for the 11th Air Assault Division experiment, wrote in his interim report of AIR ASSAULT II, "The tested organizations are prototypes, in being, of the most versatile forces that we can add to the US Army. The movement capability of all divisions, including the 11th Air Assault Division, has been enhanced by Air Force aircraft; however, the integration of Army aircraft into these test units has provided the crucial maneuver capability of light mobile forces to close with and destroy the enemy."

At almost exactly the same time as AIR ASSAULT II, the Air Force was conducting a Strike Command sponsored joint test and evaluation exercise, GOLD FIRE I, to prove that Army fixed-wing aircraft or medium helicopters were not necessary for tactical delivery of supplies or troop movement. It was their contention that the Air Force C-130 could do the majority of the air transportation mission while other Air Force aircraft provided reconnaissance and firepower. It soon became evident that the Air Force was not dealing in innovations but rather the streamlining of the long-established concepts of air support for ground troops. The Air Force test provided few surprises.

General Harold K. Johnson, Chief of Staff, US Army, in discussing AIR ASSAULT II and GOLD FIRE I stated, "I had the rare privilege of seeing the 11th Air Assault one week and the other concept [Air Force] at the early part of the following week, and I would make a comparison of perhaps a gazelle and an elephant. The two are not compatible. Each of them has a role to play, and it is important that we continue to pursue in this area where we have made such significant strides in the gains we already have."

By December 1, 1964, the interim final report on the 11th Air Assault Division was submitted after 21 months of feverish activity. The Army had convinced itself and a great many others that Air Assault was a viable concept. However, the Air Force was unsatisfied with unresolved joint operational problems associated with the new units, but no funds had been programmed for major tests during 1965. Many components of the 11th Air Assault Division returned to their home bases while the remainder of the personnel finished writing report annexes, documenting new equipment, and performing long overdue aircraft maintenance.

While the 11th Air Assault Division (Test) was winding down, the war in Vietnam was heating up. The events in Vietnam seemed tailor-made for the 11th. In March 1965, a tentative decision was made to convert the 11th into a full-fledged member of the force structure. It was decided that the new division would carry the colors of the 1st Cavalry Division, which was then deployed in Korea. On July 1, 1965, the 1st Cavalry Division (Airmobile) was officially activated at Fort Benning pursuant to General Order 185, Headquarters Third US Army and was made up of the resources of the 11th Air Assault Division (Test) and the 2nd Infantry Division.

On July 28, 1965, President Lyndon B. Johnson announced, "I have today ordered the Air Mobile Division to Viet Nam." Despite a crippling loss of personnel by reassignment throughout the division, its personnel were able to retrain, re-equip, and deploy this major force to Vietnam in 90 days. The Air Force's private fear had become a reality; the Army now had organic air assault.

This battalion, which came out of Fort Benning, faced the first major battle between the United States and North Vietnamese forces in November 1965. Later immortalized in the book and movie *We Were Soldiers Once . . . And Young*, Moore and his men fought for four days to defend two landing zones in bitter and deadly fighting, leaving 234 Americans dead. Their experiences, and that of others during the Vietnam

conflict, displayed that the airmobile assault could be a highly successful offensive technique, characterized by speed, surprise, maneuverability, and aggressiveness (ICRMP).

As expected, the army helicopter was a key component in the guerilla wars of Vietnam proving the worth of organic Airmobility repeatedly. It was, in fact, insurgency wars and not the European nuclear battlefield that established the true worth of the Army's Air Assault concept. Today, organic Airmobility is a vital part of the infantry and represents a hard fought but well-established Army Doctrine for advancing land troops.

ARCHITECTURAL INVESTIGATION

Introduction

One hundred and fifty-four (154) buildings and structures were evaluated at Kelley Hill Cantonment. This includes such mundane structures as vehicle wash racks and more high-style buildings such as Adams Orderly Room, Building 09027 (built 1957), static weapons displays, and various commemorative items such as gateways.

Maps of Kelley Hill indicate that no major construction activity occurred within the Cantonment until after World War II. By 1954, Fort Benning was ready to expand into Kelley Hill and drew up a series of plans showing the same basic layout as exists today (Fort Benning 1954). A series of barracks that form five distinct blocks ran between Marne Road and Watkins Street, which is unnamed on the plan, with service buildings such as the gym, classrooms, and headquarter buildings on the north and south sides of the barracks.

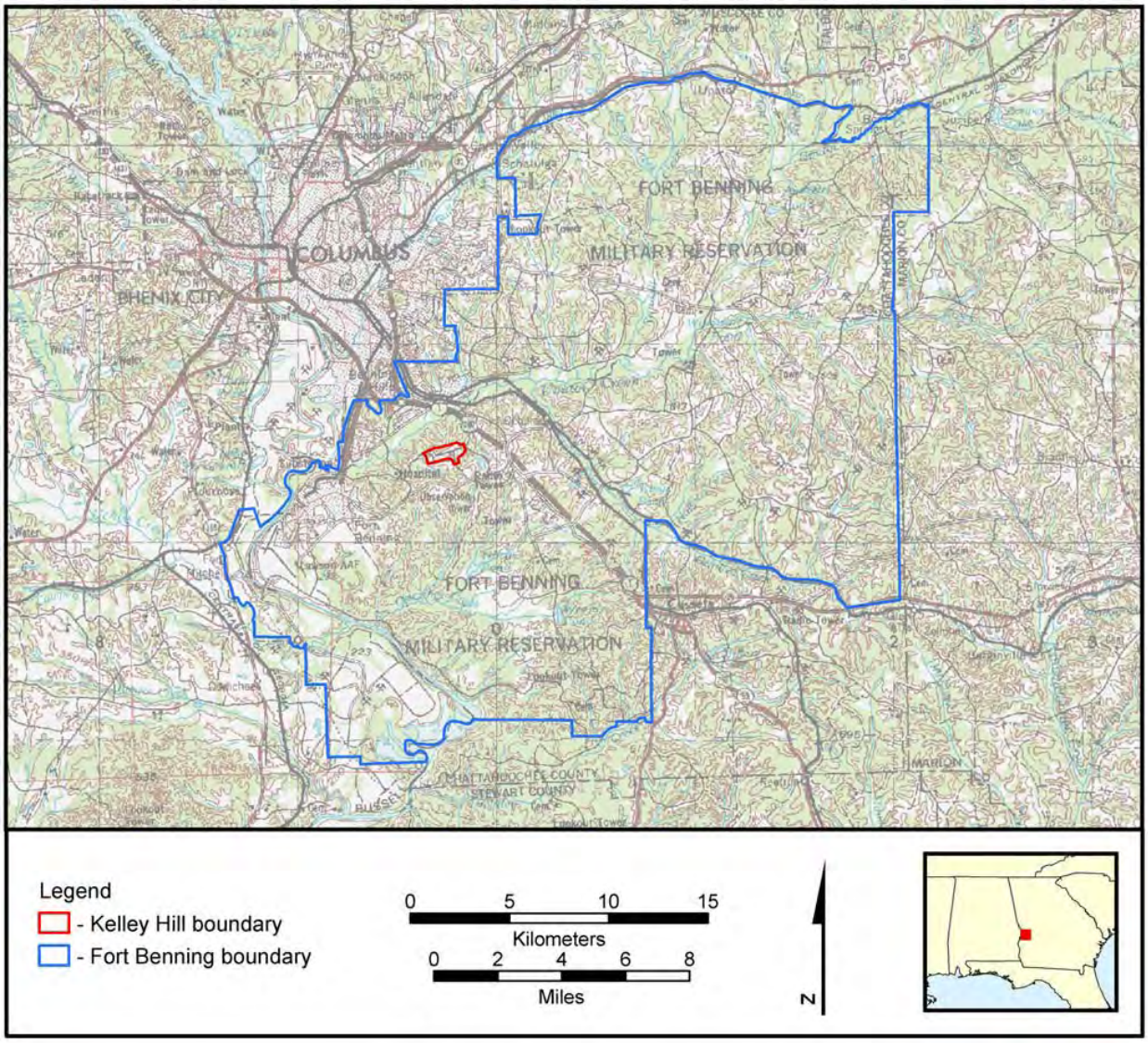
The 1954 plans indicate that eight 360-man barracks were built first on the western end of the Cantonment. These barracks were created in an odd shape that looks very much like a large hammer, thereby providing the name for the soldiers that occupy them, the Sledgehammers.

Troops of the Seventh Infantry, 3rd Division, moved into Kelley Hill Cantonment's new "giant army houses" (barracks) in August 1956 (*The Bayonet* 6/12/1958). In October of that same year, the First Battle Group, 11th Infantry, moved from Harmony Church to the new permanent barracks. The barracks were billed as having a, "360 man capacity [with] all the modern facilities available to the present day American soldier."

In addition, new training areas were being planned and laid out for completion before the next cycle of trainees arrived.

That same year, the motor park facility at Kelley Hill was constructed. This facility provided for the construction of a motor repair shop, oil storage building, grease and wash platforms, installation of certain sewers, waterlines, sanitary sewers, paving, and grading. This area is still operational as a motor pool facility.

- Building 09052, the Kelley Hill Dispensary, extant
- Building 09003, extant
- Building 09002, Whiteley Hall
- Building 09004, Warner Hall, extant
- Building 09012, Turner Barracks, extant



Source: Panamerican Consultants, Inc., July 2003

Figure A-1. Location of Kelley Hill Cantonment, Fort Benning, Georgia

- Building 09013, Shoup Barracks, extant
- Barracks 09015, Willingham Barracks, extant
- Barracks 09016, Dickey Barracks, extant
- Building 09021, Hill Barracks, extant
- Barracks 09022, Rex Barracks, extant
- Building 09026, Durham Soldier Support Center, extant
- Building 09049, the former Bowling Alley now Baker Hall
- Building 09140, Rees Hall, extant

- Building 09141, Gilliland Barracks
- The original Gilliland Barracks was 09009, but has since been demolished and rebuilt
- Building 09142, Mendocena Barracks, extant
- Building 09143, Hardee Barracks, extant
- Building 09014, Marszalek Hall
- Building 09025, Health Clinic; Cawetzka Hall
- Building 09027, Adams Orderly Room
- Building 09050, Wood Hall
- Building 09053, Long Barracks
- Building 09073, Ross Orderly Room
- Building 09076, the former theater, now Truscott Center Auditorium
- Building 09160, Murray Hall
- Building 09170, Hayes Hall

The creation of Kelley Hill Cantonment was well underway by 1961. In that year, the Kefurt Gym (Building 09001) was opened. The facility offered a large basketball court equipped with overhead lighting, glass backboards, electric score board, three large glass block windows, and collapsible seating for 1,200 spectators. The 50-foot by 90-foot building has a court designed to conform to the collegiate American Athletic Union (AAU) standards. At that time, sneakers could also be rented.

The gym also featured a large exercise room in the one-story wing that was equipped with a regulation boxing ring and easily converted for wrestling. Punching bags, flying rings, and body-building equipment were also present. In addition, there were two regulation four-wall handball courts. Rounding out the exercise area was a lounge and two locker rooms. The total building footprint was designed at 214-feet long and 94-feet wide.

Also that same year, the Kelley Hill Chapel (Building 09023) was opened. The chapel is an excellent example of the 1950s contemporary style.

By 1962, most of the elements of the 1954 plan were in place at Kelley Hill Cantonment. There were six hammerhead barracks, and eight E-shaped barracks. There were at least eight battalion or regimental headquarters, a gym, a dispensary without beds, a dental clinic, a Post Exchange (PX), several free-standing classrooms, a water tank, a power plant, a motor pool, several basketball courts and athletic fields, and a lighted base-standard military building designs or variations thereof. Kelley Hill Cantonment was now a complete training camp.

When the 11th Air Assault group moved to Kelley Hill during the spring of 1963, a number of changes specifically related to training were made. Because soldiers rappelled from helicopters instead of parachuting, special equipment related to that activity had to be constructed. A 35-foot rappelling tower was erected within Kelley Hill (site unknown). The tower, crudely made of timber and logs, appeared to use a pine tree as its support. After the men mastered rappelling from this small tower, they moved on to the 65-foot towers at the Parachute Jump area on the Main Post.

As the size of the 11th Air Assault Division grew, it began to expand into the areas of Sand Hill and Harmony Church and used the air facilities at Lawson Field on the Main Post. The men of the 11th trained all over the vast acreage of Fort Benning. The explosion of personnel caused the need for a

heliport and an airstrip exclusive of Lawson Field. Christened "Manila," the new field was constructed at Harmony Church off Highway 27. Manila was created by the 806th Engineer Battalion for the 11th Air Assault, and could accommodate both fixed- and rotary-wing aircraft. The airstrip became the home of the 11th Air Assault Division Aviation Group that had been stationed at Lawson Field. The 11th's "Idea Center" was also opened in Harmony Church in Building 5306. But even as the 11th was expanding into other areas, Kelley Hill Cantonment continued to grow.

In September 1964, Kelley Hill Cantonment opened the Army's second-largest heliport (Lowenhagen 1964). The heliport had 49 separate pads, a control tower, and across from Ivy Road, a helicopter hangar/support building (Building 09101), which is extant but greatly changed. It was at the intersection of Marne and Ivy Roads on the easternmost edge of the Cantonment. The heliport was large enough to handle any helicopters used by the 11th Air Assault Division including the gigantic ultra-heavy lifting Skycrane. It was designated as the Munsan-ni Heliport in honor of the men of the 187th Infantry who made a combat parachute jump there during the Korean War.

However, on most maps the heliport appears as the Kelley Hill Heliport or as the Munsan Heliport. Munsan-ni Field was the home of the 228th Assault Support Helicopter Battalion, the 11th Air Assault's CH-47 Chinook Helicopter unit. Munsan-ni Heliport was built in just 57 days by the 577th Engineer Battalion. They worked 59,250 hours and ran their machines for over 43,165 equipment hours moving 1,076,000 cubic yards of dirt. The battalion worked double shifts of 16 hours a day, weekends, and holidays to ready the heliport. At the heliport's dedication, the commanding officer of the 11th Air Assault, Major General Harry W. O. Kinnard, praised the 577th and declared that the heliport would be used "well and safely."

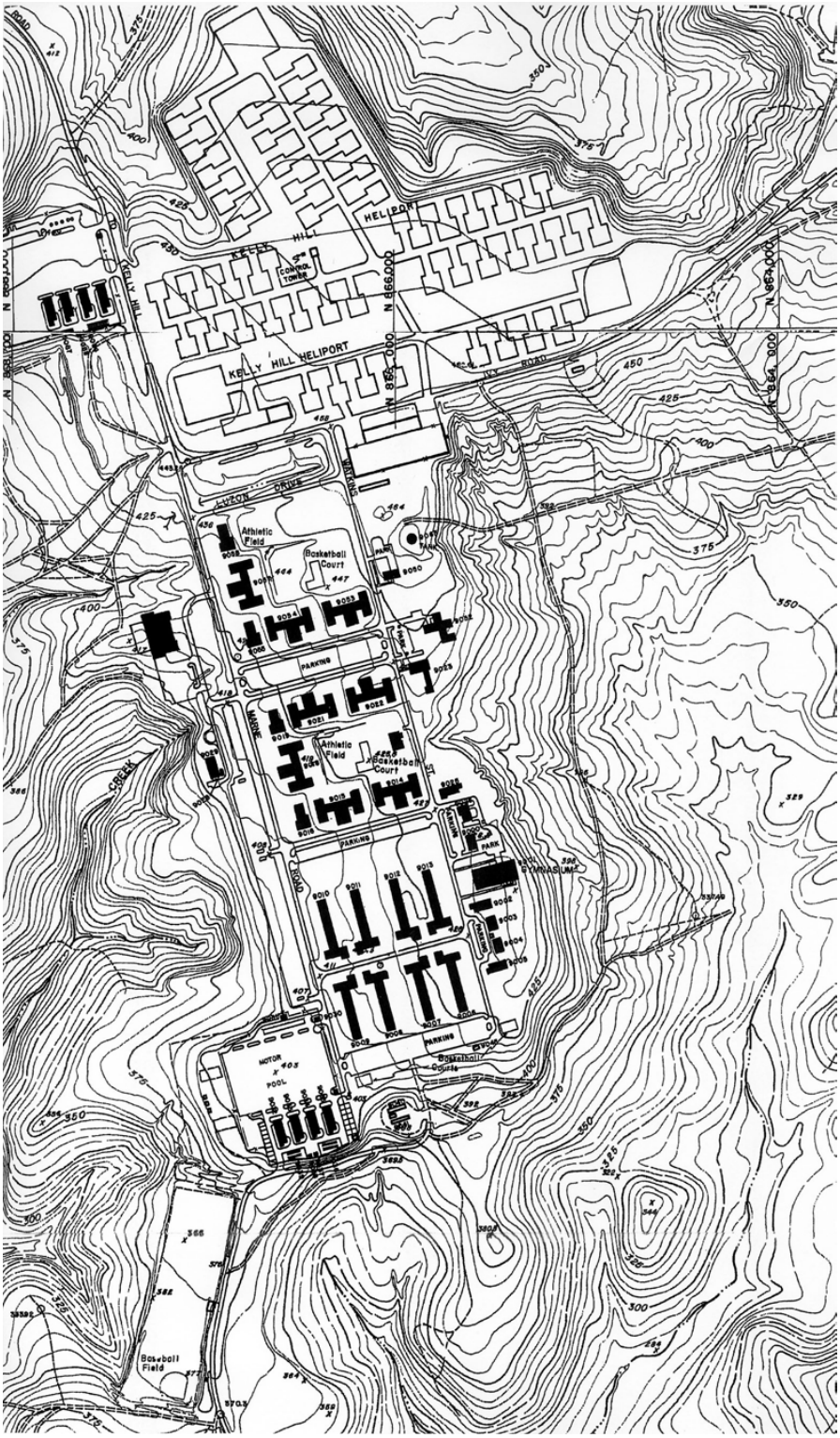
By 1965, Kelley Hill had a Service Club, Building 09079 (extant), and a second motor pool now called the Mize Motor Pool on Marne Road across from the heliport. A pool was installed at the Service Club by 1967 and a number of temporary storage and support buildings were scattered throughout the barracks area. One of these temporary buildings (Building 09044) still exists and currently serves as a recreational facility.

Although the 11th Air Assault left the Cantonment in the fall of 1965, other units immediately moved into Kelley Hill. It was, after all, a training camp, and Fort Benning's mission is to train the infantry. Kelley Hill continued to grow throughout the 1970s. A 1976 map indicated that Munsan-ni Field / Kelley Hill Heliport was now abandoned. At this time, a third motor pool was added on Marne Road between the two earlier constructed motor pools. A correctional facility was also on Marne Road adjacent to the Mize Motor Pool. It is not clear if this facility was a brig. This correctional facility is no longer extant and its former existence is marked only by a dirt parking lot. Kelley Hill also now had a theater (Building 09076) on Watkins Street as well as a Bowling Alley (Baker Hall) (Building 09049), both extant. An automotive Self-Help Garage (Building 09046) extant, was built on Marne Road at the entrance to Kelley Hill Cantonment.

In 1983, the Army decided to build a series of motor pool and maintenance facilities on the site of the then-abandoned Munson-Ni Heliport. By 1986, three large motor pool facilities had been built on the western portion of the heliport leaving only the eastern leg extant. The eastern leg of the heliport was covered in 1989 by Kelley Hill's water treatment and supply area. The water treatment plant (Building 09096) is surrounded by a number of vehicle washing stations all on an asphalt surface. The water treatment area marks the easternmost boundary of Kelley Hill Cantonment.

Source: Panamerican Consultants, Inc., July 2003

Figure A-2. Munsan-Ni Field, Kelley Hill Heliport, Kelley Hill Cantonment,
Fort Benning, Georgia, 1971, Looking East



Source: Panamerican Consultants, Inc., July 2003

Figure A-3. Kelley Hill Cantonment, Fort Benning, Georgia, 1965, Showing Munsan-Ni Field at Kelley Hill Heliport

In the early to mid-1990s, the Army decided to eliminate all its substandard barracks facilities. A number of barracks were targeted at Fort Benning including those at Kelley Hill. The barracks there are now almost 40 years old and did not have amenities currently held to be essential. Additionally, the barracks had met their life expectancy and were no longer cost efficient to maintain.

In 1998, demolition and construction began at Kelley Hill Cantonment on the hammerhead barracks in the block between Bell Richard and Sims Streets and Watkins Street and Marne Road. One of the original hammerhead barracks (Building 09146) was completely remodeled to match the new surrounding barracks losing its hammerhead appearance. This block lost three original hammerhead barracks but gained five new barracks and two service facilities (Buildings 09140 and 09145).

The block between Sims and Harvey Streets and Marne Road and Watkins Street originally featured four hammerhead barracks. Two of the original hammerhead barracks remain (Buildings 09013 and 09012) but the other two hammerhead barracks have been replaced by a series of smaller, more apartment-like barracks and a number of support facilities (mess halls, laundry, etc.).

Currently, the only period designed block intact at Kelley Hill lies between Marne Road and Watkins Street bound by Harvey Street and a large parking lot east of Buildings 09019, 09021, and 09022. This block contains the following: five E-shaped barracks (Buildings 09014, 09015, 09018, 09021, and 09022); two Battalion Headquarters (Buildings 09016 and 09018), and an exceptionally nice 1950s modern classroom space (Building 09027). All of the barracks in this area and possibly the support structures are scheduled to be demolished and rebuilt within the next few years.

In the next two remaining blocks to the east, only one period E-shaped barracks (Building 09053), Long Barracks, remains. The rest of the current barracks, classrooms, and support facilities were all built between 1999 and 2002. Traditionally, support buildings at Kelley Hill have been built on the south side of Watkins Street; however, the new construction plan has moved support buildings such as mess halls over to the north side of Marne Road, an area previously dominated by light industrial motor pools and infrastructure buildings.

Over time, Kelley Hill Cantonment has acquired a number of vehicles—mainly tanks, and weapons displays. One display on Ivy Road includes a number of Iraqi equipment pieces from the Persian Gulf War. There is also a rock post entrance gate on Ivy Road at the intersection of 1st Division Road marking the official entry to Kelley Hill. Units and companies have also created and left impromptu signs and models throughout the Cantonment. There are no monuments or historical markers at Kelley Hill.

By Army Cold War definition, Kelley Hill's buildings and structures, being almost exclusively BASOPS, are not eligible for the national register as Cold War buildings. As is the case with most military Cold War buildings, the buildings at Kelley Hill were merely shelters for the activities within. They were not built specifically for a single activity, and their uses could change as needed. Since Kelley Hill cantonment was a training camp and remains such, its buildings were constructed to accommodate that training, as are all the support facilities.

Training is a regular part of Army activity that occurs regardless of wars. It is happenstance that Kelley Hill was the site of the Cold War highly experimental program Air Assault. This activity could have happened at any Army installation and the historic record does not state as to why Kelley Hill was chosen. While the creation, training, and testing of the Air Assault concept was a truly significant military undertaking, the actual buildings that sheltered it at Kelley Hill were not specifically built for that purpose, nor did they need to be. However, if Munsan-Ni Heliport still existed, the case could be argued otherwise. Unfortunately, the one significant Cold War addition to Kelley Hill, the heliport, is no longer extant.

While Kelley Hill may have once been a good example of a Cold War training facility, thereby possibly creating a historic district, it now lacks integrity because of the significant loss of barracks, especially the hammerhead barracks that gave the area its nickname, Sledgehammer Country. Within the next few years, when all the 1950s barracks are gone, the only remnants of the original Cantonment will be the support buildings that line the south side of Watkins Street. Unfortunately, there are not enough remaining buildings to tell the story of the history of Kelley Hill. The buildings and structures of Kelley Hill Cantonment are, therefore, not eligible as a district.

No original landscapes remain within Kelley Hill that relate to the area's earlier period. The current landscape of drill fields, athletic areas, motor pools, tank road, and road system has no particular military significance and can be found at almost any installation. While many of these areas are important to the soldiers at Kelley Hill Cantonment, they do not meet the requirements for NRHP eligibility.

Even though a significant Army program, Air Assault, was developed, trained for, and tested at Kelley Hill, none of the buildings and structures at Kelley Hill can be directly related to the 1963–1964 program. Therefore, no buildings, structures, landscapes, or objects were found to be eligible under any NRHP criteria or Cold War criteria considerations in Kelley Hill Cantonment.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B:

MARINE CORPS AIR STATION, CAMP PENDLETON, CALIFORNIA

THIS PAGE INTENTIONALLY LEFT BLANK

This context was provided by Marine Corps Air Station Camp Pendleton (author, title and date unknown). This information has been augmented with additional sources as cited.

The United States entered World War II immediately after the attack by the Japanese on Pearl Harbor on 7 December 1941. Expansion of ground facilities for the Marine Corps Air Force was begun in July 1940 when a contract was made for additional flying facilities at the Marine Corps flying field at Quantico, Virginia. New stations were also constructed at Page Field, Parris Island; Cherry Point, and Edenton, North Carolina; and Eagle Mountain Lake, El Centro, Mojave, and Santa Barbara in southern California between 1940 and 1943.

As plans were underway to ready troops for combat, it became clear to Navy officials that the scale of the coming war would require a larger commitment of personnel and that the current level of training facilities was inadequate. The training facilities at Marine Corps Base (MCB), San Diego; Camp Elliott; and the Naval Training Center, San Diego, were too small and too near civilian population centers for large-scale tactical training with live ordnance.

