FLAMEOUT: THE RISE AND FALL OF MISSILES IN THE U.S. AIR FORCE, 1957-1967

A Dissertation

by

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ABSTRACT

This dissertation documents how the U.S. national perspective toward ballistic nuclear missiles changed dramatically between 1957 and 1967 and how the actions and attitudes of this time brought about long term difficulties for the nation, the Air Force, and the missile community. In 1957, national leaders believed that ballistic missiles would replace the manned bomber and be used to win an anticipated third world war between communist and capitalist nations. Only ten years later, the United States was deep into a limited war in Vietnam and had all but proscribed the use of nuclear missiles. This dissertation uses oral histories, memoirs, service school theses, and formerly classified government documents and histories to determine how and why the nation changed its outlook on nuclear ballistic missiles so quickly. The dissertation contends that because scientists and engineers created the revolutionary weapon at the beginning of the Cold War, when the U.S. and U.S.S.R. were struggling for influence and power, many national leaders urged the military to design and build nuclear ballistic missiles before the Soviet Union could do so. This pressure prompted the Army, the Navy, and the Air Force to compete for the new mission and wasted billions of dollars as the services built duplicative, unreliable and unsafe liquid fueled missiles that were only in use for a few years. Then, as the Cuban Missile Crisis revealed the true threat of nuclear conflict, the perspective towards nuclear missiles changed considerably.

The dissertation also argues that the Air Force garnered control of the new capability, primarily to retain and protect their manned strategic air mission, so it chose not to deal with inherent problems of missile duty that were revealed almost immediately, such as loneliness, boredom, tedium, and an inability to find a sense of accomplishment. Once U.S. political leaders turned their focus away from nuclear war and toward the Vietnam conflict, the Air Force relegated the missileers -- those selected to operate the new missiles -- to secondary status, allowing their concerns to fester for decades. Missileers created a proud, but dysfunctional organization that rewarded what Secretary of the Air Force Deborah Lee James in 2014 called unrealistic test scores rather than operational experience and expertise. At the same time, the Air Force intensified an unhealthy focus on manned flight that prevented the service from most effectively incorporating and using advances in technology to defend the nation.

Dedicated to my wife, Beth, and my children, Kristen and Sean.

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the National Archives, the Library of Congress, the Eisenhower Presidential Library, the Lyndon B. Johnson Presidential Library, and the Mudd Manuscript Library ensured I found the documents I needed, while the wonderful librarians at the National Defense University and the Air University libraries helped locate theses and studies written in the 1950s and 1960s by officers whose lives were tied to the new missiles. Thank you to Neil Sheehan, along with Jeffrey Flannery from the Library of Congress, for allowing me access to interviews used for *A Fiery Peace in a Cold War*. I also want to give a special thank you to Carolina DeLeon and the staff of the Texas A&M Interlibrary Services and to Joel Kitchens, the History Reference Librarian, who cheerfully responded to so many requests that they now know me by name.

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1. INTRODUCTION AND HISTORIOGRAPHY

Introduction

In December of 1957, many people in the United States perceived the nuclear intercontinental ballistic missile as the "ultimate weapon."[1] By tying the newly developed hydrogen bomb to the ballistic missile and giving it intercontinental range, scientists had created a revolution in military affairs as great as that of gunpowder or the rifled barrel. The ballistic nuclear missile could devastate portions of an enemy country in minutes and there was no defense against it.[2] Although only one working ballistic missile with intercontinental range had been successfully launched at the time, an early Atlas missile, the hopes of many Americans' future peace and security lay in this missile and its successors, already under development.[3]

The Air Force planned to recruit capable and highly educated men to operate and maintain these awesome weapons for the defense of the nation and, American leaders proclaimed, for the protection of Europe, Asia, and other areas. These men were to guide the Air Force and the United States into a future of stability and international harmony through strength. Their own futures seemed boundless.[4]

Less than ten years later, the Atlas missile was being decommissioned, along with the Titan I, the Thor, and the Jupiter, other nuclear missiles that were developed at about the same time as the Atlas. The follow-on Minuteman and Titan II missiles

were retained, but held only as a necessary deterrent to the use of enemy nuclear weapons while the nation focused on a "limited war."[5] In fact, on September 18, 1967, the official who oversaw the largest buildup of U.S. ballistic missiles, Secretary of Defense Robert McNamara, stated, "I want, however, to make one point patently clear: our current numerical superiority over the Soviet Union in reliable, accurate and effective warheads is both greater than we had originally planned and in fact more than we require."[6] He continued, "Moreover, in the larger equation of security, our 'superiority' is of limited significance, since even with our current superiority, or indeed with any numerical superiority realistically attainable, the blunt inescapable fact remains that the Soviet Union could still -- with its present forces -- effectively destroy the United States, even after absorbing the full weight of an American first strike."[7]

As McNamara shifted his focus to non-nuclear combat, the Air Force relegated missiles to a minor position, significantly behind flying operations and support to flying operations, and ignored the concerns of the missileers who controlled them. The service began to treat these men -- for they were all men at the time -- who controlled these missiles as second-class citizens, regarding them as support personnel rather than warfighters.[8]

But what led to such a development? How did such a promising field of military weaponry and its adherents drop so quickly in status? To be sure, this result was not predetermined. As the U.S. Air Force created its missile force, the Soviet Union built its own fleet of missiles and missileers. There, as in the United States, "technology was

the primary driver in strategic force decisions, since technological limitations largely dictated the shape and capabilities of the forces."[9] The Soviets developed the atomic bomb, then the hydrogen bomb. They created intercontinental bombers, followed by intercontinental ballistic missiles. However, in the Soviet Union, the destiny of these missiles and the men who controlled them followed a much different pattern.

Following Joseph Stalin's death in 1953, a power struggle at the highest levels resulted in the eventual ascendency of Nikita Khrushchev. Because Khrushchev was more concerned with consolidating power than strategic weapons, engineers and the budding aerospace industry promoted and developed the ballistic missiles, garnering "only the most grudging support of the military." However, when the Soviets launched Sputnik, the first earth satellite, Krushchev became convinced of their value and determined that future Soviet military power would be centered on the nuclear missile.[10] He "declared that 'The present period is something of a turning point. Military specialists believe that airplanes, bombers and fighters, are in their decline . . . . Fighter and bomber airplanes can now be put into museums."[11]

Initially, all Russian rocket forces were placed under the Soviet Ground Forces commander of artillery. They were then designated as brigades under the Supreme High Command Reserve (RVGK). In 1953, the Soviets created the Directorate of the Deputy Artillery Commander for Special Equipment (UZKA) to create and produce missiles and launch vehicles for nuclear weapons. Soon after, these organizations were placed directly under the deputy minister of defense for special weapons and rocket

engineering. In August 1958, strategic missiles were separated from tactical missiles, and on December 17, 1959, as the military placed the new intercontinental ballistic R-7 missiles into the weapons inventory, the Council of Ministers "established a new service of the armed forces, the Strategic Rocket Forces (RVSN)."[12] This organization and the Soviet missileers who served in it achieved and continued to retain exceptional esteem and pride even through the demise of the Soviet Union in the early 1990s, unlike their counterparts in the United States.[13]

Nonetheless, this study is not a comparison between Soviet and U.S. missileers. Rather, it will analyze how and why the United States Air Force missile community evolved as it did rather than how it was expected to progress. This project will argue that three key factors powerfully shaped the perception and treatment of ballistic missiles in the United States and those who operated them, ensuring that neither the missiles nor the missileers attained their advertised prominence. It will also contend that the decisions made about the trajectory of the missiles' potential harmed both the military personnel who controlled the missiles and, because of the lesson taken from these decisions, the Air Force.

