UNITED STATES AIR FORCE DEFENSE SUPPRESSION DOCTRINE, 1968-1972

by

JAMES L. YOUNG, JR.

B.A., United States Military Academy, 1997

A THESIS

submitted in partial fulfillment of the requirements for the degree

MASTER OF ARTS

Department of History
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2008

Approved by:

Major Professor
Donald J. Mrozek

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Abstract

On March 30, 1972 the Democratic Republic of Vietnam (DRV) launched a conventional offensive, dubbed the Easter Offensive, against South Vietnam. In response to this act President Richard Nixon ordered the United States Air Force (USAF) and Navy (USN) to resume bombing North Vietnam. For the next nine months, USAF conducted offensive operations against the whole of the DRV in an attempt to accomplish four major objectives. First, USAF units sought to interdict sufficiently the North Vietnamese Army's (NVA's) supply lines to preclude continued conventional operations in South Vietnam. Second, President Nixon had directed the Air Force to inflict sufficient punishment on North Vietnam in order to deter further aggression against its southern neighbor. Third, as implied by the Nixon Doctrine, USAF was to establish convincingly its ability to conduct conventional operations in support of an allied nation during a major conflict. Finally, with the introduction of B-52 bombers in December 1972, the Air Force was to maintain the credibility of manned strategic aircraft as part of American nuclear deterrence policy.

Historically, the United States Air Force and many civilian observers have maintained that the United States Air Force succeeded in all four tasks. However, the evidence strongly indicates that the United States Air Force not only failed to achieve all but the interdiction objective during the course of operations against North Vietnam, but that this defeat stemmed from the decision not to develop a comprehensive Suppression of Enemy Air Defense (SEAD) doctrine from 1968 through 1972. In choosing this course of action, USAF's military and civilian leaders guaranteed that American forces would be unable to bring sufficient force to bear to achieve President Nixon's goals. Furthermore, by choosing this course of action and, in addition, refocusing the Air Force on nuclear delivery rather than enhancing USAF's capability to penetrate an integrated air defense (IADS), these same leaders ignored the results of Operation Rolling Thunder. The consequence of this choice, as will be shown in the following pages, was an outcome that had serious implications for the United States' Cold War conventional and nuclear military policy.

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Acknowledgments

No individual, regardless of how gifted they are concludes a project such as this without help. Rather than thanking the numerous individuals who helped make this project a reality, I will simply say a humble and gracious thank you to the dozens of people who aided me in ways great and small.

Dedication

To Mom and Dad for ensuring their inquisitive son was given the skills to answer his own questions and Anita for having patience when those answers were several states away.

CHAPTER 1 - A Very Unhappy Easter

On March 30, 1972 the Democratic Republic of Vietnam (DRV) launched a conventional assault, dubbed the Easter Offensive, against South Vietnam. For the first time, the North Vietnamese Army (NVA) eschewed its traditional guerilla and light-infantry oriented tactics in favor of a mechanized, multi-divisional attack against the Republic of South Vietnam. Dubbed the "Easter Offensive" by the Americans, the assault was intended to simultaneously shatter the Army of the Republic of Vietnam (ARVN), occupy South Vietnam's regional capitals and, through these two events, destabilize the South Vietnamese government.[1] In response to this act President Richard Nixon ordered United States Air Force and Navy to resume bombing North Vietnam.

For the next nine months, USAF conducted offensive operations against the whole of the DRV in an attempt to accomplish four major objectives. First, USAF sought to interdict sufficiently the North Vietnamese Army's (NVA's) supply lines to preclude continued conventional operations in South Vietnam. Second, President Nixon had directed the Air Force to inflict sufficient punishment on North Vietnam that the DRV Politburo was deterred from authorizing further aggression against South Vietnam. Third, as implied by the Nixon Doctrine, USAF was to establish convincingly its ability to conduct conventional operations in support of an allied nation during a major conflict.[2] Finally, with the introduction of B-52 bombers in December 1972, the Air Force was to maintain the credibility of manned strategic aircraft as part of American nuclear deterrence policy.

Historically, the United States Air Force and many civilian observers have maintained that the United States Air Force succeeded in all four tasks. In the mind of many Air Force

officers and authors, USAF and USN aircraft pummeled the NVA spearhead in the field, shattered the North Vietnamese supply net during Operations Freedom Train and Linebacker I, then bludgeoned and dragged a recalcitrant North Vietnam back to the peace table via Linebacker II's B-52 strikes.[3] In many circles it has become an article of faith that, but for the interference of civilian leaders, what was accomplished in 1972 could have been achieved in 1968 with the end result being an independent and viable South Vietnam.[4]

This study will illustrate that the historical evidence does not support these theories. In reality, the United States Air Force only achieved its interdiction objective, and this due primarily to the tactical application of air power in South Vietnam. During the course of 1972 operations against Vietnam (heretofore referred to as Linebacker Operations), the Air Force was unable to demonstrate convincing conventional capability, punish the North Vietnamese to deter future attacks against South Vietnam, or demonstrate that its manned bombers were still viable weapons systems. As with Operation Rolling Thunder, these shortcomings did not stem from civilian interference, but the Air Force's decision not to develop a Suppression of Enemy Air Defense (SEAD) doctrine from 1968 through 1972. The evidence presented in the following pages will clearly illustrate that the Air Force's civilian and military leaders made decisions in this area which lead directly to USAF possessing obsolescent equipment and lacking operational guidance when operations resumed against North Vietnam in 1972. As a result, by the end of Linebacker operations many observers questioned USAF's ability to penetrate an integrated air defense system (IADS). This outcome, in turn, had serious implications for the United States' conventional and nuclear military policy for the remainder of the Cold War.[5]

Historical Placement

What constitutes the Suppression of Enemy Air Defenses? This question will have various answers depending on what service, nation, or reference the asker consults. Edward Luttwak and Stuart Koehl's *The Dictionary of Modern War* defined SEAD in 1991 as "a U.S. term for weapons, tactics, and operations whose aim is to destroy or otherwise neutralize anti-aircraft guns and surface to air missiles in order to allow attack aircraft to operate more freely."[6] This definition, however, was written by USAF and intended for that service's use only.[7] In the aftermath of Operation Desert Storm, which saw engagements of immobile SAM batteries by U.S. Army artillery and the opening salvo of the war fired by U.S. Army *Apache* attack helicopters, many military professionals agreed on the need for a broader definition.[8] Although these officers were initially few in number, subsequent operations against Iraq and Serbia in the 1990s reinforced the point that all of the services had a vested interest in SEAD. Thus, in June 2004 the Department of Defense modified the definition to include "that activity that neutralizes, destroys, or temporarily degrades surface-based air defense by destructive or disruptive means."[9] Although at first reading this may appear to be a small change in wording, in military terms the second definition greatly expanded the number of systems, activities, and operations that could be included in SEAD operations.

In general, what historiography is available has followed the thrust of Luttwak and Koehl's definition when examining the history of SEAD. For example, Anthony Thornborough and Frank Mormillo's *Iron Hand: Smashing the Enemy's Air Defenses* focuses on attacks against surface-to-air missile (SAM) and gun sites during Vietnam while excluding any information on efforts to destroy the NVAF's interceptors.[10] Likewise, books which focus on aerial combat (e.g., Ivan Rendall's *Rolling Thunder*) ignore the often potent effect that ground-based defenses had on the tactics employed by both sides of the conflict.[11] Only a handful of works give a

comprehensive view (i.e., one that encompasses all aspects of the struggle) of aerial combat over North Vietnam and the majority of these do not focus on the role that the Air Force's doctrinal evolution played in its eventual defeat.[12]

This paper will break from this established historiography in several ways. First, this paper will define SEAD as actions taken to degrade, destroy, or neutralize one or multiple aspects of an air defense system, to include enemy fighters. Second, this paper will illustrate how this is an operational rather than a tactical-level military task. Third, by treating the North Vietnamese defenses as an integrated whole, this thesis will provide evidence that there were critical nodes whose destruction would have unraveled the entire system. Fourth, it will illustrate that the United States Air Force was incapable of detecting, identifying, and destroying these nodes from 1965 through 1968. Fifth, it will show that it was this weakness, not civilian interference, that that led to the extraordinary losses of Operation Rolling Thunder. Sixth, it will present evidence showing that the Air Force's leaders, rather than drawing on these experiences, instead made an informed decision not change USAF's SEAD doctrine. Finally, as noted, the following pages will demonstrate that this unwillingness to change resulted in the Air Force's defeat during the Linebacker Operations in 1972.

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[1]Michael Maclear, *Vietnam: The Ten Thousand Day War, 1945-1975* (New York: St. Martin's Press, 1981), 304-305; John Pimlott, *Vietnam: The Decisive Battles* (London: Marshall Editions, 1997; Edison, New Jersey: 2003), 160-171; Stephen P. Randolph, *Powerful and Brutal Weapons: Nixon, Kissinger, and the Easter Offensive* (Cambridge, Massachusetts: Harvard University Press, 2007),, 22-31; John Schlight, "Vietnamization and Withdrawal, 1968-1975," *Winged Shield, Winged Sword: A History of the United States Air Force, Volume II, 1950-1997*, Bernard C. Nalty, ed. (Washington, D.C.: Air Force History and Museums Program, 1997), 295-336; and Lieutenant Colonel James H. Willbanks, USA ret., *Thiet Giap!: The Battle of An Loc, April 1972* (Fort Leavenworth, KS: Combat Studies Institute, 1993), 3.

[2] Richard Nixon, *The Memoirs of Richard Nixon* (New York: Grosset & Dunlap, 1978), 394-395 and 588.

[3] For examples of Air Force publications promulgating this viewpoint, see Porter, *Linebacker: Overview* 53-55 and 57-69; James R. McCarthy, Brig. Gen., USAF and George B. Allison, Ltc. USAF, *Linebacker II: A View from the Rock*, USAF Southeast Asia Monograph Series, ed. Colonel Robert E. Rayfield (USAF), Volume VI,

Monograph 8 (Maxwell AFB, AL: 1979; Washington, D.C.: Office of Air Force History, 1985); Colonel Mike Worden's *Rise of the Fighter Generals: The Problem of Air Force Leaders, 1945-1982* (Maxwell AFB, AL: Air University Press, 1998), 196-198; or Thomas C. Hone "Strategic Bombing Constrained: Korea and Vietnam," *Case Studies in Strategic Bombardment*, R. Cargill Hall, ed. (Washington, D.C.: Center for Air Force History, 1998), 469-526 with particular attention paid to 517-520.

[4] Earl H. Tilford Jr., *Setup: What the Air Force Did in Vietnam and Why* (Maxwell AFB, Alabama: Air University Press, June 1991), 288-297; Clodfelter, 201-202 and 207-210.

[5] At a minimum, there were serious questions as to the American military's ability to fulfill the United States' NATO obligations or carry out limited nuclear strikes against the Soviet Union using SAC's bombers.

[6] Edward Luttwak and Stuart Koehl, *The Dictionary of Modern War* (New York: Harpers-Collins, 1991), 514.

[7] Ibid..

[8] James R. Brungess, Lt. Col., USAF, *Setting the Context: Suppression of Enemy Air Defenses and Joint War Fighting in an Uncertain World* (Maxwell Air Force Base, Alabama: Air University Press, 1994), 35-47.

[9] Department of Defense, Joint Publication 1-02, *Dictionary of Military and Associated Terms April 2001 (As Amended Through 9 June 2004)* (Washington, D.C., 2004), 513.

[10] Anthony M. Thornborough and Frank B. Mormillo, *Iron Hand: Smashing the Enemy's Air Defences* with Tony Cassanova & Kevin Jackson (Somerset, England: Patrick Stephens Limited, 2002; Reprint Sparkford, England: Sutton Publishing, 2002). All subsequent page citations are to the reprint edition. Further research does not indicate why there was a reprint published in the same year as the original.

[11] Ivan Rendall, *Rolling Thunder: Jet Combat From World War II to the Gulf War* (New York: Dell Books, 1997).

[12] Examples of work which provide this view are Michael L. Michel III's *Clashes: Air Combat Over Vietnam, 1965-1972* (Annapolis, Maryland: Naval Institute Press, 1997) and Craig C. Hannah's *Striving For Air Superiority: The Tactical Air Command in Vietnam*, Texas A&M Military History Series #76, Joseph G. Dawson III, Ed., (College Station, Texas: Texas A&M University Press, 2002).

CHAPTER 2 - The Importance of Doctrine

First, it is important to properly define doctrine. As with SEAD, there are numerous opinions on what exactly this simple word encompasses. For example, *The Dictionary of Modern War* states that doctrine consists of "[o]fficially enunciated principles meant to guide the employment of military forces under specified conditions."[1] The current Department of Defense dictionary, Joint Publication 1-02, considers doctrine to be "[f]undamental principles by which military forces or elements thereof guide their actions in support of national objectives."[2] This study will combine these definitions to consider doctrine as a military organization's methodology for the conduct of war in support of specific operational and strategic objectives.

The importance of doctrine is clear from the definitions above. Without a doctrinal template, the vagaries of war can rapidly reduce a powerful military force to an undisciplined mob. In contrast, a military force that enjoys a well-developed, flexible, and widely disseminated doctrine is able to rapidly shift forces and change its force structure in order to meet a variety of threats. Therefore, once senior leaders decide upon a doctrine, it is incumbent on a military service to ensure that these guiding principles are widely propagated among its commanders and their staff. This way, in case of a conflict, there will not be a period where disparate units have to figure out methods for accomplishing their tasks. An effective military doctrine combined with rigorous training minimizes the effect of friction or unforeseen events. In contrast, an ineffective or rigid doctrine often leads to rapid, repeated defeats and, in most cases, to losing the war.

USAF Doctrine, 1953-1960

In order to understand how USAF reached its doctrinal nadir in Vietnam, it is necessary to explain doctrinal development in the previous decade. From 1953-1960, the civilian leaders of the United States provided the Air Force with contradictory guidance on how it wished to employ USAF against the threat of Communism. This confusion was understandable, as the Air Force had only become a separate service in 1947 and initially been brandished as a "big stick" during the period of America's atomic monopoly. However, with the Soviet Union's atomic detonation in 1949, China's transition to Communism that same year, and the subsequent Korean War (1950-1953), this strategic equation changed before the Air Force had a chance to fully develop as a separate service.

Thus, in June 1953, both the Air Force and the nation as a whole stood at a civil-military crossroads. On one hand, the Korean War had indicated that there could be conflicts between American and Communist forces that did not result in World War III. Those who adhered to this view believed that the military should be prepared to conduct operations at all levels of warfare rather than simply believing similar crises would not happen again. On the other hand, there were arguments that it was the United States' trepidation and lack of resolve which had led to the Korean War's inconclusive ending. Military officers and civilians who held this view pointed out that it had merely taken President Eisenhower hinting that he would use atomic weapons to bring an end to the Korean War. With the advances in weapons technology brought out by thermonuclear weapons, the United States would be able to prevent Communist incursions by developing forces which were capable of holding the Soviet Union itself hostage. Should war break out the United States, led primarily by Strategic Air Command (SAC), would strike quickly, violently, and decisively before the U.S.S.R. could respond.

In his first term, President Eisenhower chose to maintain the cheaper option—keeping a strong nuclear capability while maintaining a relatively small conventional ground force. The latter would, in the most likely scenarios, be provided by the nation being attacked by Communist forces. Dubbed Massive Retaliation, Eisenhower's doctrine was intended to prevent the United States from having to undertake the fiscal burden of maintaining both a large conventional force and an effective nuclear striking arm.[3] Put very simply, the American military would let its allies' absorb the brunt of a conventional assault by the Soviet Union's proxies. Should the U.S.S.R. assault America's allies itself or threaten the use of nuclear weapons, it would in turn be destroyed by the United States Air Force's bombers.[4]

Peacetime or Armageddon

This civilian guidance had a profound effect on Air Force doctrine. Led primarily by former bomber leaders Nathan F. Twining, Thomas D. White, and Curtis E. LeMay, the Air Force rewrote its doctrine with a heavy focus on nuclear delivery.[5] A layman reading the 1953 edition of the Air Force's doctrine, AFM 1-3 *Theater Operations*, could have easily believed that the Korean War had not occurred. Generals Twining and LeMay both realized that nuclear warfare, more than any other type in history, rewarded the side that struck first and hardest. Unlike World War II, a potential World War III would not allow the United States a period in which it could absorb blows while marshaling its strength. Therefore, AFM 1-3 emphasized the offensive at all levels, from the operational to the strategic. In the view of the document's authors and the leaders who approved it, the United States Air Force was expected to operate as a homogenous force whose operations were decisive in their own right.[6]

This decisive approach to operations, unfortunately for the Air Force, created a singular view of future conflicts. Regardless of the location, once the Soviet Union or proxy struck at a U.S. ally, the United States would be required to respond with a nuclear attack. In the early stages of a potential conflict, USAF would seek to deliver its arsenal against the Communist bloc's military, industrial, and political infrastructure. The Air Force would carry out this attack with great speed and violence in order to prevent the U.S.S.R. from turning a planned decisive victory into a Pyrrhic triumph by virtue of a nuclear counterstrike. Beginning with the periphery of the Soviet Union, USAF forces would strike at theater-level targets both to destroy their opposite numbers on the ground and to prevent the easy movement of hostile forces.[7] Once this task was complete, SAC would strike at the Communist bloc's "heartland" (i.e., the People's Republic of China and U.S.S.R. proper) and complete the conflict. Whereas World War II had taken a matter of years, Air Force leaders believed that this entire sequence would be complete in a matter of hours.[8]

Organizationally, this mindset meant that there was little need for tactical aircraft. Despite having just fought the Korean War, General Twining fervently believed there was no place for tactical aircraft in the Air Force. USAF leaders thought that there was no real place for close air support when they only intended to develop more advanced nuclear ordnance and delivery platforms for the foreseeable future. Since both the Army and Marine Corps were procuring their own tactical systems for use on the nuclear battlefield, Twining's logic went, Air Force efforts to deliver atomic CAS would be both duplicative and unwelcome.[9] If the Army and Marines were engaging first- and second-echelon forces with atomic howitzers and rockets, Twining and the Air Staff asked, what point was there in the Air Force maintaining capability to destroy these same forces?[10] With neither of the other services providing a satisfactory answer,

the Air Force seized the opportunity to reduce their attention to close air support in order to maximize their striking potential.

Similarly, the Air Force questioned the logic of maintaining air superiority fighters. Buying these craft, maintaining the airframes, and training the crews meant less money for USAF to spend on bombers. Given that Air Force planners believed that it was impossible to defend against a properly executed nuclear bombing force, the best technique for air defense seemed to be smashing the enemy air force on the ground. Although there were notional mentions of theater air defense in AFM 1-3, in reality Twining and other Air Force leaders believed the best defense was to reduce hostile airbases to irradiated craters as soon as the war began. Therefore, once again, it made no sense for the active duty component of the Air Force to maintain tactical fighters, especially as these airframes would come at the expense of bombers.[11]

Finally, and most importantly, Twining, White and LeMay all fervently believed in constructing an Air Force which focused solely on this nuclear mission at the expense of all others. All three men thought that this specialization was vital to American security, as they were unified in their belief that deterrence was the key to America's future. Only if the Soviet Union's leaders were certain that a future war would mean their immolation, their logic ran, would the Politburo be convinced to renounce aggression as a means for advancing communism. Twining, as Air Force Chief of Staff during the first Eisenhower Administration, posited to all who would listen that the Air Force was uniquely equipped to ensure this outcome. Therefore, Twining continued on to argue not only that the Air Force should continue to receive the lion's share of the military budget but also that it should be relieved of the requirement to train for other missions. Anything else, at least in the view of Twining, White, and the bellicose LeMay, was certain to lead to a decline in the Air Force's capability and, eventually, war.

Whither SEAD?

The other services, as well the Pentagon's civilian leaders, did not share in Twining's logic. For this and various other reasons, the other service chiefs, civilian secretaries, and the Secretary of Defense all thwarted General Twining's attempts to eliminate TAC.[12] However, while the smaller Air Force command continued to exist in name, General Twining and his successors, White and LeMay, did their level best to destroy its tactical capability. The first step in this process was to change TAC's leaders, beginning with the replacement of former fighter pilot General Frank F. Everett with a SAC officer, General Walter Sweeney.[13] The second was to force TAC to focus on the nuclear delivery mission in training, exercises, and real world alerts.[14] Finally, White and LeMay directed TAC to procure new airframes and equipment that emphasized nuclear delivery over its traditional missions of attaining air superiority, battlefield air interdiction, and close air support.

This emphasis had many negative effects on the Air Force on a whole. Nowhere was this more apparent than in the utter stagnation of SEAD doctrine. At the beginning of Twining's tenure as Chief of Staff, active air defense consisted of three basic components.[15] The simplest of these was the ubiquitous anti-aircraft gun, ranging from small-arms caliber machine guns through large-caliber, high-angle cannon. Although easy to produce, the tracking errors inherent to attempting to engage high-speed, maneuverable targets greatly limited guns' capabilities.[16] As operational experience had shown the Air Force in Korea, jet aircraft's greater speed enhanced this advantage. Although there were many other mitigating factors that contributed to jets' lower loss rates in the last two years of the Korean War, the lesson the Air Force took away from that conflict was that optically-aimed anti-aircraft artillery (AAA) was a lethal nuisance but hardly a major threat.[17]

Fighters, as the second component of air defense in the early 1950s, were likewise lightly regarded by the Air Force's planners. Although USAF had been unpleasantly surprised by the advanced MiG-15, once F-86 *Sabres* were introduced American fighters rapidly achieved a kill ratio of 8 to 10 MiGs for every U.N. aircraft destroyed.[18] Since in many cases Chinese or Soviet "volunteers" had flown the MiGs, Air Force planners believed that USAF's advantages in training would hold over to any potential nuclear conflict. Furthermore, the American aerospace industry was perceived as making far more rapid advances in technology than their Soviet counterparts due to the regular breakage of altitude and speed records by USAF. Finally, the regular penetration and evasion of Soviet interceptors by U.S. reconnaissance aircraft led to a contemptuous attitude of among many of the Air Force's leaders (and, to be honest, their civilian superiors).[19] When obsolescent, subsonic bombers were regularly bringing back pictures of the U.S.S.R.'s Ural Mountains industrial complexes or flying over Vladivostok in broad daylight, it is not hard to understand why this occurred.

Part of the reason for these easy penetrations had to do with the state of the third component, radar, in the Soviet Union. The Soviet Union had entered World War II without radar and had few indigenous systems by the end of that conflict. Even with the rapid advances made possible by the absorption of German research, Soviet radars remained far behind those of the United States. Therefore, the early systems were too bulky, temperamental, or fragile for use with forward troops and thus limited to stationing around major cities or industrial areas. In this role the radars remained extremely susceptible to simple countermeasures such as chaff, had problems providing tracking information against fast-moving targets, and could not detect aircraft flying at low altitude.[20]

Combined, the weakness inherent in the three components meant that USAF planners did not develop a SEAD doctrine because they did not see the purpose. With the adoption of massive retaliation as national policy, the Air Force believed its capabilities and equipment guaranteed a short war rather than protracted conflict. To Twining, LeMay, and their peers this meant that, at most, TAC aircraft would have to fly three sorties—one to their dispersal airfields, one to catalytic phase targets, then one more to whatever targets were assigned to them during the general war phase of a nuclear conflict.[21] Air Force planners generally assumed that Soviet defenses would attrit the aircraft during the catalytic phase at the same rate as their Communist counterparts had in Korea, which meant that over 99% would survive the first strike and be available for "heartland" operations.[22] Even in a less favorable scenario, e.g., if Soviet defenses and the vagaries of nuclear warfare translated to a loss rate ten times that of Korea, TAC's availability rate for "heartland" operations would be over 98%.

This analysis and similar studies of loss rates likely explain a lack of Air Force SEAD doctrine through 1955. When doing absolutely nothing to suppress enemy air defenses still meant over 98% of a strike force would survive the entire conflict, what logical reason was there for spending training and acquisition dollars on SEAD? There wasn't any, at least not as long as the assumptions behind USAF doctrine remained valid. From 1953 through 1956, General Twining and his successor, General White, had no reason to believe that American Cold War strategy, available aerospace technology or, most importantly of all, the Soviet Union's technological capabilities would undergo major changes. With the reelection of Dwight D. Eisenhower in November 1956, the Air Force seemed poised to retain its primacy in U.S. military affairs. From this perspective there was no need to write an overarching SEAD

doctrine, as no additional guidance was necessary—the Air Force's leaders believed their way of war would be successful.

Harbingers of Change

As with many other large military organizations throughout history, the Air Force clung to this perspective even as the foundations upon which it was built shifted from 1956 through 1965. First, the Soviet Union chose an asymmetric approach to solving the problem of America's strategic superiority. Rather than attempting to match SAC's strength in bombers, aircrew proficiency, and infrastructure the Soviet Union chose to invest in the development of intercontinental ballistic missiles (ICBMs). With the launch of Sputnik I (October 4, 1957) the Soviet Union demonstrated a nascent ability to deliver nuclear warheads throughout the continental United States. By combining their space coup with a successful propaganda campaign that greatly exaggerated the size of their bomber fleet, the U.S.S.R.'s leaders forced a radical change in American policy. Alarmed by the seemingly overnight development of Soviet missiles and production of a fleet of heavy bombers, President Eisenhower and his advisors became convinced that massive retaliation was untenable as a national policy. In these men's minds it was one thing to engage in a brutal, but one-sided, nuclear clubbing that would eliminate the Communist threat once and for all. It was quite another to engage in a war whose "victor" would be only marginally better off than the "vanquished."[23]

President Eisenhower directed the Air Force to begin developing countermeasures to the Soviets' perceived bomber capability. Unfortunately, in the absence of firm guidance and with General Twining (now serving as Chairman of the Joint Chiefs of Staff) providing political cover to General White, the Air Force only nominally met President Eisenhower's intent. First,

General White suggested increasing the production of B-52s rather than the Air Force investing heavily in ICBMs of their own. Second, White argued for the abolition of Air Defense Command, as he believed that the sheer number of Soviet bombers would preclude a successful air defense of the United States. Finally, General White, ably assisted by General LeMay, attempted to convince Congress of the necessity of investing in the modernization of the existing B-52 fleet.[24]

Although these machinations may appear to have only a tenuous relationship to SEAD doctrine, their devastating effect belied their seeming obliquity. First, in order to pay for more B-52s the Air Force had to make cuts in TAC's training across the board. This fiscal slashing grew even more pronounced when the Eisenhower Administration forced General White to increase funding for ICBM development and the expansion of Air Defense Command.[25] Second, due to the expansion of Air Defense Command and prominence of the interception over the air superiority mission, Air Force began to rely more and more upon missile armament for its fighters. As tests with these new weapons indicated that they were capable of achieving a probability kill (P_k) in excess of 80% per round, USAF's leaders saw another opportunity to reduce costs by reducing air combat maneuver (ACM) training. This decision also had the secondary benefit of reducing training crashes and thus providing another cost-saving measure.[26] Finally, with the heavy emphasis on ensuring that the bomber fleet was capable of penetrating Soviet air space there was little incentive for the aerospace industry to develop smaller penetration aids for fighters.[27]

The need for penetration aids was readily apparent by 1960. The late 1950s saw a technological renaissance with regard to the development of surface-to-air missile systems. Realizing that they had to protect their carriers, the United States Navy had developed their

famous triad of *Talos*, *Terrier*, and *Tartar* systems. Likewise, after being informed the Air Force would not be responsible for front line air defense due to TAC's nuclear role, the U.S. Army developed the *HAWK* system for tactical use and continued the development of the *Nike* family for strategic air defense.[28] Even excluding the Air Force's own abortive *Bomarc* program, there were over a half-dozen completed or soon to be fielded surface-to-air missile programs within the United States inventory alone. If one added only the systems available in the rest of the West, the number of systems that would be available by 1960 became over a dozen.

The world's militaries, by expending so much effort in fielding viable SAMs, pushed anti-aircraft technology into a new era. There is no document that illuminates why the Air Force failed to consider this burgeoning threat in its doctrine. However, the available evidence provides some clues. Given General Twining, White, and LeMay's belief with regard to the possibility of successfully defending the United States, it is unlikely that they believed the Soviet Union could field an effective air defense system themselves.[29] Even if the Soviet Union tried, however, Air Force leaders were probably of the opinion that the system's components would, for various reasons, be limited to use within the U.S.S.R.. Therefore, countering such a system remained a strategic problem and therefore not something that should concern TAC or those required to employ TAC's aircraft.