On 27 February 1942, Lt. Gen. Thomas Holcomb, Commandant of the Marine Corps, requested that the US Navy acquire the Rancho Santa Margarita y Las Flores. The Secretary of the Navy approved the request on 5 March 1942. The area was acquired under the provisions of the Second War Powers Act passed on 27 March 1942.

The Marine Corps' newest camp was named for Joseph H. Pendleton. On 15 September 1942, the base was officially dedicated. President Franklin D. Roosevelt presided over the officiating ceremony and opened the training facility for active participation in the coming war effort. Ten days later, on 25 September 1942, the Marine Corps Auxiliary Landing Field—Camp Pendleton—was officially activated.

When the Landing Field was activated in 1942, one ACFT squadron and one Marine air traffic control squadron (MATCS) were assigned to the station. The first aircraft to land on the dirt runway at the airfield was a Beech C-45. The first facilities constructed at the 355-acre Marine Corps Air Station (MCAS) were a 6,000-foot-long by 200-foot-wide runway, a taxiway, a warm-up apron, a 50,000-gallon fuel storage facility, and a tower/operations building. The runway, main taxiway, and connecting taxiway were constructed of 3-inch asphaltic concrete, 6-inch crusher run base, and a 12-inch subbase but were not sealed with asphalt until 1947. The airfield would be used to train Marine aviators during World War II and as a secondary runway for El Toro, the home of the 3rd Marine Air Wing. VMF 471 group was stationed at the base in 1944 with the F4U Corsair plane.

One of the first post-war changes came to MCAS, Camp Pendleton in 1947. All claims to the landing field at Camp Joseph H. Pendleton were relinquished to the Bureau of Aeronautics. On 4 August 1947, the Bureau of Yards and Docks instructed the Commandant of the 11th Naval District to take appropriate action to transfer the Landing Field to the Bureau of Aeronautics. On 27 August 1947, the Commander, Air Bases, Eleventh Naval District requested that the Commanding Officer at MCAS, El Toro take the necessary steps to effect the physical transfer of the landing field at MCB, Camp Pendleton to the Commanding Officer at MCAS, El Toro. The field was designated a Marine Corps "Outlying Field" (MCOLF) of MCAS, El Toro. The designation "Outlying Field" includes runways, taxiways, and aircraft parking areas. Funds were allocated by the Bureau of Aeronautics to enable MCAS, El Toro to maintain the field so that emergency airlift of ground troops could be made at any time. MCAS, Camp Pendleton became Sub-Unit One under the command of MCAS, El Toro.

Another change came to MCAS, Camp Pendleton in 1947 with the arrival of the VMO-6 squadron. The VMO-6 was organized on 20 November 1944 at Quantico, Virginia. During the 1940s, MCAS, Camp

Pendleton remained a limited component of the Marine Corps defense picture. As a Sub-Unit of MCAS, El Toro, it played a role as a back-up for the MCAS, El Toro operations and added an additional training element in conjunction with Camp Pendleton training activities. In 1950, the north end of the MCAS was an empty field used for annual combat review of troops from the 1st Marine Division and Marine Barracks.

During the 1940s, MCAS, Camp Pendleton remained a limited component of the Marine Corps defense picture. As a Sub-Unit of MCAS, El Toro, it played a role as a back-up for the MCAS, El Toro operations and added an additional training element in conjunction with Camp Pendleton training activities. In 1950, the north end of the MCAS was an empty field used for annual combat review of troops from the 1st Marine Division and Marine Barracks, but it would not stay that way much longer. During the 1950s, the technology of the national defense system would undergo major alterations and a new type of aircraft—helicopters—would become very critical to military operations.

With the dropping of the atomic bomb on Hiroshima and Nagasaki in 1945, the world entered a new era in military technology. The atomic bomb gave impetus to the use of helicopters because of the bomb's potential to stop amphibious landings in critical stages. This resulted in the development of new landing concepts. The transportation helicopter was the answer and with it came the doctrine of vertical envelopment. This meant that combat-equipped Marines could be lifted from a ship and landed beyond the beaches in strategic positions to attack the enemy from the rear. This technique could also be used to block enemy routes. In addition, the helicopter's ability to pick up and transport wounded personnel from the lines back to medical help was essential to the war effort and proved to be an invaluable addition to combat warfare.

During the late 1940s and early 1950s, the Marine Corps developed the doctrine of vertical assault. The components of vertical assault included the following concepts:

- Helicopter transportability of all assault elements of the Landing Force
- Embarkation of the Landing Force in fast amphibious ships designed for rapid unloading by helicopter
- Isolation of objective areas through the sudden and concentrated destruction of enemy air and ground forces capable of opposing the landing attack
- The use of helicopter-assault forces for the ship-to-shore movement and seizure of widely dispersed inland objectives
- General use of helicopters in subsequent tactical operations ashore

Korea was the combat proving grounds for the military helicopter. Entire Marine Corps infantry companies and battalions could be transferred to the front lines and also could be resupplied by helicopters. The first Marine Helicopter Squadron (HMX-1) was formed at Quantico, Virginia, in December 1947. Two Sikorsky HO3S-1 helicopters arrived for squadron use on 9 February 1948 and began the movement toward extensive use of the choppers for military use. The Navy recommissioned the USS *Thetis Bay* in the 1950s as 16 the world's first helicopter assault aircraft carrier. The ship could take the full ship's complement (1,000 combat-equipped Leathernecks) and a helicopter squadron out to sea. This union of sea and air power marks the beginning of the joint effort on the part of the Navy and the Marine Corps to further develop and refine doctrine, tactics, and procedures of vertical envelopment.

The Korean War (1950–1953) was a joint operation of United Nations (UN) forces to resist the encroachment of communism in South Korea. During these years, the value of the versatile helicopter proved its worth. US ground troops were immediately sent to assist the UN troops in Korea and among

them was the First Marine Brigade, which included Marine Air Group (MAG) 33. VMO-6 was the first Marine helicopter squadron to be trained for combat and was under the command of MAG-33. Originally a fixed-wing squadron flying light OY-2 observation planes, the squadron was enlarged in July 1950 with four HO3S-1s, seven officers, and 30 enlisted men from HMX-1 and thus became the first composite squadron flying fixed-wing and rotary-wing aircraft.

The first US military helicopters in Korea were four Sikorsky HO3S-1s that arrived with VMO-6 squadron when they deployed to help with the fierce battle for the Pusan perimeter in August 1950. The squadron routinely operated its eight OY-2s, but it was the Sikorsky helicopters that proved to be the workhorses and the source of its honors and awards. VMO-6 affected the first night helicopter rescue operations of wounded personnel in 1950 at Pusan, even though they were primarily an observation squadron. In the battle on 4 August at Chindong-ni, the squadron saw action as a Medevac mission.

The choppers were not equipped with stretchers and after the battle, modifications were made to the helicopter by removing the right window and fittings were installed to hold a stretcher. (However, the lash-up meant that the patient's feet would stick out the window during transport.)

During 1950, the helicopter that saw the most use was the Sikorsky H-5. Initially manufactured and flown in 1946, it was the one of the first helicopters used in Korea and was nicknamed the “last-chance taxi.” The helicopter had substantial power, could carry a pilot and a medic, and could transport two patients in pods mounted on the fuselage.

Helicopters were difficult to shoot down because the rotors were not especially vulnerable as long as the main spar of the blade was not struck. A helicopter could take shots from the ground and keep flying back to the safety areas. This allowed them to get close to the action, drop down to pick up wounded personnel, and move out quickly to deliver them for medical attention.

The speed of helicopter rescue, combined with the elimination of transporting the injured over rough ground by vehicle and possibly accelerating their injuries, saved thousands of lives during the Korean War and subsequent military operations. The death rate in Korea was one-half of the casualty count of World War II—directly attributable to the use of the helicopter. It was estimated that at least 15,000 men were removed from the lines by the choppers, and their chances of survival drastically improved by receiving medical attention within 20 minutes after being wounded. As the use of helicopters increased, the crews came into increased contact with enemy fire and soon they were firing back with small arms and automatic weapons. Helicopters quickly became a full-fledged weapon of war and the technology eventually added the combat component to their existing uses for observation, staff liaison, artillery spotting, intelligence information, transportation, search and rescue, and medical evacuation. Training for these operations occupied many hours for Marine Corps personnel.

Another of the early “work horses” of the Marine helicopter units were the Sikorsky HRS-1 and HRS-2 helicopters. These were Marine transport helicopters used for carrying assault troops and were capable of carrying eight armed troops. The single-rotor, twin reciprocating-engine helicopter was the same basic type as the HO45-1 and had a 225-mile range, even while fully loaded at 7,400 pounds. The chopper could carry 20 combat-ready Marines and remained the largest lifting helicopter until the CH-53A was introduced in the mid-1960s. These transport helicopters entered the Korean War on combat status in September 1951. The Marine Corps mission of assault landings had changed the need for helicopters from observation to transport and these helicopters did an outstanding job of moving men, troops, and supplies into strategic positions.

After the end of the Korean War in 1953, the Marines settled into their peacetime training routines, such as practicing landing from the Pacific Ocean with Naval and Marine Air Support from MCAS, El Toro. In

1955, MCOLF, Camp Pendleton, was transferred to the cognizance of the Bureau of Aeronautics for the purpose of future development of the field as a helicopter base. The purpose of the helicopter base would be to provide airlift capability for FMF units of MCB Camp Pendleton. A requirement for such a base is that it possess a runway of sufficient length to accommodate fixed-wing transport aircraft. A safety requirement for such a runway is that a clear overrun area must extend 1,000 feet from each end of the runway. Alterations would be made to the runways to accommodate these requirements. The first assignment of helicopters to the air station occurred early in the spring of 1956 with the reassignment of VMO-6 from Korea to the MCOLF.

On 5 February 1956, VMO-6 was reassigned from the Marine Wing Headquarters Group, 3rd Marine Aircraft Wing (AirFMPac). In April of that year, VMO-6 took part in Regimental Combat Team Firing Exercise I, which supported the exercise with spotting, reconnaissance, simulated medical evacuation, and liaison missions. During the first week of May, the squadron received new aircraft—Kaman HOK-1 helicopters—to replace its older aircraft. The HOK-1 was a four-place liaison helicopter used for observation, reconnaissance, medical evacuation, utility, and air/sea rescue. The helicopters had a range of 140 miles and could remain airborne for over two hours.

On 1 July 1956, the squadron was reassigned from the Marine Wing Headquarters Group to Marine Aircraft Group 36 (MAG-36) and continued its support of all 1st Marine Division activities. All pilots in the squadron were qualified and proficient in flying both the HOK-1 and the OE-1. On 9 October, carrier qualifications were flown on board the USS *Badoeng Strait* with the HOKs. Through the rest of the 1950s, the squadron participated in a variety of operations including "Operation Quickstep," which moved 75 combat loaded Marines of Company C, 1st Reconnaissance Battalion, from the deck of the submarine USS *Perch* to the beach at Camp Pendleton. This exercise once again demonstrated the extreme versatility of the utility helicopters.

As the decade of the 1950s ended, the next phase of activity for the military had already begun. Due to the commitment of the United States to combat the spread of Communism on all fronts, the US government had sent advisors into South Vietnam during the mid-1950s to assist the South Vietnamese people in their efforts to resist Communism. As the decade of the 1960s began, the military presence in Vietnam would increase dramatically. The Vietnam War became the military conflict where the versatility of the helicopter proved to be invaluable in combat warfare. Helicopter technology advanced rapidly and the helicopter became an essential component of future Marine Corps military operations.

During the years 1960–1979, the Marine Corps Auxiliary Landing Field (MCALF), Camp Pendleton underwent a process of expansion and modification prompted by the war in Vietnam and the increasing use of helicopters for combat use. Between 1955 and the early 1960s, North Vietnam began a program of guerrilla warfare to reunite the two regions of Vietnam under a Communist leadership centered in the North. The US responded by sending advisors and training teams to South Vietnam during the 1950s and early 1960s, but active involvement with combat troops and equipment began in earnest during the mid-1960s. The war in Vietnam is known as the "Helicopter War" because of the extensive use of helicopters in the combat arenas and the important changes in technology during these years.

Source: MCAS Camp Pendleton, Operations

Figure B-1. Marine Corps Auxiliary Landing Field, ca 1978

A big improvement in Marine capability in the war zone came in 1968 when the first true helicopter gunships arrived—the AH-1G Huey Cobras. The Cobras were light attack helicopters with speed, maneuverability and firepower sufficient to protect and convey troops. The Cobra could be equipped with a variety of weapons including the Emerson TAT-101 nose-mounted gun turret.

During the war years, the MCALF expanded and developed new facilities to fully support Marine Corps operations in Vietnam. In 1960, a cadre system was established whereby VMO-6 trained new pilots and ground crews for duty with VMO-2 on Okinawa. After the personnel were trained, they were pooled into a rotational draft from which three increments were sent overseas yearly. Most personnel spent a year at Camp Pendleton and then a year on Okinawa with VMO-2. The VMO-6 Squadron averaged approximately 900 flying hours a month while stationed at MCALF, Camp Pendleton. Different

operations included training flights, personnel transport, and medical evacuation requiring a helicopter and crew on constant alert.

By the 1960s, facilities at the Marine Corps Base (MCB), Camp Pendleton had expanded from their simple beginnings. Buildings were still primarily Quonset huts, storage tents, and other temporary type structures. Photos from this period show that the control tower and headquarters were combined into one building. The wooden building had narrow stairs leading to the second-story control tower and was very simple with little ornamentation. The MCB was still small but the foundation for later developments was in place. Upgrading the runways continued through these years with gradual replacement of the asphalt with concrete portions.

SCOUT

Vol. 22 No. 14 — Marine Corps Base Camp Pendleton, — April 17, 1964

Ground Broken For $450,000 Hangar

A golden shovel bit the dust April 13 as MajGen. John C. Munn broke ground for a $450,000 aircraft maintenance hangar to be built at the landing field here.

Witnessing the initiation of efforts toward the hangar construction were Col. R. E. Figley, chief of staff of the Marine Air Bases, Western Area, LtCol. G. Bowman, squadron commander of VMO-6, Maj. D. M. Bidwell, commander of the Camp Pendleton airfield, and officials of the Tri-Core Construction Co.

The Tri-Core company of Long Beach, Calif., received the building contract.

"For the past 22 years, aircraft here has been repaired outdoors, in the heat of sun and the cold of rain," Maj. Bidwell told those assembled.

The new unit can house aircraft up to 80 feet in width. Fifteen small aircraft may undergo repair at once or 30 of the small variety may be housed for storm storage.

The 12,500-square-foot concrete hangar will be bordered by parking aprons. Construction is to be completed by Jan. 1, 1965. (see picture page 4)

HANGAR – *An artist's conception of the aircraft maintenance hangar scheduled for completion at the Camp Pendleton airfield by Jan. 1, 1965, shows its relationship to existing buildings.*

Quota Increased For E-8s & E-9s

A board, convened April 6 at Corps headquarters to select Marines for promotion to sergeant major, master gunnery sergeant, first sergeant and master sergeant, has been authorized to select 162 first sergeants and 617 master sergeants for a total of 779 promotions to pay grade E-8.

According to a Division of Information announcement last Monday, the increase is published on the heels of a Scout article last week which said that

7th Comm Gets New HF Device Three-Day School Underway

Eleven portable, high frequency communication systems – designed for one-man operation – were received last week by Communication Support Co., 7th Communication Bn. Members of the company began a

old system was strictly generator powered. This meant we had to use one man to operate the old radio and another to operate the generator."

The new communication system is composed of a series of

Engineering Vets Desired For Tutoring

WASHINGTON – Retirees and those who will retire before September have a chance to get a year's additional college

Source: *Scout*, April 17, 1964, Vol 22, No. 14

Figure B-2. Article on New Maintenance Hangar (Building 2360)

A major change came to the MCB in the late 1960s with the activation of Provisional Marine Air Group (MAG) 39. MAG-39 was activated during April 1968 at Quang Tri, Vietnam. Its mission at that time was to "...help stop, disrupt, and destroy invading North Vietnamese Army units" in numerous combat operations, including Scotland II, Lancaster I and II, Kentucky, Mameluke Thrust, and Jeb Stuart II. During June and July 1968, the group helped conduct the evacuation of the Khe Sanh Combat Base, transporting all supplies and equipment to landing zone (LZ) "Stud," which became the new home for Provisional MAG-39 aircraft. The aviation unit then participated in Operation Meade River during the largest Marine heliborne assault of the Vietnam War, and during January 1969, the group's assets were directed in support of Operation Dewey Canyon. In September, the group provided support for the 3rd Marine Division as it relocated from Vietnam.

Marine Light Helicopter Squadron (HML) 267 was activated at the Marine Auxiliary Landing Field (Corps Camp Pendleton) on 15 March 1968. The squadron operated two types of aircraft, the OV-10A Bronco and the UH-1E Huey. In November 1971, the UH-1Es remained with the MHL-267, and the OV-1-s were assigned to the VMO-2. HML-267 flew utility and attack missions to include close in fire support, helicopter escort, forward air controller (airborne), resupply, troop inserts and extracts, paradrops

and other special insertion techniques, sensor drops, airborne radio relay, courier, command and control, VIP transportation, administrative movement of passengers and cargo, and MEDEVAC.

Headquarters and Maintenance Squadron (HAMS) 39 was originally activated as Provisional Headquarters and Maintenance Squadron 39 (H&HMS) on 16 April 1968 at Quang Tri Air Base, Republic of Vietnam. This squadron provided support for tactical squadrons of the 1st Marine Aircraft Wing operation in Quang Tri Province. From its commissioning until it was deactivated on 25 October 1969, the squadron participated in numerous combat operations within the Northern I Corps area. The squadron was reactivated at Camp Pendleton, California, on 1 September 1978. The nucleus of the squadron had been previously activated in 1975 as Detachment, HAMS-16 at Camp Pendleton. HAMS-39 provides intermediate maintenance, supply, and administrative support for MAG-39 and the six assigned aircraft squadrons.

Marine Observation Squadron 2 (VMO) was activated at Quantico, Virginia, on 1 November 1943. It participated in the Saipan Campaign operating the OV-1 Grasshopper aircraft, and in 1945 landed the first US plane on Okinawa. The squadron was deactivated in 1946 and reactivated in 1951 at Santa Ana. In April 1962, a detachment of two O-1B "Bird Dogs" from VMO-2 were attached to HMM-362, the first Marine Corps Aviation Unit to serve in Vietnam. As fighting intensified, another four-plane detachment was sent to the Da Nang area. The balance of the squadron deployed to Vietnam in May 1965 as part of the 9th Marine Expeditionary Brigade and participated in "Operation Starlite," the first major confrontation of the war. Following service in Vietnam, VMO-2 was placed in cadre status until activated again at Camp Pendleton in 1971. WMO-2 provides airborne tactical air coordination, fire control, paradrops, and close air support with OV-10A and OV-10D Bronco Aircraft. Additionally, day and night airborne Visual Reconnaissance is provided using the Forward Looking Infrared (FLIR/LRD) acquisition laser designation unit in the OV-10D.

Marine Attack Helicopter Squadron (HMA) 169 was commissioned 30 September 1971 and operated the AH-1G Gunship. The squadron's mission was to provide close-in fire support for aerial and ground escort operations during ship-to-shore movement and to maintain the capability of TOW missiles against point targets, including enemy armor.

As the role of helicopters in warfare continued to increase in the post-Vietnam War, improvements were made at the airfield to accommodate the changes. The first permanent squadron was stationed aboard the airfield in the mid-1960s. Among the aircraft in this composite squadron were the OV-10 Broncos and the UH-1 Hueys.

In 1972, there were 400 aviation Marines and 34 aircraft at Camp Pendleton. By 1974, the auxiliary field accommodated three operational squadrons (HMA-169, HML-267, and VMO-2) and the Marine population nears 1,000. By the end of 1975, another HML squadron was assigned, increasing the number of Marines at the air station to 1,300. The HMA-169 operated the AH1J Seacobra gunship. The HML-267 operated the UH1E "Hueys" and the VMO-2) operated the fixed-wing OV-10 "Broncos." By 1977, the MCALF, Camp Pendleton housed 67 operational aircraft and plans were underway to increase that number to 93 by 1980 with a total of 1,937 officers and enlisted personnel onboard the airfield.

Personnel lived on other areas of the base as the buildings on the MCALF were all connected with flight operations and fulfillment of the MCALF mission. The aviation Marines occupy some of Camp Pendleton's older wooden barracks in the 14 Area and share a mess hall with the 7th Engineers. By 1974, planned projects included a new enlisted billeting in the 22 Area (of Marine Corps Base, Camp Pendleton), across Vandegrift Boulevard from the airfield.

From 1956 until 1970, many upgrades were made to the airfield operations including improved runway lighting, increased apron access and aircraft parking apron, acquiring a capability for instrument landings, and approach lighting. Electrical, communication, sewer, fire suppression, ordnance build-up area, and water systems were upgraded or installed. A new aircraft maintenance hangar 3 was constructed in 1964 (90,4026 square feet) and a series of shops, classrooms, and storage buildings, including:

- Building 2368, now an auditorium, 1967, 20,632 square feet
- Building 2369, now a fitness center, 1967, 10,0891 square feet
- Building 2370, now used for aircraft rescue and firefighting, 1969, 11,472 square feet

Source: J. Aaron

Figure B-3. Building 2368, 2015

Source: J. Aaron

Figure B-4. Building 2369

Hangar space was still limited, and in 1974 a new $1.5 million, 77,813 square-foot maintenance hangar was constructed. In addition, building 2379, engine maintenance shop (22,348 square feet), and building 2380, ordnance maintenance shop (74, 6,866 square feet) were also constructed in 1974. Seven Quonsets were razed to make room for the new hangar.

As a result of its growth, MCALF, Camp Pendleton was redesignated a Marine Corps Air Facility (MCAF) on September 1, 1978, and MAG-39 was reactivated. Since that time MAG-39 has supported the 3rd Marine Air Wing, 1st Marine Division, and the MCB, Camp Pendleton. It soon became evident that a full-fledged air station under its own commanding officer was needed and by 1985 the facility had been re-designated once again. This time it was designated as Marine Corps Air Station (MCAS), Camp Pendleton. Corresponding plans to increase the facilities on the MCAS also were underway, and the station began a process of expansion that continues to the present time.

The change in status resulted in an increase in MILCON projects to take place from 1985 through 1990 at a cost of $85 million for the new facilities. The new support structures included four new OMA hangars, an HGS building, control tower, operations and communication centers, armory, operations tower complex, motor pool, maintenance facility, ACFT parking apron, associated POV parking, warehouse, ordnance facility, engineering test cell, NAMTRADET classroom, refueler vehicle complex, ACFT wash

rack, guard building, and perimeter roads. The expansion removed earlier types of structures used for housing equipment, personnel, and supplies.

SELECTED ARTICLES ON CAMP PENDLETON

OPERATION BEAT TEMPO: AIR

Marine Corps Gazette, Quantico, Start Page: 27
Author: Maj. R. F. Armbruster, USMCR
Date: February 1970

The early morning fog had burned off sooner than had been expected over the sprawling, sundried hills of Camp Pendleton. A lot of people breathed a sigh of relief at this turn of good fortune. Marine Air Group 42 (Rein), the 4th Marine Aircraft Wing support MAG for operation BEAT TEMPO, knew from past experience that weather conditions could be their trickiest problem. With the favorable early morning weather conditions, the air support mission could now be integrated fully into the air/ground exercise.

Furthermore, a helicopter landing not only would force the enemy to fight in two widely separated areas but also would create a substantial threat to his lines of communications and routes of withdrawal. So the stage was set for Marine air's vital role in the combined air/ground exercise.

Prior to the helicopter landings, A4 Skyhawk attack jets from VMA-134 and VMA-141, operating from MCAS Yuma, swooped out of the midmorning haze to prep the landing zone. After this preparation, the A4s were on call for further missions by orbiting at control points awaiting instructions from control agencies.

Besides lifting troops and moving supplies and equipment in support of operations ashore, the versatile helicopters had other duties to perform. They conducted actual or simulated medevac missions and search and rescue when required. For visual reconnaissance missions, they were invaluable because of the close survey they could provide aerial observers.

BEAT TEMPO was a perfect example of this type of coordinated effort between the ground and the air. The helicopters showed infantry unit commanders how they could execute their mission more efficiently by reducing the time element in getting their troops to the objective area, particularly if it was over difficult terrain. Even the individual rifleman who was part of a helo team had a better understanding and appreciation of the "choppers" by the time the problem was secured.

"Pinning the Commanding Officer down for specific training objectives he desires during the first week of ATD is an absolute must," commented Maj. Gilmartin. "During that first week the ground units should be completely oriented and indoctrinated as to the air's capabilities. Helo troop lift familiarization flights and individual unit training must be scheduled that first week. Then you can go into the operations order that second week with a lot more confidence. The more that can be accomplished during that first week of ATD to get everyone involved in the 'big picture' concept, the smoother the second week's actual tactical exercise will be."

It all began back in October 1968 with a detachment COs' conference at the Marine Air Reserve Training Command/4th MAW, Glenview, Ill. At this conference, operational commitments were made. Here were gathered MAG CO's from East and West Coast units ready to accept their assignments for summer ATD.