The study will first show that missiles were oversold as the ultimate weapon during a time of national political turmoil and global discord. Rapid scientific advances occurring as a Cold War escalated between two former allies, specifically during the decade between 1947 and 1957, caused the United States to develop and build intercontinental ballistic missiles as quickly as possible. Political and military leaders

who had just witnessed the most terrible and costly war the world had ever seen were determined to stay militarily ahead of their greatest international adversary as the two superpowers began to compete for global influence and prepare for conflict. The credible fear of a near-term World War III also influenced the public's perception of nuclear warfare. Consequently, both nations quickly developed and immediately incorporated the powerful new technology into their war plans.

In the United States, especially after the Soviet Union launched Sputnik, both Democrats and Republicans endeavored to prove their support for the new weapons and the military services threw themselves into the effort in an attempt to not be left behind. Numerous careers were made and broken on the premise of whether the United States was behind the Soviet Union in its ability to launch nuclear ballistic missiles. The purported "missile gap" notably influenced the election of the nation's thirty-fifth president.[14] Even though President Dwight Eisenhower knew there was no "missile gap" and actively argued the case throughout his term of office, he too was forced to participate in this dangerous race, "direct[ing] that the Intercontinental Ballistic Missile research and development program be accorded the highest national priority, above any and all other programs."[15] This ensured missiles' high standing in the short term, but tied their value to political vagaries, potentially setting them up for a future demise.

The second contributing factor was the creation of a separate Air Force and the resulting interservice rivalry. The struggle to create a separate Air Force convinced

many pilots of the need to protect and prize their cherished flying mission against any and all competitors. Many perceived the new ballistic missile as the natural replacement for the manned strategic bomber. The Air Force leaders, in response, believed they could best protect the manned bomber and their domination of the strategic air mission by controlling the new weapon so that they could determine its future.[16] The Army, conversely, stung from the loss of the Air Corps, especially as the Air Force became the nation's dominant military capability under President Eisenhower, believed the ballistic missile should belong with the ground forces. The Navy, too, recognized that this awesome new weapon had caught the attention of the nation and held the promise of extravagant funding and historical prominence. Therefore, each of the three major services struggled mightily to obtain control of the new mission in order to expand their credibility and funding, if not to ensure their survival.[17] Thus, although the first successful intercontinental ballistic missile was not built until 1957, this study will examine how the creation of a separate Air Force in 1947 influenced the incorporation of the ballistic missile into the new service and prejudiced its treatment toward the new capability after it was assimilated and political leaders returned their focus to limited war.

The third contributing factor, the Cuban Missile Crisis -- arguably the pinnacle of success for U.S. Air Force missileers -- rather than validating the nation's perception that missiles were the trend of future military operations, convinced the nation and its leaders that nuclear missiles should never be used except to deter nuclear war.

Therefore, as the nation became enmeshed in the Vietnam conflict, neither the Kennedy nor the Johnson administration seriously considered the first use of nuclear weapons. The political leaders became focused on fighting the war with conventional weapons, allowing the Air Force leaders to transfer money, personnel, and prestige away from the missiles and back to the flying mission.

Thus, as missileers moved into their second decade of existence, the meteoric rise that was promised to them disappeared as quickly as it had developed. They were no longer the exalted combatants of the future, but a proud, mostly unnoticed and unappreciated cohort of warriors tied to the monotonous grind of underground, "push-button" warfare. Many of the concerns they had expressed, including the loneliness and tedium of missile duties, unfulfilled job fulfillment, and poor promotion opportunities, were left to fester for decades.

Significance and Historiography

Historians have written numerous tomes about the U.S. Air Force and its pilots, but few have fully addressed the Air Force's ballistic missiles. Walter Boyne's *A History of the U.S. Air Force, 1947-1997* is a perfect example.[18] Boyne chronicles the growth of the Air Force, noting briefly the service's absorption of missiles, but spending the vast majority of his energy detailing the lives of pilots and their aircraft. In a similar manner, Melvin Deaile's dissertation, "The SAC Mentality," examines the origins of Strategic Air

Command's culture and addresses Strategic Air Command's pilot culture rather than that of the missileers.[19] Bernard Nalty's collected work, *Winged Shield, Winged Sword,* spends just 8 pages of a 520 page volume on missiles, but even then he only addresses the development and advances in missile technology rather than their incorporation and does not deal with their demise at all.[20]

By comparison, only a few authors have focused on the history of intercontinental ballistic missiles. Almost all, like Nalty, concentrate their efforts on how missiles were created, neglecting their incorporation into the service and operational use. Roy Neal interviewed the scientists and engineers who developed the Minuteman for the Air Force to write *Ace in the Hole*.[21] Three years later, Ernest Schwiebert published *A History of the U.S. Air Force Ballistic Missiles*, working with many of the same people to detail the scientific and logistical development of the Atlas, Titan, and Minuteman missiles.[22] Jacob Neufeld, in *The Development of Ballistic Missiles in the United States Air Force, 1945-1960* updated Schwiebert's work in 1990.[23] Each of these authors remained centered on the scientific and engineering aspects of the intercontinental ballistic missile rather than their operational maturity.

Edmund Beard, in *Developing the ICBM: A Study in Bureaucratic Politics*, expanded the study of missiles to reveal the bureaucratic and political machinations involved in building the ballistic missile and instigated the most prolific argument on the subject by stating that Air Force leaders did not want the missile to succeed as they were concerned it would replace the manned bomber.[24] Christopher Gainor argued

against Beard's thesis in "The United States Air Force and the Emergence of the Intercontinental Ballistic Missile, 1945-1954."[25] Once again, both remain fixed in the creation of missiles rather than addressing what happened to them after their construction.

Desmond Ball, in *Politics and Force Levels: The Strategic Missile Program of the Kennedy Administration*, broadened the focus again to include the influence of the political arena on missiles and vice versa.[26] Later, Neil Sheehan entered the fray, authoring *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon*, in 2009.[27] All of these authors center on missiles as a piece of technology or on the political machinations involved in gaining control of and building such weapons rather than on how they were incorporated into the Air Force inventory as a key weapon in national defense or on the struggles of the personnel assigned to control them.

In 1958, Air Force Lieutenant Colonel Kenneth Gantz gathered the writings of prominent leaders involved in creating ICBMs to edit *The United States Air Force Report on the Ballistic Missile: Its Technology, Logistics, and Strategy*.[28] They wrote about the technology of the missile, its strategic place in the Air Force, the concerns finding appropriate men to control the missile, the training these men would need, and many other fascinating topics. Nonetheless, when the book was written, there were no operational ICBMs in America, so the book is full of predictions rather than descriptions of actual missile units or personnel.

James Baar and William E. Howard followed up with an authoritative book, *Combat Missileman*, that relied on interviews and personal experiences to reveal the struggle of the early missileers, but the book contains no footnotes and was published in 1961, too early to analyze how the missile culture would develop or to comprehend what would happen by the end of the 1960s.[29] Bernard Brodie's *Strategy in the Missile Age* deals with the changes nuclear missiles produced in military capability and their potential for use in warfare, but remains centered on theory rather than the activities of missile units and personnel. In addition, being published in 1959, Brodie, like Baar and Howard, is not able to consider later events.[30]

Lastly, in 2012, David Spires wrote *On Alert: An Operational History of the United States Air Force Intercontinental Ballistic Missile Program, 1945-2011.*[31] This tome is one of the few that deal with the operations of missiles and the day-to-day activities of missileers, but Spires focuses primarily on the time after 1965, with minimal concentration on the critical time period between 1957 and 1967. This study intends to fill this historiographical chasm while placing the era into historical and political context by documenting the impact that the Cold War and establishment of the Air Force as a separate service had on the new ballistic missiles and those who worked with them.