This elevation to the strategic level ensured that USAF SEAD doctrine would remain stillborn due to SAC's capabilities. By 1960, all B-52s were capable of being armed with the *Hound Dog* missile and were projected to be equipped with the advanced *Skybolt* system. Both of these weapons had a range far in advance of any known or projected SAM system on either side of the Iron Curtain. Although their operators could shuffle them between prepared positions, the majority of SAMs in the late 1950s could only be fired from prepared, immobile

sites. In case of a general war, B-52s possessing recent intelligence photographs would be able to neutralize these immobile systems from over the radar horizon. Therefore, SAMs were not a problem and thus did not need to be addressed in doctrine.

Even the loss of Francis Gary Powers' U-2 on May 1, 1960, to Soviet SAMs had little discernible effect on the Air Force's stance. Other than directing B-52s to begin preparing for low-level ingress as they approached their targets, the Air Force did not view this first successful use of SAMs as an incident requiring fundamental changes in how it viewed the air defense environment. Given that the U-2 possessed no electronic countermeasures, flew at relatively slow speeds, and had been at high altitude when it was shot down, the Air Force planners likely believed that changing the B-52s profile was sufficient. Such reasoning was sound, but it served to indicate a continued focus on the nuclear mission despite President Eisenhower's guidance.

Further illustrating this trend was the Air Force's continued belief in civilian leaders' unwillingness to engage in limited conflict. Beginning with the Quemoy crisis in 1955, the Eisenhower Administration demonstrated that it was willing to deploy Air Force units in order to demonstrate American resolve. In most cases (e.g., the Hungarian, Suez, and Quemoy Crises) this did not result in fighting.[30] In the Formosa Crisis of August 1958, however, USAF fighter pilots joined the forces of Nationalist Taiwan in engaging Communist Chinese pilots in air-to-air combat.[31] Despite the overt and direct engagement of U.S. forces by a Communist nation and increased tensions, President Eisenhower did not begin the strategic conflagration that White and Lemay believed would naturally follow from an exchange of fire. Instead, as noted in the Air Force's official history, "[General White] declared the ominous presence of the Strategic Air Command forced the People's Republic of China to suspend operations" against Nationalist Taiwan.[32] In light of this world view, the development of SEAD doctrine was both unwarranted

and unnecessary. As will be shown, the negative impact of these beliefs would be both far reaching and long-lasting with regard to SEAD doctrine. It would take the crucible of war to jar the Air Force's leaders out of its wholly nuclear focus.

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[1] Luttwak and Koehl, 170.

[2] Joint Publication 1-02, 165.

[3] Stephen Budiansky, *Air Power: The Men, Machines, and Ideas That Revolutionized War, From Kitty Hawk to Gulf War II* (New York: Viking Books, 2004), 364-368; Warren A. Trest, *Air Force Roles and Missions: A History* (Washington, D.C.: Air Force History and Museums Program, 1998), 151-153; Gaddis, 66-68; Luttwak and Koehl, 381-382; Nixon, 376-377; and Tilford, 24-30.

[4] This is a rather large simplification of Massive Retaliation's salient points.

[5] General Twining served as Air Force Chief of Staff from 1953 through 1957. General White served as Vice Chief of Staff under Twining than became Chief of Staff from 1957 through 1961. General LeMay, perhaps the most famous and influential officer in Air Force history, served as Commander in Chief (CinC) Strategic Air Command (1948 through 1957), Vice Chief of Staff of the Air Force (1957 through 1961), then as Chief of Staff from 1961 through 1968.

[6] Department of the Air Force, AFM 1-3, *Theater Air Operations*, 1 September 1953 ed. (Washington, D.C.: Department of the Air Force, 1953), 6

[7] Ibid., 6, and 20-23.

[8] Walter J. Boyne, *Beyond the Wild Blue: A History of the United States Air Force, 1947-2007*, 2nd ed. (New York: Thomas Dunne Books, 2007), 99-113 and Budiansky, 361-368.

[9] Trest, 176-177 and Worden, 74-79.

[10] Robert Frank Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, Volume 1, 1907-1960* (Maxwell AFB, Alabama: Air University Press, 1971; Washington, D.C.: Government Reprints Press, 2002), 440-443; Boyne, *Wild Blue*, 101-110 and Trest, 171-177.

[11] Walter S. Moody and Warren A. Trest, "The Air Force as an Institution," *Winged Shield, Winged Sword: A History of the United States Air Force, Vol. II: 1950-1997*, Bernard C. Nalty, ed. (Washington, D.C.: Center for Air Force History, 1997), 97-128 and Barrett Tillman, *LeMay*, The Great Generals Series, ed. Wesley K. Clark, USA (ret.) (New York: Palgrave MacMillan, 2007), 123-125.

[12] Walter S. Moody and Warren A. Trest, "Containing Communism," *Winged Shield, Winged Sword: A History of the United States Air Force, Vol. II: 1950-1997*, Bernard C. Nalty, ed. (Washington, D.C.: Center for Air Force History, 1997), 129-160.

[13] Worden, 104-105.

[14] Cleo M. Bishop, Brig. Gen., USAF (ret.), interview by Lt. Colonel J.N. Dick, Jr., USAF, 7-8 July 1976 U.S. Air Force Oral History Program, Albert F. Simpson Historical Research Center, 84-86.

[15] In this case, "dedicated air defense" is used to differentiate both from passive (e.g., camouflage, smoke pots, etc.) and protective (e.g., an attacked ground unit hastily responding with whatever weapons are at its disposal) air defense.

[16] Kenneth P. Werrell, *Archie, Flak, AAA and SAM* (Maxwell Air Force Base: Air University Press, 1988), 71-81.

[17] Conrad C. Crane *American Air power Strategy In Korea, 1950-1953*, Modern War Studies, ed. Theodore A. Wilson (Lawrence, KS: University Press of Kansas, 2000), 136 and Werrell, *Archie*, 74-81. It could be argued that better coordination between U.N. artillery and Air Force sorties contributed as much as jets' inherent speed to lower losses in the last two years. It was common practice for artillery to fire suppressive barrages when an Air Force flight reported it had arrived on station.

[18]Ivan Rendall, *Rolling Thunder: Jet Combat From World War II to the Gulf War* (New York: Dell Books, 1997), 72-110; Michael Spick, *Fighter Pilot Tactics: The Techniques of Daylight Air Combat* (New York: Stein and Day Publishers, 1983), 120-131; Xiaoming Zhang, *Red Wings Over the Yalu: China, the Soviet Union, and the Air War in Korea*, Texas A&M Military History Series #80, Joseph G. Dawson III, Ed., (College Station, Texas: Texas A&M University Press, 2002), 201-206.

[19] Tillman, *LeMay*, 124-126.

[20] James D. Crabtree, *On Air Defense*, The Military Profession Series, ed. Bruce Gudmundsson, (Westport, Connecticut Bing: Praeger Publishers, 1994), 101-108 and Daniel Goure, "Securing the Skies of the Motherland: Soviet Strategic Air Defenses," *Strategic Air Defense*, Stephen J. Cimbala, ed., (Wilmington, Delaware: Scholarly Resources, Inc., 1989), 161-202.

[21] Budiansky, 362-367 and John R. Carter's *The Cult of the Offensive*, CADRE Papers (Maxwell AFB, AL: Air University Press, October 1998), 65-88. A catalytic war is one that provokes a higher level of conflict than that which either participant desired. Both General LeMay and his successor at SAC, General Thomas S. Power, were repeatedly quoted as believing that a conflict, if one had arisen, should have been taken to the strategic level as soon as possible to American strength in that arena. .

[22] Werrell, *Archie*, 75 cites these rates at ".18% in 1950 to .07 percent in 1953."

[23] John Lewis Gaddis, *The Cold War: A New History* (New York: Penguin Press, 2005), 66-70; Trest, 180-186.

[24] Kenneth Schaffel, "The U.S. Air Force's Philosophy of Strategic Defense: A Historical Overview," *Strategic Air Defense*, Stephen J. Cimbala, ed., (Wilmington, Delaware: Scholarly Resources, Inc., 1989), 3-22; Tilford, 31-32; Tillman, *LeMay*, 130-145; and Trest, 160-163. The Soviet display was one of the greatest ruses in history as, in reality, their manned bomber fleet was estimated to number less than 200 airframes capable of reaching the United States. Thus, it is likely that General Twining and General LeMay, though incorrect in their reasoning, were justified in claiming that Air Defense Command was a waste of budgetary dollars.

[25] Boyne, *Wild Blue*, 113-123 and 132-136; Futrell, *Vol. I*, 488-504 and 520-523; and Trest, 180-186.

[26] Michael Spick, *All-Weather Warriors: The Search for the Ultimate Fighter Aircraft* (London: Arms and Armour Press, 1994), 128-129; James E. Whitt, Major, USAF, "F-4 Employment of Air To Air Missiles In Southeast Asia: A Special Report," Project CORONA HARVEST, February 1970 (Maxwell AFB: Albert F. Simpson Historical Research Archives, Declassifed 20 NOV 1987), 18, Budiansky, 391 and Worden, 104-108. Whitt not only served as a test pilot during the tests in question, but was also an Air Defense Command instructor on many of the missiles systems he discusses.

[27]Craig C. Hannah, *Striving For Air Superiority: The Tactical Air Command in Vietnam*, Texas A&M Military History Series #76, Joseph G. Dawson III, Ed., (College Station, Texas: Texas A&M University Press, 2002), 74-78.

[28] Luttwak and Koehl, 247-248 (*Ganef*), 257 (*Goa*), 277-278 (*HAWK*), 599 (*Talos*), 604-605 (*Tartar*), and 607-608 (*Terrier*).

[29] Futrell, *Ideas Vol. I*, 532-538 and Trest, 161-163.

[30] Moody and Trest, 144-154.

[31] Tommy H. Thomason, *U.S. Naval Air Superiority: Development of Shipborne Jet Fighters, 1943-1962* (North Branch, MN: Specialty Press, 2007), 85 and Michael Spick, *Fighter Pilot Tactics: The Techniques of Daylight Air Combat* (New York: Stein and Day Publishers, 1983), 140-141.

[32] Moody and Trest, 157.

CHAPTER 3 - A Pressing Need for SEAD: Operation Rolling Thunder

Air Force doctrine, for the most part, did not change from 1958 until 1965. There were, however, several major external events that affected both the Air Force in general and the development of SEAD doctrine in particular. First and foremost, Senator John F. Kennedy won the 1960 Presidential Election over Eisenhower's Vice President, Richard Nixon. The former had railed against a "missile gap" his entire campaign and, even more importantly, believed that the President of the United States should have a wide range of military options at his disposal in order to carry out America's Cold War strategy. Once Kennedy assumed office, he found not only that was the "missile gap" was a myth but that President Eisenhower's 1958 reforms had already begun the process of alleviating any actual or perceived strategic vulnerabilities for the foreseeable future. With the exception of forcing the services to eliminate redundancy in targeting, President Kennedy needed to take little action.[1]

The issue of having a wide range of options, however, proved far harder to deal with. In order to accomplish the necessary reforms within the Department of Defense, President Kennedy appointed Robert S. McNamara as Secretary of Defense. Confident (some would say arrogant), possessing a fine mind for detail, and almost fanatical in his faith in analytical research, McNamara had made his reputation as a Ford auto executive.[2] Taking the office shortly before General LeMay became Chief of Staff of the Air Force, McNamara wasted little time in starting his process of shaping the Pentagon to Kennedy's will. After examining the Pentagon's war plans, the Secretary of Defense perceived that the services were still too focused on the nuclear mission and acted decisively to rectify this problem. Although the Army, Navy, and Marines all suffered blows to cherished programs, the Air Force suffered the most by far. Within the first

year of taking office, McNamara killed the successor to the B-52 (XB-70), cancelled the advanced *Skybolt* missile, cut planned B-52 production, and forced the Air Force to accept cost-saving measures that would allow the realignment of the nation's other armed services.[3]

General LeMay, as Air Force Chief of Staff, fiercely resisted these measures in private. The remainder of the Air Force's leaders closed rank behind their Chief of Staff. In closed hearings, General LeMay and his subordinates testified that the planned cuts would weaken Strategic Air Command's bomber fleet and, by extension, the United States. In public, the Air Force commissioned several studies that contradicted the research of civilian organizations (e.g., the RAND Corporation). Having resisted the Eisenhower Administration's attempts at forcing the Air Force to prepare for a wider range of conflict and believing their doctrine to be the only method to keep America safe, USAF's flag officers spent the first two years of the Kennedy Administration attempting to force their civilian leaders to conform to their view of how best to employ the United States' military power rather than vice versa.[4]

The State of the Air Force, February 1965

These efforts, in addition to bordering on insubordination, were a spectacular failure. With regard to the Air Force in general, the flag officers' revolt justifiably ended LeMay's career (he was only extended a single year in the name of political expediency) and, much less reasonably, destroyed what little influence the Air Force had with the overbearing McNamara.[5] Doctrinally, the energy expended meant that the Air Force was unable to develop new conventional doctrine before USAF was fully committed against North Vietnam in February 1965. TAC, as the primary conventional component of the Air Force, went to war with doctrine that the Air Force had promulgated at the conclusion of the Korean War. Its pilots, due to their

continued focus on the nuclear delivery mission, were wholly unprepared to conduct conventional operations. There was no discussion of even rudimentary SEAD tactics at the wing and squadron level, and the majority of the pilots were largely unaware of the advances made in anti-aircraft technology.[6] Unlike their Navy counterparts, the majority of whom had at least been exposed to air defense radars due to task force training operations, these men lacked any understanding of SAM or radar-directed gunfire's capabilities. As noted by an Air Force monograph, in 1965 "over 50 percent of fighter pilots had more 2,000 total flying," yet many of these men were woefully inexperienced in the practical application of firepower in a modern air defense environment when Rolling Thunder began.[7]

Exacerbating TAC's poor level of conventional training was the unsuitability of its equipment. Although there were several other types still in service, TAC's two primary aircraft in February 1965 were the Republic F-105 *Thunderchief* and the McDonnell Douglas F-4 *Phantom*. The former, a massive strike fighter from Republic Aviation, epitomized both the overwhelming influence of the nuclear mission and the dearth of SEAD doctrine in the Air Force. Developed to deliver a single nuclear weapon to a target deep within an opponent's territory, the F-105 was the fastest aircraft in the world below 10,000 feet.[8] When the Air Force selected the aircraft for production in the 1950s, Air Force planners had believed that its speed and terrain-masking tactics would allow the fighter to evade guns and outrun fighters. Although this position was arguable in 1958 when TAC began large-scale fielding of the *Thunderchief*, this was not the case seven years later. In 1965, an organization that had an adequate SEAD doctrine, trained in accordance with these underlying principles, and remained abreast of modern air defense technology might have realized that the F-105 had several major vulnerabilities. USAF did not meet any of these descriptions, and therefore its leaders did not consider the

Thunderchief's lack of an internal jammer, radar warning systems, or even simple active protective systems (e.g., chaff) as major shortcomings.[9] Instead, they believed that TAC's *Thunderchiefs* would be able to carry out their nuclear attacks with little difficulty.

The Air Force similarly failed to apply critical thought to the *Phantom*. In the F-4's case, this lapse was somewhat understandable, as it was originally a United States Navy interceptor. Secretary McNamara, believing that there was too much duplication in the Pentagon, saw in the *Phantom* an opportunity to both save defense dollars and increase the Air Force's conventional capability.[10] The Air Force, once Secretary McNamara informed its leaders they had little choice in the matter, was quick to extol the *Phantom*'s virtues and accept the aircraft as just perfect for TAC's fighter mission.[11] This was partially true, as the *Phantom* was fast, had a powerful radar, and could carry eight missiles that had performed extraordinarily well in tests. However, like the F-105 it lacked internal avionics that would have allowed it to detect, jam, or spoof enemy radars and SAMs. Even worse, given its alleged focus on enemy fighter aircraft, once it expended its missile armament the F-4 lacked an internal gun with which to continue the engagement.[12] As the *Phantom*'s AIM-9 *Sidewinder*s and AIM-7 *Sparrow*s continued to enjoy high success rates in tests, the fighters' operators did not see this as a problem in 1965.[13] Air Force leaders, it appeared, did not believe that combat conditions would be radically different from those in tests over the Mojave Desert and Gulf of Mexico.

Conventional Operations, Gradualism, and SEAD

In reality, the skies over North Vietnam would prove radically different from not only the Air Force's test ranges but also USAF's experiences in Korea. The United States' long, painful intervention in Southeast Asia has been well-documented elsewhere and, in the interest in space,

will not be recounted here. By February 1965, President Lyndon B. Johnson believed that it would serve America's strategic interests to intensify operations in Southeast Asia. Confident that the North Vietnamese could be intimidated into no longer providing support for the South's Viet Cong guerillas, President Johnson directed the Navy and Air Force to begin sustained aerial operations against the DRV. Whereas previous air raids had been specifically targeted reprisals, the President intended for these raids (dubbed Operational Rolling Thunder) to gradually increase pain across all of North Vietnamese society until communist leader Ho Chi Minh accepted the division of Vietnam into northern and southern halves as had been done with Korea.[14]

The Myth of Civilian Restrictions

There were many problems with how the Johnson Administration approached employing the Air Force, but the three most commonly cited when promulgating the myth of civilian interference will be dealt with here. First, President Johnson failed to elucidate a proper strategic focus. There were, according to multiple sources, four broad objectives to Operation Rolling Thunder. Johnson's primary objective was to avoid conducting an air campaign so intense that the People's Republic of China (PRC) or the Soviet Union was compelled to enter the conflict. The guidance on this, as well as the restrictions emplaced in order to prevent it, was quite clear. Less clear, however, was how an Air Force attempting to break North Vietnam's will (Rolling Thunder's second purpose) could accomplish this. Air power, rather than being a scalpel or even a vise, was a blunt object of limited scalability. Like a medieval mace, aircraft being used to "break" anything lose much of their effectiveness if the blow is limited in any way. Instead, both are most effective when swung with energetic malice and great abandon. In inhibiting the Air

Force while simultaneously exhorting them to hit harder, President Johnson and Secretary McNamara were giving seemingly contradictory orders. Moreover, there were few attempts to determine what would break the North Vietnamese people's will, how long it would have to remain broken, and whether this breakage was in the United States' long-term strategic interests.[15]

Further complicating the matter was the desire to interdict supplies flowing from North Vietnam to the Viet Cong. Not only was it not clear if there were sufficient airframes in the Pacific Theater to accomplish this task in and of itself, but adding it in addition to the above tasks put a great strain on the Hawaii-based Pacific Air Force Command (PACAF). The continued need for air assets in Korea, other commitments around the world, and the need to provide close air support in South Vietnam had already stretched USAF's resources in the Pacific. Inexplicably, men as devoted to systems analysis as McNamara or as "scientific" as the rest of his staff were unable to realize that they may have been attempting to do too much. A process as simple as reviewing previous air interdiction campaigns, the area they had covered, extrapolating the tonnage dropped, then applying this to Vietnam would likely have shown just how daunting an interdiction campaign was in and of itself. Instead of doing this, however, Johnson and McNamara simply demanded that the Air Force and Navy accomplish yet another objective in addition to the previous two. When one adds the last objective (demonstrating American resolve), it becomes abundantly clear that the Johnson Administration was operating out of its strategic depth.[16]

When coupled with the rigidity with which President Johnson and Secretary McNamara attempted to control operations, this strategic ambivalence has led to much of the intervening years' historiography blaming these two men for the many losses that followed. The Air Force,

as the service that had delivered the most ordnance and suffered the most losses, was the most vocal with its criticism. This began with relatively benign comments in CHECO reports (e.g., "JCS [Joint Chiefs of Staff] targeting practices added a distinct, and as it turned out, significant variable to tactical planning").[17] By 1971, however, the Air Force was openly critical of its former civilian masters, with another CHECO report on Operation Linebacker stating that "Rolling Thunder was conducted under severe, often crippling, restraints."[18] In 1976, General William W. Momyer, commander of the primary Air Force organization conducting strikes against North Vietnam (the 7th Air Force), stated that he "deeply resented the proscription of attacks on North Vietnamese airfields, SAM and AAA sites, and other targets."[19]

Lower-ranking officers were even harsher in their criticism. Even worse, they were public in their vitriol. For example, Colonel Jack Broughton called these restraints "sick" in his bestseller *Thud Ridge*.[20] Broughton then went on to elaborate:

> It's sick because we handcuff ourselves on tactical details. First we oversupervise and seem to feel that four-star generals have to be flight leaders and dictate the details of handling a type of machinery they have never known. Second, we have lost all sense of flexibility, and we ignore tactical surprise by insisting on repeated attacks without imagination. Third, our intelligence, and the interpretation and communication of that intelligence, is back in the Stone Age. Fourth, our conventional munitions are little improved over 1941 and those who insist on dictating the ultimate detail of their selection, fuzing and delivery do not understand or appreciate their own dictates. (This, of course, assumes that they have adequate quantities and varieties on hand to be selective.) Fifth, we have not advanced far enough in the field of meteorology to tell what we will have over the homedrome an hour from now. Our degree of accuracy on vital details like bombing winds over the target is abominable. Sixth, many of our high-level people refuse to listen to constructive criticism from people doing the job.[21]

The majority of memoirs, documents, and secondary sources written about the Vietnam War follow the thrust of the above paragraph. Indeed, if simply taken at face value, the

preponderance of books, articles, and memoirs would indicate that President Johnson and McNamara, in addition to providing poor strategic direction, completely handcuffed the military. In turn, this handcuffing is what led to the destruction of almost 1,000 American aircraft over North Vietnam from 1965 through 1968, prevented the Air Force and Navy from bringing the North Vietnamese to the peace table, and set in motion the long path that culminated in Saigon's defeat in 1975.

So prevalent and pervasive is this view that any work addressing the air war over North Vietnam must address it, and this study is no exception. To state that the civilian controls of the military were the primary cause of Rolling Thunder's ineffectiveness and heavy losses is to ignore the United States' martial tradition. As Lieutenant Colonel Ed Cobleigh put it in his own memoir *War For the Hell of It*, "[c]ivilian control of the U.S. military is a cornerstone of our democracy and must not be compromised, no matter how dire the situation."[22] Put another way, President Johnson and Secretary McNamara were acting well within their Constitutional authority and duty in sharply limiting the military's actions during Operation Rolling Thunder. It was not McNamara and Johnson's first responsibility to win the war in Vietnam but to preserve the United States. Put in the language of a different scenario, no one in the Johnson Administration was ready to trade Chicago for Saigon.

In this light, it becomes much easier to understand that Johnson and McNamara did not intend to conduct their actions in a capricious manner. Instead, both men were erring well on the side of safety in ensuring the accomplishment of their first strategic goal. Both men had observed the damage done to the nation when President Truman failed to keep General MacArthur in check during the halcyon days after the Inchon landings. Whereas in 1950 this had led to Chinese intervention and near destruction of U.N. forces on the Korean peninsula,

there was a real possibility that Russian and Chinese intervention in Vietnam could quickly lead to a broadened (and nuclear) conflict.[23] General LeMay indicating that this event would be a positive outcome by virtue of allowing a first strike on the People's Republic of China's nascent nuclear program probably did little to alleviate either President Johnson's or Secretary McNamara's fears. If one considers the civil-military climate, especially given the various crises of 1961 through 1964, it is easy to understand why the Air Force was given very clear directives and limitations.[24]

By constantly focusing on these directives, those who attempt to demonize President Johnson and McNamara almost completely ignore the process that led to the friction between those two men and their military commanders. In 1958, President Eisenhower had made it quite clear that massive retaliation was no longer the United States' overarching military policy. In 1960, his successor had run on the principle that a Chief Executive ought to have more options than defeat or mass murder. President Kennedy had then appointed a Secretary of Defense who fully understood this tasking less than a year later. Rather than going along with the reforms of either President, the Air Force had fought them tooth and nail. Furthermore, when both Presidents had responded to major crises without authorizing a first strike, Generals White and LeMay had not absorbed that conventional operations were not an anomaly. Instead, both men had respectively trumpeted to all who would listen that it was the Air Force's nuclear prowess that had allowed America to prevail.

Therefore, when President Johnson turned to air power to salvage Vietnam, it was not his restrictions that led to the savaging of U.S. aircraft. As Momyer himself stated, "self-imposed restraint has been a fact in all U.S. conflict since World War II, and obviously our hope in the age of nuclear and thermonuclear weapons is that some restraint will be exercised by all

superpowers in all future conflicts."[25] Instead, it was the decision, conscious or otherwise, of the Air Force's leaders to not acknowledge the effects that strategic parity (perceived or real) had on the conduct of American foreign policy which contributed to the service's heavy losses during Rolling Thunder. Rather than, as one Air Force officer has put it, "scream[ing] for changes to the operational conduct of the air war" the Air Force's leaders should have been finding effective ways to minimize losses in a conventional environment.[26] That they did not do so, contrary to what numerous sources imply, is no one's fault but those of the uniformed officers leading USAF.

The North Vietnamese-IADS

Rolling Thunder forcefully drove home just how far these leaders had fallen behind in understanding air defense technology. When the Air Force began striking North Vietnam, the North Vietnamese only had guns with which to repel American air strikes. Of these weapons, the overwhelming majority had been heavy machine guns or automatic cannons, with obsolescent radars controlling the few large-caliber cannons.[27] In part because of the limitations of these systems, the United States Navy and Air Force were able to destroy most of them during one week in March 1965. With the guns forced to optical control, North Vietnam lay largely supine before American air power.[28] This situation, however, rapidly changed once China and the Soviet Union chose to supply North Vietnam with weapons, equipment, and training in order to avoid losing prestige with other Third World nations. In addition to giving the appearance of aiding a fellow Communist nation, the Chinese and Soviets were also given an opportunity to test their weapons and techniques in a realistic environment versus their likely opponents.

Combined, these factors meant that the NV-IADS grew from its humble beginnings to, by 1968, the deadliest air defense network in the world outside of the Soviet Union itself.[29]

It was not merely the weapons themselves that made this network deadly but how the North Vietnamese employed them. Unsurprisingly, the North Vietnamese did not necessarily strictly adhere to either Chinese or Soviet air defense doctrine. Unlike their larger patrons, the DRV did not have extensive operational depth with which to attrit an attacking American force before it reached its target. Nor could the North Vietnamese realistically expect to project power over the Gulf of Tonkin or into Thailand. These two factors meant that the North Vietnamese could not engage in a true air superiority campaign like those waged by the major powers in World War II or, for that matter, the People's Liberation Army Air Force in northern Korea.