It was at this point the MAG-42, commanded by Col. J. V. Hanes, MARTD NAS Alameda, was given the nod to be the support air group for operation BEAT TEMPO, which was to be conducted during the latter

part of August 1969. Col. Hanes was designated as the landing force aviation commander, and his executive officer, Lt. Col. J. L. Sadowski, became CO of MAG42 (Rein). The stage was now set for the intensified staff planning that was to follow during the months ahead and right up to the time that all the participating units converged amidst the rolling brown hills of Camp Pendleton.

Two months later, in December, a conference was held at El Toro Marine Air Station in southern California. Dubbed as a pre-ATD planning conference, the participants included West Coast Division and Wing staff members. There were representatives from COMCABSWest, Camp Pendleton, the 3rd Marine Air Wing, Yuma and Fleet Liaison. From this conference, a letter of agreement was written by the CG 4th MAW, which covered the multitude of support functions that would be needed for BEAT TEMPO. These included manning levels, "housekeeping" details, billeting requirements, ground support equipment needs, and augmentation of available personnel and equipment.

Toward the end of January, a preplanning ATD conference was held for all units assigned to Camp Pendleton for the BEAT TEMPO air/ground exercise. All MAG-42 staff officers attended this important meeting which was hosted by the 13th Staff Group from Detroit for presentation to the regimental team as well; as MAG-42. At this same meeting, the MAG received the MEB operations and administrative plans from the 13th Staff Group. At this time, they also received a rough draft of the operation and administrative plans from the 24th Regimental Landing Team, the regiment that the group was to support. Priority of work requirements were beginning to fall into place, and the early contacts with key personnel were proving to be invaluable.

Personnel requirements were reviewed again. It was determined that because of a low manning level, the assignment of a MABS had been precluded in original planning. This made it necessary to request communications and utilities personnel from the base. The critical element involved in the request for additional personnel was the lack of availability of general purpose tents. When this became a critical factor, the tents were obtained and the manning level was raised to the desired increase of 108 officers and 637 enlisted. The lesson learned here again was that once the problem had been determined it was easily settled by actually bringing the interested parties together.

Two important meetings were held in June. One, early in the month at MCAF Santa Ana, ironed out the transportation of equipment assignments from the 3rd Wing to Camp Pendleton, and billeting and messing requirements, including the number of personnel that would be needed to augment the mess staff at Camp Pendleton. Maps were laid out plotting the tent camp sites and showing them positioned adjacent to the Camp Pendleton air strip. This is where the MAG would set up its working area. Less than a quarter of a mile away would be "tent city" which would house 656 air reservists for two weeks. An internal expeditionary communication network was also drawn to include communication requirements in the operating and billeting areas.

Late in June, a final meeting was held at Camp Pendleton to cover the small but necessary details. At this time a communication plan for base telephones was established. Further liaison with the Provost Marshal was made to decide on matters of privately owned automobiles, troop conduct, proper uniforms, and interior guard.

Months before, the warm summer skies had been alive with troop-laden helicopters heading for the landing zones. OV10 Broncos darted into "enemy" positions for target marking and reconnaissance missions. Needle-nosed A4D Skyhawks had swooped in for on-call air strikes against the enemy. It was a well-coordinated Marine aviation support tactical plan, and everyone who witnessed it knew it. The objectives of the exercise had been fulfilled. In short, the individual units had sharpened their skills, the ground units had a better appreciation of what air could do for them, and a more refined and sophisticated understanding of what it was to work with other units had been achieved.

Silver Lance, *Leatherneck Magazine*, Quantico
Author: Beardsley, Frank
Date: June 1965

Lancelot's borders extended from Barstow, California, on the northwest to Yuma, Arizona, on the southeast. The 125,000 acres of Camp Pendleton, relabeled "Campen Province," were the scene of most of the land action. Fourteen villages of various types were constructed in Campen to match similar communities around the world. "Bedivere," for example, was an oriental fishing village, complete with thatched roofs, water gate and secret tunnels. "Percivale" was a whitewashed adobe village which could be found anywhere in Latin America. "West Camelot" was an African village. "Camelot," the provincial capital and key city in the exercise, was built in wildly contrasting architectural styles of Asian, European, and Latin American design.

The costumed inhabitants of these villages represented all walks of civilian life. Some were friendly; some hostile. All of them, from butchers and bakers to troublemakers, were actually US Marines who were carefully trained to say and do the right thing at the right time. They had their own political structure, their own religious practices, their own grievances, even their own flag and national anthem.

Lancelot's language was Spanish and a high degree of proficiency in speaking it was a prerequisite in the selection of Lancelotian citizens. During the two week period of preparation for their roles, English was forbidden. They spoke Spanish in training, at briefings and in all casual conversations, day in and day out. Mayors and constables were selected and assigned to each of the 14 villages, and Camelot even boasted a US ambassador and his assistant, general of the Lancelotian Army and regional Round Table Representatives.

The goal of all this careful planning and thorough training was to make Silver Lance as close to the real thing as possible; giving all participants, from generals and admirals to privates and seamen, personal experience with the form of war prevalent in today's world war in which civil action is as important as military strategy.

In General Fairbourn's words, "Silver Lance has been a superb training vehicle because it ran the entire gamut amphibious assaults, helicopter assaults, conventional warfare, guerrilla warfare, civil affairs the works."

TRIPLE THREAT, *Leatherneck Magazine*, Quantico, Start Page: 14
Author: MSgt. Robert E. Johnson
Date: March 1959

To remain in top physical condition, Recon men do road work every day. If a study were conducted of all West Coast Marine Corps units to determine which had the most unusual job, honors would probably go to the 1st Force Reconnaissance Company located at Camp Pendleton. A similar unit is located on the East Coast the 2d Force Reconnaissance Company at Camp Lejeune. They have brought the Corps a degree of unit versatility never before attained in its 183-year history.

Each is a triple threat outfit in keeping with Corps' slogan on land, at sea and in the air. Daily work finds them marching long distances, swimming or boating through the surf, or jumping out of aircraft. Their mission represents the end result of more than 20 years of testing and experience gained in both peacetime maneuvers and the historic battlefields of the Pacific Islands and Korea. The California company is commanded by Captain Heman J. Redfield III; Captain Joseph Z. Taylor heads the North Carolina unit. They direct accelerated training programs designed to meet the resounding challenge

presented by the rapid changing concepts of modern warfare in this atomic age. Marine parachute training was dormant following World War II. Except for limited schooling for air delivery men and experimental work by the deactivated Test Unit One, this means of transportation took a back seat to conventional means.

Vertical envelopment, however, renewed parachute interest, and the Pathfinders and paraMarines came into being as a result of studies made at Camp Pendleton and Headquarters Marine Corps. Ground control was considered necessary to direct helicopter assault teams or larger units into desired battle positions. The Pathfinders do just that they parachute into position, pioneer the area and guide the assault force to the ground.

The 1st Force Reconnaissance Company is a relatively new organization in the Marine Corps structure. It was commissioned in June 1957 under the command of Major Bruce F. Meyers. He held the CO reins until January of this year, and earlier, was Reconnaissance Project Officer for Test Unit One at Camp Pendleton. Approximately 1,000 jumps were made, to test theories, from transports, bombers, jets, and helicopters. The major had a hand in writing the present-day T/O and T/E requirements for the 1st and 2d Force Reconnaissance Companies. When the Test Unit was disbanded, he and others formed the nucleus of the 1st Force Reconnaissance Company. A cry for volunteers was made to the First Marine Division to fill its ranks. Men still in the company from Test Unit One are AGySgt Lonzo M. Barnett Jr., ASgt. Robert C. Zwiener, ASgts James R. Larsen, Harry Lefthand and Roy Galihugh.

"Some Marines drive trucks, pound a typewriter or operate heavy equipment," Major Meyers said. "Our job is reconnaissance." The 1st Force Reconnaissance Company has strength of 13 officers and 147 enlisted men. They are at T/O strength which makes them one of the few units in the Corps authorized 100% onboard. The 29 staff NCOs also give the unit a higher percentage than any other company of equal size. It comes under administrative control of Headquarters Battalion, First Marine Division, and operational control of Division G3.

Force Recon is located at Camp Del Mar, at the southwest tip of Camp Pendleton. Highway 101 separates Del Mar from Camp Pendleton. The company shares building space with Schools Battalion and the 1st and 2d Landing Support Companies. The company is divided into four platoons; headquarters, Pathfinder and two reconnaissance. AMSgt. John O. Henry, company first sergeant, indicated that office paper work is larger than normal because of frequent tests of underwater and parachute gear. "An evaluation is made and if it proves successful, it is added to our Table of Equipment."

Actually, the company has enough officers and staff NCOs to staff a small battalion. T/O calls for a captain as a platoon leader, a master sergeant as platoon sergeant and a staff NCO as team leader. Each platoon makes up its own training schedule. Rarely is training accomplished using all platoons as a single unit. Diverse separate commitments are given as one reason for having captains as platoon leaders.

The 1st Force Reconnaissance Company, as a part of the task organization of the Amphibious Task Force, is employed to extend the ground reconnaissance capability of that force beyond the coverage afforded by the Reconnaissance Battalion of the Marine Division of that force. It effects this capability by conducting terrestrial pre-assault reconnaissance by amphibious or parachute means; post assault distance reconnaissance via helicopter and parachute means; and battlefield surveillance by establishment and displacement of helicopter lifted observation posts.

The company has two missions—one, to conduct pre-assault and post assault amphibious and parachute reconnaissance in support of a landing force; the other, to conduct pre-assault and post assault parachute and other Pathfinder missions in support of a landing force. The 1st and 2d Reconnaissance Platoons are governed by the first mission; the Pathfinders follow the second.

Originally, the company was formed into an Amphibious Reconnaissance Platoon, a Parachute Reconnaissance Platoon and a Parachute Pathfinder Platoon. Last year, the Amphibious and Parachute Reconnaissance Platoons were renamed as 1st and 2d Reconnaissance Platoons. Missions became identical and men of each platoon became dually qualified in both amphibious and parachute techniques. The Pathfinder unit remained the same. However, members of the teams were reduced from 11 to nine. Members of the 1st and 2d Platoons are outstanding swimmers, experts in hydrographic and beach reconnaissance, in addition to being parachute jumpers. They are required to jump, day and night, from all types of aircraft, using both static line and freefall techniques into strange terrain. They are the only men in the Marine Corps and among the few in the world to have a para-amphibious capability.

Volunteers must first be qualified infantrymen and must have at least 18 months obligated service. A diversified background is not necessary, but is sought. On present company rolls can be found men who can speak several languages, can operate heavy equipment, have private pilot licenses, etc. Each man is a specialist in many things. A majority of the new replacements join from the First Marine Division. Occasionally, a call for volunteers is made. Then, it's not unusual for 1st Force Reconnaissance Company to screen 100 or more volunteers to fill a couple dozen openings.

Presently, the 1st and 2d Reconnaissance Platoons are in the process of being cross-trained in scuba and parachute jumping. Until recently, the platoons were named the Amphibious and Parachute Reconnaissance Platoons. Each had their own mission, as the titles implied. It's required that a Marine make 10 static line jumps before he makes his first freefall. A well-known term for this type of drop is “skydiving.” The recon men prefer the term “stabilized freefall.” The advantage of freefall allows the jumper to depart the aircraft at a greater height, making it more difficult to identify him. “The longer you hang around up there, the easier you are to spot,” Captain Redfield said.

The Pathfinder Platoon is the largest unit in the company. Personnel number four officers and 33 enlisted. First Lieutenant David A. Ramsey is platoon commander and personnel are split up into four teams of nine men each. Each team is headed by an officer. The team carries approximately 1,000 pounds of gear, necessary in directing helicopters into a landing site. Webster defines a pathfinder as one who discovers a new route by exploring untraveled regions. A Pathfinder Team accomplishes just that, in a mission of paramount importance to the success of a helicopter borne assault force. Each team is a self-sufficient unit. They are identical in size and can be employed independently or as a platoon. The mission would determine how many Pathfinder Teams would be used.

Pathfinders are highly skilled specialists with a mission emerging from the needs brought by the new rapid mobile warfare. A nine man team can land within a 100-yard circle. Normally, jumpers follow each other out at about one second intervals. The “stick pusher” is the last man out. The jump master usually leads the “stick” out. No motion is wasted as Pathfinders rid themselves of parachutes and go into action. Each man in the team has specific tasks to perform, all in minutes before the assault helicopters appear on the horizon. As few as 15 minutes prior to the assault, a Pathfinder Team is parachuted into the objective. They set up radio communications with the oncoming helicopters, determine the best landing sites, rig smoke signals and panel markers. During night landings, special lights guide the 'copters in the landing zone. Upon arrival of the assault force, the Pathfinders direct the men toward the objective to be taken Because of the time element, the Pathfinders have a limited scouting requirement. If taken under fire, they simply shift the landing zone to a better protected site. Other limited capabilities of the Pathfinders include gathering of radiological data, to performing light engineering tasks. Following the landing of the last helicopter, the Pathfinders are relieved and ferried back to the carrier for later use.

In the past year, about one third of all jumps have been made at night. The training areas have centered on Camp Pendleton, El Centro, and Santa Ana. Needless to say, night “leaping” has its drawbacks, but is necessary, at times, to avoid detection. The new Pathfinder concept calls for fast, wide-awake reactions

and self-reliance. When a team hits the silk into a drop zone in enemy real estate, each member knows where he belongs in the perimeter, what communications are required for oncoming 'copters, the placement of necessary identification panels, etc. Following the Pathfinders by minutes is the helicopter assault force. Split-second timing is necessary during the ship-to-shore operation. Every advantage of the chopper's weightlifting capacity is utilized to achieve the necessary speed, mobility and maneuverability.

"There's more demanded for an NCO here than most organizations," ASSgt. James E. Canada said. "He has to do more thinking for himself and make more decisions for others." ACpl Robert J. DesRoches, a Pathfinder member, added, "We jump into a predetermined area. There is no standard size it could be the size of a postage stamp if someone wanted it." Landing in cactus, water or trees always results in a never-ending kidding by fellow members of the team. A "head-on landing" happens when a foot becomes entangled in a suspension line. Then, the parachutists lands head down. A "buddy jump" occurs when two parachutes become tangled. The parachute is a method of transportation from the plane to the ground. Once on the ground, the real job begins. To accomplish identical missions, teams could also be flown in by helicopter, fixed wing aircraft, be trucked in or could use water routes. A solid majority preferred jumping to swimming.

The goal of the company is to have 96 enlisted men qualified as jumpers and 60 with the dual capability. Other courses of study open to men of the 1st Force Reconnaissance Company include Ranger School at Fort Benning. Unconventional Warfare or Special Forces Schools at Fort Bragg, Prisoner Interrogation School at Camp Pendleton, Mountain Leadership or Escape and Evasion class at Pickel Meadows. "There's always someone on TAD orders," AMSgt. Henry commented.

FLYING LSTs, *Leatherneck Magazine,* Quantico, Start Page: 28
Author: MSgt. Robert E. Johnson
Date: May 1958

Pilot training, which began shortly after the arrival of the six helicopters, included preflight and cockpit checks using lengthy check off lists, taxiing, hovering, basic air work, ground pattern work, approaches, landings and emergency procedures. The pilots who flew the planes west acted as instructors.

In other helicopters, it's simple enough to go through a memory check of instruments, etc., before takeoff, but with the HR2S1 preflight items number 51 before the engines are turned over. An additional 91 items, including electrical and mechanical systems, are tested before takeoff. During the time the helicopter is airborne, a continual check is made of numerous switches, dials, etc., by the pilot, copilot and crew chief.

A qualified pilot or copilot is referred to as a "hac." "We must first qualify as a second pilot (copilot)," said Lt. Orey, a student pilot. "A certain amount of hours in the air is required to finish this basic training, called a 'fam stage.'" "First we learn to fly this particular type airplane, then branch into tactical flying which will later be used in the field, such as rough area landings, the uses of the basket and cargo employment and night flying," Captain Day indicated. Two pilots fly the "second story" flight deck. In an emergency, one pilot could handle the helicopter, but two are required due to the numerous checks needed in flight and prior to takeoff.

It was compared to a Marine transport plane where two pilots are needed. Nonflying officers in the squadron are Warrant Officer Walter E. Costlow, Assistant Maintenance Officer; First Lieutenant Landauer; and Second Lieutenant Edwin R. Irrgang, Material Officer. Crew chiefs in charge of the maintenance of their aircraft are Master Sergeants Titus L. Willis, Calvin C. Phillips, Richard E. Zendzian, George G. Peart, Technical Sergeants James F. Romanelli and Anthony N. Daniels. Assigned to assist the crew chiefs are first and second mechanics. A number of newly arrived mechanics are master

sergeants and they will eventually be assigned as crew chiefs after new planes arrive and they know their assigned jobs.

MSgt. Zendzian explained, “The squadron crew chiefs are directly responsible for the security of their aircraft, and a helicopter can't fly without a crew chief aboard. We are in charge of everything aft of the cockpit. This includes preflight, post flight and other periodic checks to seek out minor discrepancies which might occur on the ground or in the air.” The fatigue factor was considered very high while flying in the HR2S1. It applied to the pilot and copilot, but more so to the crew chief. In the air, he has no time for sightseeing. The chores of flight engineer keep him busy every minute during a hop. If a HR2S1 makes two flights in one day, the first mechanic relieves the crew chief on the second hop.

Major McGuire, who is also the squadron’s S3 officer, said, “Most pilots are in a flight section. Their primary job is to operate the aircraft, but, in addition, they assist the squadron in operating sections. Everything we do is directed toward the improvement of our training and the mission of the squadron.”

Along with other mechanics in the squadron, Pfc Charles J. Vedros Jr., is enrolled in the Marine Corps Institute “Helicopter Fundamentals” course. He feels that this is the quickest way to become thoroughly familiar with his present job as a helicopter mechanic. He’s a graduate of the 16-week Helicopter Fundamental School at Memphis, Tennessee, and joined the squadron in February of this year.

The squadron is divided into a number of individual departments. They include administration, engineering, planning and production control, operations, metal shop, flight equipment, material, avionics, intelligence, training, hydraulic and flight line. Four duty sections, which include members of all departments, are mustered by Technical Sergeants Shirl T. Todd, Richard D. Burke, William Mario Jr., and Royal J. Spurrier each morning. In addition, they assist in emergency recall responsibilities. These sections are on duty evenings, weekends and holidays, to insure that the squadron can operate efficiently in repair or flying assignments, if called upon. “Our squadron has 25 percent on board at all times,” said TSgt. Marlo, Administration Chief. “This figure represents one duty section which has sufficient personnel to handle any type of emergency.” He added, “The majority of our personnel hold a 6481 helicopter mechanic’s MOS.”

The most experienced man in 462 is probably Warrant Officer Costlow. He was at Quantico, Virginia, when experimental work was accomplished with the HR2SX in 1956. The Squadron's Aircraft Maintenance Department has the majority of personnel in the squadron. Two officers and 134 enlisted men are on the rolls. Their logistical capability is to perform squadron maintenance of assigned aircraft and to do first echelon organizational maintenance of assigned equipment. They are capable of performing all supply and fiscal functions required in the squadron’s operation.

It is MSgt. Slater who runs one of the busiest departments in the squadron. His office is located just off the main MCAF runway, a short distance from the huge blimp hangar which “beds down” the HR2S1 helicopters each evening. His responsibility is to make sure that the helicopters are ready to meet all flying commitments that the aircraft are serviced, gassed and made ready for takeoff. When flights return, he has necessary Aircraft Flight Records available in the flight line shack. Notations on these forms include pilot and engine hours, crew members, passengers, discrepancies and corrective measures. He makes sure that the proper departments get these notations for logging purposes, and has the added responsibility of seeing that each helicopter undergoes a daily and preflight inspection.

The Planning and Production Control office is the watchdog of all maintenance work completed on each aircraft. “We have instigated a Planned Progressive Maintenance (PPM) System,” said MSgt. Howden. “Rather than grounding a helicopter to complete major periodic inspections, this work is accomplished by crews in the air and on the ground between scheduled hops or during slack periods.”

"Periodically we issue cards which list certain items to be checked on the plane. PPM cards normally represent maintenance required for four hours' flight time," continued MSgt. Howden. "When this work is completed, the card is returned for filing and noted on the 'cribbage board' (The cribbage board is a visual aid "PPM Status Board" of all maintenance work completed on each helicopter). Maintenance work is stabilized in this way and by the time a required 60 hour check is reached, all of the preventive maintenance has already been completed.

"Civilian airlines have used this system for years," said MSgt. Howden, "and I expect that the entire Marine Corps will adopt this system in a year or so." One other helicopter squadron at MCAF is using this system. It's HMR362. "One other new procedure in expediting our work," said the sergeant, "is our ability to order parts over the telephone. Paper work is completed while action is being taken to procure the parts, speeding up our assigned task considerably."

Presently, all mechanics are assigned to a specific helicopter. Between 13 and 15 crewmen are appointed to each aircraft. As the squadron is assigned additional planes, this number will become lower. "We hope to have seven men assigned to each helicopter in a few months," said Warrant Officer Costlow. Most of the squadron's crewmen are trainees and their assignment to 462 marks their first duty with an operational squadron. Lubricating responsibilities involve the mechanic in 500 separate operations; the rotor head alone has 154. "The rotor blades fold in 35 seconds," said TSgt. Daniels, "when the internal hydraulic power is used. It would take about 30 minutes to fold them by hand," he added.

The reason for the folding blade principle, as well as the folding tail, is to allow for a limited hangar and aircraft carrier space capability. When extended, the main rotor blades have a diameter of 72 feet.

"The Fleet Marine Force is really going to like this helicopter," said Col. McCully, "when they get an insight as to its capabilities." He continued, "I've got one of the finest groups of officers and enlisted men ever to be found in one spot." Additional helicopters are expected and they will be picked up at the factory just as fast as they can be constructed. "We expect to acquire one a month, until the squadron has sufficient strength," said Sgt. Maj. Linkus. When thoroughly trained, the squadron will team up with units of the First Marine Division at Camp Pendleton to further develop the Marine Corps doctrine of close air support and vertical envelopment.

The central feature of the recent reorganization of the Marine division is the creation of a new streamlined division having increased shock and fire power. The new Marine division is completely air transportable. Its assault elements are completely helicopter transportable with the employment of the HR2S1 helicopters.

Rappelling Out of Helicopters, *Marine Corps Gazette*, Quantico, Start Page: 14
Author: SSgt. Robert G. Walker
Date: June 1963

A major problem facing recon units is planting OPs and patrols in rugged terrain. True, it is possible for men to reach almost any position on foot. However, this takes time. With the advent of helicopters, many problems have been solved. Nevertheless, there are still places where a helicopter can't land. How do we get our people into these areas if the chopper can't land? What we need is a speedy, safe method of discharging troops while the helicopter hovers above the deck.

A couple of years ago, Lt. Col. J. M. Jefferson Jr., then CO, 1st ReconBn, Camp Pendleton, asked me to devise a method of rappelling out of a helicopter. For a week we tested standard rappels used in mountain work. They proved unsuitable for use with helicopters due to time and danger involved in unhooking the

rope from our snap links while the aircraft was hovering. A method had to be found that enabled us to free ourselves from the rope with comparative ease and safety. We found a method that suited our requirements.

To set up this rappel, one end of the rope is tied to the support bar on the hoist using a round turn and two halt hitches. Leave enough line to reach one of the cargo rings on the helicopter deck where it is tied with a bowline. The end then dangles to the deck. (Climbing ropes are 120 feet long, thus allowing the aircraft adequate clearance of treetops, etc.) With the rope fastened in such a manner, the rappeller is ready to begin his descent. Sit on the deck of the helicopter with feet out the door, reach out and pull the rope in. Next, pass the rope between legs, around the outside of cither thigh, across the shin to the inside of the leg, and under the arch of the foot. After it is passed under the arch and up again on the outside of the foot, it is grasped by the hand on the same side as the foot under which it passes. For example, if the rope passes under the arch of the right foot, it is then passed to the right hand. With the other hand, the rope is grasped just above the head.

The rappeller then steps out of the helicopter onto the climbing rope. He lowers himself down the rope by relaxing his grip on the rope with both hands. He is able to control and brake his descent by tightening his grip with the hand holding the rope outside his foot. When he reaches the ground, all he has to do is step free. Further testing of this method was conducted by Company C, 1st Recon Bn. It was found to be highly effective due to simplicity and speed. Using this method, the rappeller can carry a pack or PRC10 on his back. Heavier loads, however, should be lowered by rope. Picking up Marines and heavy gear could be accomplished by using the helicopter's electric hoist, which is too slow for lowering same.

Rappelling practice can be accomplished by attaching ropes to dry net towers, platform towers of Marine Corps training tanks, or tree limbs. Fastening of rope to the beams or limbs will vary, but the feel of the rappel will be the same as if coming out of the helicopter. One final question might come up. How about rope burns? If done correctly, there will be only a slight rope burn at the most. Padding or long underwear, worn under the trousers, will reduce chances of rope burn.

A good Recon man will agree that a slight rope burn is a cheap enough price for a safer, better way of getting up on that OP.

MCALF: Camp Pendleton, *Leatherneck Magazine*, Quantico, Start Page: 48
Author: James, Larry
Date: December 1974

The 6,000-foot MCALF runway can accommodate C-130 Hercules aircraft. A refueler transport of VMGR352, from MCAS El Toro, took off after a MarLog stop. The airstrip with its 6,000 foot runway was a satellite of Marine Corps Air Station, El Toro, about 50 miles northwest. By 1947, the Pendleton activity was designated as an auxiliary landing field. It had been a fine spot, about five miles inland from the Pacific Ocean, for World War II puddle jumpers and observation aircraft. But the advent of Marine jets negated any aspirations of a “Pendleton International.” The 1950s introduced helicopters to the Corps in a big way. But there was only a limited prospect for concentrated use of the rotary-winged “birds” in the Santa Margarita valley.