One of the difficulties of analyzing the first decade of the ballistic missile in the Air Force is that most contemporary documents focus upon the scientific advancements of missiles and bureaucratic infighting involved in building them rather

than on how the military incorporated the new weapons. Former Air Force historian Jacob Neufeld, in an interview with the author, revealed that no one at the time considered the human aspect of the missiles to be important.[32] The few documents from the time that do focus on the incorporation of missiles into the Air Force remain difficult to obtain as many are still classified.[33] This study will use personal interviews with former missileers and academic studies from the time to unearth new insights.

There are several major historiographical arguments dealing with the study of Air Force intercontinental ballistic missiles. One revolves around whether Air Force leaders began working to design and build the ICBM at the end of World War II or whether the service only started to seriously undertake developing the missiles as a response to the political firestorm created by the launch of Sputnik. This dissertation acknowledges that work began well before Sputnik, but also contends that the pace and funding wavered greatly until the Soviet threat appeared real. A closely related argument is whether the Air Force developed and built the ICBM to become a significant part of its inventory or whether its leadership fought the other services for control of the new mission so that the service could retain the manned bomber as the premier weapon. This study proposes that Air Force leaders were divided on their advocacy of missiles and outside forces greatly influenced their willingness and ability to actively incorporate the new weapons into their plans, but that when General Curtis LeMay became Chief of Staff in 1961, the forces against missiles prevailed. This project also will argue that the extensive manipulation of the career field by outside forces,

including the Cuban Missile Crisis and the war in Vietnam, greatly influenced the nascent culture of missileers, preventing the group from adequately addressing significant concerns that haunted missileers to the twenty-first century.

Centered in this decade of study is one of the most influential events in twentieth century history: the Cuban Missile Crisis. Although scholarship on this incident has expanded from the Soviet and U.S. political perspectives to acknowledging the many external occurrences that could have influenced the crisis, authors still have not investigated or analyzed how the crisis influenced the Air Force or its missileers.[34] As a result, no one to date has evaluated how this event created the impetus for a tremendous shift in perception of the nuclear ballistic missile. Although it is not the primary focus, this dissertation also intends to help fill this gap in the historiography.

This dissertation will present its historical argument in a chronological narrative. Chapter 1 presented the thesis, and will provide the historical context and address the historiographical gap that this study is intended to fill. Chapter 2 will address the creation of the nuclear ballistic missile and reveal how the nation's concerns over the emergent Cold War created a pressure to build the new capability quickly, before the Soviets could deploy a missile of their own. Chapter 3 will focus on the interservice competition between the Air Force, Army, and Navy to control the missile, address the intraservice struggles within the Air Force over how to deal with the new weapon, and reveal the decisions that Air Force leaders finally made to build and incorporate what wound up being a family of ballistic missiles into the service. Chapter 4 will deal with

the problems caused by the rush to build and incorporate missiles into the Air Force, including damage to the missiles' credibility within the service and hostility engendered by their political favoritism. Chapter 5 will consider the American political perception of missiles, addressing the Kennedy administration's move away from nuclear warfare, precipitated by the Cuban Missile Crisis. Chapter 6 will analyze the impact of the Kennedy and Johnson administration's new perspective toward missiles on both the missile community and the Air Force, whose leaders learned an important, but possibly detrimental lesson on how to deal with perceived threats to the manned flying mission.

Notes

[All references to newspapers are to Section 'A' unless indicated otherwise.]

[1] Chuck Walker, who helped develop the Atlas missile while working as an engineer for Convair, believed so strongly about the ICBM being an ultimate weapon that he, with Joel Powell, titled their book *Atlas: The Ultimate Weapon* (Burlington, Ont.: Apogee Books, 2005). The Congressional Joint Committee on Atomic Energy exclaimed about the ballistic missile, "This is truly the ultimate weapon." "Findings and Recommendations Concerning the Intercontinental Ballistic Missile," Special Assistant to the President for National Security Affairs, NSC Series, Briefing Notes Subseries, Box 13, Missiles and Military Space Programs, Eisenhower Library, Abilene, Kansas. Hanson Baldwin, the military editor of the *New York Times* from 1937 to 1968, in an article about the ICBM, noted that "some military men have called [it] 'the ultimate weapon,' 'the absolute weapon,' -- 'the weapon that will rule the earth.'" Hanson himself deemed the ICBM "a supreme weapon of offense" and "the world's first unstoppable weapon." Hanson W. Baldwin, "ICBM," *Collier's Weekly* (March 16, 1956), 23, 75. General Curtis LeMay admitted "I consider an intercontinental ballistic missile with a capability of instantaneous launch and with acceptable reliability, accuracy, and yield to be the ultimate weapon in the strategic inventory." Curtis LeMay to Air Force Chief of Staff Nathan Twining, letter, Subject: (Uncl) SAC Position on Missiles, 26 November 1955, Digital National Security Archives, US Nuclear History Collection, Item #NH00547. (http://gateway.proquest.com.lib-ezproxy.tamu.edu:2048/openurl?url_ver=Z39.88-2004&res_dat=xri:dnsa&rft_dat=xri:dnsa:article:CNH00547). Accessed 20 October 2014. Ironically, one of the people who refused to hold this view was the primary Air Force officer responsible for the development of the intercontinental ballistic missile, General Bernard Schriever, who said, "this should not imply that the ICBM and IRBM are 'ultimate weapons' as they are frequently called." B. A. Schriever, "The USAF Ballistic Missile Program," *Air University Quarterly Review* Vol. 9, No. 3 (Summer 1957): 21. See also James Baar and William E. Howard, *Combat Missileman* (New York: Harcourt, Brace, and World, 1961), 19, who contended that the concept was not just an American thought, quoting from *Voyennays Mysl (Military Thought)* that "a sudden attack involving a massive use of new weapons may result in the rapid collapse of a state" and then defining the new weapons as "missiles -- ICBM's and IRBM's."

[2] One way that scholars can be persuaded that the intercontinental ballistic missile was a true revolution in military affairs is the complete change from "total war" during World War I and World War II to "limited war" after the ICBMs were introduced. Although the use of nuclear weapons were taken into account for the Korean conflict, the use of an ICBM in combat has never been seriously considered with the exception of the Cuban Missile Crisis, in which both sides refused to begin combat. Even after over fifty years, there is no effective defense against a ballistic nuclear missile and, although John Mueller, *Atomic Obsession: Nuclear Alarmism from Hiroshima to al-Qaeda* (New York: Oxford University Press, 2010), 1, 18, argues that "massive exaggerations of the physical effects of nuclear weapons have been very much the rule," he also contends that "nuclear weapons are the most effective devices ever

fabricated for killing vast numbers of people in a short period of time." See also Lawrence Freedman, *The Evolution of Nuclear Strategy* (New York: St Martin's Press, 1981), 152.

[3] Edmund Beard, *Developing the ICBM: A Study in Bureaucratic Politics* (New York: Columbia University Press, 1976), 210, states that "the first fully successful full-range Atlas flight occurred in November 1958, but Chapman, in *Atlas: The Story of a Missile* (New York: Harper and Brothers, 1960), 132-33, details the story of the first successful "limited range test" on December 17, 1957. Although the missile may not have traveled the entire intercontinental range on December 17, I consider December 1957 as the first successful launch. The *Encyclopedia Britannica* categorizes ballistic missiles as short-range--effective to 300 miles, medium range--effective from 300 to 600 miles, intermediate-range--effective from 600 to 3,300 miles, and intercontinental ballistic missiles--effective over more than 3,300 miles. http://www.britannica.com/EBchecked/topic/290408/intermediate-range-ballistic-missile. Accessed June 1, 2015. These categorizations were not as clearly defined in the 1950s, but this study will use these definitions for clarity unless otherwise stated.