Counterbalancing these negatives, however, was the fact that the North Vietnamese did not have to plan for a nuclear exchange or, for that matter, a wholesale attack against their civilian population. In this same vein, even if an American air strike was successful during Rolling Thunder, there was no single facility whose loss would truly cripple the North Vietnamese war effort. Combined, these factors meant that the North Vietnamese could ensure that conditions were favorable to their forces rather than having to make every effort to stop USAF's fighters. Aiding the DRV's military in optimizing the terms of their engagement was the fact that terrain, political and military constraints, and the previously mentioned lack of operational depth served to restrict American aircraft's ingress and egress routes. Viet Cong insurgents made this problem worse by limiting the number of aircraft that could be based in South Vietnam. Unable to expand their bases in that country, the Air Force based the bulk of its strike fighters in Thailand. In addition to greatly lengthening USAF's flight time and requiring the use of SAC's tankers, this meant that the NV-IADS commanders had additional time to

marshal their resources even if they could not attack into Thai air space. With all of these conditions, the North Vietnamese elected to conduct an air denial, rather than air superiority, campaign. Just as they intended to exhaust the United States' Army in the South, the North's leaders expected to bleed the United States Air Force white as long as it attempted to strike the DRV.[30]

Command and Control

Controlling this campaign was the responsibility of the NV-IADS command and control (C^2) nodes. The most important component of the NV-IADS, these four North Vietnamese Air Defense Command sub-headquarters were located within Hanoi and Haiphong. Tasked with coordinating the movements of the other three components (anti-aircraft artillery [AAA], MiGs, and SAMs) in order to avoid fratricide and cause the most damage to American air strikes, each center was commanded by a flag officer of the North Vietnamese Army. Each of these command nodes, in turn, was fed information by several sub-components. First, there was an extensive network of early warning radars whose medium and high-altitude coverage extended across neighboring Laos to the west and well out into the Gulf of Tonkin to the east. By virtue of detecting American strike aircraft well in advance, these systems allowed the North Vietnamese to quickly determine the speed and direction of an approaching American strike. Second, there were numerous electronic intelligence (ELINT) and radar intercept stations that would attempt to discern 7th Air Force's targets for the day. Finally, there were the reports given by defense assets in action, all of whose secondary job was to keep higher headquarters abreast of the Americans' progress so North Vietnamese commanders could direct additional forces against a strike if conditions were especially favorable.[31]

AAA Systems

The simplest of these three assets were the aforementioned guns. By 1968 the range and type of guns available to the NV-IADS commanders were truly impressive. Motivated by both patriotism and the exhortations of their party cadre, almost the entire North Vietnamese populace was engaged in anti-aircraft defense. The regular anti-aircraft forces of the North Vietnamese Army used a widely disparate suite of cannons, the majority of which were controlled by the *Fire Can* radar and associated gunnery system. Unlike its predecessors, the *Fire Can* was capable of tracking multiple, high-speed targets from low altitude (around 1,000 feet) through roughly 60,000 feet.[32] These capabilities meant that, contrary to what USAF's leaders had believed, anti-aircraft guns remained a very lethal threat to modern jet fighters. Although the *Fire Can* could be jammed, 7th Air Force strikes ignored the system at their peril.

The heaviest AAA weapons were 85- and 100-mm cannons which could engage incoming USAF and USN strikes up to 39,000 feet. Fortunately for American pilots these weapons' rate of fire and fuzing requirements greatly decreased the effectiveness of their barrages.[33] Just beneath these heavy guns, however, were 57- and 37-mm cannons. The former was a compromise between the larger cannons' heavier hitting power and lighter weapons' faster rate of fire. The latter, despite being laid optically, fired rapidly enough that well-trained crews could still manage to track fast-moving jets.

At the base of NV-IADS gun pyramid were the countless small arms of the North Vietnamese populace. As one USAF report noted:

> Added to all [the heavy weapons] was what one THUD pilot called the "Hanoi Habit": even waitresses would run outside and start firing when the sirens sounded, using weapons from 7.62 rifles to the WW II Browning M-2 .50 calibre (*sic*) machine gun.[34]

While the mental image of a cocktail waitress leaving her patrons in order to go outside and fire a few rounds up into the air may be amusing in the abstract, in reality those rounds costing a few cents were only slightly less likely to contribute to the destruction of a multi-million dollar jet aircraft than their larger cousins. Flying over North Vietnam at less than 10,000 feet was an exercise in calculated risk. Thanks in no small part to the waitresses, farmers, and other militia members flying at 5,000 feet altitude near a target would almost assuredly end in casualties. Like citizens playing a macabre lottery, every North Vietnamese saw an American air strike as an opportunity to strike a jackpot.[35]

The Air Force's leaders had not taken these defenses into account when determining their attack tactics. As they had planned to do in Europe, F-105s began air operations against North Vietnam by ingressing at low altitude, pulling up to 10,000 feet to dive-bomb their target, then egressing using the *Thunderchief*'s superior speed. The North Vietnamese, after determining USAF ingress and egress routes, began siting the guns accordingly. Furthermore, they also mixed the guns at each site so that the various cannons could complement one another. The final effect was to create a veritable steel curtain in USAF's fighter's paths. The F-105s, unlike their World War II and Korean predecessors, proved unable to pierce this curtain. All too often, a heavy shell burst was close enough to pierce the *Thunderchiefs*' unprotected fuel tanks, a cannon round struck their fragile engines, or the aforementioned cocktail waitress and her fellow militia members were lucky enough to hit the unprotected hydraulic lines of a low-flying Thud. F-4s, increasingly carrying bombs as the number F-105s were attrited, did not fare much better. In order to lessen losses, strike aircraft began to ingress and egress at high altitude.[36]

SAMs

This solution to the ferocity of North Vietnam's AAA defenses brought USAF's fighters squarely into contact with the next component of the NV-IADS—the SAM. Originally fielded by the Soviet Union in 1957, the U.S.S.R.'s military conceived the SA-2 as a counter to SAC's high-flying bombers. By the time the Soviets offered the *Guideline* (which they called the *Dvina*) to the North Vietnamese, they considered it obsolescent. Nonetheless, North Vietnam began constructing SA-2 sites in April 1965 and, within two months, had begun receiving training on the system from Soviet officers.[37] The Air Force, alarmed by this development, asked permission to strike these initial *Guideline* sites while they were under construction. Secretary McNamara, concerned with killing these Soviet military personnel and believing the deployment to be a political ploy by the USSR, refused to authorize the strikes. Although this would have possibly delayed the deployment of the SA-2, it is unlikely that it would have stopped it. Regardless, the North Vietnamese and their Soviet advisors repaid this caution with the destruction of Leopard 2, an F-4 *Phantom*, on July 24, 1965.[38] With this single stroke, the North Vietnamese and their Soviet advisors greatly complicated USAF's offensive.

There was little that should have been remarkable about the SA-2 when the Americans first encountered it, as the basic missile had not changed in its eight years of service. The *Guideline* was a two-stage weapon that was fired either singly or as part of a salvo from a fixed site. After a boost phase and separation of the first stage, the missile's accompanying *Fan Song* radar van guided the SA-2 towards a target up to 25 miles away utilizing a data link. With a maximum effective altitude in excess of 80,000 feet, a speed over three times the speed of sound, and a 420-lb. warhead, the *Guideline* could not be outclimbed, outrun, or survived by the tactical fighters used to penetrate into the heart of North Vietnam.[39] If seen in time, however, the missile could usually be outmaneuvered, yet at the cost of depleting an aircraft's energy.[40] When the

Guideline was fired as part of a salvo (a common tactic), this meant that American aircrews often found themselves blundering squarely into the path of a second *Guideline* or, even worse, the NV-IADS AAA envelope.[41]

The entry of SAMs led to a variety of countermeasures. The first method, ingressing and egressing below the *Guideline*'s minimum altitude, quickly became untenable due to the increased exposure time to AAA. The two *Thunderchief* wings subsequently modified this tactic as F-105s were hurriedly fitted with Radar Homing and Warning (RHAW) sensors. Instead of remaining at low altitude, F-105 pilots only dove to avoid SAMs if the fighter-bombers received warning that a *Fan Song* was possibly tracking them or their flight.[42] Even though this was better than nothing, it was far from optimal given the similarity between the *Fan Song* and *Fire Can*'s signals. To a pilot transitioning through the densest North Vietnamese defenses (e.g., Route Packages 5 and 6), reacting to the RHAW transformed a mission to a virtual roller coaster ride into and out of the heart of the AAA envelope.[43]

As losses continued to mount, the Air Force developed their two final solutions for dealing with the SAM sites: Wild Weasel aircraft (discussed later in this paper) and electronic countermeasures (ECM) pods. The Air Force had first explored utilizing ECM pods in 1957, but initial efforts were less than optimal and required up to date intelligence on what hostile systems would be present at the target.[44] Unimpressed with the outcome and believing that tactical fighters would not need jammers in order to penetrate defenses at low level, the Air Force had decided that continued development was not a budgetary priority.[45] With the North Vietnamese providing deadly impetus for rethinking how their doctrine viewed air defense, the Air Force initiated a crash program to develop a more effective jamming pod.

The end result, the QRC-160, protected first the F-105 strike force and then, as numbers increased and the pods improved, their F-4 escorts. Although carrying the jamming pod meant that an aircraft could carry less ordnance, pilots and Air Force leaders considered the protection gained from turning a *Fan Song* or *Fire Can*'s screen into an unreadable mass of lines worth the cost. As long as the equipped aircraft flew straight and level at around 18,000 feet, the various pods greatly reduced the effectiveness of radar defenses. This protection grew almost exponentially if the aircraft was part of a tight, precise flight dubbed the "pod formation" (see Appendix B). Although the *Fan Song* could burn through the jamming at around six miles, the SA-2's minimum effective range of 4-5 miles meant that effective engagements would have required an extremely effective crew. Losses to the SA-2 initially dropped rapidly after the pods' introduction, but there were periods of increased vulnerability due to North Vietnamese *Fan Song* operators changing their radars' frequency in November 1967.[46] Even though American ELINT quickly ascertained these new frequencies, with Air Force systems command making the necessary modifications to maintain effectiveness, it was clear that the pods as well as the formations were not the optimal solution to stop the *Dvina*.[47]

Northern Bandits: MiGs

Part of the reason for dislike of the pods had to do with the final component of the NV-IADS: MiGs. Named for the Mikoyan Gurevich company, their usual manufacturer, MiGs were North Vietnamese interceptors which attempted to destroy USAF strike aircraft by using air-to-air missiles or mounted cannon. Ground control intercept (GCI) stations guided these North Vietnamese Air Force (NVAF) fighters to their prey via radio.[48] The pod formation, as the Air Force quickly found out, made this process much easier. Although individual MiG pilots

demonstrated proficiency with their aircraft once the GCI had placed them in position, there are no indications that MiGs ever took off and operated freely as their American counterparts were able to do. Similarly, if American forces were able to spoof the North Vietnamese ELINT efforts (as they did during Operation Bolo in January 1967), GCI controllers could be enticed to place MiGs into disadvantageous situations. However, these occasions were rare and all too often it was the MiGs that were able to strike with surprise on their side. The MiGs would exploit this surprise by either continuing through their initiated attack or, if sighted by escort fighters, acting as a diversion for another MiG.[49] If the MiG continued through its attack, the NVAF considered the destruction of an American aircraft or the forced jettisoning of ordnance equally good outcomes.[50] Once its firing pass was complete, the MiGs usually sought to escape rather than attempt to dogfight the American aircraft.

All three of the primary North Vietnamese fighters were well-suited to this aerial guerilla warfare. The simplest of the trio was the MiG-17 *Fresco*, a subsonic cannon-armed interceptor that the NVAF used for point defense of selected North Vietnamese locations.[51] Highly maneuverable, the MiG-17's designers had optimized it for the swirling, close-range engagements that fighter pilots often dubbed "knife fights." This meant that, unlike the *Phantom* and *Thunderchief*, the small *Fresco* had a very large wing for its weight and thus greater maneuverability. Although it lacked the radar suite, power-boosted controls, or raw speed of either American fighter, the MiG-17 was fast enough to catch a heavily laden *Thunderchief* or *Phantom* at low altitude, provided the GCI placed it in a favorable position. If this occurred, the MiG-17's three cannons (1 x 37mm, 2 x 23mm) were more than capable of downing any American aircraft. Although its relatively unsophisticated control arrangement, inability to catch unladen American aircraft, and relatively poor high-altitude performance meant the *Fresco* was

far from an optimal air superiority fighter.[52] However, this was not what the North Vietnamese intended it for and, more importantly, it was enough of a threat at low altitude that loaded F-105s were forced to respect it.[53]

More sophisticated than the MiG-17 was its Rolling Thunder stablemate, the MiG-21 *Fishbed*. Like the *Fresco*, the Mikoyan-Gurevich company designed the *Fishbed* as a point-defense interceptor whose effectiveness depended on the quality of its supporting GCI net. However, unlike the *Fresco*, the MiG-21 could conduct high-speed slashing attacks utilizing two heat-seeking *Atoll* missiles. Only after the MiG-21 had fired these heat-seekers did the NVAF's commanders expect a *Fishbed* pilot to close into cannon range and finish off potential targets. Whereas the North Vietnamese used the *Fresco* as a knife-fighter, the *Fishbed* operated as a Parthian aircraft which fired its ordnance, turned away as its missiles were inbound, then fled before the U.S. escort could react. If the *Fishbed* was caught, however, its poor rearward visibility, inferior handling qualities at low to medium altitude, and tendency to lose energy rapidly in turns usually resulted in the MiG-21's destruction.[54]

Given the NVAF's tactics, the best fighter for North Vietnam was one that combined the best of the *Fishbed*'s and *Fresco*'s attributes. The Soviet MiG-19 was just such an aircraft, but the NVAF was unable to acquire any models before the end of Rolling Thunder. In 1969, however, the NVAF acquired the MiG-19 / Shenyang J-6 *Farmer* from China. Like the *Fresco*, the MiG-19 had great pilot visibility, was equipped with a formidable cannon armament of three 30-mm cannon, and extremely maneuverable. In addition, like the *Fishbed*, the *Farmer* was capable of supersonic flight at all altitudes and could carry the AA-2 *Atoll* for hit and run attacks on American formations. Despite requiring a great deal of maintenance and only being fielded in

relatively small numbers, the *Farmer* was an unpleasant surprise for American forces once operations resumed in 1972.[55]

Fighting the IADS: USAF SEAD Doctrine During Rolling Thunder

The strength and skill with which the North Vietnamese defended their nation came as an unpleasant shock to the Air Staff. Rather than acknowledging this fact, the majority of Air Force theses, documents, and contemporary accounts blame civilian leaders' restrictions for allowing the NV-IADS' development. To the proponents of this argument, President Johnson and Secretary McNamara crippled the *Phantom*'s ability to dominate the NVAF's MiGs by forbidding the use of *Sparrow* missiles in beyond visual range (BVR) engagements. Furthermore, by not allowing U.S. forces to engage SAM sites until they fired, President Johnson and Secretary McNamara prevented the launching of an anti-SAM offensive. Finally, by not allowing the Air Force to strike airfields, control centers within North Vietnam's populations areas, or other leadership targets within Hanoi or Haiphong, American civilian leaders did not allow the Air Force to engage in decapitation strikes in order to disrupt North Vietnamese command and control.[56]

On their surface, these arguments seem reasonable. However, they ignore one pressing problem: USAF of 1965 lacked the training, ordnance, or tactics to destroy the elements of the NV-IADS. There were many reasons for this, but underlying all of these was the pervasive lack of SEAD doctrine prior to the start of Operation Rolling Thunder. Prior to 1965, the Air Force's leaders provided each unit with its assigned targets yet allowed individual TAC wing and squadron commanders to devise their own tactics for getting there. Therefore, the Air Force that

began Rolling Thunder attacked the growing North Vietnamese defenses with a hodgepodge of techniques that reflected each wing commander's personal experiences rather than a reasoned approach that matched the technology at hand. As conditions over North Vietnam quickly proved or disproved pre-war assumptions, individual units adjusted to what did or did not work.

Although senior civilians' (and, to varying degrees, senior generals') interference did not help this process, accusing them of necessitating it is excessive. Instead, a perusal of AFM 1-3's pages quickly illuminates the proper culprit: lack of attention. AFM 1-3 devoted less than a page to enemy defenses, discussing them in this manner:

> *(8) Countermeasures:*
>
> (a) The nerve center of any modern air defense system consists essentially of electronic devices and equipment. It is primarily by these means that invading air forces are detected and located. After they are located, electronic devices assist in their interception and destruction. Antiaircraft artillery fire also is, to a large extent, controlled electronically.
>
> (b) Certain types of offensive airforce operations are facilitated and their success enhanced by the complementary actions of electronic countermeasures operations. Such complementary operations tend to disrupt and confuse the enemy, and thus permit greater success to the main operation. Airborne countermeasure devices are complex and require highly trained personnel for effective operation.
>
> (c) Due to the far-reaching implications of countermeasure operations their planning and employment transcend the responsibility of any single theater. The overall agency charged with the direction of the war determines the role each theater will perform in accomplishing certain countermeasures. The theater countermeasures' program is controlled at theater level, and is harmonized with the global plan on a continuing basis. In this manner, a concerted action is achieved which provides all forces irrespective of assigned tasks optimum benefit from such measure to deceive and confuse the enemy.[57]

Failing to Exploit a Vulnerability: USAF ECM Doctrines

Combined, these three paragraphs indicate that USAF officers thought of air defense in the following ways. First, the Air Staff clearly believed all air defenses were vulnerable to electronic countermeasures. However, they also held the opinion these systems were too complex for their operation to be entrusted to anyone other than highly trained electronic warfare officers (EWO). Since the *Thunderchief* was a single-seat aircraft and the *Phantom*'s second crewman was initially a second pilot, not an EWO, this meant that Air Force doctrine likely acknowledged that TAC fighters lacked the capability to penetrate sophisticated air defenses. However, as the Air Force's leaders had believed SAMs and other defenses would be reserved for the Soviet heartland, it followed that TAC's fighters would be unlikely to encounter them. Although controlling the countermeasures as part of a global plan all but ensured that theater commanders would not possess the assets to alleviate this shortcoming if the Air Staff was incorrect in their assumptions, given the expected short duration of future campaigns the Air Force's leaders did not believe this would be a problem. After all, given TAC's catalytic purpose in the mind of Air Force planners, SAC's nuclear tsunami would either sweep over hostile theater defenses or render them impotent by annihilating the Communist "heartland."

American command and control arrangements were less than optimal during Operation Rolling Thunder and this may appear to be the reason the Air Force was unable to apply its ECM doctrine to operations over North Vietnam. However, joint interoperability issues would likely have prevented the centralization of all ECM assets operating over North Vietnam under one commander even if the Route Package system had not been in place. Not only were the Navy's electronic warfare objectives different from those of the Air Force but, for that matter, the USN's tactics were quite different.[58] Furthermore, Navy aircraft had different performance parameters at low altitude (especially once the F-105 delivered its ordnance) and one service or the other

would have had to greatly modify its attack methodology. This would have led to longer exposure times for one or both services' primary strike aircraft and, in execution, cancelled out the likely benefits of massing electronic warfare assets.[59] Finally, geographical constraints would have made proper coordination extraordinarily difficult.

In addition to the functional issues, the "theater" commander argument ignores Momyer's travails in using those electronic assets he did control. PACAF, concerned with the possible loss of an EB-66 *Destroyer*, limited deployment of these aircraft against North Vietnam. USAF's leaders considered *Destroyers* to be strategic assets and thus 7th Air Force had to preserve the aircraft for use in a general nuclear war. Therefore, PACAF responded to any attack on or, even worse, loss of one of these aircraft with ever greater restrictions. Not only was Momyer forbidden to deploy these aircraft into the heart of North Vietnamese defenses, by the end of Rolling Thunder he was forced to maintain these aircraft at the very limit of their effective jamming range. In addition, fear of NVAF MiGs meant that 7th Air Force had to provide their attached *Destroyers* with ever heavier fighter escorts. In short, USAF's doctrinal inclination to centralize control of its ECM assets did not lead to the development of a global plan that supported the theater commander. Instead, the fear of losing what few global assets were available led to a theater paralysis.[60]

The Changing Paradigm of Air Superiority: Direct Attack on the NV-IADS

The situation with regard to direct physical attack on NV-IADS was not much better than that of ECM in 1965. As explained above, wholesale focus on the nuclear delivery mission meant that the equipment, mechanisms, and tactics for conventional attack of enemy air defenses had been allowed to atrophy after Korea. This meant that the United States Air Force entered

North Vietnam facing systems developed during the late 1950s with the same techniques that it had used in World War II and Korea. Due to the primitive nature of the weapons that the Air Force had fought in those conflicts, this meant that TAC developed tactics that focused on accomplishing a discrete, single mission rather than being part of a larger plan. However, in order to understand the operational implications, it is necessary to examine these methods briefly here.

Iron Hand Flights

The Air Force began Rolling Thunder with extremely limited means for defeating AAA systems. The simplest method was engagement with the F-105's internal 20-mm Vulcan. With a cyclic rate of 6,000 rounds a minute, this Vulcan easily shot faster than any AAA weapon in the North Vietnamese inventory. This weapon, however, was outranged by all of NV-IADS anti-aircraft cannons. Furthermore, in the words of Colonel Broughton, "[North Vietnamese] gun pits were well coordinated to insure the maximum field of fire" and would have had multiple guns to the *Thunderchief*'s one.[61] Given the *Thunderchief*'s fragility, this made a gun duel fraught with danger for even the best-trained USAF pilot. The *Phantom*, despite being a multi-purpose fighter and arguably more survivable, lacked a gun. In addition to all these facts, the sheer number of North Vietnamese AAA systems meant eliminating them would be a time-consuming task.

Far more efficient, however, was external ordnance. In 1965, the Air Force's inventory was extremely limited. High-explosive bombs, by far the most numerous option, were greatly limited as they required a direct hit in order to silence the dug-in North Vietnamese guns. Napalm, in addition to being highly unpopular due to its inaccuracy, required fighters to fly

straight and level during its delivery. Similarly, rockets required fighters to fly a predictable path. Thus, both of these weapons were not suitable for use over North Vietnam. Finally, and most effectively, there were cluster bombs. However, there were only limited numbers of these weapons through 1967, with the Air Force having to split the meager supply with the Navy and forces operating within South Vietnam.[62]

Although most Rolling Thunder strike formations had a flight of aircraft assigned as "Iron Hand," or flak suppression, these flights focused solely on defenses in the target area. Initially assignment to this mission was done in an *ad hoc* manner, with strike commanders having authority to divert flights from the main target onto nearby defenses.[63] In no small part to the unsuitability of high-explosive bombs (required to destroy the primary target) these flights carried, wings began to assign specific F-105 or F-4 formations as "Iron Hand" flights.[64] Although this made flak suppression more effective, it was far from an optimal solution. If the Iron Hand flight held its ordnance until it reached the target area, the North Vietnamese AAA along the ingress and egress routes were able to engage without retaliation. In contrast, if the Iron Hand flight attempted to suppress defenses along the ingress and egress route, the tasked F-105s often lacked enough ordnance to properly suppress the guns in the target area. Eventually, heavy losses forced USAF to fly a hi-lo-hi profile in order to mitigate the effectiveness of the optically-aimed AAA and trust in the EB-66s' jamming to reduce the *Fire Cans*' ability to track the attacking fighter-bombers.

Destroying SAM Sites and Radars

This decision to enter at high altitude meant that 7th Air Force had to do something about the SA-2 sites as well as their controlling radars. Like almost all land-based radars of the era, the

Fan Song had to remain stationary in order to perform its function. Although this meant that the North Vietnamese often had several hours to shift sites between American strikes, during the strike it meant a radiating *Fan Song* was a relatively easy target. As the radar had to remain active throughout the *Guideline*'s flight in order to be fully effective, an SA-2 site that was attacking provided a very strong electronic signature. These signals, in turn, could be detected at roughly two to three times the *Fan Song*'s effective range.[65] In effect, an SA-2 site was a large, immobile, and fragile target that was extremely susceptible to the right ordnance.

The main issue was finding the SA-2 site in the first place. Since both the *Phantom* and *Thunderchief* had been built without internal RHAW apparatus, for the first few months of Rolling Thunder USAF fighter pilots were at a severe disadvantage versus the *Dvina*. F-4 and F-105 pilots had little inkling when a *Fan Song* was even active and, thus, could not track the radar back to the source. Attempting to detect the site by visual means was difficult due to camouflage capability of the North Vietnamese and required descent into the AAA envelope.[66] Even worse, there was no guarantee that what the naked eye saw was actually an active site. For example, when the Air Force attempted to retaliate against the site which downed Leopard 2, North Vietnamese decoys convinced the pilots that they were attacking a fully-manned *Guideline* site. After photo reconnaissance aircraft conducted post strike photo runs 7th Air Force realized the North Vietnamese had rigged up dummy missiles and then surrounded the area with AAA positions. As the mission's planners had directed the use of napalm and rockets (due to their expected high P_k), the ruse worked perfectly.[67]

It was clear that 7th Air Force needed something better. One mission provided a glimpse of the future when, after coordinating with the Navy for an A-4 and pilot, the Air Force destroyed the first of many SAM sites on October 31, 1965.[68] On one hand the mission proved

that small attack aircraft could detect SA-2 sites and vector non-RHAW aircraft onto the target by voice radio. On the other hand, had the North Vietnamese destroyed the Navy A-4 prior to its arrival in the target area, the F-105s would have been unable to attack the targeted SAM site. It was obvious that more improvements were needed or else the Air Force would be unable to continue operations over North Vietnam. Aware of this vulnerability, the Air Force moved with alacrity and the Chief of Staff, General McConnell, directed USAF Systems Command to find a solution as quickly as possible.[69]

The final concept was for two-man (pilot and EWO) aircraft to be used in direct attacks against the SA-2 site. Dubbed "Wild Weasels," these fighters were equipped with highly sensitive radar detection equipment that allowed them to detect hostile radars along the path of a strike force. Once this was accomplished, the "Wild Weasel" would fly along the bearing to the hostile radar, acquire it visually, then roll in and mark the target with white phosphorus rockets. Once the target was so marked, an accompanying flight of fighters would then proceed to attack the radar and any surrounding defenses with underwing ordnance. Targeting these aircraft primarily against the SA-2's *Fan Song* radar, the Air Force expected the Wild Weasel concept to be the answer to the SAM menace.[70]

This faith would have been rewarded had the Air Force's speed been matched with wisdom. The initial choice for the Wild Weasel aircraft was the two-seat F-100F *Super Sabre*. Put into production shortly after the end of the Korean War, the *Super Sabre* had had many problems throughout its service life.[71] However, the F-100Fs were immediately available and the Air Force believed the aircraft's performance would be suitable for operations over North Vietnam. Testing at Eglin AFB in Florida reinforced this initial assumption, as the aircraft and crews showed little difficulty in acquiring and vectoring F-105s against a simulated SA-2 site.[72]

Believing that it had found a solution to its SA-2 problem, the Air Force slowed the urgency with which it began developing follow-on systems.[73]

This confidence did not last for long. Once the first Wild Weasel detachment arrived at Korat Air Force base on 25 November, 1965, several issues became apparent. The first was that the F-100 lacked the maneuverability for the assigned mission. As the *Super Sabre* had been known as a "pilot killer" throughout its service life, this was not surprising to the assigned Wild Weasel crews.[74] What was surprising, however, was that the F-100s were unable to keep up with an ingressing strike force of F-105s despite being armed only with rockets while the *Thunderchiefs* carried heavier bombs. This had not been the case at Eglin, but Air Force Systems Command had not thought to simulate the effects long-range flights would have on the F-100Fs' endurance. This unhappy discovery meant that the F-100Fs and their accompanying F-105 flight either had to enter North Vietnamese air space well ahead of the strike group, operate at lower speeds in order to conserve fuel, or risk being out of position in order to destroy attacking SAM sites.[75] Finally, the F-100F airframe did not possess sufficient structural integrity for the mission at hand.