Major Richard C. Lawe, Officer-in-Charge of Sub Unit 1, El Toro’s “station keepers” for the Marine Corps Auxiliary Landing Field, Camp Pendleton, said, “Significant growth is restricted both by terrain factors and federally regulated air space.” However, the major did not infer that the airfield facilities needed to remain World War II vintage. The auxiliary field is rapidly moving alongside other facilities in

today's modern Marine Corps. Recent construction and projected improvements will allow a three-fold expansion in the number of aircraft and Marines without any enlargement of the 355-acre site.

Two years ago, there were 400 aviation Marines and 34 aircraft at Camp Pendleton. Now the auxiliary field accommodates three operational squadrons (HMA-169, HML-267, and VMO-2) and the Marine population nears 1,000. Referring to the field as an aviation "island within the (Camp Pendleton) reservation," the senior Marine aviator assigned to the MCALF, Lt. Col. S. J. Kittler, said present plans call for another HML squadron by the end of 1975 and a total of 1,300 Marines. Lt. Col. Kittler is Commanding Officer of the Marine Aircraft Group 16 Detachment. The parent MAG16 command is at CAS(H), Santa Ana, California, in central Orange County.

Organizationally, the MAG-16 Detachment includes Marine Helicopter Attack Squadron 169 (which began to receive the new AH1J Seacobra gunships last summer); Marine Light Helicopter Squadron 267 (equipped with UH1E "Hueys"); Marine Observation Squadron 2 (which has fixed wing OV10. (Broncos); Subunit One of Headquarters and Maintenance Squadron 16 and Subunit One for Marine Air Base Squadron 16. The three operating squadrons average 150 Marines each. The Subunit for MABS totals 225 Marines and H&MS has 220.

Camp Pendleton crash crew members raced to a burn pit area during a practice alert. The 28-man section trains constantly to be ready when needed.

Maintenance Marines of HML-267 gave a Huey helicopter a close check. Their efforts helped the squadron record 4,288 accident-free flight hours in the first half of FY 1974.

Major Lawe's Subunit One, of MCAS El Toro, had two officers and 73 enlisted to handle its responsibilities of maintaining the air field's crash crew, bulk fuel setup, and the tower and weather services. Twenty-six Marines, mostly crash crew members, are actually additions to the Table of Organization (T/O). They have been FAPped (Fleet Assistance Program) to MCALF Camp Pendleton from FMF Wing units.

While the auxiliary field nears the "saturation point" as far as taking on more units, Lt. Col. Kittler sees duty at Camp Pendleton as being outstanding. "The primary advantage we have," he said, "is being close to the people we support." The air wingers not only work closely with the Marine ground forces, they share billeting and messing with Division units.

The aviation Marines occupy some of Camp Pendleton's older wooden barracks in the 14 Area and share a mess hall with the 7th Engineers. The main drawback is transportation, since it's a good four miles through Rattlesnake Canyon to reach the barracks from the airfield. However, all of Pendleton's main side facilities are within a few minutes' walk once the barracks Marines are off duty.

Hangar area was at a premium before a new $1.9 million IMA complex opened last summer. The nose of one Bronco had to be edged under the tail boom of another to get the "birds" in.

Training and motivation are synonymous with crash crew members. "Contrary to popular belief, we don't just sit around doing nothing until an accident happens," Sgt. Danny Posey recounted. "When I was at Cherry Point, it seemed like we always had a dozen emergencies before noon chow. It may be quiet here," Posey explained, "but the mechs or plane crews sure don't complain." The four-man crash crews sleep in their relatively new (erected in 1968) building in case they are needed. The MCALF has seven firefighting trucks, a 10-ton crane and a tracked, all terrain "Husky" vehicle. This is available to be trucked to other parts of the base if needed, or it can be airlifted by a CH-53.

Things may sound a little slow-paced at the Pendleton field, but 15,000 flight hours last year by just three squadrons gave the ground maintenance Marines plenty to keep up with. The three squadrons also have averaged more than 15,000 accident-free flight hours during the last few years.

The squadrons totaled 20,000 flight hours two years ago, before the fuel crunch. But the air crews were not the only ones affected. Only contaminated fuel could be used by the crash crew in practicing their firefighting technique. However, things are on the upswing at the MCALF. Last summer, Marines began working in the new $1.9 million Intermediate Maintenance Activity hangar/shop complex. This added 20,000 square feet of enclosed work area beyond the previous 12,000 feet available in hangar 2360.

Big advances for airfield operations include improved runway lighting, acquiring a capability for instrument landings and proposed approach lighting. Present plans project new enlisted billeting in the 22 Area, across Vandegrift Boulevard from the airfield. Two, three, and four-man rooms will be capable of housing 500 to 700 Marines. To cut down on the traffic congestion as a result of only one entrance to the field from the boulevard, another roadway is planned to lead into the VMO area.

Seven of those old, dusty Quonsets were to come down when the new IMA opened and two more aircraft maintenance hangars are scheduled for construction. An aviation warehouse, an armory, space for Group Supply and a building for the MAG-16 Detachment headquarters will follow. When the proposed construction is completed, the other Marine Light Helicopter Squadron will complete the MCALF roster.

The new HML will be equipped with the twinjet Hueys (UH1N's). Two restricted air spaces and a federal airway over the Camp Pendleton complex, terrain features in the Santa Margarita River valley, and the buildup of Camp Pendleton's industrial area adjacent to the airfield may be curtailing expansion but the MCALF is changing. There are no bushes on the runway; there are plenty of up-to-date Marine aircraft for the 1,000 Marines to work on; and the Quonsets are coming down.

Camp Pendleton, *Leatherneck Magazine*, Quantico, Start Page: 16
Author: Johnson, Robert E.
Date: November 1960

In addition to the main side area, there are many smaller camps located within the boundaries of sprawling Pendleton Main side area, and Camp Horno are examples of the terrain features found aboard the 126,000-acre Marine base Headquarters, MCB, is situated on Vandegrift Blvd. It is about 10 miles to the Base Main Gate. Camp Pendleton is equipped with 20 miles of beach, ideally suited for amphibious training exercises.

Vertical envelopment drills are constantly practiced by infantrymen to ensure their combat readiness. To the east, approximately 125 miles, is the Marine Corps Base, Twentynine Palms. It's situated in the high desert area and contains approximately 1,000 square miles of mountainous, desert terrain. It is here that elements of the FMF based at Camp Pendleton train in desert warfare. Combat training is not limited to the infantryman; specialist schools also operate on the base. The mission of Camp Pendleton is divided into three general categories: First, the base conducts specialized schools and training as directed by the CMC; second it provides housing, logistics, training and administrative support for the FMF units based at Camp Pendleton; and third, it trains and organizes replacement drafts for shipment overseas.

In order to accomplish its mission, the base conducts formal schools, and offers training in individual combat, cold weather operations, and General Military Subjects. Reservists are also trained on the base. The formal schools are operated by the Schools Battalion. Courses are provided in Amphibious Unit Leadership, Amphibious Tractor Driving, Amphibious Communications, and other specialized matters so

necessary in the amphibious art and requiring a high degree of training. The Field Medical Service School trains and indoctrinates doctors and corpsmen coming into the Fleet Marine Force for the first time.

Combat efficiency, as well as combat readiness, is essential in keeping all Marines prepared for their role as a "Force in Readiness." To assure each Marine thorough individual combat training, the Marine Corps maintains two Infantry Training Regiments; the First at Camp Lejeune and the Second at Camp Pendleton. During his training with the Infantry Training Regiments, every graduate Marine learns the procedures for amphibious landings, map and compass reading, tank infantry coordination, defense conduct and scouting exercises. In addition to field work, he fires the 3.5 rocket launcher, light and heavy machine guns, BAR, flame thrower, etc.

Camp Pendleton is a patchwork of areas and nine major outlying camps. The camps include Camp Vado Del Rio (home of the Motor Transport Battalion), Camp Margarita (5th Marines), Camp Pulgas (7th Marines and 1st Tank Battalion), Camp Homo (Division Schools, 7th Communications Battalion, 1st AntiTank Battalion and the Reconnaissance Battalion), Camp San Onofre (Second Infantry Training Regiment), Camp San Mateo (First Marines), Camp Christianitos and Camp Talego (1st Pioneer Battalion) and Camp Del Mar (Schools Battalion, 1st Force Reconnaissance Company, 3d Armored Amphibious Tractor Battalion. Field Medical Service School and the Tracked Vehicle Test and Experimental Unit).

Each of these outlying camps is self-sufficient, and is located in the proximity of training areas and the ranges employed by the units assigned to these camps. Located north of the Main Area and Division Area are two major impact ranges which comprise approximately one fourth, or 30,000 acres, of Camp Pendleton. This impact area is ringed by some 87 ranges of all types. They vary in size from a pistol range to a moving target range, and they include an impact area for light and medium artillery. This same impact area is also utilized by the Marine aviation units at the Marine Corps Air Station, El Toro, some 50 miles to the north, in bombing and air-to-ground gunnery exercises. The Pendleton Air Strip serves as a facility to transport type aircraft and the helicopters that train with the Fleet Marine Force units. It is headquarters for VMO-6.

Major emphasis in the Marine Corps is on rifle marksmanship training and in order to support this training, Camp Pendleton maintains and operates seven rifle ranges with a combined total of 550 targets. Annually, these targets are used by more than 20,000 Regular Marines and some 6,000 Reserve Marines during their annual marksmanship training.

While the 18-year history of Camp Pendleton has been varied, its primary mission has remained unchanged since its establishment. Training combat-ready troops for immediate employment wherever the need may arise is paramount.

The mission of the First Marine Division is "to execute amphibious assault operations as a force-in-readiness, supported by Marine aviation and required force troop units." In August, 1958, with the opening of Camp Pendleton's enlarged boat basin, readiness of the division was stepped up appreciably. For the first time, landing craft could beach at Camp Del Mar to embark the division's troops and equipment.

Helicopters have become a familiar sight at Camp Pendleton, as Marines continued to train in "vertical envelopment." New weapons and equipment, designed to improve Marine tactics, are also constantly being tested here.

Camp Pendleton is recognized as one of the nation's major Marine Corps training areas, an area which will continue to train the proud, hard-hitting fighting Marine Corps team. Its large area has provided

terrain for experimentation in practically all types of operations Marines are likely to encounter in combat. It is a camp considered to be comparatively new in Marine circles, but with which a site practically every career Marine will eventually have some association.

APPENDIX C: QUANTICO MARINE CORPS BASE

THIS PAGE INTENTIONALLY LEFT BLANK

The commandant of the Marine Corps established Marine Barracks Quantico on May 14, 1917. Thousands were trained here during World War I, including units of the 4th Marine Brigade. In 1920, Marine Corps Schools was founded (in the words of then-chief of staff for Quantico, Col. Smedley D. Butler to "make this post and the whole Marine Corps a great university." In 1947, Quantico Marines conceived of carrying troops from ship to shore by helicopter and formed a special squadron to test the idea: Marine Helicopter Squadron 1, commonly referred to as HMX-1. The helicopter techniques they used here later proved invaluable during the Korean and Vietnam Wars. More recently, Quantico played a large part in the development of vertical and/or short take-off and landing (V/STOL) aircraft and amphibious assault ships. Quantico's small, but vital air facility and HMX-1 continue to aid in development, training, and education, as well as their most visible duty, support of the president of the United States. January 1, 1968, the base was redesignated the Marine Corps Development and Education Command in the spirit of the command motto, "Semper Progredi"—always forward (http://www.quantico.marines.mil/About/History.aspx).

The following is James Anthony Ginther Jr.'s dissertation in history titled Keith Barr McCutcheon: Integrating Aviation into the United State Marine Corps, 1937–1971. It was submitted to the Graduate Faculty of Texas Tech University in partial fulfillment of the requirements for the degree of Doctor of Philosophy and approved in December 1999.

In 1939, Sikorsky built and flew the first practical helicopter in the Western Hemisphere, the VS-300. Recognizing the potential of Sikorsky's invention, the Army awarded Vought-Sikorsky a contract for experimental development. Soon the other services were showing interest and other designers began to experiment with helicopter designs, among them Frank N. Piasecki and Larry D. Bell. Together, this trio of designers would exert a great influence on the Marine Corps development of rotary-wing aircraft. Throughout World War II the various military branches continued to experiment with helicopters. Though each viewed these new aircraft as meeting with the potential for meeting certain needs in field operations, the post-war Marine Corps, faced with the challenges which atomic weapons posed to its institutional survival, chose to gamble its future on this new and largely untried technology. The decision put the Corps in the forefront of helicopter development, gave birth to a unique doctrinal approach to warfighting, and provided the Marine Corps with a secure future in the nation's defense establishment.

While McCutcheon was helping the Navy to develop guided missiles, the Marine Corps gave serious attention to the development of helicopters and the "new concept" amphibious assault. Following the recommendation of the special board, the Marine Corps, in December 1947, established an experimental helicopter squadron, HMX-l.

In commissioning the squadron, the Commandant of the Marine Corps assigned it two missions: development of techniques and tactics in connection with the movement of assault troops in amphibious operations, and evaluation of a small helicopter for use by observation squadrons for gunfire spotting, observation, and liaison missions. In carrying out these missions, HMX-1 was to: develop a doctrine for aviation tactics and techniques for employment of helicopters in amphibious operations; assist the Marine Corps Schools in the development of a doctrine covering the tactics and techniques of the employment of helicopters in amphibious operations; study the operations and maintenance of assigned aircraft; develop the flight proficiency of pilots and crewmen; develop and maintain the technical proficiency of mechanics; and submit recommendations for table of organization equipment allowances, and related data for future helicopter squadrons.

To facilitate this, the squadron was located at Quantico, which was near the Sikorsky and Piasecki helicopter factories, next-door to the Marine Corps schools, and far enough from Fleet Marine Force operations at Camp Lejeune, North Carolina, to allow its work to remain experimental rather than operational.

By May 1948, he had twelve officers and thirty-two enlisted men in place, equipped with a total of five Sikorsky H03S-1 helicopters. Despite these limited resources, the squadron was deemed ready to take part in its first major combat exercise, Operation Packard 11.

HMX-l's job in Packard II was to simulate landing a regimental landing team by helicopter from aircraft carriers at sea. During the operation, the squadron acted out 108 carrier landings and take-offs and flew sixty-six men and a large amount of communications equipment to the landing site, making thirty-five round trips in a little over twenty-eight hours. This feat was all the more impressive in that it was accomplished in helicopters capable of lifting only two combat equipped Marines and a maximum load of 1,180 pounds including pilot, fuel, and payload.

Despite the success of the squadron's first large-scale combat simulation, the most obvious lesson learned was that wide-spread employment of helicopters in amphibious assault hinged on the ability to develop larger aircraft. The operation report emphasized the urgent need to acquire a helicopter capable of transporting at least eight passengers. It concluded that carrier-based assaults were feasible, but noted that despite the successes of Packard II, much work remained to make the concept a working reality in the fleet.

One of the results of Packard II was that the information gathered about helicopter operations eventually became the basis of the Corps' first doctrinal statement on the subject. In November 1948, the Marine Corps Schools produced its first manual for instruction in helicopter operations "Amphibious Operations—Employment of Helicopters "more commonly known as Phib-31 because it was the thirty-first in a series of manuals the schools developed to teach amphibious war concepts in the post-war era. Phib-31 did not challenge any of the central tenets of amphibious doctrine laid down by the Marine Corps in the 1930s but did provide up to date information on what could be expected by adding helicopters to the mix. The fact that the equipment and organization necessary to translate these expectations into reality did not exist, did not stop the manual's authors from outlining prospects that the Corps would spend a decade refining. This willingness to examine possibilities rather than capabilities pushed the Marines out in front of the other services in helicopter development during this period. It remained to convert these ideas into battlefield techniques and tactics.

New life was breathed into HMX-1 on 1 July 1950 when Lieutenant Colonel Keith McCutcheon, recently returned from the Armed Forces Staff College, reported to Quantico as the new commanding officer. McCutcheon was not even a qualified helicopter pilot at the time. However, his enthusiasm and drive made its mark upon the unit almost immediately. Soon, it not only expanded training and experimentation programs, but by the end of McCutcheon's tenure, had begun to work out rudimentary doctrines for helicopter operations and prepare Marine helicopter units for their first combat test in Korea.

McCutcheon's enthusiasm for helicopters, however, stemmed from the possibilities resulting from their unique flight capabilities. He explained that the outstanding characteristic of the helicopter was its capacity to hover. This quality made it possible to move immediately in any direction along all three axes and to take off and land in areas inaccessible to conventional aircraft. This ability, he said, used intelligently, would make helicopters a useful means of transport. To McCutcheon, the mission of HMX-1 was to explore and exploit this potential.

Upon his return to the squadron, the unit began to do just that. Over the next year and a half, HMX-1 conducted experiments and pioneered techniques that would permit the deployment of a Marine helicopter transport squadron to combat in Korea a full two years ahead of the schedule set by the Commandant of the Marine Corps in 1949. One of the first of these tests took place in late August 1950.

McCutcheon and his men inherited from his predecessor an experiment to determine the possibility of firing rockets from a helicopter. A bazooka was attached to the right skid of a Bell HTL-4 helicopter. Tests were done to ensure that the blast created by firing the weapon would clear all parts of the aircraft. On 29 August a 3.5 inch bazooka was fired successfully.

The experiment proved that using this kind of weapon configuration on a helicopter was a legitimate possibility. Follow-up experiments were planned but other priorities prevented further testing of the concept during the year. In October, a trial along similar lines was conducted to test the feasibility of bombing targets from helicopters. Engineers built a platform at the Edgewood Arsenal in Maryland on which a helicopter could land. The bomb was attached by means of special brackets improvised by the squadron and attached to the bottom of an HRP-1 model helicopter. These allowed the bomb to be lowered on cables once it reached altitude. On 6 October 1950, McCutcheon's executive officer, Lieutenant Colonel George W. Herring, made three successful flight tests dropping bombs from an altitude of 8,000 feet. These experiments were continued and expanded to test the possibility of bombing both fixed and floating targets in January of the following year.

The squadron continued its experimental work into 1951 in a less dramatic, though no less important manner. It tested gadgets for the Marine Corps Equipment Board designed to improve navigation in close air support operations and pallets for carrying equipment which would allow helicopters to be used for logistical support in the field. The squadron also began work with night and instrument flying. It conducted more mundane experiments as well. For instance, it tried to determine the best method of reducing the fouling of spark plugs in helicopter engines, experimented with aerial photography and cinematography, and practiced lifting jeeps to test the feasibility of using helicopters like cranes to lift equipment over impassable obstacles.

During October 1950, in addition to its experimental work, the Chief of Naval Operations also authorized HMX-1 to begin training helicopter pilots. This decision was driven by the outbreak of the Korean Conflict in July 1950. Prior to this, all Navy and Marine Corps helicopter pilots had been trained at the Naval Air Station, Lakehurst, New Jersey. HMX-l's first class of ten officers began in November and received their designations as helicopter pilots three weeks later. By the end of the year, twenty pilots had earned their qualifications as helicopter pilots.

The helicopters of VMO-6 saw immediate action. They were employed in a number of tasks which included liaison flights, reconnaissance, evacuation of wounded, aerial rescue, observation, posting pickets, small-scale aerial re-supply missions, and command and control flights. These last proved extremely valuable in the terrain where the Marines found themselves deployed. Helicopters made it possible for the brigade's commander to quickly and easily move among his scattered units and personally direct a rapidly developing combat situation that otherwise would have been impossible with normal modes of overland and aerial transport. VMO-6's helicopters proved so successful in combat, that many up the command chain, including the brigade commander Brigadier General Edward A. Craig, Director of Marine Aviation Brigadier General Clayton C. Jerome, Fleet Marine Force-Pacific Commander and future Marine Corps Commandant Lieutenant General Lemuel C. Sheperd, and Commandant of the Marine Corps General Clifton B. Cates became converts to belief in the necessity of expanding the Marine helicopter program.

The first order of business in this expansion was to procure larger helicopters in greater numbers as none of those currently in the inventory was truly suited to the purposes of the Corps. Next, tactics and techniques for large scale combat employment of helicopters had to be tested. Then, helicopter transport squadrons had to be formed and trained. Finally, these squadrons had to be deployed to Korea as soon as possible to maximize the benefit of the laboratory presented by the conflict to test helicopter durability and capabilities under combat conditions. While Headquarters, Marine Corps busied itself with trying to

provide enough aircraft, much of the rest of the grunt work involved in this expansion fell to Keith McCutcheon and HMX-1.

During September and October of 1950, the squadron began detailed planning for the expansion of the helicopter program. Headquarters, Marine Corps and HMX's drafted a plan which was approved in late October. It first called for organization of training programs to expand the number of helicopter pilots available to the Corps. This was to be followed by the squadron's production of a tentative doctrine for the employment of helicopters in amphibious operations. The goal of all of this was the creation and deployment of the Marine Corps' first helicopter transport squadron (HMR).

Formation of such a unit, Marine planners were convinced, was the essential vehicle for adapting use helicopters to amphibious operations. In October, as the expanded helicopter pilot training program was taking shape, McCutcheon drafted a tentative doctrinal statement titled "Employment of Helicopters in the Marine Corps." In contrast to earlier publications, McCutcheon intended that this work be practical, rather than theoretical, in discussing the employment of helicopters in The designations HMX and HMX-1 are used interchangeably in the vernacular of the Marine Corps since only one squadron has ever borne this designation.

His purposes in writing the paper were three-fold: to provide guidance to staff officers who might find themselves participating in the planning of helicopter operations: to point out the many angles and ramifications of employing helicopters in amphibious operations; and to stimulate the objective debate and thinking regarding helicopter employment which he felt had been lacking in the Marine Corps up to that time.

He offered insights into what could be expected of the helicopter in military service and some of the limitations of current models. McCutcheon explained that helicopters, because of their ability to hover, could be employed much more broadly than traditional fixed-wing craft. This capability allowed for operation in places where large open areas or prepared airfields did not exist. For this same reason, operating from a variety of naval vessels posed no serious problem in developing missions for helicopters.

He also made note of the fact that helicopters could function at night without serious hindrance, and in adverse weather conditions better than most combat aircraft. They were also more maneuverable in that they could fly in any direction along three axes, including sideward, reverse, and vertical.

However, he pointed out that all of the impressive characteristics of helicopters were influenced by situational variables such as temperature, air pressure, humidity, weight and altitude. This, perhaps, was more significant with helicopters than other aircraft. Nowhere was the impact of such variables greater than on the one operational aspect of helicopters of most interest to the Marines; payload. Understanding that payload was a variable and not a fixed quantity was essential for effective planning of an operation using helicopters in a transport role.

The helicopter also had other limitations. One of the biggest, according to McCutcheon, was maintenance. This stemmed from a lack of spare parts and current design complexities. Other problems included the inability to fly on instruments and the fact that flying helos was taxing on its pilot and generated inordinate fatigue.

Helicopters also were expensive, costing nearly as much as conventional fixed-wing aircraft per unit of payload. Also of concern for combat operations was the fact that helicopters were slow, usually unarmed, and unarmored. Greater protection in combat was necessarily resulted in greater limits on payload and speed.

These considerations notwithstanding, McCutcheon saw great potential for helicopters in combat. He listed no fewer than twenty missions for which he thought them particularly well suited. Among these were: troop transport, aerial re-supply, evacuation of wounded, rescue, reconnaissance, mapping, wire laying, insecticide spraying and radiation surveys. He also believed they could be particularly effective e in expanding a commander's radius of command and control. Almost all these missions listed were being developed and tested in Korea or by HMX-1 at Quantico.

With these fundamental precepts in mind, McCutcheon expounded on what he believed should be the guiding doctrine for employing helicopters in a Marine Medium Helicopter Transport Squadron or HMR. Since these units were to become the backbone of Marine Corps helicopter operations in amphibious warfare, he felt their capabilities should not be squandered. McCutcheon was particularly sensitive to this and was careful to spell out explicitly how he felt these units should be tasked and where they should fall in the command chain.

He began with three basic assertions about the place of helicopter squadrons in the Marine Corps. The first was a restatement of the Corps fundamental doctrine covering aviation as applied to helicopters, that "helicopters are a tool to help the ground forces (or naval or air) but primarily infantry. They alone cannot wage effective combat let alone win a battle. They are merely a tool to assist the overall commander."

Second, helicopters rightly belonged to aviation rather than infantry units due to the similarity they had with fixed-wing squadrons in regard to parts, maintenance and logistical support. Finally, due to their technological complexity, efficient employment of helicopters depended on their missions being controlled by personnel trained and experienced in their handling and operation.

From these assertions he drew a few fundamental command and control principles. First, helicopter transport units should be under the control of a Marine force commander with oversight of both air and ground operations. Under no circumstances should helicopter operations depend on a command relationship based on cooperation between air and ground forces. Second, they should be supported logistically and administratively via aviation channels. Finally, in instances where Marines might be operating with units of other branches of the military, it was imperative that Marine helicopter transport squadrons remain under the operational control of the Marine landing force commander, not a joint force air commander, to ensure they would be used to fly support Marine ground units.