[4] Duane West to David Bath, email, September 10, 2014. West, an early missileer who served in the 578th Strategic Missile Squadron, revealed that in 1961, his Air Force career counselor advised him to enter the ICBM career field as it was "the delivery system for a nuclear weapon of the future" and "jet bombers were the past."

[5] McGeorge Bundy, President Lyndon Johnson's National Security Advisor declared, "by 1964 [Johnson] was entirely clear in his own mind that he would have no interest whatever in ordering the use of even one [atomic] bomb, ever, except in the context of some overwhelmingly dangerous and direct confrontation with open Soviet aggression." McGeorge Bundy, *Danger and Survival: Choices About the Bomb in the First Fifty Years* (New York: Random House, 1988), 462. The various missiles will be discussed at length in later chapters.

[6] Robert McNamara, "American ABM Deployment," *Survival: Global Politics and Strategy* 9: 11 (1967): 342. See also August 9, 1967 draft "Remarks by Robert S. McNamara before UPI editors and publishers," 8, National Security File, Agency File, Box 12, Defense, Department of - August 1967, Vol V [2 of 2], Lyndon Baines Johnson Presidential Library, Austin, Texas. For McNamara's support of the ICBM, see Christopher Preble, *John F. Kennedy and the Missile Gap* (Dekalb: Northern Illinois University Press, 2004), 170, where Preble contends that "the Kennedy administration had subsequently boosted the Minuteman program, effectively doubling Minuteman capacity beyond that programmed by the Eisenhower administration."

[7] Ibid.

[8] Leon Hojegian, interview with the author, October 14, 2014. Hojegian recalled being turned away from entering the Officers' Club while wearing his missile "whites" after being told that only pilots could wear operational uniforms in the club. Eric Schlosser, *Command and Control: Nuclear Weapons, the Damascus Incident, and the Illusion of Safety* (New York: Penguin Press, 2013), 10, states, "In the hierarchy of Air Force , officers, the fighter pilots and

bomber pilots each claimed to be at the top. Despite their intense rivalry, the pilots agreed on at least one thing: missileers occupied a rung far below them. Serving in an underground control center lacked the glamour of flying sorties into enemy territory or gaining command of the skies." The term for the personnel who controlled and maintained the missiles and prepared for their potential launch has changed over the years, including missilemen (as all of the first personnel were men) and missileers. This paper will use the term missileers as that is the current terminology, except where quoting sources.

[9] Steven J. Zaloga, *The Kremlin's Nuclear Sword: The Rise and Fall of Russia's Strategic Nuclear Forces, 1945-2000* (Washington, D.C.: Smithsonian Institution Press, 2002), 22.

[10] Ibid., 22-23.

[11] Raymond L. Garthoff, *Soviet Strategy in the Nuclear Age* (New York: Frederick A. Praeger, 1958), 222-23, quoting "Khrushchev, in an interview with Mr. Reston, cited in the *New York Times*, October 8, 1957." The article mentioned would be James Reston, "Khrushchev Asks World Rule of the Satellite and Missiles if Part of Wide U.S. Soviet Pact: A Long Interview," *New York Times*, October 8, 1957, 1. See also "Khrushchev Invites U.S. to Missile Shooting Match," *New York Times*, November 16, 1957, 1 & 3, quoting Khrushchev as asserting "bombers are useless compared to rockets," and "Transcript of the President's New Conference on Foreign and Domestic Matters," *New York Times*, October 10, 1957, 14, where Charles S. Von Fremd of Columbia Broadcasting System is quoted as saying, "Khrushchev claims we are now entering a period when conventional planes, bombers and fighters will be confined to museums because they are outmoded by the missiles which Russia claims she has now perfected."

[12] Pavel Podvig, ed., *Russian Strategic Nuclear Forces* (Cambridge, Mass.: MIT Press, 2001), 142-45.

[13] Graeme Gill, ed., *Routledge Handbook of Russian Politics and Society* (New York: Routledge, 2012), 222.

[14] Preble, *Kennedy and the Missile Gap*, 4-5.

[15] Undated "Memorandum to Major USAF Commands", IRIS # 1040232, MICFILM # 35258, Air Force Historical Research Agency, Maxwell AFB, Alabama.

[16] Mike Worden, *Rise of the Fighter Generals* (Maxwell AFB, AL: Air University Press, 1998), 31-32.

[17] Elliot V. Converse III, *Rearming for the Cold War, 1945-1960*, Vol. I, *History of Acquisition in the Department of Defense* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 2012), 30-33.

[18] Walter J. Boyne, *A History of the U.S. Air Force, 1947-1997* (New York: St Martin's Press, 1997).

[19] Melvin Deaile, "The SAC Mentality: The Origins of Organizational Culture in Strategic Air Command, 1946-1962," (Ph.D. Dissertation, University of North Carolina at Chapel Hill, 2007).

[20] Bernard C. Nalty, ed., *Winged Shield, Winged Sword: A History of the United States AirForce,* 2 vols. (Washington, D.C.: Air Force History and Museums Program, 1997), Vol. 2: 82-89.

[21] Roy Neal, *Ace in the Hole* (Garden City, NY: Doubleday and Company, 1962).

[22] Schwiebert, *Ballistic Missiles*.

[23] Neufeld, *Development of Ballistic Missiles*.

[24] Beard, *Developing the ICBM*.

[25] Christopher Gainor, "The United States Air Force and the Emergence of the Intercontinental Ballistic Missile, 1945-1954," (Ph.D. Dissertation, University of Alberta, 2011).

[26] Desmond Ball, *Politics and Force Levels: The Strategic Missile Program of the Kennedy Administration* (Berkeley: University of California Press, 1980).

[27] Sheehan, *Fiery Peace in a Cold War*.

[28] Kenneth F. Gantz, Lt Col, USAF, ed., *The United States Air Force Report on the Ballistic Missile* (Garden City, NY: Doubleday and Company, 1958).

[29] Baar and Howard, *Combat Missileman*.

[30] Bernard Brodie, *Strategy in the Middle Age* (Princeton, NJ: Princeton University Press, 1971).

[31] David Spires, *On Alert: An Operational History of the United States Air Force Intercontinental Ballistic Missile Program, 1945-2011* (Colorado Springs, CO: US Space Command, 2012).

[32] Jacob Neufeld, phone interview with the author dated May 2014. Some excellent examples of books that detail the scientific advancement of missiles are Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1945-1960* (Washington, D.C.: Office of Air Force History, 1990) and Ernest Schwiebert, *A History of the U.S. Air Force Ballistic Missiles* (New York: F. A. Praeger, 1965). A good but controversial study of the early bureaucratic infighting is found in Beard, *Developing the ICBM*.

[33] John Darrell Sherwood, *Officers in Flight Suits* (New York: New York University Press, 1996), 9 and Beard, *Developing the ICBM*, viii and iv. This was also made clear in conversations with Archie DiFante, archivist at the Air Force Historical Research Agency, during a December 2013 conversation.

[34] Two excellent examples are Dobbs, *One Minute to Midnight* and David Coleman, *The Fourteenth Day: JFK and the Aftermath of the Cuban Missile Crisis* (New York: W.W. Norton and Co., 2012).