The *Super Sabre*'s unsuitability quickly translated into losses. The initial detachment of Wild Weasel crews and their F-100Fs arrived at Korat Air Force Base on 25 November 1965. By 11 March, three of the first nine F-100Fs had been lost to ground fire and one overstressed beyond repair. The remainder were so damaged that they could not field enough aircraft to support operations into Route Package V and VI.[76] The Air Force, satisfied that the initial detachment had proven the concept, rushed the next set of Weasel aircraft (F-105Fs) and crews to the theater, then rotated many of the initial Weasel pilots back to Nellis Air Force Base in order to open a training program. In addition to selecting the *Thunderchiefs* as the next

airframe, the Air Force also increased the number of AGM-45 *Shrike* missiles from the Navy. As Rolling Thunder continued, the Wild Weasels would transition to the next airframe (the F-105G) and add the AGM-78 *Standard* anti-radiation missile (*StARM*) to their inventory. Although these missiles, improved airframes, and other more lethal ordnance (e.g., reliable cluster bombs, better marking rockets) were introduced, losses remained heavy among the radar suppressors.[77]

Many of these losses were suffered due to a lack of SEAD doctrine. With no overarching guidelines on how to use this new equipment, 7th Air Force was left to find its own way. There were several negative outcomes to this decision. First, rather than unifying the Wild Weasels at one air base, 7th Air Force split the aircraft between the F-105-equipped 355th and 388th TFWs.[78] This arrangement had the positive of simplifying the Weasels' ability to support the strike wings to which they were attached. The negatives, however, far outweighed this solitary advantage. By separating the Wild Weasel squadrons, 7th Air Force made maintaining these specialist fighters more difficult by requiring maintenance crews at two bases rather than one. In addition, the geographical separation prevented the ready exchange of tactics or observations, slowed the issuance of improved equipment, and prevented the central stockpiling of Weasel-specific munitions (e.g., *Shrike* and *StARM*).[79]

Combined, these shortcomings decreased combat efficiency during Operation Rolling Thunder. With regard to future developments, the differences in tactics employed by the two *Thunderchief* strike wings inhibited the development of a standardized training syllabus for the Wild Weasel school at Nellis AFB.[80] Had the Air Force only developed a rudimentary SEAD doctrine in 1966, this guidance may have facilitated the massing of the Weasels' efforts by the end of Rolling Thunder. Instead, attrition drove Wild Weasel detachments down to as few as

four aircraft per wing. This was barely enough airframes to allow suppression in the target area, much less during ingress and egress. Supporting the available Weasels with a flight of hunter-killer F-105Ds only alleviated the problem somewhat. All too often, the Wild Weasels found themselves in the same position as the Iron Hand flights: too many targets, too little ordnance. Even though their psychological effect was great upon North Vietnamese radar operators and losses from SAMs consequently dropped, this still left the initiative with the NV-IADS.[81]

Airframe and ordnance limitations also contributed to the Weasels' steady losses. Due to ECM emitters' interference with their radar detection equipment, the Wild Weasels were initially forced to fly without the jamming pods that protected their F-105D brethren. Even when the Weasels received compatible pods (November 1967), they could not easily maintain the pod formation given their requirement to hunt down and kill SAM sites. Further complicating their task were the limitations of the initial RHAW suites. Lacking range-finding finding capability, the Weasels' initial sensors only provided a bearing to the targeted SAM site. At this point, attacking a SAM site became a struggle between the Weasel crews' knowledge of the area and the North Vietnamese troops' ability to camouflage and defend themselves. With atmospheric conditions limiting visibility from the air, Weasels were often required to expose themselves to a large number of optically laid weapons in order to attack an SA-2 site with bombs or their white phosphorus rockets. As the F-105F and G shared the same survivability issues as a standard F-105, this meant every Weasel attack was the equivalent of a knight running a gauntlet of archers in order to duel with a dragon at the far end—even if initially successful, the final outcome was very much in doubt. With the *Thunderchief*'s limited maneuverability, all too often neither the two-seated Weasel nor its accompanying hunter-killer strike were able to get close enough to destroy the SA-2 site with bombs and rockets.

Finally, the North Vietnamese quickly developed countermeasures to the Wild Weasels. Even though equipping the F-105 with the *Shrike* reduced the need for a Weasel to overfly the targeted radar, *Fan Song* operators grew adept at rapidly exploiting the AGM-45s' limitations.[82] In an attempt to alleviate this shortcoming, the Air Force acquired the *StARM* from the Navy. However, despite its longer range and heavier warhead, the AGM-78 was too expensive, too heavy, and fielded too late to be a truly effective weapon for the F-105 Weasel.[83] In addition to exploiting the weaknesses of the Weasel's ARMs, North Vietnamese SAM site operators greatly shortened the amount of time it took them to engage American aircraft. Able to pick out the F-105F/Gs by their maneuvers, the North Vietnamese made the hunter-killer flights priority targets for MiG attacks. This often resulted in the F-105F/Gs having to abort their attacks against SAM sites in order to evade the MiGs.

Combined, the heavy losses and their limited numbers meant Wild Weasels would remain a tactical solution to an operational problem. This is not to say that these pilots, brave men all, were ineffective—they reduced losses and degraded the NV-IADS effectiveness whenever they were in the area. However, due to their small numbers, the area the Wild Weasels covered was often small. Even worse, due to the countermeasures listed above, it was rare that they were able to obliterate a SAM site or *Fire Can* completely. Instead, even if the radar operators did not shut down their emitter in time, the missiles' (especially the *Shrike*'s) limited warheads meant that the damage was often limited only to the antenna or radar van. Thus, rather than killing the radar operators and missile crews, the Wild Weasels were often forced to allow them to survive to fight another day. This, in turn, increased the North Vietnamese defenders' proficiency—a far from optimal solution to the radar problem.[84]

No Aces Here: Combating the MiGs

This evolution of increasing skill on the North Vietnamese side and gradually eroding experience on the American side was not limited to the fight against radars and SAMs. As in World War II and Korea, USAF sought to establish air superiority over North Vietnam from 1965-1968. Seventh Air Force never accomplished this task for many reasons. The most commonly cited one is that civilian leaders curtailed Air Force freedom of action both against MiGs on the ground and in the air. Proponents of the first line of thought argue that it was the decision to not allow 7th Air Force or, for that matter, USAF and USN combined to strike at Phuc Yen, Kep, and associated other airfields that allowed the North Vietnamese to build an effective MiG arm in the first place. Then, once these MiGs were airborne, the restrictions requiring 7th Air Force pilots to identify their targets visually rather than allowing the *Phantom* to use its long-ranged *Sparrows* to shoot MiGs forced USAF fighters to fight on NVAF terms. McNamara's detractors claim that these two actions in particular allowed the North Vietnamese to hold the initiative and thus ensured that the battle for air superiority had only one possible outcome.[85]

These arguments are not supported by historical evidence. First, the timeframe for which most authors castigate McNamara is March to November 1965. However, those criticizing the Secretary of Defense for not allowing airfield strikes during this period ignore the fact that the JCS were recommending low-level night attacks by B-52 *Stratofortresses*. Rather than serving as the primary strike force, tactical fighters were to be employed only if the B-52s did not completely devastate their assigned objectives.[86] It is unsurprising that the Secretary may have been hesitant to use nuclear-capable bombers due to fears of escalating the Vietnam War.[87] Attacking North Vietnam with tactical fighters and their somewhat limited bomb loads was one thing. Unleashing the very symbol of the United States' strategic might was quite another. Whether this would have led to Chinese or Soviet intervention will never be known. However,

what can be surmised is that Secretary McNamara and President Johnson had absolutely no intention of finding out.

However, acknowledging that McNamara's concerns were valid lends some semblance of credibility to those who attack him for not authorizing these attacks. In reality, an objective examination of the myriad factors that would have affected the strikes removes even these few remaining tatters. As they were oriented on the nuclear mission, the majority of SAC's B-52s possessed extremely limited conventional capability. This Air Force partially alleviated this problem by authorizing the "Big Belly" series of modifications, but none of these had occurred prior to late 1965.[88] Therefore, as noted by an Air Force academic paper, B-52s would have been limited to "27 500 lb. or … [27] 750 lb. bombs internally."[89] In turn, these weapons would have had to be the conventional, low-drag variants of these weapons, as the B-52 was incapable of carrying any other type. Without retardation, the B-52s would have had to drop from at least 1,000 feet. Given the need to acquire the targeted airfields by the *Stratofortresses*' radar, a more realistic altitude would have been 2,000-3,000 feet, i.e., the heart of the AAA envelope and also at the lower end of the SA-2's engagement capabilities.[90] Although the B-52s ECM suite was quite advanced for the era, darkness would have degraded North Vietnamese AAA, and the NVAF was incapable of flying night operations, it quickly becomes apparent that the NV-IADS possessed more than enough capability to make an attack by slow, lumbering B-52s problematic. Therefore, those who claim that Secretary McNamara prevented effective attacks on North Vietnamese airfields, at least in the initial stages of Rolling Thunder, are both absolving the JCS of blame and ignoring the large number of relevant issues in order to seek a target for their frustrations.

That the JCS were even willing to consider B-52s, however, indicates just how much TAC's ability to engage in conventional airfield attack had deteriorated. This issue was not merely one of SEAD doctrine, but spoke to the difficulties inherent in conducting the counter-airfield mission. Indeed, it is unlikely that 7th Air Force possessed, at any time, a sufficient number of aircraft to conduct a sustained airbase destruction campaign and carry out the remainder of its Rolling Thunder tasks. In 1965, the North Vietnamese had nine MiG airfields. By 1968 they had a total of nineteen. It is unlikely that 7th Air Force, with only two *Thunderchief* wings in theater, possessed sufficient pure strike capability to attack repeatedly even the nine original bases and keep them out of commission. Even if one doubles the number of available wings to four by forcing F-4s to carry their maximum ordnance and not pursue airborne MiGs and if one then adds the three or four carrier air wings the USN could provide from Yankee Station, the numbers are stark. In addition, these numbers are only applicable if there was a period of sustained good weather, as only the USN's A-6 *Intruder* was capable of all-weather attack throughout Operation Rolling Thunder. Combined, these factors make it clear that the airfield strikes McNamara's critics envisioned were unfeasible from 1965 to 1968.

Even had 7th Air Force possessed the necessary resources to attempt such a campaign there were still technical issues endemic to the Air Force through 1967. First there were senior leaders' justifiable concerns regarding collateral damage. This, combined with the strength of target defenses, lack of intelligence, and 7th Air Force's demonstrable problems with navigation, meant that the Air Force could not have struck some of these airfields. Kep, Phuc Yen, and Giam Lam International Airport were all near major civilian population centers. It is easy to argue that none of these problems were sufficient reason to avoid striking the bases in retrospect. At the time, it was likely much harder to see how killing an entire international delegation at

Giam Lam or having a fully loaded F-105 be forced to jettison ordnance over a Hanoi residential neighborhood would have served American war aims. Military leaders, inexplicably, seemed oblivious to this possible outcome. President Johnson and Secretary McNamara, on the other hand, were quite fearful of it. The benefits of attacking the airfields were far less than the risk of Chinese or Soviet intervention.

Target defenses were another area where military leaders seemed rather oblivious to realities in the area. Although General Momyer would later argue that "strike forces were already penetrating the areas where airfields were located, and there were no major changes in the defenses the [North Vietnamese] could have employed that would have made our losses greater than they already were against other targets in the area," this statement is somewhat disingenuous.[91] Airfields, in general, are among the most difficult objectives for a strike force due to their unique construction. Even though it would appear that all that is necessary is to crater the runway, most modern military airfields are constructed with taxiways that their stationed fighters can use for emergency takeoffs and landings. In addition, runway craters are relatively easy to fill if sufficient manpower is available (which it was in North Vietnam), and the MiGs' inherent capabilities to operate from rough fields would have greatly reduced the necessary repair times. The revetments where these fighters were stored, in addition, meant that a single attacker would have great difficulty destroying more than one or two MiGs on the ground. Finally, the fuel storage, pilot barracks, maintenance bays, and control facilities of a modern airfield present a series of dispersed targets for any attacker.[92]

Combined, these passive defenses would have meant that, in order to properly attack an airfield, a 7th Air Force offensive in late 1965 or early 1966 would have exposed the F-105s and F-4s tasked to accomplish it to more AAA and SAMs than any civilian target did during that

period. This would have been especially true if the attacking fighter flights were chronologically spaced so as to allow for the clearance of smoke and dust and the prevention of fratricide due to bomb fragments. Although this would not be true if the technique chosen had been for a multi-wing low-level ingress, strike, and high-speed egress, this type of approach would have presented the defenses with the spectacle of thirty to forty tactical fighters occupying the limited air space over a MiG airfield while attempting to strike individual revetments, buildings, and grounded MiGs.

In addition to giving whole new meaning to the phrase "target rich environment," airfield strikes would have likely been ineffective. USAF, based on its doctrinal beliefs, had not focused on attacking airfields as a tactical task. This was understandable—it would be somewhat superfluous to pick out individual structures when TAC's doctrine called for the use of multi-kiloton bombs. Even when the Air Force struck the associated MiG bases from 1967 on, the historical evidence indicates that there was little attempt to focus attacks on critical sub-components as opposed to attempting to destroy MiGs.[93] For example, a typical F-105 load for attacking an airfield was "a mix of CBU-24 bomblets and 750-pound bombs."[94] While the former was excellent at destroying MiGs on the ground and the latter sufficient to crater the runway, the NVAF enjoyed the same position with regard to aircraft and airfield availability as the RAF had during the Battle of Britain—the former was easily replaceable and the high number of the latter meant that any airborne MiGs had numerous places to which they could recover.

It could be argued that, like the *Luftwaffe* in 1940, Seventh Air Force was concentrating on the wrong targets during Operation Rolling Thunder. Given North Vietnam's reliance on China and the Soviet Union for training, control technicians, maintenance crews, aviation fuel

and, most importantly, pilots may have proven far more difficult to replace than obsolescent MiGs. However, in order to hit these targets, Air Force pilots would have had to vary their ordnance and gained proficiency in its use. Given that F-105 crews arrived in Thailand without ever having even seen, much less dropped, the 3,000-lb. bombs which the Air Force used against heavy targets, it is unlikely that the latter would have occurred without concentrated effort.[95] The former, on the other hand, was difficult in an Air Force that initially lacked sufficient ordnance to properly arm its fighters at all, never mind acquiring more exotic weapons, e.g., rocket-propelled bombs suitable for penetrating either concrete or earthen shelters.[96] This lack of appropriate ordnance meant that the Air Force would have had great difficulty in neutralizing North Vietnamese ground personnel, facilities, and pilots in the most efficient manner possible and was yet another reason airfield attacks were unfeasible.

Whereas 7th Air Force may have found it difficult to destroy the NVAF on the ground, on paper there should have been little difficulty in defeating the MiGs once they were airborne. The F-4, with its powerful radar, high speed, and missile armament would have seemed ideal for this task. Even with the justified restrictions on BVR engagements, one might expect that the disparity in training hours flown and aircraft capabilities should have allowed 7th Air Force to quickly seize and hold air superiority from 1965 to 1968.[97] Instead, a combination of USAF fighters' flaws, Air Force hubris, and superior North Vietnamese tactics prevented 7th Air Force from eliminating the MiGs as a threat. Although there were periods where the Americans gained the upper hand, NVAF interceptors still managed to challenge the majority of Rolling Thunder strikes to some degree. By 1968 it was clear USAF's pre-war beliefs about the nature of air combat had been deeply flawed.[98]

Chief among these mistaken ideals was TAC's concept of what constituted an ideal fighter. The Century Series fighters (F-100, F-101, F-102, F-104, and F-106) and the *Phantom* had all been built with a focus on speed, climbing ability and, by the conclusion of the series, missile capability. Initially, the Air Force had deployed the F-100 and F-104 as their primary air superiority aircraft. However, in the often poor visual conditions over North Vietnam, neither fighter proved capable of dealing with the GCI-directed MiGs. The Air Force quickly relegated the former exclusively to close air support and the *Starfighter* only lingered long enough to confirm its extreme vulnerability to SAMs before also being withdrawn.[99]

This left the *Phantom* with its all missile armament. The Air Force's leaders had believed that the tests proved this combination would have great success, yet USAF pilots quickly realized the difference between targeting drones and thinking, adaptive opponents as they engaged the NVAF. When *Phantoms* began engaging MiGs, they found that the *Sparrow*'s performance was far from optimal. With its very high minimum range, a startling number of rounds that simply refused to fire, and proximity warheads that regularly failed to function even when the missiles passed close to their intended target, the AIM-7 quickly developed a reputation for unreliability with its users. So common were these mishaps that *Phantom* crews regularly ripple-fired all four missiles in order to have a decent chance of attaining one hit.[100]

Even with all four *Sparrows* expended, an F-4 nominally had four heat-seeking missiles remaining. However, neither of the weapons available during Operation Rolling Thunder did much to improve missiles' reputations. The *Sidewinder*, in addition to being regularly outmaneuvered by the agile North Vietnamese fighters, found plenty of other heat sources to guide upon in the hot, humid climate of Southeast Asia.[101] The other heat-seeking missile, the Air Force's AIM-4 *Falcon*, had an even worse P_k due to its small warhead, lack of proximity

fusing, and complicated launch requirements. So poor was the *Falcon*'s performance that, after the 8th TFW attempted to use the weapons for the first time, Colonel Olds directed his armament staff to break Air Force regulations and rewire the wing's new F-4D *Phantoms* to fire the *Sidewinder* instead.[102] Disgusted with their missiles, some F-4 pilots clamored for guns in hopes of engaging with a weapon that worked.[103]

Exacerbating the missile issues were those with the *Phantom* itself. The avionics, which had worked well in the more temperate climates of Europe and North America, regularly malfunctioned in the damp of Southeast Asia. When the radar did work, it had difficulty detecting the low-flying MiGs or differentiating between friendly and enemy aircraft. This made use of the *Sparrow* rather problematic. Exacerbating this problem, McDonnell Douglas's engineers had decided to optimize ease of manufacture rather than maintenance or operation when laying out the cockpit controls.[104] It was not unheard of for Air Force F-4s to enter combat with radios that did not work due to the difficulty of performing maintenance on them or for crews to be unable to switch to the correct weapons system during the high-g turns common to air combat.[105]

The F-4's issues as an air superiority fighter continued when one considered its external structure. The *Phantom*, already at a disadvantage due to its very large size compared to the North Vietnamese MiGs, was further handicapped by the fact that its two J-79 engines smoked profusely unless the engine was in idle or the fuel-guzzling afterburner was ignited.[106] This meant that, even beyond the inherent advantage given to them by their GCI, North Vietnamese fighter pilots could see the F-4 before being seen themselves or, in some cases, outside the maximum range of the F-4's radar.[107] Lastly, and most ominously, once *Phantom* pilots began actually pushing their fighters, the F-4 displayed a disturbing tendency to go into a stall and spin

sequence.[108] Called either "departure" or "adverse yaw," if this occurred below 10,000 feet recovery was difficult if not impossible. Although increased training and familiarity with the aircraft decreased the odds that a crew would find themselves spinning out of control, it was easy to press the aircraft too far when engaged in combat with MiGs.

The *Phantom*'s virtues, in the hands of a well-trained pilot, made up for many of its vices. However, the U.S. Air Force's own policies tended to minimize the former and exacerbate the latter. Even after Rolling Thunder's initial engagements served notice that the demise of traditional fighter combat was not quite at hand, the Air Force made no attempt to change its method of training air-to-air combat throughout Rolling Thunder. Furthermore, Air Force leaders made few attempts to determine the reasons behind the success of units such as Robin Olds' 8th TFW.[109] Nor, despite the fact that it placed the F-4s at a disadvantage, did 7th Air Force stop the process of making most *Phantom*s carry bombs into combat rather than allowing them to enter combat carrying only fuel and air-to-air missiles.[110] When carrying the extra weight of bombs, F-4s had to fly much slower speeds and lower throttle settings in order to conserve fuel. This gave MiGs an initial speed advantage during their attack and, given that the *Phantoms* usually had to jettison these weapons prior to engaging the North Vietnamese fighters, a head start in making their escape. In the thick haze, smoke, and ground clutter over North Vietnam, this advantage was often all that was needed for NVAF interceptors to escape pursuit.

Experienced fighter pilots may have been able to overcome 7th Air Force's insistence that F-4s carry bombs, developed the techniques that were not taught in training, or become strong enough leaders that men such as Olds were not as missed. This process was prevented by the Air Force's questionable personnel policies. After 100 missions, pilots were rotated to non-combat postings in either Europe or the United States. In an attempt at "fairness," the Air Force ensured

that these men were replaced with pilots who had not faced combat yet.[111] Initially these were other TAC pilots, but as Rolling Thunder continued the other flying commands were increasingly forced to provide pilots that were sent to a replacement training unit (RTU), given a short transition course in the F-4 (or the F-105 for strike pilots), then given orders to Southeast Asia.[112] Although not necessarily fodder, the majority of these men lacked the mentality or aptitude to fly powerful fighters in combat. In addition, the difference in attitudes between their former communities and the one which the Air Force's personnel policy thrust them often had a negative effect on unit cohesion.[113] Many of these pilots were able to overcome their initial shortcomings as they progressed in their tours, but in the interim their inexperience had a negative effect on the Air Force's combat capability.

The State of the Air Force, November 1968

This problem with manning was only one of the numerous issues facing the Air Force as Rolling Thunder ended in November 1968. First and foremost, it was clear that USAF leaders had wildly exaggerated the likelihood of nuclear war when writing the service's doctrine. Second, the severe cost of Rolling Thunder had indicated that the Air Force's views on hostile air defense systems were fatally flawed. The NV-IADS had not only taken its measure of 7th Air Force but it had also shot down so many *Thunderchief*s that the Air Force was forced to withdrawal the F-105D from active service.[114] Third, conventional training and pilot proficiency had been clearly lacking at the beginning of Rolling Thunder. The ensuing combat operations had almost reversed this problem by 1968 yet few could argue that the cost had been exorbitant. Finally, the psychological effect of these devastating losses, frustration with what the pilots perceived as indifference of Air Force leaders and wide availability of jobs in the civilian sector

resulted in many combat-experienced pilots opting for civilian life.[115] This exodus occurred concurrently with the accelerated exit of the World War II and Korean War pilots who had led Rolling Thunder's squadrons and wings. With most of the experienced officers leaving, the Air Force was in great danger of losing most of the lessons it had learned from Operation Rolling Thunder.[116]

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[1] Boyne, *Wild Blue*, 148; Tillman, *LeMay*, 144-146; and Trest, 180-188.

[2] H.R. McMaster, *Dereliction of Duty* (New York: HarperCollins, 1997; HarperPerennial, 1998), 2-3.

[3] McMaster, 20-23 and Tillman, *LeMay*, 145-156;.

[4] Tilford, 50-55 and Worden, 109-131.

[5] McMaster, 18-23; Tillman, *LeMay*, 159-165; and Worden, ibid..

[6]Ed Cobleigh, Ltc. USAF (ret.)*War For the Hell of It: A Fighter Pilot's View of Vietnam* (New York: Berkley Caliber, 2005), 145-146; Bishop, 209-211; Michel, *Clashes*, 10-20; Whitt, 27-28 and 36;

[7]A.J.C. Lavalle, Maj., USAF, ed., *The Tale of Two Bridges and The Battle for the Skies Over North Vietnam*, USAF Southeast Asia Monograph Series, Series Editor Major A.J.C. Lavalle, Volume I, Monographs 1 and 2 (Maxwell AFB, AL: Air University Press, 1976; Washington, D.C.: Office of Air Force History, 1985), 120.

[8]Jerry Noel Hoblit, "F-105 Thunderchief," *Flying American Combat Aircraft: The Cold War*, Robin Higham, ed., (Mechanicsburg, PA: Stackpole Books, 2005), 248-257 and Ed Rasimus, *When Thunder Rolled: An F-105 Pilot Over North Vietnam* (New York: Ballantine Books, 2003), 4.

[9]Enzo Angelucci with Peter Bowers, *The American Fighter: The Definitive Guide to American Fighter Aircraft From 1917 to the Present*, First American ed. (New York: Orion Books, 1987), 355-356; Jack Broughton, *Going Downtown: The War Against Hanoi and Washington*, Pocket Books ed. (New York: Orion Books, 1988; Pocket Books, 1990), 49-50; and Dennis R. Jenkins, *F-105 Thunderchief: Workhorse of the Vietnam War*, Walter J. Boyne Military Aircraft Series (New York: Penguin Books, 2000), 11-14.

[10] Tilford, 50-52.

[11] The texts are not clear, but given McNamara's strong desire to field the TFX it is entirely possible that the Air Force's leaders were informed that they could wait for that aircraft's development.

[12] Ray Bonds, ed., *Modern Fighting Aircraft*, vol. 4, *F-4 Phantom*, by Doug Richardson and Michael Spick (New York: Arco Books, 1984), 8-10 and ibid..

[13]The Air Force's leaders had this view even though most of TAC's line (as opposed to test) pilots had fired these missiles in training. See Bishop, 209-211; Cobleigh, 145-146; Michel, *Clashes*, 10-20; and Whitt, 27-28 and 36 for more discussion of this issue.

[14] Wayne Thompson, *To Hanoi and Back: The U.S. Air Force and North Vietnam, 1966-1973* (Washington, D.C.: Smithsonian Institution Press, 2000), 2-38, McMaster, 222-234; and Tilford, 89-95.

[15] Ibid..

[16] Jacob Van Staaveren, *Gradual Failure: The Air War Over North Vietnam, 1965-1966* (Washington, D.C.: Air Force History and Museums Program, 2002), 33-67 and 310-315 ;Clodfelter, 39-72; and McMaster, 217-242.

[17] Major John C. Pratt, *Air Tactics Against NVN Air Ground Defenses, December 1966-1 November 1968 (U)* (Maxwell AFB, AL: Project CHECO (Contemporary Historical Examination of Current Operations) Report, Pacific Air Force (PACAF) Tactical Evaluation Directorate, 30 August 1969 (Declassified July 1991)), 10.

[18] PACAF, *Linebacker: Overview of the First 120 Days*, 2.

[19] Momyer, *Air power*, 378.

[20] Broughton, *Thud Ridge*, 95.

[21] Broughton, Ibid., 95-96.

[22] Cobleigh, 4.

[23] For further discussion of this issue, see T.R. Fehrenbach, *This Kind of War: The Classic Korean War History*, Brassey's Edition, (New York: Macmillan (as *This Kind of War: A Study in Unpreparedness*), 1963; Washington: Brassey's, 1994), 216 -242 and 320-346 and Max Hastings, *The Korean War* (New York: Touchstone, 1988), 115-147. As the Vietnam historiography illustrates, the specter of Korea constantly haunted President Johnson's thoughts.

[24] Drue L. DeBerry, R. Cargill Hall, and Bernard C. Nalty, "Flexible Response: Evolution or Revolution?" *Winged Shield, Winged Sword: A History of the United States Air Force, Volume II, 1950-1997*, Bernard C. Nalty, ed. (Washington, D.C.: Air Force History and Museums Program, 1997), 163-200 and Tilford, 45-60.

[25] Momyer, *Air power*, 378.

[26] Ricky James Drake, Maj., USAF, "The Rules of Defeat: The Impact of Aerial Rules of Engagement on USAF Operations in North Vietnam, 1965-1968" (Thesis presented to the faculty of the School of Advanced Air power Studies, May 1992), 32.

[27] Crabtree, 134.

[28] Frank Futrell and others, eds., *Aces and Aerial Victories: The United States Air Force in Southeast Asia, 1965-1973*, ed. by James N. Eastman, Jr., Walter Hanak, and Lawrence J. Paszek (Maxwell AFB, Alabama: 1976), 4; Ibid.; and Momyer, *Air power*, 133.

[29] Boyne, *Influence*, 330-331; Budiansky, 390-394; Clodfelter, 131-133, and Momyer, *Air power*, 132-165.

[30] Ironically, the North Vietnamese methodology was somewhat close to the USAF's perspective on Theater Air Defense. AFM 1-3, on page 25 discussed theater air defense from the USAF's perspective in this manner [**emphasis added**]:

(c) *Theater Air Defense:*

(1) The complete neutralization of the enemy's air force is seldom possible; therefore, the establishment of an air defense system for the theater is necessary. Although some of the attacking air forces will still penetrate theater defenses and attack vital targets**, the maintenance of an effective air defense system compels the attacker to rely heavily on tactics of maneuver and deception which divert part of the attacking force to noneffective operations, and which tend to minimize the effects of the attack**.

The NV-IADS easily meets this description of an ideal air defense system. Therefore, arguments that the ferocity of the North Vietnamese defenses was "unforeseen" by Air Force leaders are somewhat hard to believe.

[31] Michel, *Clashes*, 44-45 and Thompson, 40-41.

[32] Crabtree, 106-107 and 135-136 and Werrell, 101-103.

[33] Broughton, *Downtown*, 119 and Pratt, x.

[34] Pratt, 2.

[35] Correspondence from Robert L. Simon, Ltc., USAF, 7th Air Force Director of Combat Tactics, to PACAF, located in Pacific Air Forces (PACAF), *Air Tactics Against NVN Air Ground Defenses, December 1966-1 November 1968, Volume II--Supporting Documents (U)* (Maxwell AFB, AL: Project CHECO (Contemporary Historical Examination of Current Operations) Report, Pacific Air Force (PACAF) Tactical Evaluation Directorate, 30 August 1969 (Declassified July 1991)); Broughton, *Downtown*, 117-137; Budiansky, 394-395; Crabtree, 134-135; Michel, *Clashes*, 121; and Pratt, x (Figure 1 which follows this page number). All sources agree that a great majority (Michel cites 85 percent) of casualties to AAA were accrued at between 3,000-6,000 feet. I have chosen 5,000 feet altitude as a middle ground.