Having laid down these basic principles, McCutcheon further defined the command relationships that should exist for helicopter transport squadrons (HMRs) during amphibious operations. The command chain of a force utilizing HMRs should, he argued, consist of three planning levels. At the top should be a force commander, in overall command of the operation, which would define the mission, designate the ground and helicopter units to be employed, set time limits, and coordinate intelligence, communications, reinforcement and re-supply. The next level of control was that of the Helicopter Troop Commander who was responsible for planning the ground mission, training and assembling ground personnel, determining composition of the ground force, suggesting landing zones, selecting approach routes, maintaining the ground end of the air-ground communications net, loading and unloading of the helicopters, and developing re-supply and evacuation plans. The third level, or helicopter commander, had similar responsibilities regarding the helicopter elements. For the sake of flexibility in tailoring the force size and composition, this command structure might be occupied by three individuals or simply by one performing three separate functions. The important thing was to define the angles from which a coordinated and effective mission plan using helicopters had to be approached.

As further guidance, McCutcheon provided a list of possible advantages and disadvantages to employing helicopters in an amphibious operation in their current state of development. As advantages he listed constant mobility free of submarine attack; giving the naval force carrying the landing units the advantage

of greater distance and dispersion in relation to the landing site; eliminating tide, current, reefs, and beach obstacles as barriers to landing; expanding the number of potential landing sites; and providing greater possibility of surprise. The disadvantages included limits on payload; limits on numbers of helicopters available; and limits in the number of available ships from which helicopters could operate.

On 11 December 1950, McCutcheon gathered the men of HMX-1 and outlined plans for the formation of a second helicopter squadron to be outfitted for Korean service. This would be the first helicopter transport squadron in the Marine Corps, HMR-161. It was to be the first squadron formed and employed in a manner reflective of the model for helicopter transport that had been in development since General Geiger's seminal report of 1946. HMX-1 would provide an initial contingent of ten officers and fifteen enlisted men to be sent to the Marine Corps Air Station, El Toro, California, around which the squadron was to be built. The Marine Corps named McCutcheon's executive officer,

Throughout the remainder of the spring and summer, McCutcheon and HMX-1 concentrated on getting the Marine helicopter transport squadrons outfitted. All of the hard work paid off when, on 15 August 1951, HMR-161 sailed from San Diego for duty in Korea. It landed on 10 September and immediately went into operation. On the 11th, the squadron arrived at its new air field, X-83, in the Marine sector of the X Corps operational region near the Punchbowl, a field it shared with VMO-6. On the 13th HMR-161 began to put the techniques developed by HMX-1 to use in combat, executing the first major helicopter re-supply operation in history.

Throughout the fall, HMR-161 added success to success and continued to prove that faith in the helicopter as a combat tool was warranted. Operation Windmill was followed by Operation Summit, the first movement of a small combat unit by helicopter. Operation Blackbird tested the ability to use helicopters in night operations. In Operation Bumblebee, HMR-161 lifted an entire battalion and its equipment to the front. Operation Houseburner I tested the use of helicopters counter-guerrilla operations. These successes convinced many Marines in Korea of the utility of helicopter transport squadrons.

Shortly after Operation Blackbird, HMR-161 commander Lieutenant Colonel George Herring wrote McCutcheon, ‘. . . .[First Marine Division Commander] General [Gerald C.] Thomas and Col. Krulak are solidly behind us as regards our theories and ideas for employing HMR’s. They authorize our use only for tactical operations and emergency supply missions for attacking units. Krulak frequently refers to us as the Division’s strategic reserve. The accomplishments of HMR-161 reflected favorably not only on that unit, but also on the training, organization, doctrinal, and experimental work done by McCutcheon and pilots of HMX-1 back at Quantico.

End of Dissertation

APPENDIX D:

HELICOPTER EVALUATIONS AT PATUXENT RIVER NAVAL AIR STATION

THIS PAGE INTENTIONALLY LEFT BLANK

Patuxent River Naval Air Station (NAS), located on southern Maryland, played a pivotal role in Navy and Marine Corps helicopter development. The Naval Air Station has conducted all rotary-wing aircraft testing and evaluation for the Navy and Marine Corps since 1949. Patuxent River NAS has also assisted the Army with their rotary-wing aircraft testing and evaluation.

The establishment of the Naval Air Station was linked to US preparations for World War II and the increasing importance of aircraft in the military. In an effort to streamline research and development, the Navy's Bureau of Aeronautics initiated the planning for a Naval Aviation Experimental Station in January 1941. At the time, Navy aircraft testing and development took place at five different locations (Naval Air Station Anacostia, Dahlgren Proving Ground, Naval Air Station Norfolk, Washington Navy Yard, and the Naval Aircraft Factory in Philadelphia). A panel formed by the Bureau of Aeronautics considered several locations before settling on a 6,400-acre site at southern Maryland's Cedar Point in September 1941. The Navy took possession of the site in April 1942.[237]

Initial development of a Patuxent River NAS occurred between April 1942 and 1945. This required extensive construction, including a runway complex; nine hangars; testing complexes; barracks; quarters for married, bachelor, and female officers; a drill hall with gym and pool; a recreation hall; a 1,700-seat theater; officers' club; diesel power plant; steam plant; sewage treatment facility; outdoor recreation facilities; elementary school; and infrastructure.[238] The NAS housed the Naval Air Testing Center (NATC),[239] which included five divisions by the end of World War II: Flight Test, Radio Test, Armament Test, Tactical Test, and Service Test.

The United States Coast Guard conducted the testing and evaluation of Navy rotary-wing aircraft prior to the mid-1940s. This began to change when three helicopters were delivered to Patuxent River NAS (one Sikorsky HNS-1 and two Sikorsky HOS-1s) for testing in 1944. The Flight Test Division was asked to determine the handling qualities and performance characteristics of the new rotary-wing aircraft. The division went on to test several other aircraft, including the XHOS-1, HSL (Bell Tandem), XHRP-1, HRP-1, HUP-1, HO4S, HO5S, HJP-1, and HTL-1, between 1944 and 1949.[240]

The increasing complexity of helicopter designs and unique testing conditions the aircraft required resulted in the establishment of a dedicated rotary-wing testing groups in 1949 when the Rotary-Wing Section of the Navy Flight Test Division was established.

Formally organized on April 25, 1949, the Rotary-Wing Section was one of three sections of the Flight Test Division. The other two focused on fixed-wing aircraft and were designated Carrier Based and Non-Carrier Based. Flight Test Division Director, V. W. Davis Jr., wrote that the Rotary-Wing Section will be "assigned all tests and trials of rotary-wing aircraft and associated equipment." Helicopter testing was fairly autonomous. The Rotary-Wing Section was responsible for all aspects of their program, including plans for future expansions, scheduling testing, establishing test criteria, and even supervision of helicopter maintenance. Finally, the Flight Test Division was expected to cooperate with other branches

[237] Marene Elizabeth Sweeney, "Growing Pains: The Effects of the Base Realignment and Closure Procedures on Lexington Park, Maryland" (M.A. Thesis, New Mexico State University, 1999) 17–18; Philip E. Pendleton, Richard M. Casella, and Martha H. Bowers*, Historic Architectural Resources: Naval Air Station Patuxent River: Historic Contexts and Evaluation Criteria*, 1999, 8-10, On file at Naval Air Station Patuxent River, Maryland; Timothy R Sara and Jesse Bergevin, *Phase I Archaeological Survey of Approximately 3,250 Acres Aboard Patuxent River Naval Air Station, St. Mary's County, Maryland*, Contract Number ARCH-RP00071-03, Miscellaneous Reports of Investigations Number 293, 2004, 33, On file at Patuxent River Naval Air Station.

[238] Sara and Bergevin, *Archaeological Survey Patuxent River Naval Air Station*, 38.

[239] The base also housed Navy's Naval Air Transport Service Command, Atlantic Wing.

[240] Joe Carbonaro, "HX-21 Celebrates 65 Years since the establishment of the Rotary Wing Section at Patuxent River," Computer printout provided to author by Mr. Carbonaro.

of the military to ensure efficiency.[241] Indeed, the Rotary-Wing Section worked, and continues to work, cooperatively with other divisions. The section had no specific buildings or structures constructed to support their testing. They used repurposed existing buildings or shared test facilities with other sections and divisions.

The founding group of the Rotary-Wing Section consisted of just six individuals. Three were Navy officers: Lieutenant Commanders H. S. Brown and J. A. H. Torry, and Major R. L. Nickerson, and three were civilians: Mr. John Mazur, Mr. Elmer Congdon, and Mr. Robert Stange. The first decade of testing and evaluation was active but moderate. The US involvement in the Vietnam War, however, resulted in a dramatic increase in the volume and complexity of testing and evaluation. There was a concomitant increase in staff, but it was slow in coming.[242] The Rotary-Wing Section consisted of nine engineers and six pilots in 1964. This core staff was occasionally supplemented with pilots from other DoD branches and other countries.[243]

The Rotary-Wing Section grew considerably over the next decade. By 1975, the section consisted of five branches: Air Systems Branch, Maintenance Branch, Weapons Branch, Sea Control Branch, and SAR Branch. The Air Systems Branch focused on flying qualities, service suitability, human factors, and related areas of inquiry. The Maintenance Branch handled all helicopter maintenance, with civilian contractors when necessary. As the name suggests, the Weapons Branch conducted research and testing of helicopter-mounted attack and assault components. The Sea Control Branch focused on minesweeping, avionics, anti-submarine warfare, and related topics. Finally, the SAR provided search and rescue support services. A director headed the Rotary-Wing Section, with support from a deputy director, chief engineer, and chief projects manager.[244]

The Rotary-Wing Section's evaluation process often began before a helicopter took its first flight. The pilots and engineers, working in teams, initially collected data and reviewed the progress of new aircraft development (or new versions of existing helicopters). Next, they monitored the flight tests conducted by the contractor designing and building the helicopter. It was during this stage that they identified many aircraft deficiencies and corrected them in consultation with the contractor. If a helicopter made it past these initial evaluations, it was delivered to Patuxent River NAS for a 90-day evaluation to ensure that the helicopter met the general expectations of the Navy. Once this initial evaluation was complete, the Rotary-Wing Section began a more robust series of trials, typically lasting 8–12 months. Known as the Board of Inspection and Survey (BIS) trials, these tests were designed to identify and correct, if possible, any remaining performance, stability, or safety deficiencies.[245]

The Rotary-Wing Section undertook various testing programs in the 1950s, including the development of airborne mine countermeasures, a program that was authorized in 1951. This led to the development of helicopter minesweepers, the first of which was a modified Piasecki HRP-1. The HRP-1 minesweeper was first tested at Patuxent River NAS in 1952. The Bell 61/HSL-1 was tested as a minesweeper a year later. Similar evaluations occurred throughout the 1950s with various large helicopters. The tests eventually led to the incorporation of modified Sikorsky HSS-2 (SH-3A) minesweeper helicopters into Navy operations in 1962. The minesweeping development program evolved throughout the Vietnam War.

[241] V. W. Davis Jr., Director, Flight Test Division, US Naval Air Test Center, Patuxent River Maryland, Flight Test Order 2-49, April 25, 1949, On File at Patuxent River Naval Air Station.

[242] Larry Trick, "RW Testing," On file at Patuxent River NAS.

[243] D. F. Mayers, "Helicopter Testing at Patuxent River," *Naval Aviation News,* July 1964, 34.

[244] Bruce Leon Valley, "A Research Study of the Rotary Wing Test and Evaluation Segments at the Naval Air Test Center, Patuxent River, Maryland" (M.A. Thesis, Naval Postgraduate School, Monterrey, CA, July 1975) 48. Six-hundred-fifty people work for the section today.

[245] Mayers, "Helicopter Testing," 34.

Patuxent River NAS played a crucial role in the evaluation of specially modified H-53s developed for minesweeping in 1973. The helicopters were delivered to the naval air station for weapons system trials before they could be used by HM-12 in Operation Endsweep.[246]

Indeed, the Rotary-Wing Section was busy by the 1960s. They administered or contributed to several interrelated evaluation programs broadly organized into evaluations of helicopter stability and control characteristics, performance, structural integrity, carrier suitability, and electronics and weapons systems.[247]

The section participated in the development of all helicopters used by the Navy and Marine Corps in Vietnam. The evaluation process was arduous at times. For example, the first version of the venerable Sikorsky Sea King helicopter (HSS-2, SH-3) arrived at Patuxent River NAS for testing in 1959. Evaluations immediately revealed problems with the helicopter's design and power. Sikorsky engineers and Navy evaluators spent the next three years addressing the aircraft's limitations. The Navy and Marine Corps accepted the helicopter for service in 1962. The CH-53 Sea Stallion went through a similar process and the Naval Air Station before being adopted in 1966. Once adopted, the Sea King and Sea Stallion helicopters were conspicuous in Navy and Marine Corps operations throughout the Vietnam War.[248]

Testing did not conclude once the helicopter was accepted for service. Post-adoption projects conducted in the early 1960s included tests of stability enhancements on the Sikorsky SH-3. Some research was driven by performance gaps that resulted from improvements in helicopter performance. By 1963, it was apparent that the vibration damping characteristics in the UH-2 were so effective that pilots often did not notice impending rotor blade stall. Patuxent River NAS pilots and engineers developed an envelope (graphic mathematical formula) showing blade stall as a function of air speed, density at altitude, gross weight, and load. Analytical tools such as this were as important to helicopter performance and safety as mechanical modifications.[249] Indeed, testing and analysis was long term. Any modification to a helicopter required testing and evaluation. The Boing Vertol CH-46 was introduced in 1962 and adopted by the Navy in 1964. Testing and evaluation on the versions of helicopter continued until 2012. The helicopter was only recently retired by the Marine Corps and is still in use by the US State Department.

Armament evaluation and testing played a major role in the Rotary-Wing Section's activities during the Vietnam War. In 1960, the Rotary-Wing Section successfully tested the launching of an air-to-surface missile from a Marine Corps HUS-1 helicopter. Like much of the testing and evaluation undertaken at the Naval Air Station, the successful launch represented the culmination of years of experimentation. Attempts to arm Navy and Marine helicopters with missiles began in the early 1950s, with considerable challenges. The velocity of the early launches had the tendency to increase the speed of the helicopters beyond translational lift. Also, the rocket after burners briefly engulfed the aircraft in flames. Modifications to the rocket mounts and other mechanical components eventually addressed many of the problems in the early 1950s, before the Joint Chiefs of Staff cancelled the research program. Research was reinstituted almost a decade later, leading to the successful 1960 launch.[250]

[246] Larry Trick, "RW Testing," on file at Patuxent River Naval Air Station.

[247] Mayers, "Helicopter Testing," 34.

[248] William R. Fails, *Marines and Helicopters, 1962–1973* (Washington, DC: History and Museums Division, United States Marine Corps, 1978) 49, 62; Trick, "RW Testing."

[249] Mayers, "Helicopter Testing," 35.

[250] Linda C. Drew, *The History of Naval Air Station Patuxent River Maryland (*Patuxent River, MD: Patuxent River NAS, 1999) 14, 15; Fails, *Marines and Helicopters,* 5; Trick, "RW Testing."

The retrofitted armament kits developed early in the Vietnam War were also tested at Patuxent River NAS. For example, the armament retrofits, called TK-2, used during Operation Shufly were assembled at Jacksonville, Florida, and sent to Patuxent River for evaluation in 1963. It was here that evaluators discovered that the ejected shells from the mounted weapons could damage the helicopter's rudder on the left side. The contingencies of war resulted in the approval of the kits for use, but only on the right side of the helicopter. Meanwhile, evaluators at the Naval Air Station continued modifying armament kits in order to address problems like the potential for damage from ejected shells. Patuxent River NAS had its own machine shop located in Building 104 (the Butch Nelson Building) where engineers developed and modified mounting brackets, armament, and other components attached to the helicopters. Modified TK-2 kits were finally approved for use in January 1965. The TK-2 kits were initially shipped to VMO-6 at Camp Pendleton where they were installed on UH-1Es bound for Vietnam.

The Marine Corps adopted the Cobra in April 1969. The first USMC Cobras were purchased from the Army and since the Army already approved them for use, there was no Navy aircraft test and evaluation requirement prior to the helicopter's use in combat. This was not the case with the AH-1J Sea Cobra, a Navy and Marine Corps specific Cobra. The AH-1J differed from the original Cobra in only a few ways. For example, it was slightly longer and had twin engines instead of a single engine. The disparities in the design of the two helicopters required that the AH-1J be tested at Patuxent River NAS before it could be used in Vietnam. The Naval Air Station received four Ah-1Js for testing in July 1970. Testing progressed quickly. Seven Sea Cobras were shipped to MCAS New River in September and assigned to VMO-1 for eventual combat testing. Once a detachment of maintenance crews and flight crews completed training they deployed to Vietnam for four months of combat testing. The crews and aircraft returned to the United States four months later. The helicopters were further evaluated and subsequently approved for use in July 1971.[251]

In addition to their own testing and evaluation, the Rotary-Wing Section also provided support for operational evaluations. For example, The Marine Corps was considering adopting the UH-1E helicopter for the VMO squadrons in 1962, but there was concern that the new helicopter lacked appropriate visibility. Advocates for the adoption arranged a meeting of Marine Corps officers at Patuxent River NAS in order to assess the helicopter's visibility characteristics. Testing took place under difficult weather conditions, but the helicopters proved more than adequate. This led to further testing, in which the Rotary-Wing Section evaluated the effects of sand and salt spray on the helicopter's performance. The section also developed and tested modifications to the UH-1E that were deigned to increase turbine power. [252] The UH-1Es were, ultimately, adopted by the Marine Corps in February 1964.

The Rotary-Wing Section conducted evaluations for the Army while they were testing the UH-1E. In fact, they evaluated the UH-1B *Iroquois*, the Army version of the UH-1E prior to its adoption in the summer of 1963. This helicopter became a fundamentally important component of US Army operations in Vietnam. [253] The Rotary-Wing Section worked with the Army, at Edwards Air Force Base, again in 1964 and 1965 when they assisted with the evaluation of Light Observation Helicopters.[254]

Navy research at Patuxent River also attracted the attention of other branches of the military. For example, the Navy successfully tested a helicopter-mounted countermeasures chaff weapon using a 2.75-inch FEAR flare warhead in 1971. The weapon was designed to spread a 2-mile swath of small pieces of aluminum or other material intended to overwhelm enemy radar. The army enthusiastically reported the

[251] Fails, *Marines and Helicopters*, 156, 157.

[252] Mayers, "Helicopter Testing," 35.

[253] Fails, *Marines and Helicopters*, 45, 46.

[254] Mayers, "Helicopter Testing," 35.

Navy's results in September 1971 and suggested that US Army Aviation Systems Command conduct further research.[255]

The work of Rotary-Wing Section at Patuxent Naval Air Station clearly reflects the test and evaluation process that occurred at military bases in the United States during the Vietnam War. The pilots, engineers, and other evaluators literally shaped the helicopter war in Vietnam. They did not work in isolation, but rather crossed both divisional and service lines in their efforts to improve rotary-wing aircraft. The men of the section helped save lives and shape helicopter technology, a legacy that continues at Patuxent River Naval Air Station and spreads beyond the Naval Air Station.

Helicopter Evaluation Resources at Patuxent River Naval Air Station

Helicopter resources at Patuxent River NAS were rarely used exclusively by the Rotary-Wing Section. The Fixed-Wing and Rotary-Wing Sections shared many testing and evaluation facilities at the Naval Air Station. This was not an unusual phenomenon during the Vietnam War where, unlike World War II, there was not a cohesive national construction program to support the military mission. There was certainly construction at DoD installations during the war, but the adaptive reuse of World War II era buildings was common. Moreover, training, testing and maintenance facilities were shared across mission designations when it was efficient to do so. For example, both Rotary-Wing and Fixed-Wing Sections used World War II hangars at Patuxent River NAS. The buildings and structures below are associated with helicopter use and evaluation, but that does not mean they are not associated with other historically significant eras and/or topics. Many are already considered eligible for the National Register of Historic Places under other contexts.

Buildings. The section below provides a bief description of the buildings and other resources used by the Rotary-Wing Section during the Vietnam War. The building locations are highlighed below in a 1969 map of the Naval Air Station (Map D-1). This discussion does not endeavor to make any determinations on NRHP eligibility. It only aims to provide a brief description of buildings and structures used by the Rotary-Wing Section during the Vietnam War.

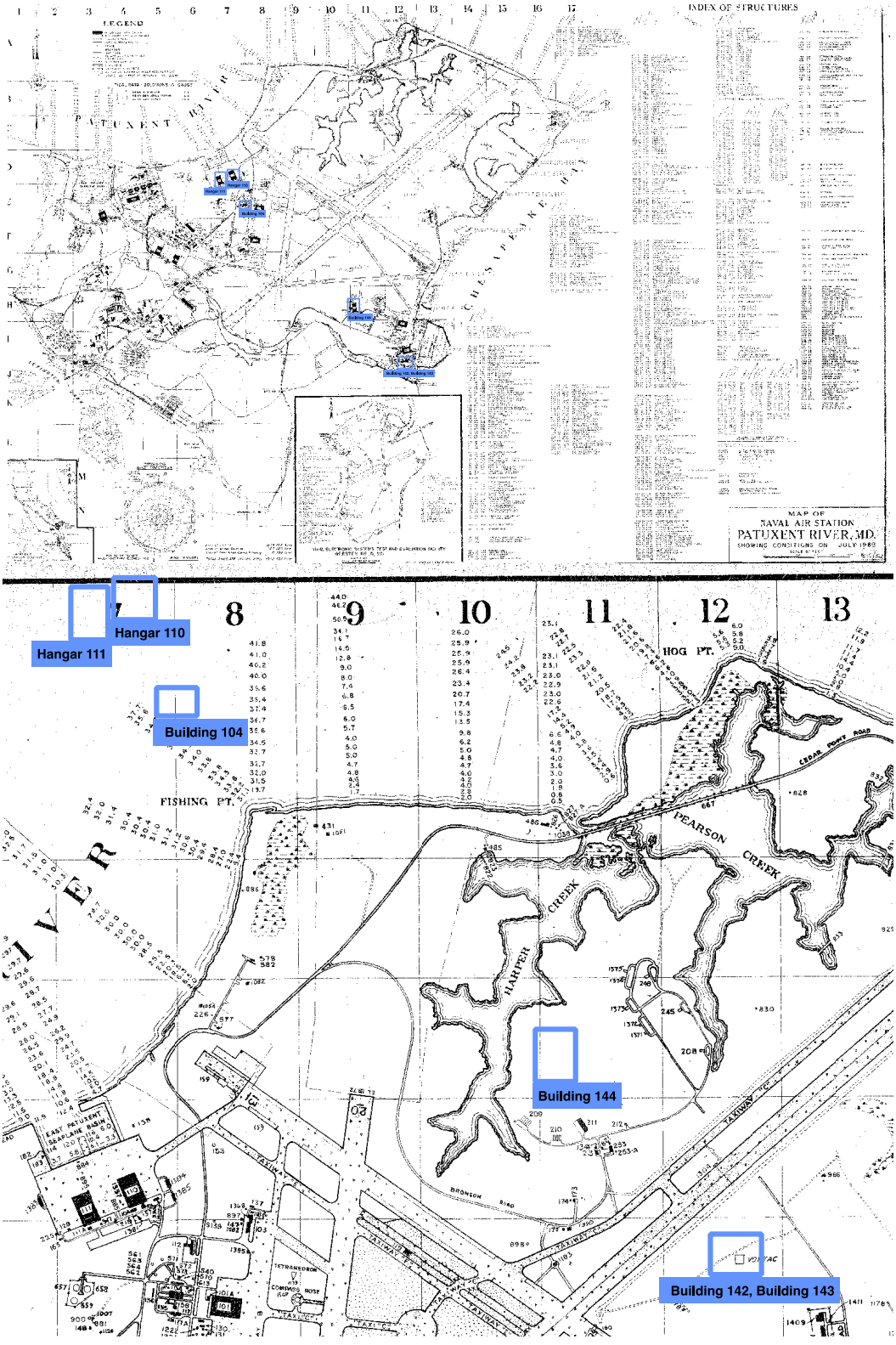
Hangar 111 (Constructed as a seaplane hangar in 1944) has always served as the headquarters of the Rotary-Wing Section. Hangar 111 and its associated heating plant is part of the Flight Test Historic District at Patuxent River NAS.

Hangar 110 (also constructed as a seaplane hangar in 1944) is also used by the Rotary-Wing Section. It was originally the service test hangar, but is now used by the test pilot school to store fixed and rotary-wing aircraft. Hangar 110 and its associated heating plant is part of the Flight Test Historic District at Patuxent River NAS.

The Rotary-Wing Section has also always used the ramp between Hangars 110 and 111. In addition, the section used four dedicated helipads at Patuxent River NAS. One was beside Hangar 111. Another was along taxiway B/E. Two more were along taxiway A. The Navy constructed an additional helipad at the Solomons Complex in 1968.[256] Finally, the Rotary-Wing Section used turf areas at Patuxent River NAS and associated areas (Solomons Complex and Webster Field) for helicopter testing during the Vietnam War. The turf areas allowed testers to evaluate the aircraft's ability to operate in varied terrain and slopes. The section still uses various turf areas and helipads.

[255] US Army, Munitions Branch, "Chaff Warhead, 2.75 Inch FEAR," September 3, 1971.