2. LIFTOFF: RACE FOR SURVIVAL

World War II ushered in a time of significant scientific and technological advancement. Scientists discovered the structure of DNA, Jonas Salk identified a vaccine for polio, the television was invented, Bell Laboratories conceived the transistor radio, Hans von Ohain and Frank Whittle designed and constructed jet propulsion, and Enrico Fermi triggered an atomic chain reaction.[1] It was also a time of significant political upheaval throughout much of the world. As the fighting wore down, the ties began to wear thin between the Allies who fought the Nazis. Soviet, British, and American leaders found that without the chilling threat of Nazi expansion, national interests prevailed over the concerns of their partners in the conflict. Soon, the former Allies became enmeshed in a struggle of their own -- the Cold War.[2] This new clash led to continued rapid scientific progress, including the construction of the nuclear ballistic missile. This chapter will reveal how the end of World War II and the emerging Cold War motivated United States leaders to accelerate their weapons programs and to amplify the criticality of the nuclear ballistic missile.

The manufacture of the nuclear ballistic missile would not have occurred at all except for remarkable scientific advances in two separate fields, taking place roughly twenty years apart. The first was the creation of the ballistic rocket in 1926. The second was the creation of the atomic bomb in 1945. In December 1919, Robert H. Goddard published "A Method of Reaching Extreme Altitudes" in the *Smithsonian*

Miscellaneous Collections, the first public proof that rockets could work in the vacuum of space.[3] Then, on March 16, 1926, Goddard became the first person to successfully launch a rocket using liquid fuel.[4] Goddard offered the American military "all of his research data, patents, and facilities . . . at a meeting with representatives of Army Ordnance, Army Air Corps, and the Navy's Bureau of Aeronautics" on May 28, 1940, but the U.S. military services were not interested.[5]

The Germans, on the other hand, expressed great interest in Goddard's work.[6] They initiated work on rocket technology in the 1930s and as the Nazis rose to power, German military leaders substantially expanded the program. They hoped to use missiles to replace the long-range artillery that was banned to them by the Versailles Treaty. In 1937, scientists working with the German Army began to develop the A-4 rocket, later known as the V-2.[7] On September 8, 1944, they launched the rocket against Paris and London. Although the first attack missed Paris, the attack on London created quite a stir within the American and British military.[8] By 1945, the Germans were working on newer versions of the V-2, including a two-stage rocket that was expected to travel about 3,000 miles, a distance that would threaten the United States.[9]

General Henry Arnold, the commander of the Army Air Corps, responded to reports of German advances in rocketry by prophetically exclaiming, "Someday, not too far distant, there can come streaking out of somewhere (we won't be able to hear it, it will come so fast) some kind of a gadget with an explosive so powerful that one

projectile will be able to wipe out completely this city of Washington."[10] He expounded further on these ideas in a letter to General George C. Kenney, noting that "at present it appears that there will be probably two and possibly five great powers in the next 20 years. Certainly, presently conceived weapons will not be successfully used against any of these powers because of distance and weather limitations and I for one propose to be the leader and not the follower in the experimental development." Arnold continued, "Whether we have rockets, menless [sic] aircraft, or something that replaces the aircraft in its entirety, I want to be very sure that the Air Forces are not again slightly behind our enemies in pre-war development and potential offensive capabilities and countermeasures."[11]

During the war, Germany also began working on the other half of the future intercontinental ballistic nuclear missile, the creation of a bomb using the fission of atoms to create energy. This threat, like the V-2, did not escape Allied notice. In August 1938, Albert Einstein wrote President Franklin D. Roosevelt, warning that some scientists were close to creating "a nuclear chain reaction" that would allow "the construction of . . . extremely powerful bombs of a new type" using uranium, and that Germany had "stopped the sale of uranium," leading him to believe they were doing the same. Einstein's warning concerned Roosevelt greatly and he directed the actions that started the Manhattan Project and creation of the first atomic bomb.[12] Henry Stimpson, the U.S. Secretary of War, later explained Roosevelt's policy on atomic weapons, a policy similar to the one that would be followed in the development of

ICBMs: "It was to spare no effort in securing the earliest possible successful development of an atomic weapon . . . . In 1941 and 1942 they [the Germans] were believed to be ahead of us, and it was vital that they should not be the first to bring atomic weapons into the field of battle."[13]

The U.S. response to the atomic threat was much more focused and successful than its response to the missile threat, with Allied scientists successfully exploding an atomic bomb in New Mexico on July 16, 1945. Soon after, on August 6, the U.S. used the bomb to devastating effect in Hiroshima and August 9, in Nagasaki.[14]

While the military reacted quickly to the threat of missiles, the three major army elements, the Army Ground Forces, the Army Service Forces, and the Army Air Forces began duplicative efforts that would plague missile development for years, with each trying to gain control of the new capability.[15] To reduce friction between the contending organizations, Lieutenant General Joseph McNarney, the Army Deputy Chief of Staff, signed a policy statement on October 2, 1944, dividing responsibilities between the contenders. He focused on each one's proven capabilities, granting the Army Air Forces "responsibility, including designation of military characteristics, for all guided or homing missiles dropped or launched from aircraft" and for "all guided or homing missiles launched from the ground which depend for sustenance primarily on the lift of aerodynamic forces" while giving Army Service Forces, who controlled the Ordnance Command, "research and development responsibilities for guided or homing missiles launched from the ground which depend for sustenance primarily on

momentum of the missile." Army Ground Forces were to develop their own requirements and provide them to either of the other two organizations. McNarney refused to give any of the three operational control of missiles since there were no missiles ready for operational use at the time and he concluded that assigning operational control would "jeopardiz[e] future development."[16] (The interservice competition and its influence on missiles will be addressed further in Chapter3.)

Major General Curtis LeMay, who became the Army's first and only Deputy Chief of Air Staff for Research and Development in December of 1945, noted that after Japan's surrender "we were at least ten years behind the Germans at the end of the war in aerodynamics and jet propulsion and missiles and things of that sort."[17] Both the United States and the Soviet Union recognized this, but both also recognized the value of Germany's embryonic missile technology as a vehicle for the newly developed nuclear weapons. Many believed the two technologies, atomic weapons and ballistic missiles, could be combined to create a revolution in military affairs that would make other military weapons and strategies obsolete.[18] Each state raced to seize the scientists who designed and built the German missiles and their associated equipment from the defeated country. In the United States, Army Ordnance was most successful in this quest, "liberating" Wernher von Braun, providing him with resources, and watching him work. Von Braun said that he was going to build a rocket that would take man to the moon and he didn't appear to care who helped him do so. However, the

Soviet Union also captured several German scientists and began their own missile program as well.[19]

In late 1945, six months after Harry Truman replaced Franklin Roosevelt as president and about a month after World War II was over, the Army Air Force expanded its work in missiles, distributing letters to the corporations of the retrenching aviation industry, inviting proposals to work with them to conduct research and development on missiles over the next ten years. Contracting officers requested input on four types of missiles: air-to-air, air-to-surface, surface-to-air, and surface-to-surface. There appears to have been no concern about abiding by General McNarney's guidance of the previous year as by the next spring, they were working on twenty-eight different projects, including one with Consolidated Vultee Aircraft Corporation (also known as Convair) to develop a ballistic missile.[20]

The $1.4 million dollar Convair contract actually requested that the company research two separate missiles, both meeting a requirement for a long range missile capable of launching a 5,000 pound atomic warhead over 5,000 miles to within one mile of its planned target. The company was not expected to produce the missiles, but to review possible options that could be built in five to ten years. The first was a subsonic, jet-powered winged missile while the second, called Project MX-774B, would be supersonic and rocket powered.[21] Soon after, the Army Air Force offered a second contract to Northrop Aircraft, the only other company to be contracted to develop a

missile for the long range requirement. Northrop's contract required the company to design a supersonic turbojet aeronautical missile.[22]