[36] Angelucci with Bowers, 407-409; Bell, 155-157; Hobson, 239 and 269; and Rasimus, *Thunder*, 272-277.

[37] Hobbs, 25.

[38] Jeffrey L. Schrader, Maj., USAF, "A History of the U.S. Air Force Wild Weasels in Southeast Asia," (Student Report prepared for the Air Command and Staff College, Maxwell Air Force Base, Alabama, in partial fulfillment of requirements for graduation, April 1985 (declassified December 2006)), 7; Budiansky, 393-394; and Hobbs, 26.

[39] Jane's Information Group, *Jane's Land-Based Air Defense, Thirteenth Edition, 2000-2001*, edited by Tony Cullen and Christopher F. Foss (Alexandria, VA: Jane's Information Group, 2000), 285-288; Stephen J. Zaloga's, *Red SAM: The SA-2 Guideline Anti-Aircraft Missile* (Oxford, England: Osprey Publishing, 2007), 16-21; and Schrader, 6-7.

[40]Interview of Major Hal Dortch, USAF, located in Pacific Air Forces (PACAF), *Air Tactics Against NVN Air Ground Defenses, December 1966-1 November 1968, Volume II--Supporting Documents (U)*; Bell, 101; Broughton, *Downtown*, 158-159, and Handley, 124.

[41] Energy, in this case, refers to an aircraft's ability to move throughout space. Aircraft with low energy may be capable of maintaining straight and level flight, but they will be capable of little else for fear of stalling.

[42] Bell, ibid., and Jenkins, 90-91.

[43] Bell, 101-103; Momyer, *Air power*, 100-113; and Rasimus, *Thunder*, 92-99. The Route Package System (see Figure B.1) arose due to interservice rivalry in the initial stages of Rolling Thunder. Rather than attempting to unify all strikes against North Vietnam under a single commander, Admiral Shaw, CINC of the Pacific region (CINCPAC), had chosen to divide North Vietnam into seven "Route Packages," or target areas (see Appendix B). A monument to interservice rivalry at its worst, the Route Package system meant that joint USAF/USN strikes usually required coordination at the CINCPAC level. Considering CINCPAC was located in Honolulu and would then have had to ensure these strikes were approved by the JCS in Washington, joint attacks were extremely rare.

[44] Jenkins, 93.

[45] Hannah, 77-78.

[46] Pratt, 21.

[47] Jenkins, 93-96; Michel, *Clashes*, 71-72.

[48] Michel, *Clashes*, 73-74.

[49] Ibid., 44 and Spick, *Fighter*, 150-151;

[50] Thompson, 44-47. If the American aircraft jettisoned its ordnance and caused collateral damage, this could often be exploited for propaganda purposes.

[51] According to Michel, *Clashes*, on pg. 188, some MiG-17s were "modified to carry *Atoll* [heat-seeking] missiles" prior to Linebacker I. However, these seemed to have had very little, if any, success.

[52] Michael Spick, ed., *The Great Book of Modern Warplanes* (London, UK: Salamander Books 2000; reprint 2003), 448-449 and Michel, *Clashes*, 16-20.

[53] Bell, 124-127, 166-169 and 220; Broughton, *Downtown*, 138-144; Rasimus, *Thunder*, 200.

[54] Luttwak and Koehl, 214-215; Michel, *Clashes*, 73-81; Spick, *Modern Warplanes*, 450-465.

[55] Luttwak and Koehl, 201; Michel, *Clashes*, 188-190, Spick, *Modern Warplanes*, 449. According to Spick, opinions on the MiG-19 were mixed, as the Israeli and Indian Air Forces did not believe the MiG-19 was a tremendous threat in their conflicts. American pilots, however, found it a rather tough opponent when they faced it during Rolling Thunder (in Chinese hands due to border violations) and in 1972.

[56] See Bell; Drake; Momyer, *Air power*; Broughton (both *Downtown* and *Thud Ridge*); and Rasimus throughout for examples of these arguments.

[57] AFM 1-3, 18.

[58] Thornborough and Mormillo, 26-32 and Thompson, 50-51. This and all further *Iron Hand* citations are to the reprint edition. Further research has not indicated why there was a reprint edition published in the same year.

[59] The Navy's primary attack aircraft, the A-4 and A-6, were both subsonic. Air Force F-105s, once clean of their bombs, regularly egressed North Vietnam at supersonic speeds.

[60] Michel, *Clashes*, 30-31 and Thompson, 97-98.

[61] Broughton, *Downtown*, 118.

[62] Thompson, 49-50 and 244.

[63] Pratt, 30.

[64] Ibid..

[65] Luttwak and Koehl, all entries from 181 (electromagnetic spectrum) through 185 (electronic warfare).

[66] Van Staaveren, 192-195.

[67] Tom Clancy with Chuck Horner, General, USAF (ret.), *Every Man a Tiger*, Berkley Paperback Edition (New York: G.P. Putnam's Sons, May 1999; Berkley Caliber, May 2000), 89-110 and Billy Sparks (WW #330), "Iron Hand One—How To Become Disillusioned," *First In, Last Out: Stories by the Wild Weasels (First Person Stories By Wild Weasel Pilots, EWOs and Their Associates)*, Colonel Edward T. Rock, USAF (ret.) ed., (Bloomington, IN: Authorhouse Press, 2005), 13-22. Sparks' squadron dispatched 12 aircraft on this first mission. Of these, two were shot down with only four of the remaining ten being flyable the next day. One positive outcome of this strike was the effect it had on Horner and his subsequent planning for Operation Desert Storm.

[68] Michael Cooper, "Navy / Air Force Joint Iron Hand," *First In, Last Out: Stories by the Wild Weasels (First Person Stories By Wild Weasel Pilots, EWOs and Their Associates)*, Colonel Edward T. Rock, USAF (ret.) ed. (Bloomington, IN: Authorhouse Press, 2005), 23-25.

[69] Hans Halberstadt, *The Wild Weasels: History of U.S. Air Force SAM Killers, 1965 to Today*, Motorbooks International Mil-Tech Series (Osceola, WI: Motorbooks International Publishers & Wholesalers, 1992), 11-12 and Jeffrey L. Schrader, Maj., USAF, "A History of the U.S. Air Force Wild Weasels in Southeast Asia," (Student Report prepared for the Air Command and Staff College, Maxwell Air Force Base, Alabama, in partial fulfillment of requirements for graduation, April 1985 (declassified December 2006)), 14. The urgency the Air Force gave to this program can be ascertained by the fact the initial contract was drawn up on a blackboard, photographed, and work begun as soon as the pictures could be developed rather than taking the time to go through the normal acquisition process.

[70] Schrader, 14, 19, and 23-31. This is a gross simplification of the Weasel tactics Schrader discusses.

[71] Perry D. Luckett and Charles L. Byler, *Tempered Steel: The Three Wars of Triple Air Force Cross Winner Jim Kasler* (Dulles, Virginia: Potomac Books, Inc., 2005; Paperback Edition, 2006), 48-52; Robert Coram, *Boyd: The Fighter Pilot Who Changed the Art of War*, Paperback Edition (New York: Little, Brown and Company, 2002; Back Bay Books, 2004), 81-89; Angelucci with Bowers, 352-355; and Broughton, *Downtown*, 42-43. The F-100 had been a handful from its inception, killing two test pilots during its acceptance trials. and As one of these pilots was Pearl Harbor hero and Pacific ace George Welch and the other is described by Luckett and Byler, "[t]he leading test pilot for Britain's Royal Air Force," it is easy to see how the *Super Sabre* was a handful for even highly experienced pilots.

[72] U.S. Air Force Systems Command memoranda, "SUBJECT: Anti-SAM Test Program Status Reports," November 5 and November 30, 1965, located in the Albert F. Simpson Historical Research Center Archives and declassified 27 March, 1996.

[73] U.S. Air Force Systems Command memoranda, "SUBJECT: Anti-SAM Test Program Status Reports," 4 December, 1965 and 4 January, 1966, located in the Albert F. Simpson Historical Research Center Archives and declassified 27 March, 1996. The reduction in effort can be seen from the number of sorties and types of aircraft flown in support of continued testing despite little corresponding change in items to be tested.

[74] Perry D. Luckett and Charles L. Byler, *Tempered Steel: The Three Wars of Triple Air Force Cross Winner Jim Kasler* (Dulles, Virginia: Potomac Books, Inc., 2005; Paperback Edition, 2006), 48-52; Robert Coram, *Boyd: The Fighter Pilot Who Changed the Art of War*, Paperback Edition (New York: Little, Brown and Company, 2002; Back Bay Books, 2004), 81-89; Angelucci with Bowers, 352-355; and Broughton, *Downtown*, 42-43. The F-100 had been a handful from its inception, killing two test pilots during its acceptance trials. and As one of these pilots was Pearl Harbor hero and Pacific ace George Welch and the other is described by Luckett and Byler, "[t]he leading test pilot for Britain's Royal Air Force," it is easy to see how the *Super Sabre* was a handful for even highly experienced pilots.

[75] Halberstadt, Ibid.; Rasimus, *Thunder*, 92-103. Part of the reason for the discrepancy was the F-100F sorties at Eglin were flown without the *Super Sabres* being equipped with fuel tanks. These were a necessity for strikes from Thailand and greatly slowed the F-100F's cruising speed. Rasimus' account highlights the difficulties the F-105D hunter-killers had in maintaining station with the initial Wild Weasels.

[76] Schrader, 31 and Thornborough and Mormillo, 42-47.

[77] Schrader, 36-37.

[78] Bishop, 159-160.

[79] James E. McInerney, Maj. Gen., USAF (ret.), "Interview with Major General James E. McInerney, Jr., USAF (Ret.)," transcript of interview by Mr. W. Howard Plunkett (Maxwell AFB, 25 January, 2006), Air Force Oral History Program, 1-2 and 4.

[80] Thornborough and Mormillo, 60.

[81] Stanley J. Dougherty, Maj., USAF, "Defense Suppression: Building Some Operational Concepts" (Thesis presented to the Faculty of the School of Advanced Air power Studies, Maxwell Air Force Base, Alabama, for completion of graduation requirements, Academic Year 1991-1992), 11-14 and Pratt, 31-33 and 37-39.

[82] Schrader, 37-38. The *Shrike* had a shorter range (12 miles) than the SA-2, flew slower than the *Guideline*, would go ballistic if the targeted enemy radar turned off, and was confused if presented with two radars at roughly the same range but opposite bearings. Please see the vignette by George Acree (WW #289), Col., USAF (ret.), entitled "Something Better Than The Shrike" in *First In, Last Out: Stories by the Wild Weasels (First Person Stories By Wild Weasel Pilots, EWOs and Their Associates)*, Colonel Edward T. Rock, USAF (ret.) ed. (Bloomington, IN: Authorhouse Press, 2005), 361-381 for further discussion of the AGM-45's limitations and the initial USAF fielding of the *StARM*.

[83] Thornborough and Mormillo, 84-87.

[84] Rasimus, *Thunder*, 155-156.

[85] See Broughton, *Downtown*, 138-141; Boyne, *Influence*, 328-329, 333-334, and 341; Clodfelter, 99, 106-107, 110; Drake, 30; and Momyer, *Air power*, 157-158 for examples of this argument.

[86] Clodfelter, 122, 126-129, and 144; McMaster, 52-53; and Van Staaveren, 143-144 and 241.

[87] There are indications that members of the Air Staff were gravely concerned that B-52 losses in Southeast Asia would detract from the bomber's value as a strategic deterrent. However, there were almost as many SAC officers who believed that the threat was minimal given the B-52's ECM capabilities. Given that the JCS, to include

General McConnell, continued to recommend B-52 strikes, this study will assume the latter was the Air Force's official position.

[88] William Head, Ph.D.., "War From Above the Clouds: B-52 Operations During the Second Indochina War and the Effects of the Air War on Theory and Doctrine," The Fairchild Papers Series, (Maxwell AFB, Alabama: Air University Press, July 2002), 22-23.

[89] Head, 22. The B-52s internal carriage racks could be modified to allow the carriage of the same number of bombs despite the difference in weight.

[90] Head, 91-93 and Luttwak and Koehl, 94 (bombing techniques) and 570 (*Stratofortress*).

[91] Momyer, *Air power*, 157.

[92] For a detailed discussion of these issues, see B.L. Blustone and J.P. Peak's technical report entitled "Air Superiority and Airfield Attack: Lessons from History," prepared for the Defense Nuclear Agency, 15 May, 1984, Contract No. DNA 001-81-C-0183.

[93] Bell, 266-270. Pratt has the only mention (15) of a control tower being purposefully targeted and destroyed utilizing a *Walleye* bomb.

[94] Ibid..

[95] Rasimus, *Thunder*, 70-71.

[96] Rendall, 165; Tilford, 114; and Van Staaveren, 263-265. The air munitions shortage affected all of the services and, in the cases of the USN, was a contributing factor to several operational accidents during that service's campaign. See Rene J. Francillon's *Tonkin Gulf Yacht Club: U.S. Carrier Operations off Vietnam* (Annapolis, MD: Naval Institute Press, 1988) or Peter B. Mersky and Normal Polmar's *The Naval Air War in Vietnam* (Annapolis, MD: The Nautical & Aviation Publishing Company of America, 1981) for further discussion of the Navy's dealings with these issues.

[97] Barry D. Watts, "Doctrine, Technology, and War," Air and Space Doctrinal Symposium, Maxwell AFB, AL, 30 APR-1 May 1996 and *Six Decades of Guided Munitions and Battle Networks: Progress and Prospects* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 2007), 115-148; Hobbs, 18; and Michel, *Clashes*, 68-69. The restrictions on missile engagements stemmed from several fratricide incidents in 1965. According to Hobbs, a Navy F-4 was shot down by a *Phantom*'s AIM-7 *Sparrow* during an engagement with Chinese MiGs. Watts points out in both his works that there were several times that Air Force F-4s locked onto and were cleared to engage Navy aircraft by their higher control agencies. Given these examples, the high number of American aircraft, relatively low number of MiGs, lack of reliable identification friend or foe (IFF), and cluttered electronic environment, restricting use of the AIM-7 at will made sense. Furthermore, this was often a self-imposed restriction as well. Finally, from the *Sparrow*'s adoption to the conclusion of the Israeli Bekaa Valley campaign there are only four confirmed BVR kills despite extremely permissive ROE on the Israeli Air Force's part during the 1973 Yom Kippur War and their Lebanon campaign.

[98] Michel, *Clashes*, 181-185; Momyer, *Air power*, 178-179; Rendall, 178; and Whitt, 39.

[99] Futrell et al, 4; Hannah, 46-47; and Hobbs, 270.

[100] John Trotti, *Phantom Over Vietnam* (Novato, CA: Presidio Press, 1984; New York: Berkely Press, 1985), 51-52; Michel, *Clashes*, 150-158; Richardson and Spick, 34-37; Wilson, 105-106; and Witt, 41-47. Ripple-firing is the process where all four *Sparrows* are fired as rapidly as the *Phantom*'s fire control system would allow.

[101] Ibid.. It was not unknown for a *Sidewinder* to go after a factory chimney, sun-warmed cloud formation, or cooking fire rather than the MiG it was fired at.

[102] Walter J. Boyne, *Aces In Command: Fighter Pilots as Combat Leaders* (Washington, D.C.: Brassey's, 2001), 191-192 and Jerry Scutts, *Wolfpack: Hunting MiGs over Vietnam*, Motorbooks International Edition (Shewsbury, England: Airlife Publishing Ltd., 1988; Osceola, WI: Motorbooks International, 1988), 44-45.

[103] F.C. "Boots" Blesse, Maj. Gen., USAF (ret.), *Check Six: A Fighter Pilot Looks Back* (Mesa, AZ: Champlin Fighter Museum Press, 1987), 120-126.

[104] Alexander H.C. Harwick, "F-4 Phantom," *Flying American Combat Aircraft: The Cold War*, Robin Higham, ed., (Mechanicsburg, PA: Stackpole Books, 2005), 316; Momyer, *Air power*, 177-178; and Richardson and Spick, 28-29.

[105] Ibid..

[106] Boyne, *Phantom*, 112-113. The Air Force and Navy had both declined to adopt the modification that would prevent this problem, although the Navy adopted the necessary change prior to the start of Linebacker I.

[107] Ibid..

[108] George J. Marrett, *Contrails Over the Mojave: The Golden Age of Jet Flight Testing at Edwards Air Force Base* (Annapolis, MD: Naval Institute Press, 2008), 137-140; and Boyne, Ibid., 113 and 116; Ed Rasimus, *Palace Cobra: A Fighter Pilot In the Vietnam Air War*, Paperback ed. (St. Martin's Press, April 2006; St. Martin's Paperbacks Edition, September 2007), 34-35. Harwick, 311, has a far differing opinion on how susceptible the F-4 was to departure, but he is also acknowledged (on 318) as a pilot who "has more time in the F-4 than any other pilot in the world---3,900 hours." This is, to be charitable, akin to someone with multiple rally race championships stating that he or she does not see the problem with your average driver being unable to operate in adverse conditions.

[109] Boyne, *Aces*, 189-191; Cobleigh, 145-149; Michel, 184-184; and Sherwood, 33-34. Colonel Olds, despite the 8th TFW's and his own stellar performance, was promoted to Brigadier General and sent to the Air Force Academy as Commandant. To say that this was a less than effective use of resources would be an understatement.

[110] Robert E. Buhrow, Maj., USAF (ret.), interview by Lt. Colonel Robert Eckert and Major Harry Shallcross, USAF, 28 September 1967, CORONA HARVEST #28, U.S. Air Force Oral History Program, Albert F. Simpson Historical Research Center, Declassified 17 August, 1992., 18-19 and Momyer, 162. Momyer justifies this requirement on the short duration of authorization to hit targets and a desire to "destroy as much of the target as possible with each strike."

[111] There was a great disgust with this policy. Captain L.W. Thornal, a Rolling Thunder Veteran, comments on how this policy affected his own view of the war several times throughout his interview. Rasimus devotes an entire chapter entitled "Pilots Flying Fighters" (237-253) in *When Thunder Rolled* to the pernicious affects this policy had on his wing. The majority of the historiography, even if they do not go into the explicit detail he does, is in concurrence with his assessment. Furthermore, they openly state that these factors affected both the F-4 and F-105 community as, unlike during World War II, these replacements were not specialist fighter pilots but whatever flying officers the Air Force personnel system decided should go next. Although rotating units through the combat area had its own set of problems (as the USN found out), transferring former bomber and transport pilots to fighters, giving them a short transition course, and then sending these officers into combat led to more immediate and often fatal problems for the receiving units. It is telling that General Horner specifically cites his Vietnam

experience as the reason why he refused to countenance a possible rotation policy for Operation Desert Storm (Clancy, 297-299).

[112] Ed Rasimus, *Palace Cobra: A Fighter Pilot In the Vietnam Air War*, Paperback ed. (St. Martin's Press, April 2006; St. Martin's Paperbacks Edition, September 2007), 23-42; Sherwood, 59-61; and Tilford, 215-217.

[113] William W. Momyer, Gen., USAF (ret.) in memorandum to General Ellis, "SUBJECT: CORONA HARVEST (Out Country Air Operations, Southeast Asia, 1 January, 1965 – 31 March, 1968," with enclosures (Maxwell AFB, Alabama: Albert F. Simpson Historical Research Archives, General Momyer Correspondence, Declassified December 31, 1982.) Memorandum is undated, but is stamped for archival entry 23 JUL 1974, 6-7; Bishop, 178-180; Michel, *Clashes*, 162-165; Rasimus, *When Thunder Rolled*, 188-190, and Worden, 185-186.

[114] Hobbs, 271.

[115] Clancy, 95-110; Anderegg, 39-40; Clodfelter, 134; and Sparks, 20-22.

[116] Anderegg, ibid.. The majority of these pilots were departing flight billets due to their advanced age. A pilot who had been inducted into the Army Air Corps at 18 in 1945 was, by 1968, a 42-year-old senior officer with over 20 years of service. The performance of several Rolling Thunder squadron and wing commanders notwithstanding, the Air Force felt that this was far too old for continued, regular flying duties.

CHAPTER 4 - Between Thunder and a Linebacker

The Air Force's leaders had limited options with which to prevent the loss of knowledge gained from 1965 to 1968. First, there was the option of preventing experienced pilots from leaving the service. There are no indications that senior military leaders considered this drastic step and, even if they had, the legality of it would have been in question. A second option was to begin an oral history and interview program that attempted to record the thoughts of all of the former combat officers. General McConnell began such a program (initially called LOYAL LOOK but later dubbed CORONA HARVEST), but time and constrained resources limited its effect.[1]

The final option available to General McConnell and the Air Force was to update its doctrine. The Air Staff had begun this process prior to Operation Rolling Thunder.[2] Indeed, one of McConnell's first acts as Chief of Staff had been to circulate an almost prescient memorandum on the need for the Air Force to revise its views on air superiority.[3] However, operations over North Vietnam had absorbed a great deal of the Air Force's institutional and intellectual energy. This absorption, in turn, had resulted in the stagnation of doctrinal development.

SEAD Doctrine, 1968 through 1972

Ideally, this torpid state of doctrine development should have been a blessing in disguise for the Air Force. With both a large number of experienced officers as well as guidance clearly in need of revision, the Air Force should have been poised to make a radical doctrinal advance. This did not occur. Instead, USAF, from 1968 to 1972, did little to increase its conventional

capability in general and almost nothing to change its SEAD capability. Lacking the pervasive guidance of doctrine, the Air Force made few advances with regard to fixing the vulnerabilities exposed by the NV-IADS during Rolling Thunder. The changes made to training, equipment, and procurement policies were minimal and, for the most part, had little effect on the ability to destroy an NV-IADS. There is little evidence that USAF leaders at any level attempted to determine how Air Force units were to identify or destroy an IADS's command and control elements. With regard to AAA, from 1968 to 1972 the Air Force continued to preach the gospel of terrain avoidance and low-level ingress and egress rather than concentrating solely on the far safer medium-altitude ingress followed by dive-bombing delivery.[4] This was a clear indication that USAF leaders' views on the effectiveness of AAA against modern jet aircraft were still in flux even though Operation Rolling Thunder had provided overwhelming evidence in the affirmative.[5]

Anti-radar efforts faced a similar organizational malaise. In addition to its Rolling Thunder experience, USAF was also able to observe the Israeli Air Force's (IAF's) issues in facing Egyptian defenses from late 1967 on.[6] Despite this, there were minimal advances in anti-radar capability, either through ECM or through physical attack. The EB-66, despite its creeping obsolescence, continued to be the primary jamming aircraft. As for Wild Weasels, USAF once again attempted to use an obsolescent airframe (the F-4C) rather than attempt to develop a wholly new system or diverting new *Phantom* production for modification. In addition to not being able to carry *StARM*s, the F-4C had serious issues with regard to its avionics suite.[7] These proved difficult to resolve and, as the Air Force gave little priority to this task, the Wild Weasel IV was not ready for combat prior to October 1972.[8]

The sum effect of these changes was that the Air Force aircraft went to war in 1972 with less electronic warfare capability than it had when Operation Rolling Thunder ended. On the positive side, the ability to carry more *StARM*s, better jammers, minor improvements in avionics, and an increase in the total available airframes meant that Wild Weasels were somewhat more capable. This increase in capability, however, was more than counterbalanced by the increased proficiency of the North Vietnamese, the F-105F/G's age, the *Thunderchiefs*' lower speed at medium altitude, and the need for Wild Weasels to be provided with an additional flight of escorts. Whether or not one believes that the Air Force's anti-radar capability actually regressed, there is overwhelming evidence that markedly improving Wild Weasel capability had not been a priority of the intervening four years.[9]

The Air Force appeared similarly disinterested in making major improvements in its ability to destroy airborne MiGs. Despite the heavy losses suffered from NVAF interceptors, especially in the final months of Rolling Thunder, the Air Force did not increase its focus on ACM. Instead, the number of aerial combat training flights flown by new pilots actually decreased.[10] Even worse, those missions which were left in the syllabus did not include dissimilar training, but instead were the same rigidly controlled exercises that had passed for training prior to Rolling Thunder.[11] Rather than learning how to use their *Phantom*s' strengths against an enemy's weaknesses, new pilots were often sent to war with only a rudimentary understanding of their fighters' capabilities.[12]

This lack of training made the improvements the Air Force made to the *Phantom* itself superfluous. Equipping the "E" model of the *Phantom* with a gun did little good if no one taught the pilots flying the fighter how to bring their cannon to bear. Improved avionics and ergonomically modified cockpits had little effect if the Air Force did not ensure that pilots

received the number of training sorties to make their use second nature. When TAC did not develop a training regimen that instructed pilots on how to fly an F-4 throughout its flight regime, expecting these same pilots to take advantage of maneuvering slats that were designed to improve the *Phantom*'s performance in air-to-air combat was somewhat wishful thinking. Finally, the continued problems with the *Sparrow* and *Sidewinder* meant that the F-4s' primary armament remained ineffective.[13]

SEAD doctrine was not a panacea for all of these issues. However, it is clear that, in its absence, the Air Force continued most of the same policies that had caused the heavy losses during Operation Rolling Thunder. From the lack of movement on SEAD doctrine, equipment, or training from 1968 through 1972, it appeared that Air Force leaders focused on the wrong issues after rolling Thunder. Although, as noted by Air Force historian Michael Worden, "TAC worked closely with Systems Command to develop cluster-bomb munitions (CBU), precision-guided munitions (PGM), radar warning systems…F-4E gatling guns…electronic warfare aircraft, and long-range aid to navigation (LORAN) systems," the majority of these efforts were conducted without thought to their integration with each other.[14] For almost four years the Air Force, in focusing on individual aircraft components and ordnance effects on targets, did not apply a great deal of effort in determining how their pilots would get to their objectives through an integrated air defense system.

Thoughts on Air Defense

Noting the Air Force's lack of SEAD doctrine is not intended to imply that the 1971 edition of AFM 1-1 completely ignored the enemy air defenses. Indeed, if the Air Force had not just spent three years being mauled over North Vietnam, its treatment of a possible enemy IADS

would have appeared to be sufficient given the dearth of other information for analysis. At the tactical level, the Air Force's revised doctrinal manual provided a doctrine of what the "counterair mission" consisted of [bold in original copy]:

> **3-4. Conventional Mission Characteristics.** In a conflict involving only conventional weapons, the following mission characteristics will generally apply:
>
> **a. The Counterair Mission.** Conventional operations require the use of aircraft of such a scale as to be impracticable without air superiority. The counterair mission can best be accomplished by multiple attacks against the enemy's airbases, air order of battle, and his command and control facilities, but must also include the interception and destruction of enemy aircraft in flight. If sanctuary is permitted near the battle zone, air superiority will depend on air-to-air combat.[15]

This tactical definition complemented the counterair operational task [bold in original copy]:

> a. **Counterair.** Counterair operations are conducted to gain and maintain air superiority by destruction or neutralization of an enemy's offensive and defensive air capability. The counterair mission involves both offensive and defensive air action.
>
> (1) Offensive counterair operations are normally conducted throughout enemy territory to seek out and destroy aircraft in the air or on the ground, missile and anti-aircraft artillery sites, air bases, air control systems, fuel stores and other elements which constitute or support the enemy air order of battle.
>
> (2) Defensive counterair operations are generally reactive to enemy initiative. Air defense operations involve destroying enemy air vehicles attempting to penetrate friendly air space. While air defense is vital to the overall counterair program and to the security of friendly forces and installations, the most rapid and conclusive results are obtained through offensive action.
>
> (3) Centralized allocation and direction of air forces is essential to achieve maximum effectiveness of the counterair effort and to insure coordination of the overall air campaign.[16]

In order to accomplish these tasks, according to AFM 1-1, aerospace forces would have to be "capable of":

> (1) Sustained operations under austere conditions.
>
> (2) Continuous mission performance under all conditions of light and weather.
>
> (3) Continued and effective operations in a sophisticated enemy electromagnetic environment.
>
> (4) Survivability under enemy fire.