[256] Department of the Navy *Integrated Cultural Resources Management Plan (2011–2016), Naval Air Station Patuxent River Maryland, 2011–2016* (Washington, DC: Naval Facilities Engineering Command, 2011) appendix B.



Source: Patuxent River Naval Air Station

MAP D-1. PATUXENT RIVER NAVAL AIR STATION 1969 (HELICOPER FACILITIES HIGHLIGHTED)

Source: U.S. Navy, *Navy Aviation News* 1950)

FIGURE D-1. AERIAL VIEW OF HANGAR 111 (FOREGROUND) AND HANGAR 110, 1940S

Source: U.S. Navy, Patuxent Naval Air Station

FIGURE D-2. HELICOPTERS ON RAMP BETWEEN HANGARS 110 AND 111, 1950

Building 104 (Butch Nelson Building), constructed in 1944, was originally a flight test utility shop/ parachute loft, but served as the machine shop for the Rotary-Wing Section during the Vietnam War. The building still serves as a machine shop for various divisions at Patuxent River NAS.

Four **Theodolite Towers** (figure D-3) were constructed at, and in the vicinity of, the Naval Air Station in 1960. Theodolites, which were used in aircraft evaluation as early as 1911, are essentially instruments that measure angles in vertical and horizontal planes. [257] Both the fixed-wing and rotary-wing test sections used the instruments during the Vietnam War. The theodolites provided detailed measurements of aircraft flight performance. For example, pilots conducted fly-by tests in which they would fly over a level fixed course at varying speeds. In these tests, the theodolites were able to provide detailed data on the actual aircraft altitude and angle.

Armament testing played a significant role in the Rotary-Wing Section's activities during the Vietnam War. Evaluators used a specially designed building, known as the firing tunnel (Building 142) to perform tests on weapons and ammunition. Like many facilities, both the Fixed-Wing Section and the Rotary-Wing Section used the firing tunnel. The tunnel, which is still in use, is a large (roughly 75 feet by 360 feet) World War II-era concrete building with a flat roof. The east side of the building has large overhead doors that, once opened, provide aircraft access to the firing bays. The firing tunnel provides a controlled environment in which evaluators were able to remotely collect various data, including weapon behavior, firing speed, blast, and the heat generated by the weapons. Data was collected in the nearby Instrument Building (Building 143). Buildings 142 and 143 are part of the Armament Test Historic District at Patuxent River NAS.

Helicopters were also evaluated at Building 144, the Electronics Test Hangar (Shielded Hangar). The building, which was constructed just after World War II, was specifically designed with shielded walls to prevent electronic interference inside the hangar. The hangar was used to test aircraft communication and other electronic equipment in a controlled environment. Such facilities became extremely important after World War II as aircraft came to rely on ever more sophisticated electronic systems. As these systems became more complex, it became more important to evaluate whether the helicopter's (or airplane's) internal electronics interfered with each other. The Electronics Test Division, which administered testing in the shielded hangar, was one of the largest at the Naval Air Station. The hangar was determined eligible for listing on the National Register of Historic Places in 1999.[258]

[257] Franck Waldo, "Measuring High Flights: How Science Comes to the Aid of Aviation," *Electrician and Mechanic,* Vol. 23, No. 5 (November 1911) 312–315.

[258] Richard M Casella, "Maryland Historical Trust, Determination of Eligibility Form: Hangar 144 Patuxent River Naval Air Station" May 1999. The division employed 37 officers, 264 enlisted men, and 448 civilians by 1951. The evaluation does not address the use of the hangar by the Rotary-Wing Section.

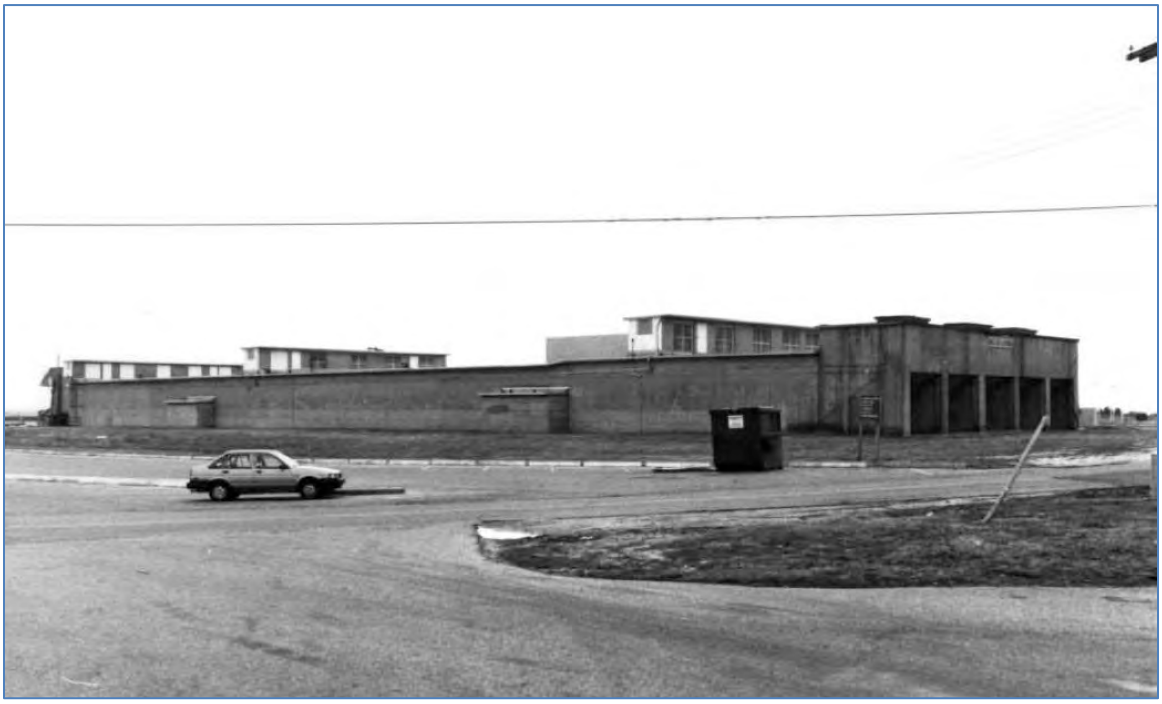
Theodolite Tower: Cedar Point

Theodolite Tower: Armament (Strike Force) Area

Theodolite Tower: Point Lookout

Theodolite Tower: Point No Point

FIGURE D-3. PATUXENT RIVER NAS THEODOLITE TOWERS



Source: Maryland Historical Trust

FIGURE D-4. BUILDING 142

While most testing and evaluation occurred on-site, there were occasions when the Rotary-Wing Section used facilities at other installations. One of the most unique test buildings used by the Patuxent River evaluators was the McKinley Climatic Laboratory (Climatic Chamber) at Eglin Air Force Base in Florida. The laboratory, which was designed to test the performance of aircraft components in extreme hot or cold temperatures, was constructed in the late 1940s. The test area is artificially cooled or heated to mimic extreme weather conditions. Rooms can be heated up to 170°F or down to -80°F. Testers can also create snow and other weather conditions in the lab. The first tests, which included an R5D helicopter, occurred on May 24, 1947. The McKinley Climatic Laboratory is a recognized National Historic Mechanical Engineering Landmark.[259]

The building descriptions above provide a basic geography of the variety of buildings and structures used by the Rotary-Wing Section. It does not include every resource used at Patuxent River NAS to analyze helicopters. For example, the section used the firing ranges and waters of the Chesapeake Bay and Navy ships for components of their testing and evaluation program. Nonetheless, the narrative above does reveal the interconnectedness of the Navy's aircraft analysis programs. There are no buildings that can be specifically and exclusively linked to helicopters. These two conditions have resulted in a situation in which helicopter resources are overshadowed. Many resources significant to the development of fixed-wing aircraft are likely also associated with rotary-wing aircraft. The buildings and structures, however, have been evaluated for their association with World War II or fixed-wing aircraft. None have been evaluated expressly, or concomitantly, for their association with rotary-wing aircraft. This is even the case with Hangar 111, the home of the Rotary-Wing Section since 1949.

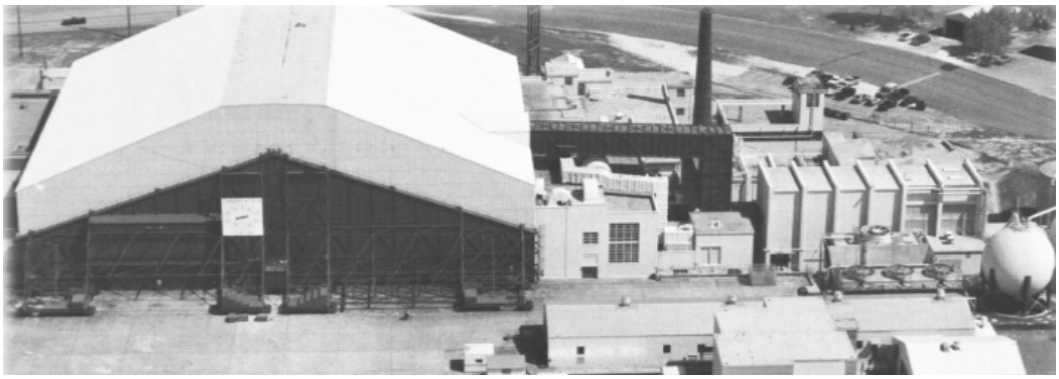
[259] The American Society of Mechanical Engineers, "National Historic Mechanical Engineering Landmark: McKinley Climactic Laboratory, Eglin Air Force Base, Florida," 1987.

Source: Maryland Historical Trust

FIGURE D-5. BUILDING 143

Source: US Navy, Patuxent Naval Air Station

FIGURE D-6. BUILDING 144



Source: American Society of Mechanical Engineers

FIGURE D-7. MCKINLEY CLIMACTIC LABORATORY, EGLIN AIR FORCE BASE

APPENDIX E:

US NAVAL AVIATION AIR STATION ELLYSON FIELD, NAVAL AIR STATION PENSACOLA

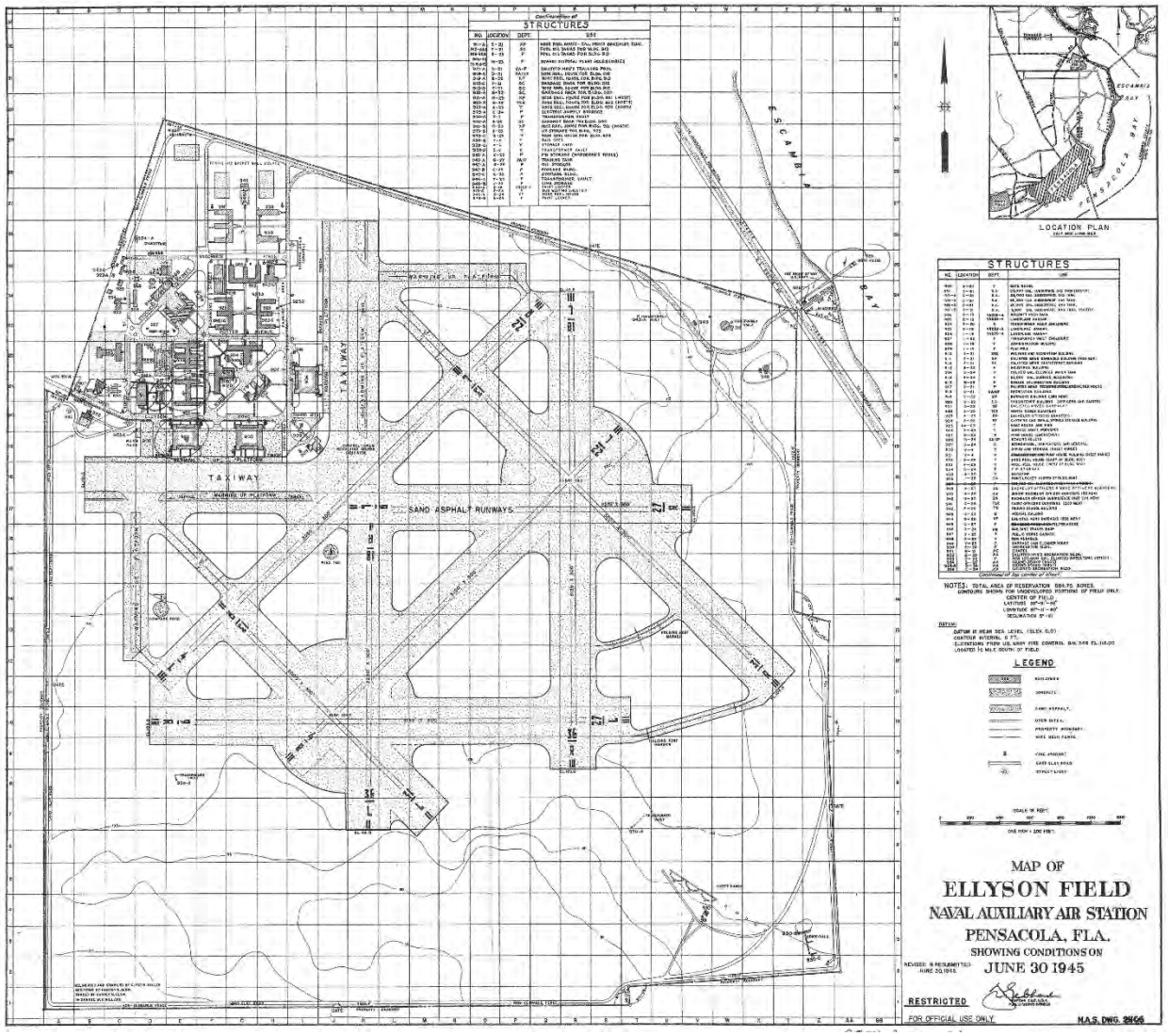
THIS PAGE INTENTIONALLY LEFT BLANK

Naval Air Station Pensacola traces its origins back to 1928 when President John Quincy Adams and Secretary of the Navy Samuel Southard made arrangements to build a navy yard on the southern tip of Escambia County (where Naval Air Station Pensacola is today).

The Navy Department, investigating the possibilities of naval aviation through the efforts of Captain W. I. Chambers, urged Congress to include in the Naval Appropriation Act, enacted in 1911–1912, a provision for aeronautical development. In October 1913, Secretary of the Navy Josephus Daniels appointed a board, with Chambers as chairman, to make a survey of aeronautical needs and to establish a policy to guide future development. One of the board's most important recommendations was the establishment of an aviation training station in Pensacola. The recommendation was approved, and the first US naval air station was created in 1914 on the site of the abandoned navy yard.

Upon entry into World War I, Pensacola was still the only naval air station. In the years following World War I, aviation training slowed down. However, by 1928, envisioning great expansion at Pensacola, the Navy Department ordered the construction of an auxiliary field 5 miles northwest of NAS (Corry Field).

With the inauguration in 1935 of the cadet training program, activity at Pensacola again expanded. When Pensacola's training facilities could no longer accommodate the ever-increasing number of cadets accepted by the Navy, two more naval air stations were created—one in Jacksonville, Florida, and the other in Corpus Christi, Texas. In August 1940, a larger auxiliary base (Saufley Field) was added to Pensacola's activities. In October 1941, a third field (Ellyson Field) was commissioned. Ellyson Field consisted of six taxiways and runaways, three hangars, administrative and operations buildings, barracks, and a mess hall. The training tempo increased during the Korean War. NAS Pensacola graduated 6,000 aviators between 1950 and 1953.



Source: Naval Air Station Pensacola

Figure E-1. Ellyson Field, 1945

As US forces played an increasingly important and active combat role in Vietnam, NAS Pensacola and other state-side military installations contributed to the effort, providing critical training in support of the mission. In support of operations in Vietnam, NAS Pensacola increased training operations, an expansion of programs reminiscent of those conducted during World War II. A record 2,552 pilots graduated from NAS Pensacola in 1968, almost all of which were transferred directly to the flight decks off Southeast Asia. To accommodate this huge influx, NAS Pensacola dedicated millions of dollars to improve officer housing and training facilities. For example, in 1968 the Cabaniss Crescent neighborhood was expanded following the construction of seven new duplexes for married officers and their families. NAS Pensacola also constructed the Lighthouse Terrace neighborhood that same year. The neighborhood contained 54 multi-family townhomes for married enlisted personnel and junior officers. Due to the rapid increase in training, by 1972 Naval Communications Training Center (NCTC) Corry Field expanded astronomically with the construction of Corry Village Housing. In addition to these housing additions, NAS Pensacola added a new classroom for the Basic Training Squadron in Griffith Hall at Forrest Sherman Field in 1969.

The classroom provided advanced technological instruction facilities, and included a radar trainer and two digital computer demonstrators, totaling a cost of over $1 million.

Source: Collections of the National Naval Aviation Museum, Pensacola

FIGURE E-2. TRAINING HELICOPTERS AT ELLYSON FIELD, 1964

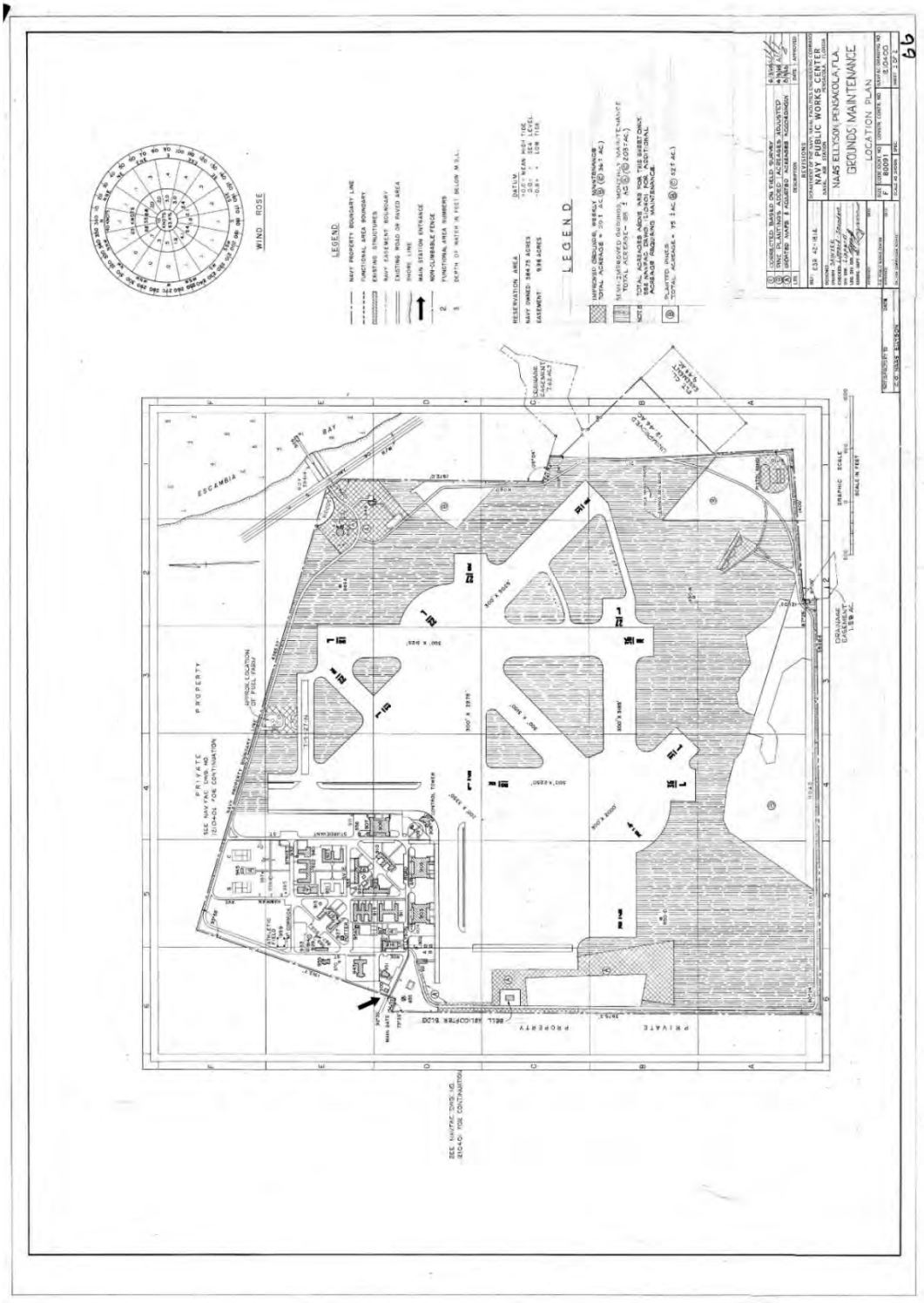
Pilot training again increased during the Vietnam War, as the air station hosted three training squadrons and numerous other training units. In 1971, Pensacola became headquarters for the Chief of Naval Education and Training. Aviation training continued to dominate station activity, as Pensacola absorbed activity from closing activities. To handle the increase in pilot training, numerous auxiliary airfields around Pensacola, Florida, were developed.

Helicopters, having proven their value in the Korean War, increased in importance. Navy helicopter training began in 1943 with the Navy's purchase of its first helicopter, the HNS. The training site was Floyd Bennett Field, Brooklyn, New York. In 1950, operations were moved to NAS Lakehurst, New Jersey, with the onset of the Korean War. The demand for fleet helicopter detachments increased dramatically. At Lakehurst, the helicopter squadrons caused increased congestion in the mat area at Lakehurst, and their flights interfered with those of fixed-wing aircraft. The squadron needed a new home. The Navy found one at Naval Auxiliary Air Station (NAAS) Ellyson, an unused base near Pensacola, Florida. Built during the construction programs just before World War II, Ellyson had a suitable area for practice flights and was near the Navy's other pilot training facilities at Pensacola.

Ellyson Field was a training field at Pensacola that was deactivated after World War II. Idle for five years, Ellyson Field began to see new life in the late 1950s. The Korean War was escalating and the helicopter was proving its worth in the combat zone. Realizing a need for pilots, the Navy decided to reopen Ellyson Field as a helicopter pilot training school. Ellyson Field once again became a beehive of activity with the first class beginning its eight-week training course on January 15, 1951. The intense eight-week program included 60 hours of flight training and 35 hours of ground school. Initially, all training flights were conducted within the field's boundaries except for some advanced instruction. As the training progressed, students moved to larger, more advanced helicopters to complete their schooling (NAS Pensacola doc, n.d.). All Navy, Marine, and Coast Guard helicopter training was conducted at Ellyson.

Ellyson, 13 miles northeast of NAS Pensacola, had a two-airfield layout. In 1961, the airfield comprised 576 acres, three hangars (175 feet by 111 feet wide with 20 foot tall by 108 foot wide doors); four asphalt runways (3,125 x 300; 3,025 x 300, 3,350 x 200, 3,185 x 300) and 58,835 square yards of concrete parking area; permanent administrative and operations buildings; and personnel housing capacity for 598 (102 officers; 496 enlisted). There were 783 personnel assigned to the airfield and 55 aircraft (2-T28, 2–SNB, 20-HO4S, 6 HUP, 25 HTL).

Whiting Field, Ellyson Field, and Saufley Field were all redesignated as naval air stations under separate commands in 1972. However, in 1973, the mission at Ellyson was no longer for aviation, and Ellyson was closed in 1979 (NAS Pensacola doc, n.d.). The airfield was transferred out of the Department of Defense and is an industrial park today. Two helicopter training squadrons were assigned to NAS Whiting during the 1970s, making Whiting one of the busiest aviation training facilities in the Navy. Whiting's mission of training aviators in basic and advanced helicopter operation continued through the end of the Cold War.



Source: Naval Air Station Pensacola

FIGURE E-3. ELLYSON FIELD, 1968

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX F:

PRIMARY VIETNAM HELICOPTER INSTALLATIONS

THIS PAGE INTENTIONALLY LEFT BLANK

This appendix does not include closed installations that are now in non-federal ownership and use. It does include installations that have been closed, but are still used by elements of the National Guard or Reserves because such use can constitute a Federal Undertaking for purposes of NHPA and NEPA. The list represents a broad cross-section of installations that played an important role in helicopter development and use during the Vietnam War.

The following information is summarized from these sources: Art Leatherwood, "Biggs Army Air Field," Handbook of Texas Online (http://www.tshaonline.org/handbook/online/articles/qbb04), accessed January 22, 2016. Uploaded on June 12, 2010. Published by the Texas State Historical Association; John Manguso, "Fort Sam Houston," Handbook of Texas Online (http://www.tshaonline.org/handbook /online/articles/qbf43), accessed February 2, 2016. Uploaded on June 12, 2010. Modified on February 20, 2014. Published by the Texas State Historical Association; Roger W. Lotchin, *Fortress California 1910–1961, From Warfare to Welfare* (New York, NY: Oxford University Press, 1992); David F. Winkler, *Training to Fight: Training and Education During the Cold War*, Legacy Project 95-10092, July 1997; Thomas A. Manning Command Historian, Dr Bruce A. Ashcroft, Richard H. Emmons, Ann K. Hussey, Dr. Joseph L. Mason, *History of Air Education and Training Command 1942–2002*; Office of History and Research Headquarters, Air Education and Training Command Randolph Air Force Base, Texas, 2005; and respective installation websites.