Shortly thereafter, funding began to dry up quickly. The Cold War had not started in earnest and, as *Atlas* author John L. Chapman reminded his readers, "in the years immediately following World War II the nation was naturally less concerned about military preparedness for new wars than about the immediate problems of demobilization and readjustment."[23] Moreover, many thought ballistic missiles were not yet ready to power the proposed nuclear revolution. The V-2 missile, the most powerful ballistic missile operational at the time, only had a range of about 180 miles, not the thousands of miles required to accomplish the long-range nuclear mission, and the missile was notoriously inaccurate.[24] Vannevar Bush, the highly influential head of the U.S. Office of Scientific Research and Development during World War II, ridiculed the idea of an intercontinental ballistic missile, saying that such an idea was not feasible and arguing that even if a long-range ballistic missile could be built that would reach a predicted target, its cost would be astronomical and would economically exhaust the nation before its use affected the enemy.[25]

Thus began a second American struggle over the fate of missiles. Some politicians, scientists and military officers in the United States, including General Arnold and Dr. Theodore von Karman, Chairman of the Air Force's Scientific Advisory Group, believed the nation should obtain the new "ultimate weapon" -- the intercontinental ballistic missile carrying a nuclear warhead -- as soon as possible.[26]

Others like Vannevar Bush determined that the scientific knowledge and technology of the time could not adequately extend the range and accuracy of the missiles to make them practical, so argued that the time and money should be put toward improving the ability of bombers to deliver the nuclear weapons rather than being wasted on dubious missile technology.[27] In addition, many expected that the nation would retain exclusive control of nuclear technology for several years, if not decades, and believed the nuclear bomb had established the United States as the dominant world power in the Cold War, so there was no need to expend the effort to rush the new weapon.[28]

On June 30, 1945, when General Arnold finally conceded that he had major heart problems and retired from active duty, the United States lost a powerful voice in support of missile research.[29] Consequently, when Congress cut the services' research and development budget by 40 percent in 1946, the Army Air Force decided to reduce support for ballistic missiles. Instead, the organization focused on jet-powered bombers and aerodynamic missiles, weapons that service leaders believed would be operational sooner, were cheaper, and could travel further with a larger payload, so the organization focused more effort on these assets. General Donald Putt, Director of Research and Development for the Air Force Deputy Chief of Staff for Materiel, had an alternate explanation. He believed that the Air Force put wings on its missiles and kept them in the atmosphere to distance itself from the Army's interpretation of missiles. "We were afraid that if we developed them to look like rockets or a big artillery shell, that eventually the Department of Defense would give the mission to the Army." He

also conjectured that psychologically, air-breathing missiles closely resembling aircraft were easier for the service to accept than ballistic missiles.[30]

Regardless of the reason, in December 1946, the Army Air Force reduced its budget for missile development from about $29 million to $22 million. This forced the Army Air Force to cancel over one third of its twenty-eight missile projects, including Convair's subsonic missile, and to reduce funding for the company's long range rocket powered missile.[31]

Seven months later, in July 1947, the Army Air Force terminated Convair's contract, stating that the MX-774 missile did "not promise any tangible results in the next eight to ten years."[32] In fact, an Air Staff evaluation of the guided missile program proclaimed that "for the next ten years, at least, the subsonic bomber will be the only means available for the delivery of long-range (1,000 miles and over) air bombardment."[33] Fortunately for both the nation and for Convair, the officers controlling the contract allowed the company to retain the funding it had already received and continue work on the project with the remaining resources.[34] This decision was probably one of the most critical affecting the future Air Force's development of ballistic missiles.

Like other manufacturers of the time, Convair based its missile on the German V-2, but improved the German missile's weak guidance system to enhance its accuracy. The company's chief engineer on the project, Karel "Charles" Bossart, also decided that the only way to extend the range was to reduce the weight of the airframe so he made

the entire area between the warhead and the rocket into a large fuel tank of thin aluminum rather than designing separate tanks inside a strong metal exterior.[35] The only thing separating the fuel from the oxidizer was a single bulkhead so the weight of the warhead had to be held up by the gases inside the missile as the metal was not strong enough to hold the warhead by itself. However, the changes were expected to increase the range of the missile significantly. In addition, the company redesigned the rocket's engines, increasing their thrust and designing a control system to move the engines in flight so the rocket could be steered. The designers were not required to produce a missile, but they thought that building one would allow them to learn more quickly. They requested permission and, since it did not cost them any more money, the Army Air Force allowed it.[36]

In July 1949, the National Security Council recommended that President Truman prioritize the production of the atomic bomb as the nation's highest priority and the production of the B-36 bomber to carry it as the second highest priority. Ballistic missiles were not listed as a priority. Significantly, U.S. intelligence reports that the Soviet Union successfully tested an atomic bomb on August 29, 1949, did not alter the decision to ignore ballistic missiles. After careful study and deliberation, on January 31, 1950, Truman announced that he had "directed the Atomic Energy Commission to continue its work on all forms of atomic weapons, including the so-called hydrogen or superbomb."[37] However, the military services feared that the Soviet Union might gain the upper hand militarily in the near term since high level political and military leaders

had not thought the Soviets would obtain atomic technology for another decade, so they funded "current" technology, aircraft and aeronautic missiles, to combat this threat rather than "technology of the future" including ballistic missiles.[38]

On June 25, 1950, a critical shift in the Cold War altered the status quo for ballistic missiles. North Korean communists invaded South Korea. As war broke out on the Korean peninsula, President Truman replaced Louis Johnson with a new Secretary of Defense, former General George C. Marshall, and the Defense Department initiated a partial mobilization. The communist aggression drove increases in defense funding. Some of the added funding became available to support further research and development for missiles.[39]

Convair had prepared for this moment. Even though the government support for its missile development program had run out, Convair had provided "Charlie" Bossart, the primary engineer for the MX-774 contract, with about $3 million to conduct further research on the project between 1949 and 1950, believing that their advances would lead to future contracts. This foresight paid substantial dividends. With the money provided from the earlier contract, Convair had built a working ballistic missile, launching the first on July 13, 1948. Although it had never traveled further than about thirty miles, the Convair missile was the most promising ballistic missile America had to offer.[40]

Hearing that the Air Force was again considering new research on missiles, the company proposed several options to officers in Air Material Command in October

1950, including a ram-jet missile that Convair thought the Air Force favored. Two months later, when the service's Engineering Division wanted to determine the best approach to build a long range surface-to-surface missile, the Air Force turned to Convair, the only company with any real experience and operational concepts in this arena.[41]

Thus, on January 23, 1951 -- three and a half years after it cancelled its original agreement with Convair, the Air Force signed a new $500,000 contract with the company to study "an intercontinental missile with a minimum range of 5,000 miles, a minimum speed of Mach 6 over the target, a circular error probable (CEP) ['the radius of a circle within which half of a missile's projectiles are expected to fall'] of 1,500 feet, and a nuclear warhead."[42] Donald MacKenzie, in *Inventing Accuracy*, speculates that the CEP requirement was designed to mimic the target area believed to be achievable by 1950s era bombers dropping bombs by radar from 25,000 feet. These requirements were deemed impossible at the time, leading some historians to believe Air Force leaders established the requirement to ensure Convair could not succeed. Cruise missiles, the closest weapon to the missile, had still not achieved a circular error probable of 5,000 feet, over three times larger than the target established for Convair's ballistic missile.[43]