(5) Obtaining complete and timely intelligence on enemy activities.

b. Underlying the foregoing capabilities is the requirement for a secure, responsive, flexible control system to direct the forces, integrate their efforts, and coordinate operations with those of other friendly forces.

c. Standardized equipment, ordnance, and operational procedures are desirable, however, efforts to standardize should not compromise mission flexibility nor create stereotyped operational patterns.

d. Combat aircraft are designed to accomplish specific operational tasks. At the same time to achieve flexibility, combat aircraft are capable of performing multiple missions.[17]

Finally, the ordnance which these aircraft would carry would meet the following description [bold in original text]:

3-3. Conventional Weapons Capabilities. Conventional weapon capabilities should not be considered as fixed or static. Since military capability is sensitive to new types of weapons and improved delivery systems, efforts to upgrade conventional systems must proceed alongside comparable efforts in the field of nuclear warfare. Smoke, incendiary agents and riot control agents are included within the concept of conventional air operations.

These descriptions and analysis would have been suitable if written in 1965. However, when compared to descriptions of operations over North Vietnam and the stated national policy of the Nixon Administration, they were far from adequate. The Air Force was tasked with multiple worldwide missions, and Air Force leaders repeatedly emphasized that a potential war in Central Europe was their paradigm for measuring effectiveness and contingency planning.[18] AFM 1-1's authors wrote the above paragraphs as if many of these contingencies would not entail fighting the very same systems that had just savaged 7th Air Force over the DRV. Indeed, by looking at AFM 1-1 an outside observer would have believed that an individual AAA site was as worthwhile a target as fuel stores for a major air base. If one accepts that the purpose of doctrine is to provide clear guidelines, AFM 1-1 did not meet this standard with regard to SEAD.

This shortcoming did not end with target prioritization. Based on the document's own definitions, it was impossible for a theater commander to organize an effective SEAD aerospace

force from systems available in 1971. With only limited capability to operate at night, marginally better suitability to operations in an electronic environment, and no innate reconnaissance capabilities, the F-4 airframe did not even meet most of the criteria for aerospace power in the document. Thus, commanders expected to carry out SEAD would not be able to employ the proposed Wild Weasel IV aircraft against ground-based threats even as the document was being written, much less in the near future. This dissonance becomes even more pronounced when one considers that the F-105 F/G, not the F-4C, was still USAF's primary suppression aircraft in September 1971.

This dissonance between doctrinally stated requirements and existing Air Force capabilities in 1971 continues with regard to conventional weapons. Although AFM 1-1 alludes to conventional weapons, there is no mention of what these weapons are expected to do to targets. SEAD weapons are not even described in general. As doctrine should drive procurement, this is a curious omission. The Air Force had learned through painful experience over North Vietnam that not all conventional weapons were created equal. Although having the central doctrinal text list every weapon by type would be unwieldy, having a general description of what each type of weapon should be capable of in the service of aerospace power could have been accomplished in a short number of pages. The Air Force's doctrinal writers did not do this and, in addition to leading to later weapons procurement mischief, this omission increased the likelihood that the bomber, fighter, and electronic warfare communities would suffer confusion when communicating with one another.

Finally, AFM 1-1 continued the tie Air Force conventional and nuclear capabilities together as part of a warfighting whole. Tying conventional capabilities to nuclear advancements (see para. 3-3 above) did not make much sense. The Soviet Union's

advancements in nuclear weapons by 1971 greatly decreased the likelihood that a nuclear exchange would occur. Simultaneously, this paradigm increased the probability of a conventional conflict. By stating that R&D efforts for both had to be "comparable," USAF leaders indicated their belief both that thermonuclear exchange continued to be a viable national strategy and, in addition, that conventional weapons should not be given primacy of place in future Air Force plans regardless of the increased likelihood of their use. Further evidence of this mindset can be seen in the fact that conventional weapons operations are covered in one chapter, yet AFM 1-1 dedicated two chapters to nuclear warfare. Although it was feasible that there could be low-intensity as well as high-intensity nuclear conflict in 1971, the Air Force had not used a single nuclear bomb in combat throughout its entire existence. Therefore, the devotion of so much space to this topic in AFM 1-1 is somewhat puzzling when the Air Force had fought at least six years of mid-intensity conflicts and continued to support a low-intensity counterinsurgency in South Vietnam.[19]

Even harder to understand is why the Air Force included these two chapters yet did not include one on SEAD. North Vietnam's air defenses had accounted for the downing of almost 1,000 aircraft using obsolescent systems. The Air Force was well aware that the Soviet Union possessed far more capable systems. Even excluding the primacy of the Central European scenario in USAF war planning, Air Force leaders and pilots were well aware of the Soviet Union's willingness to provide advanced systems to client states.[20] Despite this knowledge, AFM 1-1's writers saw fit to provide only three paragraphs on this threat. With regard to discussion on how Air Force pilots would go about defanging future threats, the doctrine published in September 1971 was fundamentally the same as that published in 1953.

Explaining the Excluded

No single event explains why Air Force SEAD doctrine did not evolve from 1968 to 1972. The Air Force remained a large organization and, like all similar entities, had many complexities and interactions that usually prevented any one person from greatly influencing its doctrinal development. However, historical evidence indicates that there were three major incidents that influenced the development of AFM 1-1 in general and the exclusion of SEAD doctrine in particular. First, the election of Richard Nixon and appointment of his cabinet not only changed the Air Force's civilian leadership in 1968 but revamped USAF's strategic focus yet again. The 1969 appointment of General John D. Ryan to succeed General McConnell as Air Force Chief of Staff meant that this reorientation occurred in a period when military leadership was also transitioning. Finally, in yet another shift, General McConnell appointed General William Momyer to become head of Tactical Air Command. Having all three of these positions change hands simultaneously had interesting effects on Air Force doctrine.

President Nixon, in addition to wanting to end the Vietnam War, also sought to shift American military responsibilities. The Nixon Doctrine and Vietnamization were merely the conventional portions of this plan. As part of the larger U.S. military framework, Nixon sought to reduce tension with the Soviet Union and exploit the increasing acrimony with that nation and the People's Republic of China. In addition to believing that this would help the United States extricate itself from Vietnam, President Nixon believed that this would have the effect of reducing the military budget.[21] Nixon may not have understood what was needed to enact the Nixon Doctrine, but his intentions were quite apparent soon after he took office.

No matter how bluntly Nixon put things, however, the President was hamstrung by his frosty relationship with Secretary of Defense Melvin R. Laird. Laird had not been Nixon's first choice to head DoD and, as the President did not know him well, did not enjoy the Chief

Executive's full confidence.[22] As would be the case with many others, this lack of trust led Nixon to regard Laird with increasing acrimony and paranoia. Laird's actions during a crisis with North Korea followed shortly by Nixon's suspicions that his Secretary of Defense was the source of the leak regarding operations in Cambodia did not help matters.[23] Eventually, the friction between the two men grew to the point that their relationship was barely functional, as Nixon began to believe that Laird was more interested in simply abandoning South Vietnam than achieving any semblance of victory.[24] Although a degree of tension between a President and his Secretary of Defense in time of war may be normal or even healthy, the relationship between Nixon and Laird exceeded this standard. This friction, combined with the damage done to the Department of Defense by the Johnson Administration, prevented Laird from acting as Nixon's agent of change within the Department of Defense.

In contrast to Laird and Nixon, the problem with the association between Secretary of the Air Force Robert Seamans, Jr. and General Ryan was that it was too friendly. Air historian Walter J. Boyne describes Seamans as "able" and an "excellent match" for General Ryan when the latter became Air Force Chief of Staff.[25] If one accepts that the Air Force needed change, it stands to reason that this was not a good thing. Furthermore, Seamans not only established the Air Force's Central European focus but also gave every indication that the Air Force's leaders did not have to worry about a return to North Vietnam.[26] With this lackadaisical approach to solving the war at hand, Seamans likely contributed to, as Earl Tilford puts it, the "sense within the Air Force that the [Vietnam] war was over" in 1971.[27] Finally, there are no indications that Seamans questioned the Air Force's continued attempt to develop a successor to the B-52 or, given the Nixon Doctrine, why continued strategic upgrades should have priority over upgrading the conventional fighting force.[28] Taken altogether, these actions strongly indicate that Secretary

Seamans, regardless of the extent of his knowledge about the Air Force or what had occurred during Operation Rolling Thunder, was not interested in forcing major modifications to doctrine on the Air Force's military leadership.

Air Force Leaders

That impetus for sweeping changes would have to come from an external source is apparent from examining the three Air Force officers who were responsible for conventional readiness prior to Operation Linebacker. The first of these, General McConnell, was only briefly upon the scene. Having served as Air Force Chief of Staff for the entirety of Rolling Thunder, McConnell blamed most of that campaign's shortcomings on civilian leaders' restrictions.[29] Furthermore, McConnell felt that the Air Force had allowed its strategic strength to decline to dangerous levels.[30] Although he had cut SAC's research and development budget to the bone in order to support tactical fighters in contact, McConnell had also strongly resisted cutting prohibitively expensive bomber programs in order to expedite the production of conventional fighters.[31] It was clear that General McConnell believed the Air Force should reallocate the bulk of its budget from conventional operations to rebuilding SAC as soon as the Vietnam War was over. It is not hard to imagine how the Chief of Staff's views may have influenced doctrine writers in general and, given that McConnell gave little indication that he believed suppressing enemy air defenses was a key task, with regard to SEAD in particular.

General John D. Ryan, McConnell's successor, believed even more strongly in the primacy of strategic forces. General McConnell, desiring Ryan to be his successor, had appointed the latter as Commander in Chief, Pacific Air Forces at the beginning of Operation Rolling Thunder. McConnell had done this specifically so that Ryan, who had spent his entire

career within SAC, could gain some experience overseeing tactical fighters. This appointment did not go well. First, General Ryan regularly demonstrated ignorance of what his pilots were going through and gave few indications that he wished to learn.[32] Second, he displayed a very poor leadership style which often prevented the flow of information between PACAF and 7th Air Force and also had a negative impact on pilots' morale. Finally, on more than one occasion he seemingly demonstrated a lack of integrity to his subordinates.[33]

Had Ryan not become Air Force Chief of Staff, these personality traits would not have had much bearing on how USAF developed doctrine. However, General Ryan carried these same traits to Washington when he succeeded McConnell. Two incidents will suffice to illustrate this point. First, after tacitly encouraging 7th Air Force commander General John D. Lavelle to interpret liberally his rules of engagement with regard to striking North Vietnamese targets in 1971, Ryan did not defend his subordinate when these incidents drew the ire of President Nixon.[34] Second, after having dispatched then Brigadier General Robin Olds to conduct an evaluation of 7th Air Force's capabilities, General Ryan did not reward the World War II ace and MiG killer for his candor. Instead, General Olds was shuffled off to the Air Force Inspector General's office, effectively ending his career.[35] Justifiably or not, General Ryan began to develop a reputation for not wanting to hear bad news or have subordinates confront him in public.[36] Although the effect this environment had on doctrinal development cannot be quantified, it is unlikely that it was positive.

The last Air Force leader who, by virtue of position and experience, could have had a great influence on Air Force doctrine was General William Momyer, commander of TAC. Of all three military leaders, it is General Momyer's unwillingness to force change that is hardest to explain. The commander of 7th Air Force throughout Rolling Thunder, Momyer had been an

approachable leader who often visited his wing commanders.[37] Unlike Ryan at PACAF, Momyer had been well aware of the NV-IADS's effect on his forces. In response to the strength of the DRV's defenses, General Momyer had regularly scheduled tactics meetings involving all of his subordinate leaders then disseminated the collective input throughout his organization.[38] When General McConnell appointed Momyer as head of TAC, it was with the understanding that the latter would bring these same techniques with him to his new posting. General Ryan reaffirmed this expectation when he succeeded McConnell as Chief of Staff.[39] Therefore, it is hard to understand why General Momyer did not ensure that AFM 1-1 encapsulated more of the lessons, to include the necessity for SEAD, which 7th Air Force had learned.

One possible cause could be combat fatigue, as Momyer had overseen the longest bombing campaign in the Air Force's short history while simultaneously running the air war over South Vietnam. Another is that Momyer may have believed that the Air Force, and he, had executed Rolling Thunder to the best of their ability given the resources at hand and civilian restrictions in place. Momyer espouses this view throughout his book *Air power In Three Wars* and it is hard to believe that this opinion did not affect his actions as TAC commander. Providing further evidence that this stance may have been a factor is a 1974 memorandum that accompanied the CORONA HARVEST report on operations over North Vietnam and Laos during Rolling Thunder. In it, Momyer states:

> Many of the restrictions on the attack of SAMs and AAA came from the location of these weapons. The North Vietnamese deliberately sited many of these weapons in civilian areas knowing full well there would be a reluctance to strike these sites because of the civilian casualties that would ensue. The question of expected collateral damage became a major consideration in the selection of targets at the highest level. The SAMs and AAA that were located in the ten and thirty mile circle were usually surrounded by civilian structures. Collateral

> damage could be significant when striking these targets which invariably had a political effect on the international scene.[40]

Momyer proceeds to give a similar treatment to air-to-air combat during Rolling Thunder:

> With the **projected weapon systems now being developed and procured**, [emphasis added] we should have a vastly improved potential for air to air combat. Although the air to air engagements were dramatic in the Vietnam War, they were of **limited significance** [emphasis added] in terms of operations against the warmaking structure of the North Vietnamese. The MiG force was relatively small and the size of the engagements was limited to four to five aircraft at any given time. Even under the intensive effort by the North Vietnamese, the number of MiGs up for battle never exceeded fifteen to twenty aircraft. We should, therefore, be cautious about the lessons derived from these limited combats. Most certainly, relative performance of aircraft could be judged and restricted conclusions on air to air tactics could be deduced, but one should not try to extrapolate these limited experiences in generalizing about the character of an air war in Europe where thousands of fighters would be involved.
>
> Recommendation. **Current actions are considered adequate** [emphasis added]. Care should be exercised in the application of the Vietnam experience to our tactical operations manuals. TAC should be directed to review such publications for applicability to a large scale war.[41]

Considering that General Momyer wrote this in 1974, i.e., two years after the Linebacker Operations, it is safe to assume that Momyer had these same opinions from 1968 to 1972. This means that, in Momyer's view, it was not the Air Force's current doctrine or its lack of guidance that explained 7th Air Force's inability to combat the NV-IADS. Nor was it USAF's inability to reliably detect active *Fan Song* and *Fire Can* radars, lack of a suitable ARM or conventional munitions to destroy SAM sites, or lack of pilot training in the delivery of these weapons that explained the resiliency of North Vietnam's defenses.

Instead, in Momyer's view it was the DRV's cunning use of civilian structures coupled with President Johnson and Secretary McNamara's unwillingness to suffer a loss of international

prestige that explained 7th Air Force's issues with ground defenses. Likewise, the missiles that had failed to work reliably in Rolling Thunder had done so, in part, due to a lack of a target-rich environment or high-altitude clash between droves of MiGs and squadrons of *Phantoms*. Finally, as long as the Air Force could wait until new systems were produced, there was no need to change training or ensure that pilots knew how to use their high-technology mounts once they began to arrive in the Air Force.

Combined, these factors meant that TAC, like the remainder of the Air Force, marked time and focused on attempting to mitigate the damage Operation Rolling Thunder had caused. Although Momyer did make several changes, the majority of these did not require strenuous action or risk taking on his part. By emphasizing that TAC focus on the development of guided bombs, all-weather capability, and sensor systems, General Momyer ensured that USAF's next generation of warriors would go to war with the ability to threaten an ever growing list of targets.[42] Unfortunately for the generation he commanded, however, the North Vietnamese did not wait until these projects came to full fruition. When the Easter Offensive broke, USAF's tactical fighters once again went to war with a focus on what would happen once a strike group reached a target but little idea of how to get there.

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[1] Futrell, *Ideas Vol. II*, 318-323.

[2] Ibid., 235.

[3] Ibid., 470-471.

[4] Anderegg, 22-26 and 63-65; Rasimus, *Palace Cobra*, Ibid..

[5] Clodfelter, 131; Hobbs, 14-170 and 270-271; and Michel, *Clashes*, 149. Hobbs' work especially indicates the lethality of small arms and AAA throughout Southeast Asia, as the overwhelming majority of USAF losses were due to these systems. Although 7th Air Force would conduct a wholly different war during the Linebacker Operations, the fact that TAC continued to train pilots in methods which were proven to lead to increased losses indicates a lack of Air Force focus.

[6] Belli, 108.

[7] Schrader, 50-53 and Thornborough and Mormillo, 93-98. Schrader indicates that part of the reason for this decision was a desire to maintain F-4D strength in Europe. Thompson and Mormillo detail than the F-4C Wild Weasel was initially deployed to Korea in 1969 but due to the continued electronic problems was not considered wholly operational by the Air Force.

[8] Schrader, 50-53; Thompson, 266-267; and Thornborough and Mormillo, 125.

[9] Dortch interview; Bishop 206; and Schrader, 46-47,

[10] Michel, *Clashes*, 181-185.

[11] Ibid. and Rasimus, *Palace Cobra*, 23-42.

[12] Anderegg, 20-21.

[13] Michel, *Clashes*, 181-185; Worden, 188-189.

[14] Worden, ibid..

[15] AFM 1-1, 28 September 71 edition, 3-2.

[16] Ibid., 2-1. Numbering is as presented in original text.

[17] Ibid., 2-4. Numbering is as presented in the original text.

[18] Futrell, *Vol. II*, 490-498 and Trest, 213-214.

[19] Chapter 4 and Chapter 5, respectively. The six years includes three years of Rolling Thunder and the entire Korean War.

[20] R.A. Mason, "Air power as a National Instrument: The Arab Israeli Wars," in *The War in the Air, 1914-1994*, American edition, Alan Stephens, ed. (Maxwell AFB, Alabama: Air University Press (in cooperation with RAAF Aerospace Center), January 2001) 191-220 with particular attention to 200-201; Belli, 108-109; Futrell, 472-475 and 490-492.

[21] Nixon, 394-397 and 400-418.

[22] Nixon, 289 and Randolph, 7. Nixon stated in his memoirs that President Eisenhower expressed doubts not once but twice about Laird's duplicity. As President Nixon ostensibly agreed with Eisenhower, it is hard to understand why he decided to still nominate Laird as Secretary of Defense.

[23] Nixon, 380-385 and 388.

[24] Ibid., 400, 407, 433, 450, 509.

[25] Boyne, *Wild Blue*, 256.

[26] Tilford, 166 and 215; and Trest, 207-208.

[27] Tilford, 215.

[28] Worden, 192-196.

[29] Futrell, *Ideas Vol. II*, 478.

[30] Boyne, *Wild Blue*, 256 and Worden, 192-193.

[31] Boyne and Worden, both ibid..

[32] Bell, 216-218; Broughton, *Downtown*, 98-99 and Thompson, 59-61.

[33] Ibid. and Clodfelter, 123. For example, according to Clodfelter, Ryan directed the bombing of a North Vietnamese village despite protestations that there was little evidence that a suspected SAM facility was actually present. Another example, cited by Bell and Broughton, was Ryan's actions during the *Turkestan* incident.

[34] Thompson, 193-210.

[35] Boyne, *Aces*, 190 and Sherwood, 34-35.

[36] Worden, 194-195.

[37] Blesse, 120-126.; Boyne, *Aces*, 178-181; and Broughton, *Downtown*, 99-100.

[38] The existence of these meetings is indicated in the notes from the various CHECO reports cited in this paper. However, unlike these reports, the majority of these documents have yet to be unclassified.

[39] William W. Momyer, Gen., USAF (ret.), interview by Dr. Edgar F. Puryear, Jr., 9 September, 1981, Part I interview transcript, U.S. Air Force Oral History Program, Albert F. Simpson Historical Research Center, 10.

[40] Momyer, CORONA HARVEST enclosures, 3.

[41] Ibid., 4.

[42] Bishop, 206-207.

CHAPTER 5 - The Linebacker Operations

The North Vietnamese offensive was, in many ways, the first chance to test the Nixon Doctrine. President Nixon, true to his word, relied on American air power to support an ally's ground forces in resistance to Communist aggression. Unlike his predecessor, President Nixon released these forces with reasonably clear strategic goals and the will to accomplish them. The North Vietnamese, in response to this onslaught, defended their country with the same systems they had from 1965 to 1968. Beginning with Operation Freedom Train, transitioning seamlessly to Linebacker I and then, after a two-month pause (October through November 1972), ending with Linebacker II, the United States Navy and Air Force once again put America's air power theories to the test.

Measuring Effectiveness

There are many opinions on the outcome of this test. Many of these judgments depend on how one views the ultimate objectives. As one Air Force historian has noted, a football linebacker disrupts the offense through speed, strength, and the application of controlled violence.[1] Although urban legend has it that Linebacker I was so dubbed "because of [President Nixon's] fondness for football," the moniker was an apt allegory given American intentions to disrupt North Vietnam's strategic war aims from 30 March to 23 October, 1972.[2] However, as disruption is a vague term, clearly enumerating President Nixon's objectives will better serve further discussion. Generally speaking, the Air Force and USN were dispatched to accomplish the following objectives:

1. Interdict the NVA's supply lines in order to prevent the success of the Easter Offensive;

2. Sufficiently punish North Vietnam, both by destroying its military capability and civilian infrastructure, that its leadership was both compelled to accept American peace terms and deterred from future aggression;[3]

3. Validate USAF and USN's ability to conduct conventional operations in a high-threat air defense environment;

4. If USAF introduced strategic bombers, all elements were to ensure that the deterrent value of the manned strategic bomber was preserved.

Goal #1: Battlefield Interdiction

The first two tasks were clearly and repeatedly stated by President Nixon. By deploying the North Vietnamese Army in a modern combined-arms mechanized assault the Politburo had made their forces vulnerable to a traditional aerial interdiction campaign. If DRV's leaders had been correct in their analysis of Nixon, this vulnerability would have been of no consequence—South Vietnam did not have an Air Force capable of many operations beyond close-air support. However, when his military leaders made clear to Nixon the extent and type of the North's attack, the President made several clear comparisons to the North Vietnamese offensive and the *Wehrmacht*'s Ardennes Offensive of December 1944. Equally direct were his indications that he expected the North Vietnamese offensive to suffer a similar fate as that of the German one: strangulation and destruction under the weight of American air power.[4]

Whether or not air power caused the NVA's offensive to fail is arguable even as its importance is not. On one hand, the Linebacker strikes wrought great destruction on the North Vietnamese logistical network through the destruction of bridges, railways, and supply caches throughout that country.[5] On the other, the NVA had foreseen just this possibility and stockpiled sufficient supplies to conduct the initial phase of their offensive.[6] This simple preparation meant

that any interdiction campaign, no matter how rapid, would have taken several weeks to show any effect.

The massive amounts of air power directed against the NVA's offensive forces, however, ensured that the exposed North Vietnamese divisions suffered losses far exceeding what their leaders had prepared for. With a myriad number of aircraft, to include everything from U.S. Army A-1 helicopter gunships through South Vietnamese A-1 *Skyraiders* up to B-52 Arc Light missions dropping 60,000-180,000 pounds of high explosive every thirty minutes, the NVA's armored spearheads faced firepower unlike any seen to that point in warfare. As Nixon desired, this resulted in the defeat of the North Vietnamese offensive in conjunction with the interdiction campaign. Regardless of which phase caused more damage, the NVA's general offensive did not achieve the conquest of the South and thus USAF and USN met President Nixon's goal.[7]

Goal #2: Punishment

The military could not so easily meet the second objective to punish North Vietnam. From Nixon's perspective, the DRV's Politburo had rewarded three years of good faith negotiating with an overt, aggressive betrayal. Moreover, North Vietnam's actions threatened to undermine Nixon and National Security Advisor Henry Kissinger's Cold War détente policies with the People's Republic of China and Soviet Union. Additionally, Nixon had watched his predecessor attempt a gradual campaign that had been a spectacular failure. Finally, and most importantly, Nixon wanted to make certain that the North Vietnamese were keenly aware of the penalties involved should the DRV force the United States to again intervene in Southeast Asia. All four of these factors compelled Nixon to ensure the military understood his intent for the Linebacker operations to be an act of violence so extreme as to deter any future large-scale North

Vietnamese offensives against South Vietnam for at least the remainder of his term. Nixon, contrary to what the DRV's Politburo had expected, had the will to aid South Vietnam. Even worse, as they were about to be made aware, the American President had the necessary vindictiveness to ruin North Vietnam's civil and industrial capability if this would result in the DRV's leadership being cowed into giving South Vietnam breathing room.[8]

It is unknown whether what Nixon asked of the American military was even achievable. Like President Johnson's goal of demonstrating "resolve," Nixon's desire to "punish" the North Vietnamese cannot be quantified. The DRV's Politburo was highly motivated to expedite the United States' exit, as they felt this was the only way to ensure the fall of South Vietnam. After the death of Ho Chi Minh in 1969, some observers noticed that North Vietnamese Politburo members increasingly focused on their own mortality. Ho Chi Minh's death similarly stoked the North Vietnamese people's desire to reunite their country.[9] Combined, these two factors meant that it is unlikely that the United States could achieve a sufficient level of violence to persuade these men to accept a divided Vietnam or, for that matter, any dictated American objectives. That Nixon's goals kept changing not only hindered this process, but also had a negative effect on just how much and what type of pain USAF and USN needed to inflict.[10]

Regardless of these facts, one possible guideline does exist: Operation Rolling Thunder. The North Vietnamese people and leadership had weathered USAF and USN's efforts from 1965 to 1968. Considering North Vietnam's continued intransigence from 1968 to 1972, infiltration of NVA regular units into South Vietnam, and the launch of the Easter Offensive, Operation Rolling Thunder had not greatly affected the DRV's society nor deterred its leaders. Therefore, in order to have achieved Nixon's "punishment," the Linebacker operations would have had to at

least equal if not surpass that earlier effort. This did not occur, and the primary reason was the continued strength of the NV-IADS and the inadequacy of Air Force SEAD doctrine.

It is necessary to examine some factors before the impact from a lack of SEAD doctrine becomes apparent. In 1972, USAF did not deploy as many aircraft to Southeast Asia as it had in 1968. During Linebacker Operations, 7th Air Force had roughly 100 fewer aircraft capable of striking Vietnam that its Rolling Thunder predecessor.[11] The material quality of this force, however, was far greater. During operations from April to October, 7th Air Force's primary strike aircraft was the F-4 *Phantom*, each of which was capable of carrying slightly more tonnage than the F-105. More importantly, the Air Force had developed the *Paveway* (laser) and *GBU / HOBO* (optical or EOGB) families of guided weapons. In clear conditions, both of these systems allowed the F-4 to engage targets that had been previous unassailable due to their proximity to urban centers or sensitive buildings. In addition, they allowed the rapid destruction of bridges, bunkers, and other hardened North Vietnamese structures. The General Dynamics F-111, the end result of Secretary McNamara's TFX program, provided an all-weather, night-attack capability from September 1972 forward.[12]

Taken altogether, these new capabilities meant that General John W. Vogt, 7th Air Force's commander, possessed a far deadlier force than General Momyer had. When one added SAC's B-52s, first used in April 1972 and fully committed in December 1972, USAF seemingly had more than enough firepower to break the will of the North Vietnamese people and their leaders.[13] Contrary to the claims of some authors, this did not happen and, thus, USAF did not achieve its second objective. The reason for this shortcoming was directly attributable to the strength of the NV-IADS and thus stemmed from the Air Force's inattention to SEAD doctrine between Operation Rolling Thunder and the start of Linebacker operations.