Installation	State	Brief History
Army		
Fort Rucker	Alabama	In 1954, the Army moved its Aviation School from Fort Sill, Oklahoma, to Fort Rucker. During the late 1950s, with the advent of advanced helicopter models, tactics were developed at Fort Rucker to take advantage of the aircraft's versatility. The first demonstration of Sky Cavalry took place in July 1957. To support the air infantry, helicopters were armed and became known as gunships. Changes in Army doctrine during the 1960s increased the tempo at Fort Rucker. With the advent of Air Cavalry Division and their deployment during the Vietnam War, pilot training increased dramatically. Non-officers were offered the opportunity to fly. In 1973, the post and the US Army Aviation Center came under US Army Training and Doctrine Command jurisdiction. Aviation courses became focused on combat scenarios in Europe. Simulators were installed to provide pilots with additional quality training at lower cost. With the closure of Fort Wolters, Texas, all helicopter training was consolidated at Fort Rucker.
Fort Wolters	Texas	Fort Wolters assumed the mission as a primary helicopter school in 1956. During the 1960s, the post trained numerous helicopter pilots who went on to serve in the Vietnam War. With the US withdrawal from Southeast Asia, helicopter training was consolidated at Fort Rucker, Alabama.
Biggs Army Airfield	Texas	Biggs Army Air Field was established outside El Paso, Texas, in 1918. The base became headquarters of the 20th Bomber Command and the 16th Bombardment Operational Training Wing in 1942. The USAF used the airfield between 1947 and 1966. The base was turned over the United States Army in 1966 and has continued to serve as a support base for Fort Bliss.

Installation	State	Brief History
Fort Lewis	Washington	Camp Lewis was established in 1917 as an intake and training center. The camp was occupied by the 37,000 soldiers of the 91st Division by the end of the year. The 91st were deployed to World War I in the summer of 1918. Camp Lewis became a separation center for soldiers returning from war. Conditions at Camp Lewis deteriorated in the 1920s as the base was occupied by a small contingent of just over 1,000 troops. Local residents concerned about the state of the installation implored the federal government to either maintain the base or relinquish it to Pierce County. Congress finally appropriated money for base construction in 1927. The funds allowed the Army to develop a planned permanent military base at Camp Lewis, which was subsequently renamed Fort Lewis. The base building program spanned from 1927 to 1939. Gray Army Airfield, which was originally established in 1930, was improved in 1938 with Works Progress Administration (WPA) funds. The airfield is still in use. Preparations for World War II resulted in increased activity at Fort Lewis as the base provided training for various infantry units, including the assignment portions of the 3rd Infantry Division, the 40th Infantry Division, the 41st Infantry Division, 33rd Infantry Division, the 96th Infantry Division, and the 44th Infantry Division. The period immediately after World War II resulted in a brief reduction of activity at Fort Lewis. However, the Koran War resulted in another period of increased activity. Fort Lewis was a major training and receiving center for soldiers heading off to the war. The base was also an important deployment center. Solders left directly from Fort Lewis to Korea. When the Vietnam War commenced, the 4th Infantry Division was stationed at Fort Lewis when US involvement in the Vietnam War escalated. The division deployed to Vietnam on September 25, 1966. They, however, were not the first units deployed from Fort Lewis to Vietnam. Helicopter units from Fort Lewis were already in Vietnam. The 8th Transportation Company was among the first units to deploy to Southeast Asia in 1961. The 283rd Medical Detachment joined them in 1965. The 54th Medical Detachment arrived two years later. The post-Vietnam era saw the base grow into one of the major US military bases in the Pacific. Moreover, Fort Lewis has played a prominent role in every military conflict since the Vietnam War. The base's stature was further reinforced when Fort Lewis and McChord Air Force Base merged in the early 2000s creating Joint Base Lewis McChord. Currently, the base is home to a wide variety of units including the 1st Corps, 17th Fire Brigade, 191st Infantry Brigade, 1st Air Support Operations Group, 1st Joint Mobilization Brigade, 1st Special Forces Group (Airborne), 201st Military Intelligence Brigade, 22nd Military Police Battalion, 2nd Ranger Battalion, 75th Infantry, 3rd Ordnance Battalion, 51st Signal Battalion, 42nd Military Police Brigade, 44th Military Police Detachment, 4th Brigade of the 2nd Infantry Division, 593rd Corps Support Group, 62nd Medical Brigade, 64th Engineer Detachment, Director of Dental Services, Director of Health, Naval and Marine Corps Reserve Training Center, and the Western Regional Veterinary Command.
Fort Benning	Georgia	Fort Benning was established as a temporary post (Camp Benning) in 1918 to provide basic training for World War I units. Camp Benning became a permanent installation in 1920 and was renamed Fort Benning in 1922. The installation's mission expanded shortly after World War I when tank and infantry schools were established at Camp Benning. The Civilian Conservation Corps (CCC) constructed much of the base's early infrastructure in the 1930s. The preparation and prosecution of World War II greatly expanded activity at

Installation	State	Brief History
		Fort Benning, where several units were activated in 1940, including the 2nd Armored Division, 82nd Armored Reconnaissance Battalion, and 17th Armored Engineer Battalion. The Airborne School was also established in 1940 and several Parachute Battalions, including the 1st Airborne Brigade, were subsequently activated at the base. Three years later, the 555th Parachute Infantry Battalion, a Black paratrooper battalion, was activated at Fort Benning. The group trained at Fort Benning but was not deployed overseas. They worked as smoke jumpers in the Pacific Northwest. The base remained active in the post-war era. For example, the 4th Infantry Division was organized and trained at Fort Benning in 1950 and 1951. The division was the first of four US Divisions committed to NATO. The Vietnam War resulted in a significant increase in rotary-wing aircraft use at Fort Benning. The 11th Air Assault Division (test) and 10th Air Transport Division (test) were formed in 1963 to conduct field exercises testing the utility of helicopters in wide-ranging combat situations. Many of the methodologies developed by the test units are still in use, such as the use of night vision equipment, forward refueling systems, and armed helicopter support for special forces operations. The expansion of US involvement in Vietnam after 1965 resulted in the reorganization of the 11th Air Assault Division (test) to the 1st Cavalry Division (airmobile), the first major Army formation specifically trained and tasked with airmobile warfare. Other helicopter units deployed to Vietnam from Fort Benning included the 498th Medical Company and 334th Assault Helicopter Company. Fort Benning is addressed in more detail in appendix A of this report.
Fort Riley	Kansas	Fort Riley was established as an outpost on the Santa Fe Trail in 1952. Its early history was intrinsically linked to western expansion. By the late 19th century and 20th century, the base also became the preeminent base for cavalry and light artillery training. The School of Cavalry and Light Artillery started operations in 1892. The Mounted Service School (Cavalry School) was opened in 1907. The installation's training role has continued throughout the 20th century and into the 21st century. Fort Riley has several training centers that have prepared soldiers for World War I, World War II, the Korean War, the Vietnam War, and the wars in the Middle East. Fort Riley is also the home base of the 1st Infantry Division, which arrived in 1955. The 1st Infantry Division served in Vietnam beginning in 1965. The 159th Medical (helicopter) detachment also deployed to Vietnam in 1967.
Fort Sam Houston	Texas	Fort Sam Houston was initially established as Camp Almus in 1845. The camp became a permanent military post in the 1870s and was named Fort Sam Houston in 1890. A year later, it was the second-largest Army installation in the United States. The base expanded by nearly 1,300 acres during World War I and continued growing after the war. Five hundred new permanent buildings were constructed between 1928 and 1939. Fort Sam Houston was the headquarters for the 3rd, 6th, 9th, 10th, and 15th Armies, 8th Corps, 2nd Infantry Division, 88th Infantry Division, 95th Infantry Division, and other smaller units who trained and deployed from Fort Sam Houston. The Army base was also a center of medical training and care based at Brooke General Hospital and the US Army Medical Training Center. All of the army's medical personnel trained at Fort Sam Houston during the Korean War and the Vietnam War. Several helicopter ambulance units deployed to Vietnam from Fort Sam Houston.

Installation	State	Brief History
		The Army base continued to play a prominent role in military preparedness and medical care in the decades after the Vietnam War. The installation also continues to grow. Several major organizations moved to Fort Sam Houston after 2005, including the enlisted medical training of the US Navy and US Air Force, the Army's Installation Management Command and Army Mission and Installation Contracting Command. Fort Sam Houston is a national historic landmark.
Fort Ord	California	Fort Ord was established in 1917 as a 28,000-acre training site for US Army infantry troops stationed at the nearby Presidio of Monterey. The site had permanent improvements for over two decades. This changed as the United States prepared for World War II. The Army constructed various buildings at the site in the late 1930s to support increased training at what would soon become Fort Ord. The federal government purchased additional land and received other land by donation in 1938 to expand the base. The Army's 7th Division was based at Fort Ord until it was deployed to Alaska in 1943. Fort Ord also served as a staging and training area for various troops deployed to the Pacific Theater during the war. The fort continued to serve as an important training base for various infantry divisions after the war. This continued into the Vietnam War when the base was, once again, a central installation for the deployment of troops. This time they were deploying to Southeast Asia. The increased importance of aviation to infantry operations resulted in the construction of the Fritzsche Army Airfield at Fort Ord in 1959. The airfield supported both medical and transportation helicopter units that served in Vietnam. Fort Ord continued to operate as an infantry base until it was closed in 1994. The Army retained a small portion (5%) of the installation, including the Presidio of Monterey Annex and Reserve Center and Presidio of Monterey (Defense Language Institute). A portion of the former Army base is now a national monument, and another portion is used as a campus of Cal State Monterey. The airfield (now Marina Municipal Airport) was converted into a general aviation facility that also houses the University of California (UC) Center for Science, Technology, Education and Policy (STEP Center) and the Naval Postgraduate School Center for Interdisciplinary Remotely Piloted Aircraft Studies (NPS/CIRPAS).
Fort George C. Meade	Maryland	Fort Meade was established in 1917 as a cantonment for the training of troops drafted for World War I. The installation housed three infantry divisions, three training battalions, and one depot brigade. The base was also the headquarters for the "Hello Girls," women who served as bilingual telephone-switchboard operators in the US Army Signal Corps. Fort Meade was a hub of training activity during World War II. The base's ranges and other training facilities were used by more than 200 units. It was also home to the Cooks and Bakers School, the Third Service Command Special Services Unit Training Center, Women's Army Corps (WAC), and German and Italian prisoner-of-war (POW) camps. The base became the headquarters of the 2nd US Army in 1947, with command over Army units throughout a seven-state area. Nineteen years later, the 2nd US Army merged with the 1st US Army, with oversight of the activities of Army installations in a 15-state area. The 44th medical brigade was based at Fort Meade during the Vietnam War. At least three helicopter units based at Fort Meade served in Vietnam—the 57th Medical Detachment, 571st Medical Detachment, and 237th Medical Detachment.

Installation	State	Brief History
		Fort Meade continues to serve as a dynamic multifaceted military installation with broad defense, intelligence, and support responsibilities.
Fort Bragg	North Carolina	Fort Bragg was established as Camp Bragg in 1918, and the installation was occupied by 1919. Camp Bragg was initially used for the testing of long-range weapons developed during and after World War I. Aviation was also an early activity at Camp Bragg. Aircraft and balloon detachments were based at the installation and used for aerial photography, fire control, artillery support, and tactical testing. The aviation elements operated out of Pope Field. Camp Bragg branched out into training in 1921 when the 13th and 17th Field Artillery Brigades began using the camp. Camp Bragg became Fort Bragg in 1922. Artillery testing and training continued through the 1920s. The continued development of aircraft tactics also occurred during the 1920s. The fort grew slowly throughout the 1920s and 1930s. The World War II era resulted in dramatic growth. The dirt runways at Pope Field were paved in 1940 and the Army created the Airborne Command in 1942. As a result, the 82nd and 101st Airborne Divisions moved to Fort Bragg, creating a full complement of airborne divisions at Fort Bragg. All five World War II airborne divisions were based at the installation, along with the 555th Parachute Infantry Battalion. Artillerymen continued to train at Fort Bragg also. The 9th and 100th and 2nd Armored Divisions were based at Fort Brag during the war. Fort Bragg remained a center of airborne and artillery after the war. The base also became the headquarters for the Special Forces in 1952. The installation also hosted basic training during the Vietnam War. Elements of the 82nd Airborne deployed to Vietnam as did helicopter medical detachments, an aviation battalion, and transportation company. Fort Bragg, one of the largest military installations in the world, continues to play a vital role in military preparedness as home of the Airborne and Special Operations.
Campbell Army Airfield	Kentucky	Fort Campbell was established as a temporary training area (Camp Campbell) for armored divisions in 1941. It was also the headquarters of the IV Armored Corps and XXII Corps. The first troops arrived in 1942. The 8th, 12th, 14th, and 20th Armored Divisions, and portions of the 26th Infantry Division trained at the site. Activity at Camp Campbell reduced considerably after the war. By 1947, there was concern among local residents that the camp would be shut down. However, this would not be the case. The Atomic Energy Commission decided to develop a portion of the base for nuclear weapons development. The 3rd Infantry Division arrived a year later, but was replaced by the 11th Airborne Division in 1949. Camp Campbell became Fort Campbell in 1950. The arrival of the airborne division began the base's long association with aircraft. The 11th Airborne Division moved to Germany in 1956 and was replaced by the 101st Airborne, a division that continues to call the base home. Fort Campbell operated an airborne training school from 1950 to 1962 and provided basic training during the Vietnam War. The 101st Airborne, including its helicopter elements, was deployed to Vietnam in 1965. The post briefly housed the Sixth Infantry Division during the Vietnam War. The 101st Airborne returned to Fort Campbell after the Vietnam War and was eventually joined by additional elite units: the 5th Special Forces and the 160th Special Operations Aviation Regiment. Fort Campbell remained a primary Army aviation base.

Installation	State	Brief History
Fort Knox	Kentucky	Fort Knox was established as Camp Knox in 1918. The installation was dedicated to the training of artillery units. Shortly after the base was established, the Army constructed Godman Army Airfield, the first airfield in Kentucky. The airfield supported the 29th Aero Squadron. A victim of the post-war reductions, the base was closed as a permanent installation in 1922. The base remained active as a Reserve and National Guard training center. Activity at the base increased in the early 1930s when Camp Knox became the new headquarters for the Mechanized Cavalry and became home to the 1st Cavalry Regiment. Camp Knox was also renamed Fort Knox. Preparation for the United States entry into World War II resulted in the creation of the Armored Force, which was established at Fort Knox in the summer of 1940. It was responsible for establishing armored formations, doctrine, and training in the use of armored vehicles. The importance of the Armored Force in World War II is undeniable. At the close of World War II, there were 16 combat tested armored divisions and approximately 65 tank battalions. Armored units had participated in every major theater of operations. Fort Knox remained an important training base after the war. It was also home to the 3rd Armored Division from 1947 to 1955. The Cold War helped secure the Armor Branch's role in the Army and the Armor Center continued to fulfill the role of producing capable and highly trained armor personnel. By the late 1960s, more than one million trainees had completed one or more training programs in the Fort Knox Training Center since its inception in 1940. Combat operations in Korea and Vietnam presented new challenges for the branch that differed from those learned during World War II. Thus, the Armor Center continued its role in the development and evolution of tactics and vehicles for armor and cavalry. The 114th Airmobile Company deployed from Fort Knox to Vietnam in 1963. Fort Knox has continued to provide innovative training and development for the US Army's armored divisions.
Fort Sill	Oklahoma	Fort Sill was established as a frontier cavalry post in the mid-19th century. Units from Fort Sill fought on the southern Great Plains in 1869 and in the Red River War of 1874–75. Throughout the rest of the 19th century they served in a variety of peacekeeping duties. Fort Sill declined in the late 1800s and early 1900s. The cavalry left the post and were eventually replaced by field artillery regiments. The artillery regiments led to the expansion of Fort Sill infrastructure and programs. The School of Fire and Infantry School (the Infantry School moved to Camp Fort Benning, Georgia, in 1918) were established in 1911 and 1913, respectively. Fort Sill was an early adopter of aircraft, which first arrived in 1915. The Army Air Service constructed Post Field two years later. The School for Aerial Observers was established in 1918 and the School of Fire became the Field Artillery School in 1919. Fort Sill became the permanent home of the field artillery in 1930. The fort expanded during World War II. In addition to its role as the home of the field artillery, Fort Sill became the training post for the 45th Infantry Division. Training capabilities expanded further in 1945 when the US Army Aviation School was established at the installation. The aviation school eventually moved to Fort Rucker.

Installation	State	Brief History
		The field artillery mission expanded during the Korean War when Fort Sill acquired responsibility for army missile and atomic warhead training. Evolution continued during the Vietnam War as the field artillery units adopted increasingly specialized weapons and technology, including target-locating radar, rocket-assisted munitions, self-propelled howitzers, "Beehive" rounds, and the first night vision device. Field artillery battalions from Fort Sill deployed to Vietnam. Aviation also continued to play a role in Fort Sill operations. The 1st Aerial Artillery Group (Provisional) was organized at Fort Sill in 1963 to test CH-34 transport helicopters equipped with rocket pods. The 33rd and 81st Transportation Companies deployed from Fort Sill to Vietnam in 1962. Fort Sill has remained an active and important military installation after the Vietnam War. The base is currently home to the US Army Field Artillery Training Center and four brigades of Third Corps artillery. Facilities include Post Army Air Field, Reynolds Army Community Hospital, and the Fort Sill Museum, a national historic landmark.
Fort Carson	Colorado	Fort Carson was established as Camp Carson as a training site in 1942. The camp also housed the 89th Infantry Division and provided training for the 71st , 104th, and 10th Mountain Divisions. Various smaller units also used Camp Carson, including nurses, tank battalions, a Greek infantry battalion, and an Italian ordnance company. The immediate post-war era resulted in a significant reduction of activity at Camp Carson until the beginning of the Korean War. The war brought renewed activity because Camp Carson became a base for preparing soldiers for deployment to Korea. Camp Carson was officially established as Fort Carson in 1954. The 8th Infantry Division was activated at the base the same year, only to be reassigned to Germany in 1956. The 9th Infantry Division, a division with nuclear capability, replaced the 8th at Fort Carson. The 5th Infantry Division was formally activated at the base in 1962. The 5th was a mechanized infantry division and, as such, triggered the need for more land. Fort Carson expanded by almost 80,000 acres in 1965 and 1966. Fort Carson provided pivotal training and support during the Vietnam War. The 254th Medical Detachment (Helicopter Ambulance) was deployed from Fort Carson to Vietnam in 1965. Nearly 30,000 Carson-trained soldiers were sent to Vietnam between 1966 and 1968. Many of these soldiers were part of 61 units that were activated at Fort Carson at the time. These included 1st Brigade of the 5th Infantry Division (Mechanized), which was airlifted directly to Da Nang in July 1968 in the second-largest airlift in history. The era after the end of the Vietnam War has not diminished Fort Carson's prominence at one of the preeminent Army installations in the United States. The base continues to support infantry divisions and a wide variety of other units. Fort Carson is currently home to the 3rd Armored Cavalry Regiment, 3rd Brigade, 4th Infantry Division, 43 ASG, and Special Forces. As a result of its history supporting infantry, the base has extensive support infrastructure, including vehicle maintenance facilities for tanks and other tracked and wheeled vehicles, a tank engine depot maintenance and testing facility, and an active runway and hangar facility used by rotary-wing aircraft.

Installation	State	Brief History
Fort Polk	Louisiana	Fort Polk was established as a training base in 1941, but was deactivated after the war. The base was briefly activated during the Korean War, only to be placed back on caretaker status until 1962, when Fort Polk was activated as a permanent base to conduct training for the Vietnam War. This included helicopter training. The 501st Aviation Brigade and 236th Medical Detachment, both of which served in Vietnam, were based out of Fort Polk. The base became the home of the 5th Infantry Division (Mechanized) after the Vietnam War. The division was based at Fort Polk until moved to Fort Hood, Texas, in 1993. Fort Polk subsequently became the Fort Polk Joint Readiness Training Center and remains an active military installation.
Fort Devens	Massachusetts	Camp Devens was established as a demobilization center after World War I. The reception center was subsequently put on caretaker status from 1922 until the fall of 1931 when the 13th Infantry Regiment and three companies of the 1st Tank Regiment were garrisoned at the site. Camp Devens was officially declared Fort Devens in 1932. The installation took on an additional role once World War II began. Fort Devens was designated a reception center for all New England men drafted into the Army. The army base was also home to three divisions, the 1st, 32nd, and the 45th. It was also home to a POW camp and several training centers, including a Women's Army Corps Training Center. The Fort Devens Airfield (Moore Army Airfield) was established in 1941. Fort Devens was again designated a demobilization center after World War II. It was also, once again, placed on caretaker status after demobilization was complete. The base was reactivated during the Korean War as a reception center, but it had no resident divisions during the 1950s. The base did support several smaller units and programs, including two signal battalions, the United States Army Security Agency Training Center and School and the First Army Chemical Defense School. This pattern continued into the Vietnam War. The 196th Light Infantry Brigade and elements of the 2nd Brigade were sent from Fort Devens to Vietnam. A helicopter company from Fort Devens, the 93rd Helicopter Company, was one of the first rotary-wing companies to serve in Vietnam. Fort Devens continued to prepare soldiers for deployment to conflict zones after the Vietnam War. The installation was deactivated as an active duty military base 1996. However, a portion of the base was retained as a training area for the Army Reserve and National Guard.
Air Force		
Stead Air Force Base	Nevada	In 1954, Stead became a helicopter training facility. The base was operated by the 3635th Flying Training Wing. At the direction of the Department of the Air Force, ATC inactivated Stead Air Force Base, Nevada, and its 3635th Flying Training Wing (Advanced) on June 15, 1966. Stead's helicopter pilot training unit, the 3638th Flying Training Squadron (Helicopter) was discontinued on April 1, and the 3637th Combat Crew Training Squadron (Survival and Special Training) ceased to exist on June 1. Helicopter training moved to Sheppard Air Force Base in Texas, and survival training transferred to Fairchild Air Force Base in Washington. The ATC helicopter mechanic courses at Edward Gary moved to Sheppard, and pilot training went to Randolph Activated on March 1, 1966, to assume survival training at Fairchild was the 3636th Combat Crew Training Group (Survival). The group reported directly to HQ ATC.

Installation	State	Brief History
Randolph Air Force Base	Texas	Established in 1928 near San Antonio, Randolph was once called the "West Point of the Air." During World War II, this base served as a basic pilot and instructor training facility. Facilities were modified in 1954–1956 to support C-119 and T-33 pilot training. T-33/B-57 instructor and transition training was conducted from September 1954 to October 1955. Helicopter pilot training arrived from Gary Air Force Base in mid-1956 and remained for two years.
Sheppard Air Force Base	Kansas	In addition to serving as a technical training center during the 1960s, Sheppard hosted a B-52 wing. With the deactivation of the bomber wing, Sheppard assumed the mission of helicopter training beginning in 1965. This training was consolidated with the Army in 1970. The Medical Service School arrived from Gunter AFS Alabama in 1966 and 1967. Due to the war in Vietnam, this school increased production by training in multiple shifts six days a week. Also in 1967, a runway was extended to accommodate German Air Force training. On January 1, 1973, the Air Force activated the 80th Flying Training Wing as a multinational unit organized to train pilots for the North Atlantic Treaty Organization (NATO) and other allied nations. During its early years, the wing provided undergraduate training for pilots from South Vietnam, West Germany, Iran, El Salvador, Kuwait, Ecuador, and Saudi Arabia. To support the training, additional housing and administrative facilities were built. On April 8, 1968, ATC ended its UH-19 helicopter pilot training course at Sheppard Air Force Base. The TH-1F replaced the UH-19.
Hill Air Force Base	Utah	Hill Air Force Base was established in 1939 as the Ogden Air Depot (Hill Field). The depot served as an important maintenance and supply base during World War II. The depot was transferred to the Air Force in 1947 and was renamed Hill Air Force Base (AFB) a year later. Hill AFB served as a pivotal logistical component of the Air Force's contribution to the war. Most of the base's history is associated with fixed-wing aircraft, but in 1971, Hill AFB established a combat helicopter school and began testing the UH-1H Iroquois helicopter, subsequently adopted by the Air Force for use in Vietnam. The Air Force Base continues to support both fixed-wing and rotary-wing aircraft.
Eglin Air Force Base	Florida	Eglin Air Force Base (originally an Army Air Corps Proving Ground) was established in 1940 as a test site for aircraft armament, equipment, and tactics. Eglin was involved in testing all new aircraft and their modifications during World War II. This mission was expanded in 1946 when the installation became a center for the development and testing of guided missiles and drones. The Air Force constructed specialized facilities such as the McKinley Climactic Lab and Eglin Gulf Test Range to conduct high-level evaluations of weapons systems and aircraft, including helicopters, over the next decade. The testing and evaluation mission played an important role during the Vietnam War and after. Search and Rescue Helicopter Special Operations squadrons based at Eglin also served in Vietnam.
Shaw Air Force Base	South Carolina	Shaw Air Force Base was established in 1941 as a flight training school. The base's mission expanded after the war when it became the home of the 363rd Tactical Reconnaissance Wing in 1951. The 363rd participated in the military response to the Cuban Missile Crisis in 1962. The base also became home to the 21st Helicopter Squadron, one of two Air Force Special Operations Squadrons to serve in Vietnam in 1967. The 21st was one of the last two USAF helicopter squadrons to leave Vietnam in 1975.