Within the Air Force, most thought the optimum missile would be a "glide" missile, launched into orbit and remotely guided to its target by the use of attached wings after reentry into the atmosphere. However, Convair engineers chose the

ballistic rocket, believing the glide rocket would be too easily intercepted and that building a winged system to reenter the atmosphere was much more difficult than creating a solid warhead to do the same. The Air Research and Development Command supported the company's premise, predicting that a working ballistic missile could be operational in the early 1960s. General John Sessums, the Deputy Commanding General of Air Research and Development Command, later remembered that "members of the Air Force Scientific Advisory Board told him that in his advocacy of ballistic missiles, he was promoting a comet that would burn up upon atmospheric reentry."[44]

Over the summer, the Air Force perspective on glide missiles changed and, in September 1951, Headquarters USAF directed that all work on Project Atlas, the Convair study, "be directed towards the development of a rocket-powered ballistic missile rather than a rocket-powered glide missile." In the meantime, the Strategic Air Command, the organization responsible for launching the Air Force's nuclear arsenal, which had been established in 1946, published their goals for missiles in "Preliminary Plans for Activation and Employment of USAF Guided Missile Units."[45]

On November 1, 1952, another technological development greatly improved the prospects of the Air Force missile program. American scientists successfully tested a thermonuclear or hydrogen bomb, producing a much lighter warhead with much greater explosive capability, which meant the missiles could carry it much further and accuracy was not as vital. This advancement made intercontinental ballistic nuclear

missiles feasible in the near term. A preliminary Air Force Special Weapons Center (AFSWC) study dated September 15, 1953 identified how the new development made ballistic missiles viable, but this fact did not appear to have been widely understood or accepted at the time and the official Air Force perception of missiles did not change.[46]

In December 1952, after Dwight Eisenhower was elected president, Roswell Gilpatrick, Truman's Undersecretary of the Air Force, explained the official Air Force position on ICBMs to the incoming Secretary and Undersecretary of the Air Force, stating that "many years will elapse before major dependence can be placed on these new weapons and that meanwhile another generation of piloted aircraft . . . will be needed."[47] Airmen working in missile programs were ordered to refer to their creations as "pilotless aircraft" rather than missiles.[48]

Not all airmen agreed with the official Air Force position on missiles. Trevor Gardner, the newly appointed Special Assistant to the Secretary of the Air Force for Research and Development, had a decidedly different view.[49] Gardner believed "the era of the unmanned missile in warfare . . . is very much at hand," and contended that "the United States must have 'weapons of such superior ingenuity, performance and effect as override the enemy's ability to attack or defend himself.'"[50] Thus, in his opinion, the current military requirements for missiles were "unnecessarily complex, and occasionally impossible. . ., especially those concerning CEP's [expected ability to hit within a defined target area], payloads, and guidance."[51] Gardner wanted the Congress and the President to vigorously back the creation of an operational ICBM

capability "to assure that the peacetime checks and balances which are necessary in our system of government will not be the cause of time delays in the accelerated progress of the program."[52] He lobbied the nation's political leaders to accelerate Air Force research into and production of ballistic missiles, but found himself struggling against the tide.[53]

After assuming the presidency, Eisenhower worked to extricate the United States from the conflict in Korea and, on June 27, 1953, an armistice was signed. Achieving the ceasefire allowed Eisenhower to implement another goal, a significant reduction in government spending based on the administration's "New Look" and "more bang for the buck" defense philosophies by focusing on nuclear weapons. In the spring of 1953, as the combatants in Korea worked toward a peace agreement, Charles Wilson, Eisenhower's Secretary of Defense, reduced research and development funding for the services by 25 percent. This cut again highlighted the duplication between the services' work on missiles, so, a few weeks later, Wilson ordered a review of the guided missile programs to eliminate duplication and identify a standard missile to accomplish the service's operational requirements.[54]

Gardner made the most of this opportunity. When Secretary Wilson charged the Secretary of the Air Force to guide the study, Gardner became the point man for a tri-service study group, but he also established a Committee on Strategic Missiles, sometimes called the Teapot Committee or von Neumann Committee after its leader, John von Neumann, to evaluate the various Air Force missile programs against available

technologies, especially in comparison to the expected capabilities of potential enemies, and to recommend solutions to any problems identified. Gardner ensured the committee was made up of nationally esteemed "university and industrial scientists" who were strongly in favor of missiles, as he was.[55]

On February 10, 1954, the von Neumann Committee, officially renamed the Strategic Missiles Evaluation Committee, presented its findings. The report postulated that the new thermonuclear bomb, or hydrogen bomb, would indeed allow the military to reduce the size of warheads within a few years and recommended accelerating the ICBM program, strengthening Gardner's position immeasurably.[56] Those who had been working intimately with the future missile systems recognized this fact over a year earlier, but had been "dismissed without serious consideration" because their views seemed "so incredible." Some of these workers were frustrated that their own views had not been accepted as readily as those of the committee, but they quickly seized on the opportunity.[57]

In its report, the von Neumann Committee contended that the ICBM program should be accelerated because "unusual urgency for a strategic missile capability can arise from one of two principal causes: a rapid strengthening of the Soviet defenses against our SAC manned bombers, or rapid progress by the Soviet in his own development of strategic missiles which would provide a compelling political and psychological reason for our own effort to proceed apace." The committee then observed that while "available intelligence data are insufficient to make possible a

positive estimate of the progress being made by the Soviet in the development of intercontinental missiles . . . evidence exists of an appreciation of this field." The Committee further asserted that they could not rule out that "the Russians are ahead of us."[58] It also recommended relaxing "the military requirement . . . on C.E.P. . . . from the present 1500 feet to at least two, and probably three, nautical miles." By using the new thermonuclear warhead to reduce weight and increasing the target size, some member of the committee believed the nation could produce a "preliminary system. . . sometime between mid-1958 and mid-1960." Thus, instead of reducing costs as the Secretary of Defense intended for it to do, the committee called for a tremendous increase in missile expenditures.[59]

The Committee's recommendation gained strength from a similar report that was released two days prior. The RAND Corporation published "A Revised Program for Ballistic Missiles of Intercontinental Range" predicting that an Atlas ICBM could achieve initial operational capability by the early 1960s if performance criteria were relaxed and the program was prioritized and funded appropriately. The von Neumann Committee had reviewed the RAND report and received several briefings from RAND employees as they prepared their own report "and used much of the material in the preparation of its own findings and recommendations."[60]

Once Gardner had the reports, and even before he presented them to the Air Force, the Assistant Secretary recommended the Air Force abandon the current missile program and replace it with a new, more aggressive program run by a group focused

only on ballistic missiles. In this way, he insisted, the Air Force could attain an emergency capability between 1958 and 1960. He obviously convinced Secretary Talbott of at least some of his plan. The next week, Talbott informed the Air Force Chief of Staff, General Twining, that "Mr. Trevor Gardner has developed a plan for accelerating our efforts so as to achieve . . . an intercontinental ballistic missile operational system within approximately five years." He then directed that "the Air Force immediately accelerate the intercontinental ballistic missile program . . . at maximum effort . . . on the assumption that total funding required will ultimately be provided by Congress." Thus, while Secretary Talbott did not abandon Convair's Atlas program, he approved acceleration of the ICBM program. Two months later, in May, he boosted the program to the top of the Air Force's research and development priority list and directed the Air Research and Development Command to "accelerate the revised ATLAS program to the maximum extent permitted by technology."[61] This level of political pressure to design and build ballistic missiles remained and even increased until the Air Force had developed several types of ballistic missiles in the early 1960s.