The amount of impact a lack of SEAD doctrine had on the first phase of Linebacker operations stemmed from the increased capabilities 7th Air Force possessed. A typical LGB strike began with an F-4 flight arriving in the vicinity of the targeted structure armed with three aircraft carrying *Paveway* bombs and one aircraft (usually the flight leader) equipped with a *Pave Knife* laser pod.[14] This pod was an improvement on an earlier system that had required the designating aircraft to remain in a gentle, predictable orbit while other aircraft dropped bombs. When in the target area, the flight leader would designate the strike's objective and, on his signal, the entire flight would drop the allocated number of *Paveway*s on the target. The control units on these bombs then detected the light reflected from the *Pave Knife*'s laser and guided the ordnance to impact.[15]

EOGB operations were somewhat similar to those of LGBs. Once again, a flight of F-4s approached a target area at medium altitude. Upon acquiring the objective, the F-4's backseater would acquire the desired target visually. The *Phantom*'s pilot would then bring the aircraft into the correct attitude, altitude, and air speed to release the glide bomb as the backseater attempted to lock the EOGB's self-contained television camera onto the target's contrast with its surroundings. In optimal conditions, this process could take 5-10 seconds. Over North Vietnam it could take up to 30 seconds depending on the ground haze, target contrast, and position of the sun. Once lock on was achieved, the bomb was released and, provided there was no further interference, impacted its target.[16]

There were several limitations on USAF's employment of these weapons. First, the weather had to be fairly clear and relatively windless over the proposed target area. Second, there had to be a minimal amount of smoke or dust in the vicinity of the structure to be destroyed. In the case of LGBs, obscurants scattered the guidance laser and caused the weapon

to "go stupid" and follow a ballistic path. EOGBs, on the other hand, had a tendency to lose their contrast unless light conditions remained ideal. Finally, and most importantly, there had to be minimal interference from enemy defenses in the area. The release parameters for both EOGBs and LGBs were in the heart of the SA-2's envelope, and the F-4s carrying the large bombs could only carry out the SAM evasion maneuver with difficulty. These problems grew even worse once the *Phantom*s entered the target area. While the former were fire and forget weapons, the more accurate *Paveway*s required target illumination throughout. This illumination would be problematic if the designating aircraft was performing the SAM evasion maneuver. This was also true if the *Pave Knife* F-4 had to evade a determined MiG attack while designating, as the pod's gimbal-mounted laser had specific g-limits that would prevent designating if exceeded.[17]

Collectively, all of these factors greatly constrained how 7th Air Force could use its most effective weapons. There were only six *Pave Knife* pods in 7th Air Force's inventory at the start of the Linebacker operations.[18] The only crews certified to use the *Pave Knife* pods were concentrated in a single unit (the 8th TFW). Likewise, the 8th TFW was also the only unit whose backseaters were extensively trained in the use of the EOGB. Seventh Air Force's guided weapon capability, in other words, resided in a half-dozen pods, a little more than twenty F-4s, and the fifty or so men who manned them. The fragility of this force was not lost on General Vogt and his staff, and they immediately set about determining methods to create the permissive air defense environment necessary. It was at this point AFM 1-1's lack of SEAD doctrine reared its head. Rather than being able to refer to a common doctrine that established how to engage an IADS, 7th Air Force was left to find their own way to prevent destruction of 8th TFW aircraft.

The method General Vogt and his staff chose had three major components. First was the use of "chaff bombers," i.e., a fleet of F-4s equipped with droppable chaff dispensers. When these containers opened, they spread radar reflective metal strips specifically manufactured to jam the *Fan Song* radar. This "chaff corridor" then descended slowly and prevented North Vietnamese SA-2 sites from locking onto the following strike force. Complementing this technique were direct attacks on North Vietnamese radars by Wild Weasel aircraft. Finally, in order to counter the NVAF's interceptors, several flights of F-4s served as MiG Combat Air Patrol (MiGCAP).[19]

In one way, this approach was successful—the Air Force lost only one *Pave Knife* to enemy action throughout the Linebacker operations and the overall loss rate was far lower than that of Rolling Thunder.[20] Yet the inefficiency of 7th Air Force's SEAD technique more than balanced the positives of lower casualties and preservation of capability. From 30 March through 23 October, 1972 Seventh Air Force had to dispatch 4-8 sorties of support aircraft (Wild Weasels, jammers, chaff bombers, and escorts) for every F-4 actually delivering bombs to a target.[21] In numerical terms, this meant that the NV-IADS forced 7th Air Force to forswear 4-8 *Phantoms*' worth of ordnance (typically 16,000-32,000 lbs. maximum) for every two to four LGBs (2,000-6,000 pounds maximum) delivered by an 8th TFW F-4. Operationally, such effort meant USAF had enough aircraft to conduct interdiction missions or strikes against North Vietnamese infrastructure but seldom both.

Strategically, this meant that 7th Air Force could not deliver enough consistent firepower against North Vietnam to shake its resolve. It is true that targets which had resisted every effort to attack them in 1968 (e.g., the Paul Doumer and Than Hoa bridges) were destroyed to great psychological and material effect.[22] Similarly, the precision weapons placed targets such as NV-

IADS command posts at risk for the first time in the war.[23] However, the effort required to accomplish these feats meant that 7th Air Force was unable to strike a great many others. Without doctrinal guidance that provided methodologies on how to dismantle an NV-IADS, Seventh Air Force had chosen a method that had denied air power its greatest strength: flexibility. In turn, because the NV-IADS forced USAF to employ so much of its force in protecting the 8th TFW's F-4s, 7th Air Force's lower loss rate and ability to place all targets at risk was not fully realized. By not being able to replicate the fury of Rolling Thunder, much less exceed it, USAF provided no incentive for the DRV's leaders and populace to change their course of action.[24]

Goal #3: Conventional Deterrence

In addition to preventing the delivery of sufficient punishment, the amount of effort required for USAF to penetrate North Vietnamese air space called into question its conventional capabilities. This was not a small matter given the primacy of USAF in many alliance and individual allies' defense plans. For example, United States Air Force Europe (USAFE) was considered to be the primary interdiction and deep strike organization for the entire NATO alliance. Similarly, the Republic of Korea Air Force (ROKAF) was organized primarily towards close air support with the understanding that USAF would carry the bulk of interdiction and strike missions against North Korean forces should a second conflict erupt on the Korean peninsula.[25] In these and other contingency examples, American allies expected that USAF would be able to achieve and exploit air superiority quickly and thus planned accordingly.

USAF's leaders recognized this reality as evidenced both by AFM 1-1's acknowledgments of conventional operations and the war plans developed with allied nations.

However, thoughts and theories were one thing whereas 7th Air Force's difficulties in striking Hanoi were quite another. During Linebacker operations, the NV-IADS was able to force USAF to adopt measures that were only feasible due to the unique situation in Southeast Asia. With bases in Thailand and the NVAF possessing only a feeble strike capability, 7th Air Force could take liberties with regard to its own defense. This would not be the case in the majority of the contingencies that allied or national interest compelled the Air Force to plan for. Similarly, the NV-IADS continued to use the obsolescent SA-2 rather than being equipped with the far more modern systems available to North Korea, the Warsaw Pact, or other potential American enemies. Finally, although the NVAF's MiGs operated in a favorable environment due to GCI and the existence of sanctuary, they also were not present in the numbers that USAF could expect to face in a likely Central European, Korean, or Middle East contingency.[26]

Combined, these factors led to a lack of internal confidence in USAF's conventional capability. By the conclusion of Linebacker operations, Air Force pilots did not have faith in their ability to defeat modern Soviet-bloc air defense systems either singly or when these were part of an integrated whole.[27] Indeed, the mere possibility that the North Vietnamese may have possessed the SA-3 *Goa* during 1972 caused many anxious moments both to 7th AF planners and, once the B-52s were committed, their SAC counterparts.[28] Similarly, Air Force pilots had begun to doubt their ability to combat hostile interceptors in a major conflict.[29] Finally, TAC's and SAC's own leaders came to believe that 7th Air Force's performance indicated that USAF's conventional capability was far beneath that which would be required to meet its conventional requirements.[30]

This lack of internal faith clearly indicated a breakdown in conventional deterrence capability. The President and Congress could not expect national policy to be executed by a

service that had lost faith in itself. Moreover, the Air Force's performance had left the United States' civilian leaders questioning the service's capability to carry out any of its missions.[31] Both of these outcomes, in light of the facts, were to be expected and stemmed from a lack of SEAD doctrine. Had the Air Force's leaders provided 7th Air Force guidance on how to destroy an integrated air defense system, there is a possibility that it could have done so and demonstrated American conventional capability. However, as with the punishment objective, USAF's doctrinal vacuum and subsequent *ad hoc* arrangement made this unfeasible. The effort required to attack North Vietnam left the Air Force's own pilots, America's civilian leaders, and, more than likely, allies and enemies alike questioning USAF's ability to project power against a hostile air defense system. This undermined the Nixon doctrine and was hardly what the President expected from the Air Force's efforts.

Goal #4: Preserving the Manned Strategic Bomber Deterrent

The inability of 7th Air Force to inflict sufficient punishment on the North Vietnamese forced President Nixon to seek alternate means of persuasion. Furthermore, he needed to convince South Vietnam's President Thieu to trust American promises for long-term commitment. With this in mind, President Nixon committed SAC's B-52s against North Vietnam in December 1972.[32] In his memoirs, Nixon indicates that he was well aware of the risks when he made this decision, but settled upon it with the expectation that the Air Force would be able to carry out his assault with little difficulty.[33]

It is easy to understand why Nixon was so confident. General LeMay, during his time as head of SAC, Vice Chief of Staff of the Air Force, and USAF Chief of Staff had made the *Stratofortress* into a symbol of American security. Over two decades, the big Boeing bomber

had become to much of the American populace what the Royal Navy's warships had been to the English people.[34] To the Soviet Union, the B-52 was a system so fearful that it had elicited multiple weapons systems and the wholesale modernization of an entire military service whose sole purpose had been its destruction in wartime.[35] In deploying the bomber that the *Dictionary of Modern War* described as "the mainstay of SAC's bomber force," Nixon not only intended to send the North Vietnamese a message but also demonstrate America's power projection capabilities to the entire world.[36]

Had the Air Force had a unified SEAD doctrine, it is likely that this gambit would have worked. Two raids against the North Vietnamese panhandle in April 1972 had demonstrated the B-52s' ability to penetrate the NV-IADS with appropriate TAC and naval air support. At that time, desiring to cut the NVA's southernmost supply link, PACAF staff had conceived of and directed a comprehensive plan that limited the big bombers' vulnerability to SAMs and NVAF fighters. Even though the North Vietnamese defenders damaged one B-52, the shock effect on the NV-IADS and destruction of material made the mission a smashing success.[37] Unfortunately for USAF, this planning had not been as a result of doctrine but that of a theater staff applying its experience and knowledge. Furthermore, the raids in question had been small, sharp affairs involving fewer than twenty-five bombers. These small attacks, in turn, did not require the length or breadth of defensive suppression that a much larger raid would require. Finally, a raid in November 1972 had led to the loss of a B-52. Ominously, the techniques used by the North Vietnamese to down this bomber indicated the NV-IADS had begun to adapt to both the B-52s' internal ECM as well as tactical SEAD measures.[38]

Regardless of this loss's implications, the Air Force's leaders still believed that USAF could carry out the massive raids President Nixon desired. Due to the size of the B-52 force,

SAC refused to delegate any authority for the operation to forces in the Pacific theater. Inexplicably, SAC's staff did not consult either PACAF or 7th Air Force during the planning phase. Instead, SAC's commander, General John C. Meyer, with the full consent of General Ryan, used SAC's staff to compose the operations orders for the initial strikes.[39] These orders were then, in turn, passed down to a subordinate unit, the 8th Air Force. Based in Omaha, the 8th's primary focus was preparing for nuclear strikes against the Soviet Union, but it had developed plans for striking against North Vietnam in April.[40] SAC's staff, ostensibly concerned with collateral damage, ignored this previous work and developed its own set of orders that it dictated to 8th Air Force. SAC headquarters did not give 8th Air Force the option of modifying the directives, citing the subordinate headquarters' involvement in the coordination of support assets and the sundry details inherent to such a massive undertaking.[41]

Given these facts as well as the internecine warfare that dominated the Air Force during this time period, it is debatable just how much influence SEAD doctrine would have had on the development of SAC's plan. However, it is clear that the lack of guidance strongly influenced both the planning and execution of operations conducted in support of the bombing raids. Due to the choices made by 7th Air Force in the absence of SEAD doctrine, the NV-IADS had not suffered permanent degradation from April through December 1972. On the contrary, emphasis on passive measures had allowed SAM operators and crews to gain in proficiency as well as develop countermeasures during the ensuing months.[42] Similarly, despite the effect mining Haiphong and President Nixon's diplomatic efforts had on retarding Soviet and Chinese resupply, 7th Air Force's SEAD techniques had not resulted in a gradual attriting of *Fan Song* or early warning radars.[43] Finally, instead of eliminating the NVAF's MiGs, 7th Air Force's *Phantom*s had once more been fought to a virtual draw. Therefore, rather than concentrating on

using the tactical fighters to maximum effect, American staffs had to develop an escort plan that placed F-4s on MiGCAP. Combined, these circumstances meant that SAC was, for all practical purposes, engaging the NV-IADS when the latter was both experienced and at peak strength.

The resulting carnage not only came as an unpleasant shock to USAF but also signaled the shattering of the strategic triad's manned bomber leg. Fifteen B-52s were destroyed and ten more damaged during what the Air Force called Operation Linebacker II but participating SAC crews would dub "The Eleven Days of Christmas." Only the strenuous intervention of fighter bombers, naval gunfire support, changes in tactics, and electronic jamming aircraft prevented losses from being far worse.[44] Contemporary Air Force monographs and papers attempted to sugarcoat the losses by pointing out that the majority of B-52s lost either had their electronic countermeasures improperly configured, flew poorly, or simply blundered into the path of volley-fired surface-to-air missiles (SAMs).[45] These statements, given SAC's alleged strategic mission, were sophistry at best. Regardless of the reason, the world had observed a second-tier military force equipped with obsolescent weapons inflict heavy losses on what was allegedly the premier Air Force in the world.

It is not hard to surmise the effects this had on the manned bomber as a strategic deterrent. From the American perspective, Linebacker II provided President Nixon with even more evidence that USAF could only function in ideal conditions. In addition to being incensed by the casualties the losses represented, Nixon was concerned at what effect the loss of bombers had on the North Vietnamese.[46] Given that the North Vietnamese dubbed the B-52 raids the "Dien Ben Phu" of the skies, President Nixon's anxiety was quite justified.[47] Just how unconcerned the North Vietnamese were about return visits from the B-52s can be seen by how quickly the NVA set about violating the 1973 Paris Accords.[48] The fact that USAF no longer

deterred even North Vietnam speaks volumes to how greatly Linebacker II shattered the B-52s' mystique.

The United States primary strategic opponent, the Soviet Union, echoed this disdain for the bombers. The first night's situation (e.g., short warning time, prepared enemy defenses, and limited tactical fighter support) closely replicated that which would be in place during a nuclear war. The U.S.S.R., as North Vietnam's main arms supplier, was well aware of three things. First, the equipment of the North Vietnamese was far inferior to that of PVO *Strany*. While Soviet doctrine dictated that military services retain obsolescent systems in order to maintain a defense in depth, faster, larger, and more sophisticated SAMs in the U.S.S.R. had long superseded the SA-2. Second, the North Vietnamese had been able to inflict heavy losses on USAF without the full use of the NV-IADS due to a lack of pilots trained in night flying. The Red Air Force on the other hand maintained at least a limited night capability with all of its interceptor squadrons.[49] Finally, with the Soviet Union's strategic depth serving to limit tactical fighter support, the majority of these elements would be able to operate without the interference of Wild Weasels or escorting fighters that proved so critical to limiting SAC's losses after the first three days' of bombing.[50] Even with total losses far beneath those expected by SAC, Linebacker II all but finished the manned bomber as a nuclear deterrent as well.[51]

This erosion of the B-52s' deterrent value was far from necessary and USAF's response to the first three nights' losses demonstrates this fact. Stung by the strength of the NV-IADS, the Air Force quickly began to revise its tactics and operational focus. First, both SAC and 7th Air Force began to consider the NV-IADS as an entire operational system, complete with supply lines and vulnerable points. Second, after determining these vulnerable points, General Vogt and his staff began to place pressure against them. Using all the weapons within their arsenal, SAC,

7th Air Force, PACAF, and the USN's TF 77 began to strike at MiG airfields, SAM assembly sites and, in a couple of cases, SAM batteries that had displayed an above-average level of proficiency. Finally, after the Christmas break SAC routed the B-52s in manner that facilitated 7th Air Force's defense suppression efforts.[52]

Although it is hard to quantify the effects of these efforts or separate them from the other, non-SEAD countermeasures being conducted, the precipitous drop in SAM launches and number of B-52s destroyed indicates that they had a positive effect. Whether a SEAD doctrine which directed these efforts at the start of Linebacker II would have lessened the losses and maintained the viability of the manned bomber remains an open question. Regardless of one's answer, however, the sharp decrease in losses strongly indicates that the Air Force's initial problems stemmed from the lack of guidance. It is hard to imagine a situation where a manual that laid out a proper SEAD doctrine prior to the start of Linebacker II would have been detrimental given these results.

Nadir

Even with the improvements USAF had been able to cobble together at the conclusion of Linebacker II, that operation's conclusion served as the nadir of USAF SEAD capability. In response to North Vietnam's overt aggression and attempt to destroy the South Vietnamese government by force, President Nixon had dispatched the Air Force to Southeast Asia with the intent of disrupting the North's offensive, punishing the DRV's leaders, proving USAF's conventional capabilities, and maintaining the strategic deterrence value of the manned bomber fleet. The Air Force's only success had been the interdiction of North Vietnamese supply lines, and the inability to complete the other three objectives had been due to the improvised nature of

USAF's SEAD efforts. With a well-thought out doctrine that laid out the steps necessary to disrupt or destroy an enemy air defense, the Air Force may have had a chance to achieve its goals. Without it, however, Air Force commanders were left to develop a plan that not only botched the suppression of the NV-IADS but also ensured that the North Vietnamese had little fear of future attacks. In the end, rather than serving as a success, the Linebacker operations were a stunning defeat brought about by the Air Force's military and civilian leaders' decisions concerning SEAD doctrine development after Operation Rolling Thunder.

[1] Tilford, 234.

[2] Michel, *Clashes*, 210; Thompson, 229; and Tilford 233-234. Linebacker II was so dubbed due to it being a sequel to the first operation. As noted in the *Linebacker: Overview* document (14), "Linebacker 'began' long before it was initiated," and most sources only consider there to be a division between Operation Freedom Train and Linebacker I due to the ferocity of operations on May 10, 1972. Since there was no operational pause or, for that matter, change in tactics between Freedom Train and Linebacker I nor did 7th Air Force cease striking Vietnam from October-December, 1972, this paper will consider Freedom Train, Linebacker I, and Linebacker II as "Linebacker operations."

[3] Clodfelter, 154-157; Randolph 80-101 and 114, Tilford, 228-234

[4] Clodfelter, 154; Michel, *Clashes*, 211; Porter, *Linebacker: Overview*, 8-11; Smith, 77; and Tilford, 228.

[5] Clodfelter, 166-167; Porter, *Linebacker Overview* 53-55; Tilford, 233-237; and Worden 197-198.

[6] Colonel G.H. Turley, USMCR ret., *The Easter Offensive: Vietnam, 1972* (Novato, California: Presidio, 1985; New York: Warner Books Edition, 1989), 30-37; Randolph, 30-39; and Tilford, ibid.

[7] Bernard Nalty, *Air War Over South Vietnam, 1968-1975* (Washington, D.C.: Air Force History and Museums Program, 2000), 333-402.

[8] Clodfelter, 155-158; Randolph, 160-181; and Thompson, 220.

[9] Maclear, 249-254; Randolph, 23-26; and Turley, 28-29.

[10] Clodfelter, 152-158; Randolph 160-181 and 331-338; and Thompson, 250-253.

[11] Thompson, 301-302.

[12] PACAF CHECO / CORONA HARVEST Division, *The F-111 In Southeast Asia, September 1972 – January 1973*, by A. A. Picinich, Col., USAF, et. al., Project CHECO Report, U.S. Air Force (Maxwell AFB, 21 FEB 1974 (Declassified 16 January, 2000).

[13] PACAF Directorate of Operations Analysis, *Guided Bomb Operations in SEA: The Weather Dimension, 1 FEB —31 DEC 1972*, by Patrick J. Breitling, Col., USAF, Project CHECO Report, U.S. Air Force (Maxwell AFB, 1 OCT 73 (Declassified 31 December 1980); Out Country Air Operations Pacific Air Force (PACAF) Office of History, *Linebacker: Overview of the First 120 Days (U)*, by Melvin F. Porter, Project CHECO (Contemporary Historical Examination of Current Operations) Report, U.S. Air Force (Maxwell AFB, 27 September 1973 (Declassified 31 December 1983)); and Ibid., 229-236.

[14] Michel, *Clashes*, 203-207.

[15] *Guided Bomb Operations*, 1-7 and *Linebacker: Overview*, 20-21 and 58-59.

[16] *Guided Bomb Operations*, 7-10.

[17] Out Country Air Operations Pacific Air Force (PACAF) Office of History, *Linebacker Operations: September-December 172 (U),* by Calvin R. Johnson, Maj., USAF, Project CHECO (Contemporary Historical Examination of Current Operations) Report, U.S. Air Force (Maxwell AFB, 31 December, 1978 (Declassified 8 July 1991)), 37-40; United States Air Force Operations (Strategic and General Operations Section), J-3, briefing entitled "The Employment and Effectiveness of Missile and Guided Weapons in SEAsia," located at Albert F. Simpson Historical Research Center Archives, Declassified 31 December, 1982, 50-55 and AG-VU (slides) 1-7; *Guided Bomb Operations*, 10-39; and *Linebacker Overview*, 59.

[18] John T. Smith, *The Linebacker Raids* (London: Cassell & Co., 1988; 2000), 75 and Michel, ibid.. The shortage was due to the *Pave Knife* still being technically in development rather than accepted for production.

[19] *Linebacker: Overview*, 44-60 and Momyer, *Air power*, 144-145.

[20] Thompson, 230-236.

[21] Benjamin S. Lambeth, *The Transformation of American Air Power* (Ithaca, New York: Cornell University Press, 2000), 27; and William Momyer, Ellis memorandum, 6-7 and 14-15.

[22] Smith, 142-165.

[23] Thompson, 250-253. Interestingly enough, many of the leadership and infrastructure targets were vetoed by Secretary Laird without President Nixon's knowledge. However, given the difficulty 7th Air Force had in striking even those targets assigned, Laird's decisions did not have much impact on Linebacker operations.

[24] Maclear, 249-254; Randolph, 23-26; and Smith, ibid..

[25] John S. Duffield, *Power Rules: The Evolution of NATO's Conventional Force Posture* (Stanford, CA: Stanford University Press, 1995) 194-202; William Park, *Defending the West: A History of NATO* (Boulder, CO: Westview Press, 1986), 100-101; and Nixon, 372-373 and 394-395. The ROKAF information is based on the author's own discussion with USAF personnel while stationed in Korea.

[26] Russell F. Weigley, *The American Way of War*, The Wars of the United States, ed. Louis Morton, (New York: Macmillan Publishing Co., Inc., 1973), 467-477; C.R. Anderegg, 126-127; Futrell, *Vol. II*, 475-485; and Lambeth, 54-55.

[27] Anderegg, 39-67 and Clancy, 125-136.

[28] Michael L. Michel III, *The 11 Days of Christmas: America's Last Vietnam Battle* (San Francisco: Encounter Books, 2002), 223 and 235; Randolph, 220; Rasimus, *Palace Cobra*, 294-296; and Thompson, 243-244.

[29] Der Baron (pseud.), "Anything Else Is Rubbish," *Fighter Weapons Review*, Summer 1972, 32-34 and Donald L. Gish, Maj., USAF, "F-4 Air to Air Training," *Fighter Weapons Review*, Fall 1975, 1-5.

[30] Momyer, Ellis memo and enclosures and Michel, *Christmas*, 222-231.

[31] Boyne, *Wild Blue*, 253-260 and Budiansky, 395-402.

[32] Nixon, 726-735.

[33] Nixon, 733-734..

[34] Budiansky, 394-395 and Michel, *Christmas*, 1-4.

[35] Crabtree, 106-109 and Goure, 181-186.

[36] Edward Luttwak and Stuart Koehl, *The Dictionary of Modern War* (New York: Harpers-Collins, 1991), 570-571 and *Linebacker Operations*, 62-64.

[37] Randolph, 118-128 and Thompson, 224-227.

[38] *Linebacker Operations*, 31-34 and Michel, *Christmas*, 44-47.

[39] Head, 74-78 and McCarthy and Allison, 39-85.

[40] Head, ibid..

[41] Karl J. Eschmann, *Linebacker: The Untold Story of the Air Raids Over North Vietnam* (New York: Ivy Books, 1989), 205-211; Michel, *Christmas*, 54-70; and Worden, 199-201.

[42] The experience level of the North Vietnamese SAM operators had definite impact on their successful adjustment to operating against the B-52s. For further discussion, see Michel, *Christmas*, 139-143; Dougherty, 11-14; Momyer, Ellis memorandum; and Schrader, 58.

[43] Clodfelter, 167-169 and *Linebacker Overview*, 62.

[44] John J. Zentner, Ltc., USAF, "The Art of Wing Leadership and Aircrew Morale in Combat," The Cadre Papers, Cadre Paper No. 11, (Maxwell AFB, Alabama: Air University Press, June 2001); Johnson, 60-70; Michel, *Christmas*, 185-186 and 239-242; and Schrader, 55-59.

[45] McCarthy and Allison, 86 and Johnson, 31-34.

[46] Head, 80 and Nixon, 737.

[47] Michel, *Christmas*, 232-234. The Battle of Dien Ben Phu was a decisive victory for the Viet Minh against the French Army. It is usually considered the defeat which broke France's will and desire to retain Indochina.

[48] Maclear, 310-312 and Tilford, 271-272.

[49] Spick, *All-Weather*, 133-136.

[50] Goure, 161-165 and Spick, ibid.

[51] Walter J. Boyne, *The Influence of Air Power Upon History* (Gretna, LA: Pelican Publishing Company, Inc., 2003), 337-341; Luttwak and Koehl, 93-94; and Tilford, 55-62. One possible counterargument to these thoughts would be that B-52s would have been equipped with stand-off weaponry in a general conflict. This theory ignores the fact that PVO *Strany* interceptors and SAMs would have been equipped with nuclear warheads as well.

[52] Dave Brog (WW #420), "The Black SAM," *First In, Last Out: Stories by the Wild Weasels (First Person Stories By Wild Weasel Pilots, EWOs and Their Associates)*, Colonel Edward T. Rock, USAF (ret.)ed., (Bloomington, IN: Authorhouse Press, 2005), 509-511; Jim Winzell (WW #1098), "Linebacker-II: The Eleven Days Of Christmas," *First In, Last Out: Stories by the Wild Weasels (First Person Stories By Wild Weasel Pilots, EWOs*

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[1] Although this work states it is a Second Edition, as indicated by the author and the editor it contains sufficient new information to be considered a distinct, separate work from the original work of the same title.