Installation	State	Brief History
Navy / Marine Corps		
Naval Air Station Whiting	Florida	Located at Milton, the field was established as an auxiliary airfield for NAS Pensacola during World War II. Designated as a Naval Air Auxiliary Station, Whiting served as a primary pilot aviation training facility during the post-war period. In the 1950s, Whiting became a stepping-stone facility for pilots electing to fly single-engine aircraft. During the 1960s, Whiting was redesignated as a naval air station and hosted two training squadrons to train Navy, Marine, and Allied pilots. With consolidation following the Vietnam War, Whiting added an additional fixed-wing training squadron and two helicopter training squadrons during the 1970s, making it one of the busiest aviation training facilities in the Navy. Whiting's mission of training aviators in the primary and intermediate phase of propeller-driven aircraft and basic and advanced helicopter operation continued through the end of the Cold War.
Ellyson Field, Pensacola Naval Air Station	Florida	Ellyson was a training field at Pensacola that was deactivated after World War II. During the Korean War, Ellyson Field was activated for helicopter training. Helicopter training continued as the field's primary mission through the Vietnam War. This mission was assumed by NAS Whiting in the 1970s. Idle for five years, Ellyson Field began to see a new life in the late 1950s. The Korean War was escalating and the helicopter was proving its worth in the combat zone. Realizing a need for pilots, the Navy decided to reopen Ellyson Field as a helicopter pilot training school. Ellyson Field once again became a beehive of activity with the first class beginning its eight weeks of training on January 15, 1951. The intense eight-week program included 60 hours of flight training and 35 hours of ground school. Initially, all training flights were conducted within the field's boundaries except for some advanced instruction. As the training progressed, students moved to larger, more advanced helicopters to complete their schooling. The base became a non-aviation installation in 1973 and closed in 1979. July 1, 1961 – conditions report, NAS Pensacola. Mission: conduct helicopter pilot training; location 13 miles northeast of NAS Pensacola, area: 576 acres (navy owned); personnel housing capacity: 598 (officers – 102; enlisted – 496); personnel assigned 783 (officers: 130; enlisted: 568; NAVCAD 16; civilian 69); personnel living at station: 348 (officers: 32; enlisted: 300; NAVCAD 69); Units attached: HELTRARON-8; aircraft capacity – 68 helicopters; aircraft aboard: 55 (2-T28, 2–SNB, 20-HO4S, 6–HUP, 25 HTL); hangar 3 – length 175 feet by 111 feet wide; doors – 20 feet high by 108 feet wide; four asphalt runways (3,125 x 300; 3,025 x 300, 3,350 x 200, 3,185 x 300), and 58,835 square yards of concrete parking area. Ellyson field is addressed in appendix E of this report.
Naval Air Station Patuxent River	Maryland	Patuxent River Naval Air Station, located in southern Maryland, played a pivotal role in Navy and Marine Corps helicopter development. The Naval Air Station has conducted all rotary-wing aircraft testing and evaluation for the Navy and Marine Corps since 1949. Patuxent River NAS has also assisted the Army with their rotary-wing aircraft testing and evaluation. Initial development of Patuxent River NAS occurred between April 1942 and 1945. Three helicopters were delivered to Patuxent River NAS (one Sikorsky HNS-1 and two Sikorsky HOS-1s) for testing in 1944. The Flight Test Division was asked to determine the handling qualities and performance characteristics of the new rotary-wing aircraft. The division went on to test several other aircraft, including the XHOS-1, HSL (Bell Tandem), XHRP-1, HRP-1, HUP-1, HO4S, HO5S, HJP-1, and HTL-1, between 1944 and 1949. The increasing complexity of helicopter designs and unique testing conditions the aircraft required resulted in the establishment of a dedicated rotary-wing testing group in 1949 when the rotary-wing section of the Navy Flight Test Division was

Installation	State	Brief History
		established. The rotary-wing section was responsible for all aspects of their program, including plans for future expansions, scheduling testing, establishing test criteria, and even supervision of helicopter maintenance. The rotary-wing section undertook various testing programs in the 1950s. The US involvement in the Vietnam War, however, resulted in a dramatic increase in the volume and complexity of testing and evaluation. There was a concomitant increase in staff. By 1975, the section consisted of five branches: Air Systems Branch, Maintenance Branch, Weapons Branch, Sea Control Branch, and Search and Rescue Branch. The work of rotary-wing section at Patuxent Naval Air Station reflects the test and evaluation process that occurred at military bases in the United States during the Vietnam War. The pilots, engineers, and other evaluators literally shaped the helicopter war in Vietnam. Patuxent River Naval Air Station is addressed in more detail in appendix D.
Naval Air Station Norfolk	Virginia	Naval Air Station Norfolk was established as a training facility during World War I. The air station was initially used to train aviators, but it also quickly became a center for aircraft maintenance training. The post-war year resulted in a reduction of aviation operations at Norfolk until the 1930s and early 1940s, as the United States prepared to enter World War II. War preparations resulted in significant construction. The Navy built new hangars, runways, warehouses, barracks, and other structures. Construction continued through the war. The base's mission remained an aviation training mission. The importance of aviation was clear during World War II and the base's aviation operations continued to operate at or near peak levels after the war. NAS Norfolk became the headquarters for the Fleet Air Command. NAS Norfolk was, at least temporarily, the home base of helicopter transport ships used in the Pacific and Vietnam, including the USS *Okinawa* and USS *Thetis Bay*. The Air Station was also the home base for the Helicopter Mine Countermeasures Squadron (HM)-12, which participated in Vietnam operations after 1971. The Naval Air Station has continued to play a prominent role in rotary- and fixed-wing aviation in the years since the end of the Vietnam War.
Naval Air Station Jacksonville	Florida	Naval Air Station Jacksonville was established as a flight and gunnery school in 1940 as the United States prepared for World War II. The air station expended dramatically during the war. The Navy constructed three runways, seaplane ramps, overhaul and repair facilities. Indeed, NAS Jacksonville had more than 700 buildings by the end of the year. The Naval Air Station remained at the forefront of aviation after World War II. The first Navy jet carrier and jet squadrons were based at Jacksonville, as were the Blue Angels. The air station was also involved in the modification and testing of aircraft. For example, in the 1950s the Overhaul and Repair Department modified the R4D transport airplane and H04S-3 helicopter for the 1955 Byrd expedition to the South Pole. The modification and testing mission played a role in the Vietnam War. For example, modified armaments used by the Marine Corps in Operation Shufly were assembled at NAS Jacksonville. The Air Station was also the home port for two helicopter squadrons during the Vietnam War. Helicopter Combat Support Squadron 2 and Helicopter Anti-Submarine Wing 1, however, never served in southeast Asia during the war.

Installation	State	Brief History
Naval Air Station Key West	Florida	Naval Air Station Key West was established during World War I as a training facility and coastal air patrol station. The air station was placed on caretaker status after the war until 1940 when the base was reestablished in preparation for World War II. The base served as an operating and training base for land- and fleet-based aircraft squadrons and lighter-than-air operations. The base reverted to a training installation after the war, but took on an increased role as a base for reconnaissance and operational flights in the Atlantic during the Cold War. The base hosted both rotary- and fixed-wing aircraft squadrons. Helicopter Squadron 1, which served in Vietnam, is based at NAS Key West.
Camp Pendleton	California	Camp Pendleton was established on a 121,000-acre parcel outside San Diego in 1942. The troops of the 9th Marine Regiment arrived in August 1942 and Camp Pendleton was officially dedicated one month later. The base became the primary Marine Corps training facility on the west coast and was designated a permanent installation after World War II. Activity at Camp Pendleton increased during both the Korean and Vietnam Wars. The installation provided training and staging for troops on their way to and from Southeast Asia. This remains a core mission of the installation. The installation is addressed in more detail in appendix B of this report.
Marine Corps Air Station, New River	North Carolina	MCAs New River was established during World War II, but only operated briefly before being placed in caretaker status until 1951. Three years later, the installation adopted its mission as one of the Marine Corps' primary helicopter bases. The first helicopters arrived in 1954 with Marine Aircraft Group (MAG) 26. A second aircraft group MAG-29 was established at MCAS New River in 1971. The groups continue to operate out of the installation.
Marine Corps Air Station, Kaneohe Bay	Hawaii	The Marine Corps installation at Kaneohe Bay was established from a deactivated Navy facility in 1952. The installation played an important role in air/ground training. Marine Corps helicopter transport squadrons were based at Kaneohe Bay during the Vietnam War. In 1972 the air station also became home to the Station Operations and Maintenance Squadron (SOMS).
Marine Corps Air Station, Quantico	Virginia	MCAS (originally Marine Barracks) Quantico was initially established in 1917 as a major east coast training and testing installation. Often on the forefront of technology, the Quantico base received their first helicopter (an HMX-1) in 1947. The air station has continued to play a pivotal role in the integration of helicopters into Marine Corps battle doctrine. The installation is addressed in appendix C of this report.

APPENDIX G:

VIETNAM HELICOPTER UNITS MENTIONED IN THE CONTEXT

THIS PAGE INTENTIONALLY LEFT BLANK

[Note: The table should not be considered all-inclusive. It reflects the units discussed in the narrative text and online research.]

Branch	Unit	Conus Base During the Vietnam War	First Deployment
Army	8th Transportation Company	Fort Lewis, WA	1961
Army	57th Transportation Company	Fort Bragg, NC	1961
Army	120th Aviation Company	Fort Richardson, AK	1963
Army	117th Aviation Company	N/A: Korea	1963
Army	57th Medical Detachment (Helicopter Ambulance)	Fort Meade, MD	1962
Army	93rd Transportation Company	Fort Devens, MA	1962
Army	33rd Transportation Company	Fort Ord, CA	1962
Army	81st Transportation Company	Fort Sill, OK	1962
Army	114th Air Mobile Company	Fort Knox, KY	1963
Army	134th Aviation Company	Fort Benning, GA	1965
Army	121st Aviation Company (Air Mobile Light)	N/A Established in Vietnam	1963
Army	118th Assault Helicopter Company	N/A Established in Vietnam	1963
Army	Utility Tactical Transport Helicopter Company (UTTHCO)/68th Assault Helicopter Company	Fort Ord, CA	1962
Army	223rd Combat Aviation Battalion	N/A Established in Vietnam	1966
Army	13th Aviation Battalion	Fort Bragg NC	1964
Army	501st Aviation Battalion	Fort Polk, LA	1964
Army	502nd Aviation Battalion	Fort Campbell, KY	1964
Army	173rd Airborne Brigade	N/A: Okinawa	1965
Army	1st Cavalry division (airmobile)	Fort Benning, GA	1965
Army	147th Aviation Company	Fort Benning, GA	1965
Army	1st Transportation Corps (TC) Battalion,	Corpus Christi, TX	1966
Army	82nd Medical Detachment (Helicopter Ambulance)	Fort Sam Houston, TX	1964
Army	283rd Medical Detachment (Helicopter Ambulance)	Fort Lewis, WA	1965
Army	254th Medical Detachment (Helicopter Ambulance)	Fort Carson, CO	1965
Army	Air Ambulance Platoon	Fort Benning, GA	1965
Army	498th Medical Company	Fort Sam Houston, TX	1965

Branch	Unit	Conus Base During the Vietnam War	First Deployment
Army	436th Medical Company	N/A Formed in Vietnam from Detachments Already In-Country	1966
Army	45th Medical Company	Fort Bragg NC	1967
Army	54th Medical Detachment	Fort Campbell KY, Fort Lewis, WA	1966
Army	159th Medical Detachment	Fort Riley, KS	1967
Army	571st Medical Detachment	Fort Meade, MD, Fort Bragg, NC	1967
Army	1st Aviation Brigade	Various (established to provide oversight for all the infantry helicopter battalions)	1966
Army	334th Assault Helicopter Company	Fort Benning, GA	1966
Army	101st Airborne	Fort Campbell, KY	1965/1967
Army	236th Medical Detachment	Fort Polk, LA	1968
Army	237th Medical Detachment	Fort Ord, CA / Fort Meade, MD	1968
Army	498th Medical Company	Fort Sam Houston, TX / Fort Benning, GA	1964
Marine Corps	HMM-362	MCAS Tustin	1962
Marine Corps	HMM-163	MCAS New River	1962
Marine Corps	HMM-162	MCAS Tustin	1963
Marine Corps	HMM-261	MCAS Tustin	1963
Marine Corps	HMM-361	MCAS Tustin	1963
Marine Corps	HMM-364	MCAS Tustin	1964
Marine Corps	HMM-365	MCAS New River	1964
Marine Corps	VMO-2	N/A Okinawa	1965
Marine Corps	HMM-161	Kaneohe HI	1965
Marine Corps	HMM-363	MCAS Santa Ana	1965
Marine Corps	HMM-164	MCAS Santa Ana / MCAS El Toro	1966
Marine Corps	HMM-165	MCAS Santa Ana	1966
Marine Corps	HMM-265	Camp Allen (Norfolk), VA	1966
Marine Corps	HMM-262	MCAS New River	1966
Marine Corps	HMH-463	MCAS Santa Ana	1966

Branch	Unit	Conus Base During the Vietnam War	First Deployment
Marine Corps	HML-167	N/A Formed in Vietnam from Detachments Already In-Country	1968
Marine Corps	HMH-462	MCAS Santa Ana	1968
Marine Corps	HML-367	N/A Formed in Vietnam from Detachments Already In-Country	1968
Marine Corps	VMO-6	Camp Pendleton	1965
Marine Corps	HMH-361	MCAS Santa Ana	1969
Marine Corps	HMA-369	N/A Okinawa	1972
Marine Corps	1st Force Reconnaissance Company	Camp Pendleton	1965
Marine Corps	HAMS 16	N/A Okinawa	1965
Marine Corps	9th Marine Expeditionary Brigade	N/A Okinawa	1965
Navy	HU-1	NAS Imperial Beach	1962
Navy	HS-1	NAS Key West	1965
Navy	HS-4	NAS Imperial Beach	1965
Navy	HS-6	NAS Imperial Beach	1965
Navy	HC-1	NAS Imperial Beach	1965
Navy	HC-7	N/A: Japan	1967
Navy	HM-12	NAS Norfolk	1971
Air Force	917th Field Training Detachment	Stead AFB	1963
Air Force	Detachment 4 (Temporary)	Eglin AFB	1964
Air Force	38th ARS	Moody AFB	1965
Air Force	3rd Aerospace Rescue and Recovery Group	N/A Thailand	1966
Air Force	37th ARRS	N/A Thailand	1967
Air Force	20th HS/ 20th SOS	Eglin AFB	1965
Air Force	21st HS / 21st SOS	Shaw AFB	1967
Air Force	40th ARRS	N/A Thailand	1972

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX H: CONTRIBUTORS

THIS PAGE INTENTIONALLY LEFT BLANK

Jayne Aaron, LEED AP Environmental Planner / Architectural Historian

Education

- Master of Environmental Policy and Management, University of Denver
- Bachelor of Environmental Design (Architecture and Planning), University of Colorado, Boulder

Summary

Ms. Aaron has over 20 years of hands-on experience as a project manager, architectural historian / cultural resources specialist, and NEPA specialist. Ms. Aaron meets the qualification of the Secretary of the Interior for Architectural Historian. She has been involved in all aspects of Section 106 compliance for cultural resources, including the evaluation of US Coast Guard vessels, campgrounds, civil works projects, numerous military installations, and other buildings and structures. She has also designed innovative strategies and management plans to integrate new and existing regulations, policies, and guidance, and cultural and natural resource management activities into single planning and compliance programs, including NEPA, Environmental Justice, and the National Historic Preservation Act, and Native American Graves Protection and Repatriation Act of 1990. As part of her compliance responsibilities, Ms. Aaron has participated in consultation and meetings with a variety of stakeholder groups, including state and federal regulators, Indian tribes, environmental consultants, and the public. She has written public releases, given presentations, responded to public comments, and facilitated meetings for various sized groups. She has also designed and developed training courses and has taught in numerous educational and training programs.

As an Architectural Historian and Cultural Resources Specialist, she has extensive experience evaluating a large variety of historic properties for many federal agencies, developing management plans and strategies, and, when necessary, completing mitigation strategies for historic buildings, structures, and districts. The following are just a few project examples to illustrate this experience:

Project Experience

Wake Atoll Hurricane Damage Assessment, Cultural Resources Inventory, and HABS Documentation for Air Force, Wake Island. Ms. Aaron was the project manager and principal investigator for the survey and evaluation of 128 buildings and structures for listing on the National Register of Historic Places (NRHP). Ms. Aaron also assessed 139 features that comprise the Wake Island National Historic Landmark for damage caused by Typhoon Ioke in 2006. Upon completion of the inventory, Ms. Aaron prepared the HABS documentation for the air terminal on Wake Island. The package included 123 black and white 4 x 5 photographs of the exterior, interior, and architectural details, and architectural drawings and a Level II report.

Project Manager / Principal Investigator. DoD Legacy Project. A National Historic Context for the Hush House (Test Cell) on Current Department of Defense (DoD) Installations Nationwide and Evaluation of a Representative Sample of Extant Hush Houses on DoD Installations. Ms. Aaron was the project manager and principal investigator for the development of a historic context, survey, and evaluation of a sample of ANG and other military branch hush houses. Ms. Aaron led a team of researchers to develop a context detailing the military development and use of the hush house at installations throughout the United States, spanning from WWII through the Cold War. The report

provides an understanding of the evolution of test cell structures and technology from propeller testing rigs to jet engine development and maintenance. The context further examines different types of hush houses with attention being paid to technical demands, their spatial arrangement on the landscape, function, and other influences, such as fire considerations, military construction and design regulations, federal FAA regulations, aircraft changes with related maintenance practices, and requirements based on surrounding population density and "good neighbor" policies. The report includes examples of hush houses from all military branches, addressing similarities and differences based on service branch, function, and aircraft.

Principal Investigator. Determination of Eligibility and Determination of Affect for Building 2050, Fairchild Air Force Base, Spokane Washington. Ms. Aaron developed a Determination of Eligibility and Determination of Affect for a World War II-constructed hangar at Fairchild Air Force Base in support of an environmental assessment. The project was on a short time schedule and both the DOE and DOA were conducted simultaneously and presented in the same report. The entire process, including consultation with the SHPO and the Spokane County Historic Preservation Office, was completed in less than four months.

Project Manager / Principal Investigator. Cultural Resource Evaluations for the Air National Guard. Ms. Aaron was the Project Manager and Technical Lead for aboveground cultural resources on the development of four Air National Guard Base (ANGB) installations. The installations are Camp Perry ANG Station and its subinstallation Plumbrook ANG; Alpena ANGB and its subinstallation Grayling Weapons Range; Klamath Falls ANGB; and Des Moines ANGB. The team is identifying significant cultural resource properties and making recommendations on potential National Register of Historic Places eligibility, special protection requirements, and management requirements. Ms. Aaron evaluated over 275 buildings and structures at these four installations.

Project Manager, Case Study for Preserving a DoD Historic Building and Achieving LEED Certification for Renovation Project. Ms. Aaron was the project manager for a Legacy project to determine the feasibility of renovating a DoD historic building to achieve LEED certification and preserve the historic integrity of the building. The purpose of this feasibility study is to apply existing guidance and other studies and involve military and industry experts into an actual renovation scenario to determine whether preservation, sustainability, and energy conservation goals can be incorporated, and to understand the costs, benefits, and tradeoffs of doing so. The building is Indiana Army National Guard (INARNG), Indianapolis Stout Field Building 5. Building 5 was built in 1941 as a National Defense Project funded by the federal New Deal Works Projects Administration. The feasibility study and information provided as part of this project will be used by the INARNG in the design and construction phases of the renovation of Building 5.

Project Manager / Principal Investigator. Historic American Engineering Record (HAER) for the Northwest Field, Andersen Air Force Base, Guam. Ms. Aaron is managing, designing, and developing the HAER for the Northwest Field Complex at Andersen Air Force Base, Guam, which is eligible for listing on the National Register of Historic Places. The final HAER documentation is mitigation for the proposed adverse effects to the field. The package will record five historic contexts, including large format photography and drawings to depict the critical role that the field played in World War II and the firebombing of Japan.

Historical and Architectural Overview of Aircraft Hangars of the Reserves and National Guard Installations from World War I through the Cold War, DoD Legacy Project. Ms. Aaron was the project manager for the development of a nationwide historical and architectural context for US Military Reserve and National Guard installations. The report provides a context for understanding the history and

design of Reserve and National Guard hangars, an inventory of hangars, and methodology for applying the context to hangar evaluations.

Regional Cold War History for Military Installations, Including Air Force, Navy, and Army in Guam and the Northern Mariana Islands, DoD Legacy Project. Ms. Aaron was the project manager for the development of a Regional Cold War Context for US military installations in Guam and the Commonwealth of the Northern Mariana Islands (CNMI). The report presents a framework for determining NRHP eligibility within the definitive context. This context focuses on the specific relevance of US military installations on Guam and CNMI, with emphasis on two primary events when the Cold War went "hot," namely, the Korean and Vietnam Wars and the proximity of Guam and CNMI to these war fronts.

Steven Christopher Baker, PhD, Historian

Education

- Doctorate, History, University of Colorado, Boulder
- Master of Arts, New Mexico State University
- Bachelor of Arts, History, Texas Tech University

Summary

Dr. Baker has over 15 years of experience as a professional historian. His proficiency spans several sub-disciplines, including traditional historical research and analysis, cultural resource management, and litigation support.

Dr. Baker has conducted specialized studies of water and agriculture in the Southwest, especially as it relates to the construction of reclamation (dam) projects. Other projects he has worked on include studies of the Manhattan Project and Nuclear West, migrant railroad labor during World War II, and the role of the United States / Mexico border and the US military during the Mexican Revolution.

Dr. Baker has also undertaken a wide range of projects related to the identification and management of historic resources. He has conducted cultural resource management documentation and impacts assessments; evaluated historic buildings, districts, and structures; developed cultural resource management plans and mitigation; and designed innovative strategies to integrate new and existing regulations, policies, guidance, and resource management activities into single planning and compliance programs. Dr. Baker has performed these tasks on projects in 19 states for NASA, the Army National Guard, US Army Corps of Engineers, Department of Defense, the US Fish and Wildlife Service, National Park Service, United States Forest Service, United States Geological Survey, General Services Administration, Air National Guard, US Coast Guard, US Air Force, Colorado Springs Utilities, and Denver Housing Authority. Dr. Baker's projects include a national context study of National Guard and Reserve aircraft hangars and statewide contexts and evaluations of Cold War assets of the Georgia and Washington State Army National Guard Installations. He has also worked with the National Park Service to determine the national significance of potential NPS sites in Colorado and Texas. Dr. Baker has conducted National Register of Historic Places eligibility determinations for single buildings, boats, water conveyance structures, districts of over 200 buildings, administrative facilities, and other buildings and structures.

Dr. Baker also has experience providing expert witness services in litigation associated with federal cases relating various aspects of public lands management, rights of way (especially RS 2477 disputes), water rights, mineral management, navigability determinations, mining, and Indian policy. In this capacity, he advises attorneys on the historic aspects of the questions that the litigation encompasses.

Project Experience

Historical and Architectural Overview of Aircraft Hangars of the Reserves and National Guard Installations from World War I through the Cold War, Department of Defense Legacy Resource Management Program. Dr. Baker is a historian on the development of a national historic context for aircraft hangars serving the Army National Guard, Air National Guard, and Army, Air Force, Navy and Marine Reserves. The project includes the development of a historic context related to the national guards and reserves, narrative of hangar and aircraft development over time, analysis of building forms, explanation of NRHP evaluation criteria, and a database of hangars that might fall under the context.

Historian, Cultural Resources Evaluations Redmond and Camp Murray, WA. Dr. Baker was the lead historian and conducted historic structures evaluations of buildings at Washington Army National Guard facilities at Camp Murray and in Redmond. The project involved record searches at the Washington State Historic Preservation Office and the Washington Army National Guard Headquarters. Thirty-three buildings were evaluated and recorded. Dr. Baker was also lead author of the Historic Structures Evaluation Report, which covered the results of the evaluations as historic properties and/or Cold War resources, photo-documentation, historic context, management recommendations, and applicable historic structure evaluation forms.

Cultural Resource Specialist and Project Manager, Integrated Cultural Resource Management Plan, New Jersey Army National Guard, NJ. Dr. Baker was the Cultural Resource Specialist and lead author on the integrated cultural resources management plan, which was developed using a newly developed integrated ICRMP template. The plan addressed all known cultural resources and inadvertent discoveries, including preservation, survey, and mitigation recommendations. This New Jersey project also included the development of a photographic database of character defining elements of the state's ten historic armories. This photo database was eventually expanded to include all potentially historic properties and objects and was integrated into the New Jersey National Guard's GIS database.

Historian, Integrated Cultural Resource Management Plan, Alaska Air National Guard, AK, and Integrated Cultural Resource Management Plan, Oklahoma Air National Guard, OK. Dr. Baker was responsible for the development of historic contexts for the management, conducted the historic structure evaluations and photo-documentation, and wrote pertinent portions of the management plans.

Historian, Cultural Resources Evaluations, Washington Army National Guard, WA. Dr. Baker was the lead historian in a project with a team of cultural resource specialists that conducted a historic structures evaluation of Washington Army National Guard facilities throughout the state. The project involved record searches at the Washington State Historic Preservation Office and the Washington Army National Guard Headquarters. Fifty-six buildings were evaluated and recorded. Mr. Baker was also the lead author of the Historic Structures Evaluation Report, which covered the results of the structure evaluations as historic properties and/or Cold War resources, photo-documentation, historic context, management recommendations, and applicable historic structure evaluation forms.