Appendix A - NV-IADS Illustrations

Weapon	Maximum range		Maximum effective AA range (f)	Muzzle velocity (ft/sec)	Rate of fire		Elevation tracking rate* (deg/sec)	Elevation limits, lower/ upper (deg)	Fire Control
	Horiz. (ft)	Vert. (ft)			Practical (rounds/min/ barrel	Cyclic (rounds/min/ barrel			
Quad 12.7-mm Heavy machine gun, DShK	19,500	14,436	3,000	2,821	100	600	25	0/90	Optical AA speed ring)
14.5-mm Heavy machine gun ZPU-2 (twin) & ZPU-4 (quad)	22,950	14,750	4,000	3,280	150	600	25	0/90	Optical (reflex)
37-mm AA gun M1939	26,256	10,685	4,500	2,886	80	180	25	-5/85	Optical (mechanical computing sight)
57-mm AA gun, ZSU-57-2 (twin) self-propelled	39,360	28,873	13,120	3,280	70	120	20	-5/85	Optical (mechanical computing sight)
57-mm AA gun, S-60	39,360	28,873	13,120** 19,700#	3,280	70	120	20	-4/87	Optical (mechanical computing) PUAZO-6; FIRE CAN
85-mm AA gun, KS-12	50,850	34,450	27,500	2,642	15	20	20	-3/82	PUAZO-6 and WHIFF (SON-4)
100-mm AA gun, KS-19	69,000	50,500	39,000	2,952	--	15	20	-3/85	PUAZO-6 and FIRE CAN (SON-9)

Figure A.1 NVN AAA Weaponry[1]

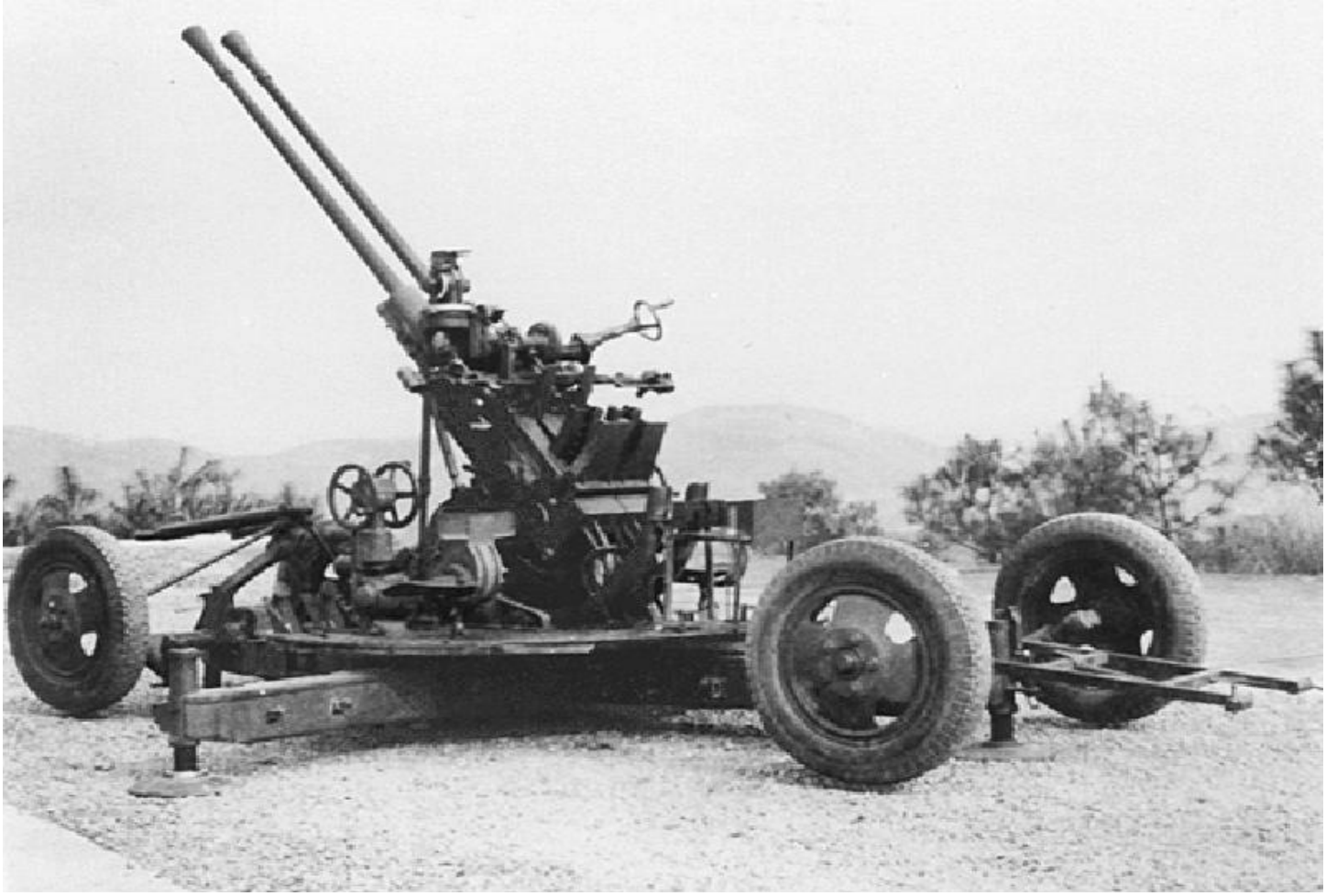

Figure A.2 37mm AA Gun[2]

Figure A.3 57mm AA Gun[3]

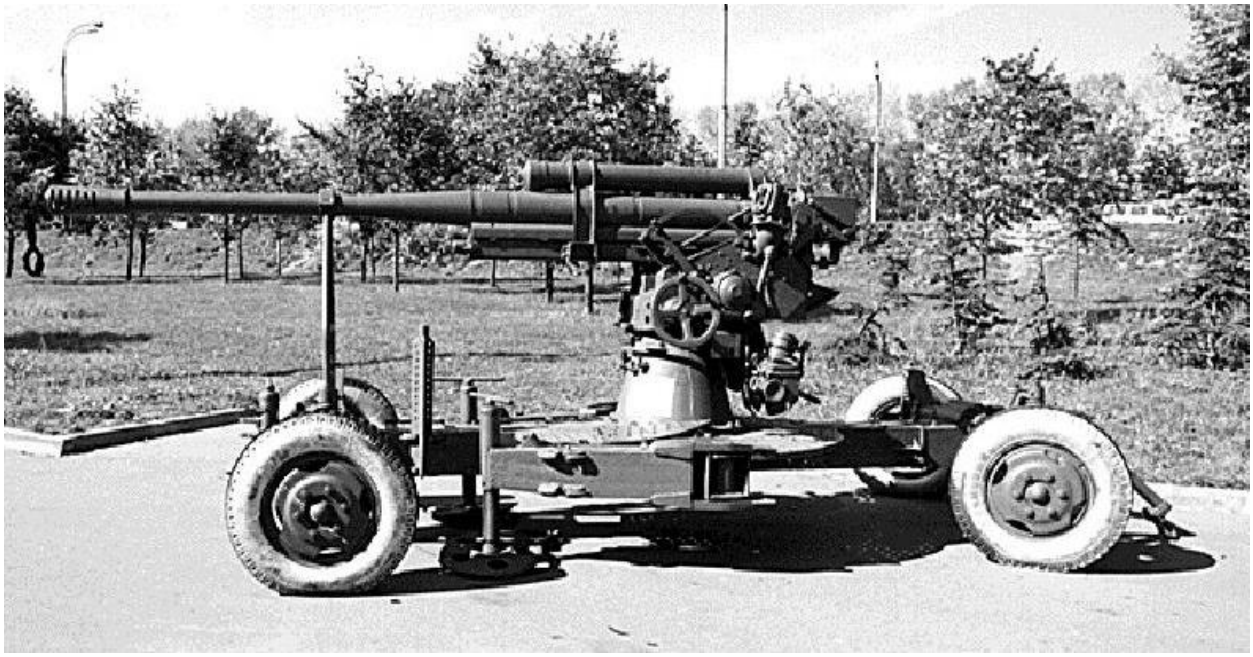

Figure A.4 85mm AA Gun[4]

Figure A.5 SA-2 *Guideline* missile.[5]

Figure A.6 Typical NVN SA-2 Site.[6]

Figure A.7 MiG-17 *Fresco*.[7]

Figure A.8 MiG-17 *Fresco*.[8]

Figure A.9 MiG-19 *Farmer*.[9]

Figure A.10 MiG-21 *Fishbed*.[10]

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[1] Pratt, x (chart follows page).

[2] DoD photo from author's personal collection.

[3] Ibid..

[4] Ibid..

[5] Ibid..

[6] Pratt, 2 (illustration follows page).

[7] DoD photo from author's personal collection. Note MiG's size relative to crewmen.

[8] Author's collection. Note pickup trucks in background for scale.

[9] DoD photo from author's personal collection.

[10] Ibid..

Appendix B - USAF Illustrations

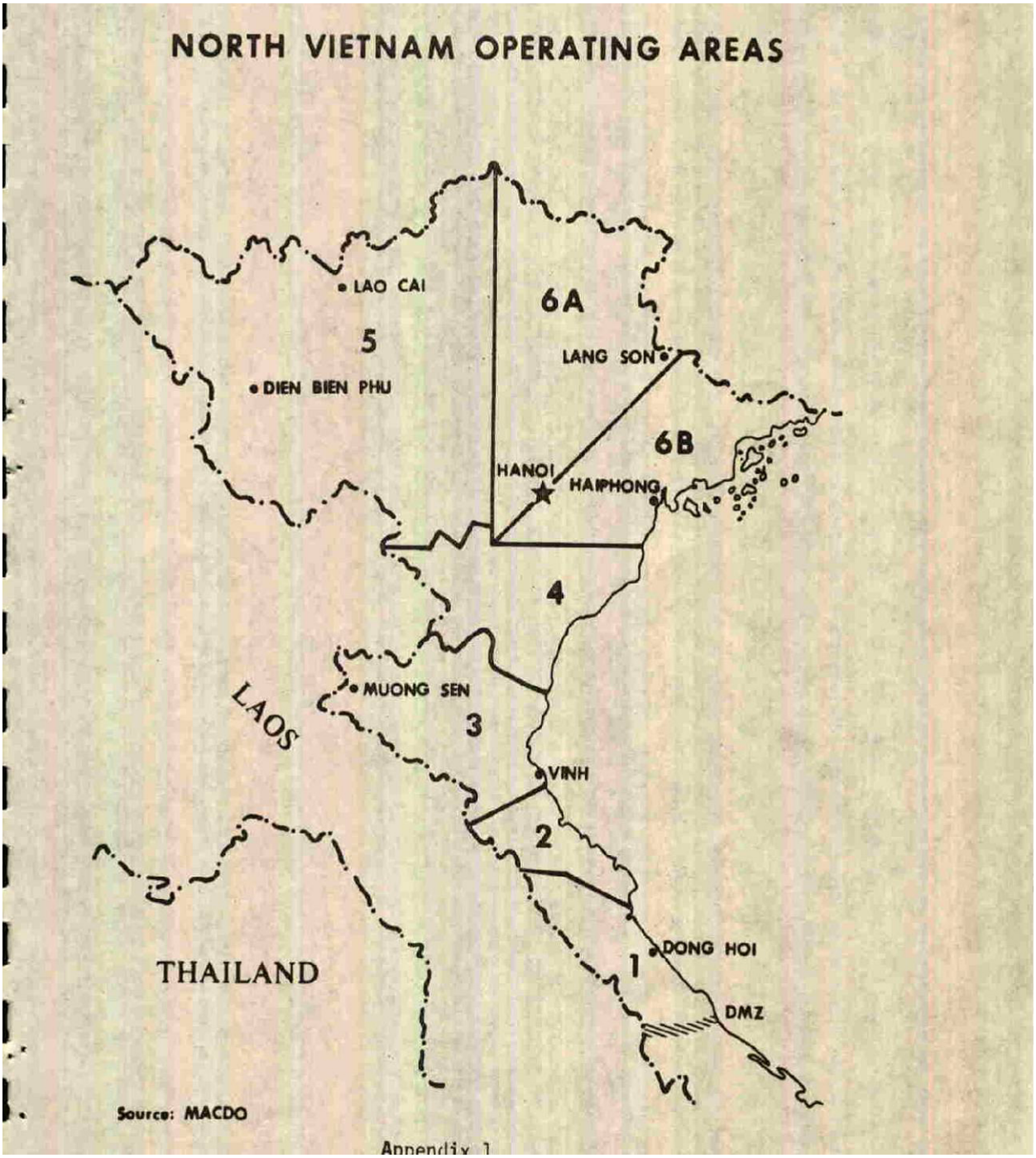

Figure B.1 USAF / USN Route Packages[1]

Figure B.2 F-4 *Phantom* with MiG-21.[2]

Figure B.3 F-105 in clean configuration.[3]

Figure B.4 F-105 carrying full bombload.[4]

Figure B.5 F-105 Wild Weasel.[5]

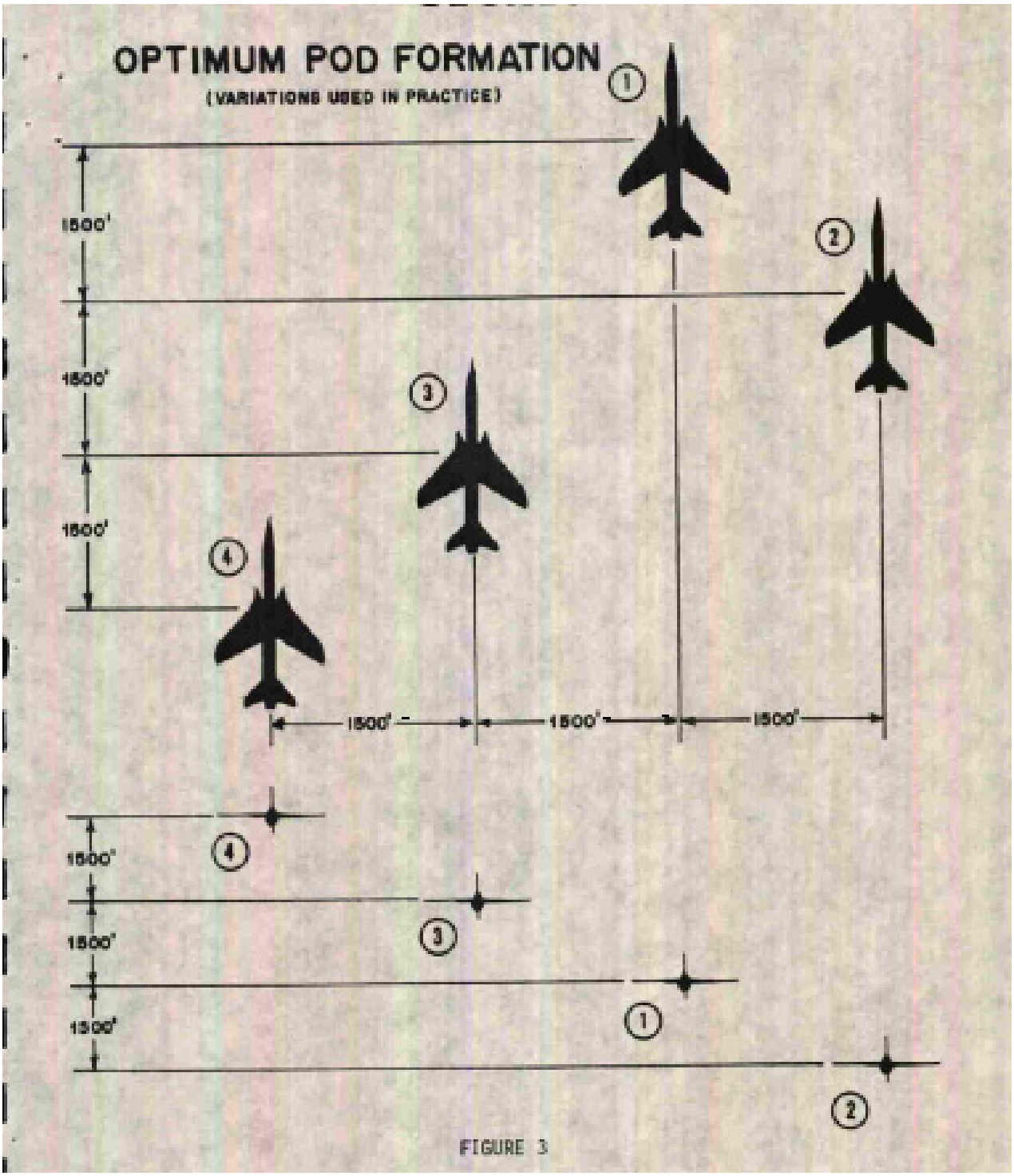

Figure B.6 Optimal Pod Formation.[6]

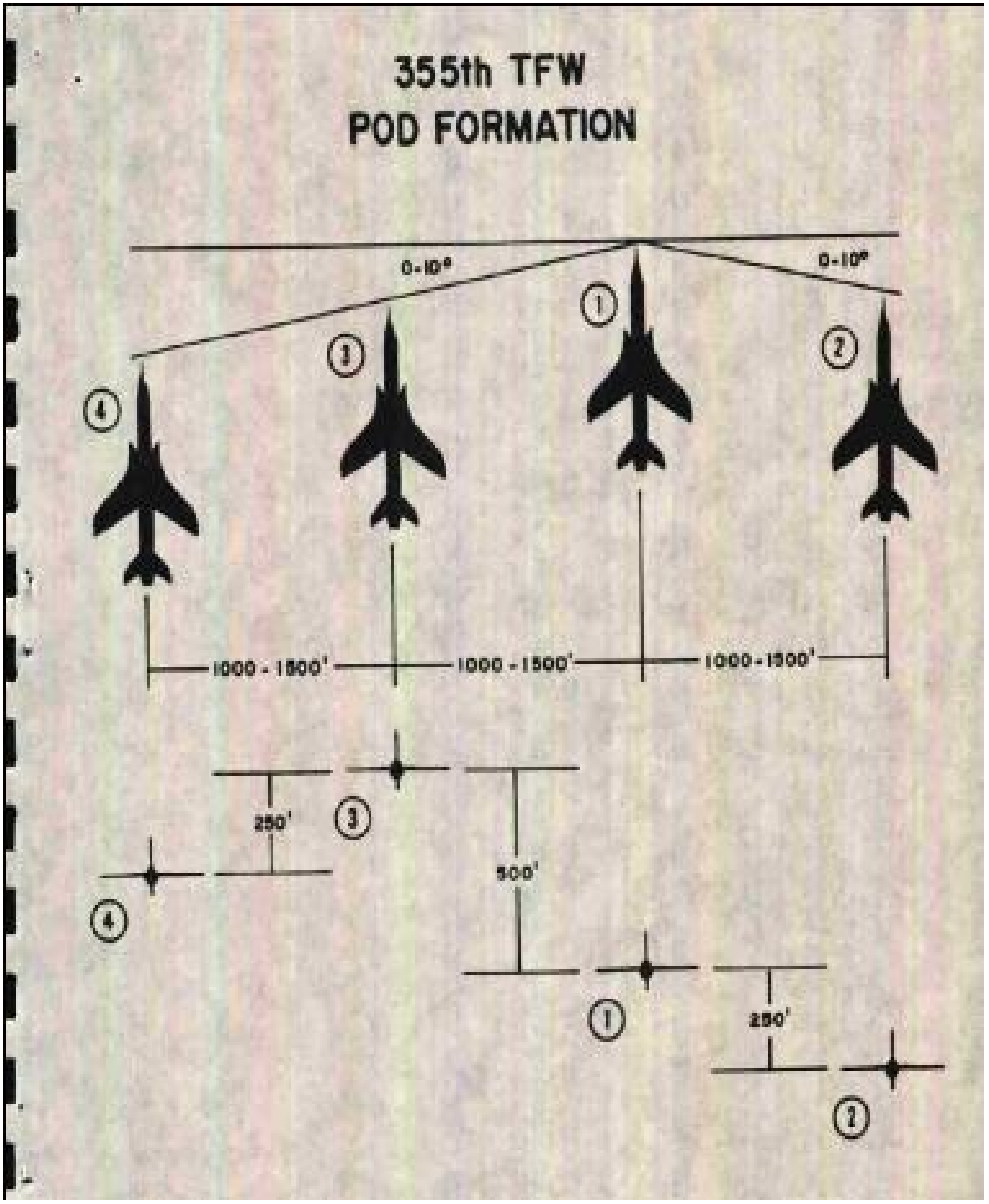

Figure B.7 355th TFW (Tahkili *Thunderchief* Wing) Pod Formation.[7]

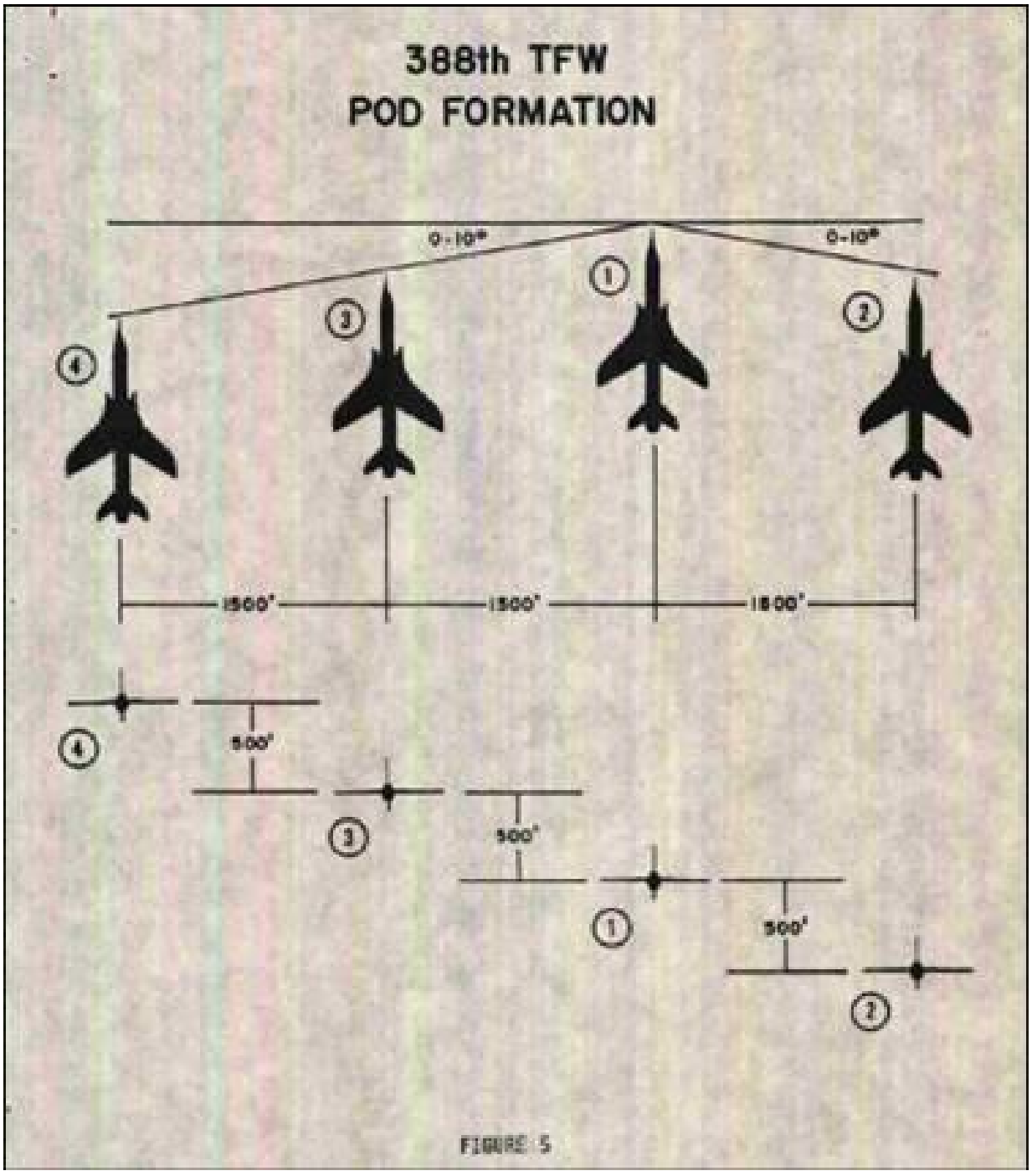

Figure B.8 388th TFW (Korat *Thunderchief* Wing) Pod Formation.[8]

Figure B.9 General Dynamics F-111.[9]

Figure B.10 Boeing B-52 Stratofortress.[10]

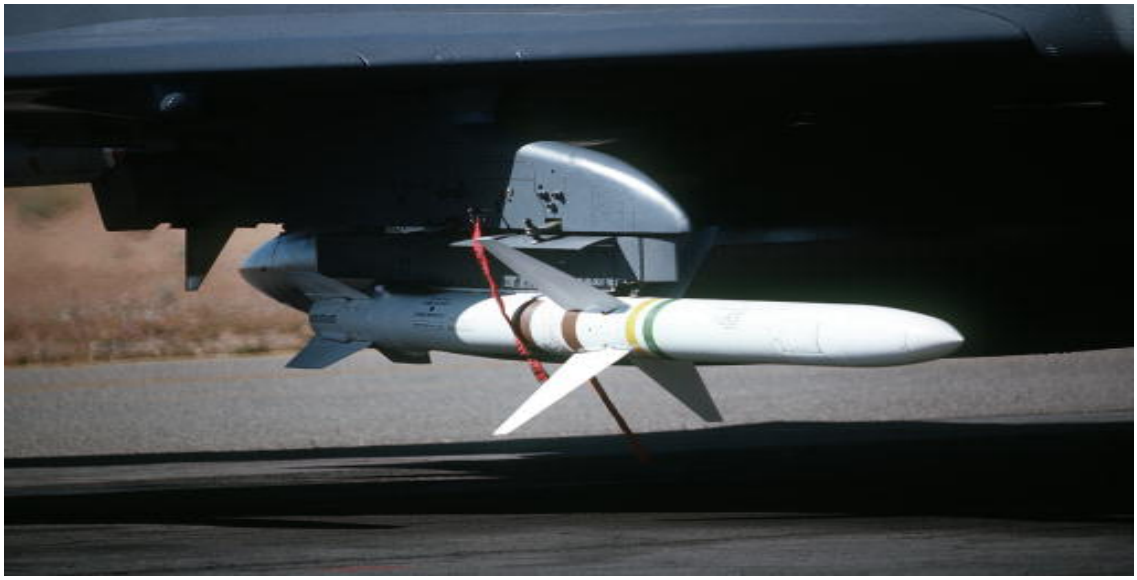

Figure B.11 AGM-45 *Shrike*.[11]

Figure B.12 F-4 *Wild Weasel* Carrying *Shrike* (outboard), *Maverick* (mid-wing), and *Standard* (inboard) on external pylons.[12]

Figure B.13 AIM-9 *Sidewinders* (top row) and AIM-7 *Sparrows* (bottom row) being loaded on an F-4C. Note crewman for scale.[13]

Figure B.14 F-4C configured for multi-role mission. This was the usual configuration for *Phantoms* tasked with an air-to-ground primary mission followed by a secondary air-to-air encounter. This particular F-4C was Colonel Olds' mount during Operation Bolo.[14]

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[1] PACAF CHECO / CORONA HARVEST Division, *The F-111 In Southeast Asia, September 1972 – January 1973*, by A. A. Picinich, Col., USAF, et. al., Project CHECO Report, U.S. Air Force (Maxwell AFB, 21 FEB 1974 (Declassified 16 January, 2000), 66.

[2] Author's personal collection. Note the F-4's wings are folded, giving it the appearance of being smaller than it actually would be in flight. This particular F-4, a 'D' model located at Topeka's Combat Air Museum, destroyed a MiG-21 on October 12, 1972.

[3] Courtesy of the USAF Museum. Note the crewmen standing next to another *Thunderchief* in order to get a general idea of the fighter's great size.

[4] Courtesy of the USAF Museum. As can be seen, external bombs and pylons broke up the F-105's normally clean aerodynamic lines with resultant loss of speed and maneuverability.

[5] Courtesy of the USAF Museum. Note the F-105 *Wild Weasel*'s two-seat arrangement.

[6] Pratt, 20 (figure follows page).

[7] Ibid..

[8] Ibid..

[9] Courtesy of the USAF Museum. Note external carriage of *Paveway* and *Sidewinder* weapons.

[10] Ibid..

[11] Ibid..

[12] Ibid.. Note large size of *Standard* compared to *Shrike*.

[13] Courtesy Department of Defense.

[14] Courtesy USAF Museum.

Appendix C - Glossary of Terms

TERM	DEFINITION
AAA	Anti-Aircraft Artillery
AFM	Air Force Manual
AGM	Air to Ground Missile
AIM	Air Intercept Missile
ARM	Anti-Radiation Missile
BVR	Beyond Visual Range
DRV	Democratic Republic Vietnam
ECM	Electronic Countermeasures
EOGB	Electro-optical Guided Bomb
EWO	Electronic Warfare Officer
GCI	Ground Controlled Intercept
IADS	Integrated Air Defense System
LGB	Laser Guided Bomb
MiG	Mikoyan Gurevich Design Bureau
MiGCAP	MiG Combat Air Patrol
NVA	North Vietnamese Army
NVAF	North Vietnamese Air Force
PACAF	Pacific Air Force
SAC	Strategic Air Command
SAM	Surface to Air Missile
SEAD	Suppression of Enemy Air Defense
StARM	Standard Anti-Radiation Missile / AGM-78
TAC	Tactical Air Command
TFW	Tactical Fighter Wing
USAF	United States Air Force