On July 1, 1954, the Air Force established the Western Development Division and named Brigadier General Bernard Schriever as its commander. This organization was to "exercise complete authority and control over all aspects of the development program for WS-107A (ATLAS), including ground support, operational logistic and personnel concepts, and all engineering decisions."[62] Motivated by the opportunities and the political support, Schriever published a development plan in April 1955 setting

a target date of July 1959 for having an "operational launch capability from an operational base." A month later, in May, Schriever managed to accomplish another of Gardner's agenda items, by establishing an alternate ICBM development program called Titan. This was ostensibly to "provide alternate development routes and greater assurance of successful accomplishment of the ICBM development mission within target dates," but the action also set up an opposing system to Convair, which both Schriever and Gardner disliked. Even with this tremendous success, Gardner was not satisfied and kept pressing for greater effort on the ballistic missile.[63]

Just one month after the von Neumann Committee released its report, in March 1954, Eisenhower provided another opportunity for Gardner. The President met with members of his Science Advisory Committee of the Office of Defense Mobilization to discuss his concerns about a surprise attack on the United States. Lee DuBridge, the chairman, recommended an ad hoc committee be set up to study the problem. On July 26, 1954, Eisenhower established the Technological Capabilities Panel of the Scientific Advisory Committee to "consider the vulnerability of the United States to surprise attack." It is not known exactly why Eisenhower requested this study, but he faced many threats and was concerned about a "Pearl Harbor" type nuclear attack. Communists were invading Guatemala, Chinese Communists threatened Taiwan, and the French were struggling against Communist nationalists in Vietnam. In addition, just a little over a month earlier, Senator Joseph McCarthy (R-Wisconsin) had attacked the Army for coddling communists, although this proved to be his undoing. Eisenhower

was also struggling with political pressure to increase the defense budget, an action he was loathe to do.[64]

In February 1955, the forty-two member committee released its report, stating that "the intercontinental ballistic missile [could] profoundly affect the military posture of either [the United States or the Soviet Union in the future] and recommending that the "National Security Council formally recognize the present Air Force program for the development of an intercontinental ballistic missile as a nationally supported effort of highest priority."[65]

The National Security Council asked the Department of Defense to comment on the Killian report, named for the head of the Technological Capabilities Panel. Gardner again took advantage of this opportunity. When Gardner presented his response to the Secretary of the Air Force, he revealed that he had already given much of the information to Senator Henry Jackson's Subcommittee on Military Appropriations of the Joint Congressional Committee on Atomic Energy in response to the committee's queries and suggested that Talbott forward a copy of the report to them. Within days, Senator Jackson (D - Washington) and Senator Clinton Anderson (D - New Mexico), the chairman of the Joint Congressional Committee on Atomic Energy, both of whom strongly agreed with Gardner's views on missiles, sent Eisenhower their "Findings and Recommendations Concerning the Intercontinental Ballistic Missile." In their report, the congressmen warned that "the question of war or peace may depend upon who gets the ICBM first" and that "the ICBM . . . is the natural weapon of an aggressor bent

upon carrying out a nuclear Pearl Harbor. If the Soviets win the race for the ICBM, and if they thereupon use it in a massive surprise attack against our cities and industries and the bases of the Strategic Air Command, effective retaliation may be impossible." To resolve these concerns, the Joint Committee strongly recommended that the president "immediately issue a directive singling out the ICBM as the most important project in our entire defense effort, assigning it unique and over-riding priority within the entire defense establishment."[66]

Other alarms were ringing as well. At almost the same time, retired Brigadier General Thomas Phillips, U.S. Army, publicly expressed his concerns that the Soviets "started two years later than we to make a jet intercontinental bomber and now they have it in formations while we don't; . . . they have built more jet aircraft of a single type -- the MiG-15 -- than we have of all jet aircraft combined and have built more light two-engined jet bombers than all the free world put together." He then criticized the U.S. missile program, proclaiming, "At the same time that the Soviets were involved in crash programs for medium and heavy bombers, they also had crash programs on long-range missiles. The United States, in contrast," Phillips contended, "completely dropped its intercontinental ballistic missile for two years and was progressing at a leisurely pace until Soviet progress forced a top priority on our missile programs."[67]

A week after receiving the Congressional report, on July 6, 1955, Eisenhower met with Wilson and Talbott and requested a briefing on ballistic missiles. It appears that Gardner and his executive assistant, Vincent Ford, had been working behind the

scenes to convince like-minded presidential staffers to schedule an opportunity for them to brief the National Security Council and President Eisenhower on the nascent U.S. missile capability while the senators and representatives pushed from the front. Consequently, on July 28, Gardner, with Dr. von Neumann and General Schriever, the Air Force point man for missiles, informed the president of their endeavor to build a ballistic weapon that could carry nuclear weapons across the world and warned of the threat of a similar Soviet effort.[68]

Compelled by Senate Democrats, concerned citizens, and members of his own administration, on September 13, 1955, Eisenhower approved NSC Action No. 1433. The NSC's document acknowledged that "there would be the gravest repercussions on the national security and on the cohesion of the Free World, should the USSR achieve an operational capability with the ICBM substantially in advance of the United States" and directed that "the U.S. ICBM program [be] a research and development program of the highest priority above all others, unless modified by future decision of the President."[69]

That same day, Gardner established an ICBM Administrative Procedures Evaluation Group to streamline management procedures for ballistic missiles. Like the von Neumann Committee, the new committee was often called the Gillette Committee after its chair, Hyde Gillette, the Deputy Secretary of the Air Force for Budget and Program Management. Less than two months later, on November 8, Secretary Wilson approved the Gillette Committee's recommended procedures, officially titled "the Air

Force Plan for Simplifying Administrative Procedures," setting up the Air Force Ballistic Missiles Committee and the Office of the Secretary of Defense Ballistic Missiles Committee as the only formal approval authorities. The Gillette procedures also "established a separate ICBM funding category, separate from other Air Force programs." This change was significantly more important than its title appears, as it granted Schriever authority "only exceeded by that of the head of the wartime atomic bomb effort."[70] With the added authority came extra stress. General White, the Air Force Chief of Staff, directed that Schriever use his new authority and budget to attain the earliest possible initial operational capability and called for "the speediest possible integration of missiles and aircraft."[71] In addition, by stiff arming more than forty organizations that previously had authority to help Schriever and his organization, the new procedures created many more enemies within the government than had previously existed.

Nevertheless, significant changes to the missile program continued apace. During its review, the von Neumann Committee had only been asked to study intercontinental missile programs, but the committee had warned that "there is . . . no current Air Force program for ballistic missiles of medium range (say, 200-1500 miles) [which] . . . should be considered by some qualified agency."[72] The Killian Committee had seconded this concern, reporting that "we believe the development of a medium range ballistic missile would be an easier development, more certain of success in a shorter time than that of the 5500 n[autical] m[ile] missile. Thus the Soviets could

achieve a medium range ballistic missile capability sooner than the U.S. could achieve an intercontinental ballistic missile capability." The Killian Committee recommended "the U.S. initiate a medium range ballistic missile program to increase the probability that the U.S. is first to achieve a ballistic missile capability."[73] The State Department influenced the decision as well, with a study that "concluded that, should the Soviets be the first to develop a long range ballistic missile, this achievement would greatly reduce Free World confidence in American technological superiority and might lead several nations toward a 'third world orientation.'" The study then speculated that "if the United States managed to develop an IRBM at the same time that the Soviets demonstrated an ICBM, that feat would mitigate the problem."[74]

Therefore, even though Eisenhower had serious concerns about the efficacy of ballistic missiles, the willingness of the services to work together on their development, and the technological expertise required to accomplish the two demanding tasks simultaneously, he conceded.[75] On December 20, 1955, a little over a month after the CIA produced a National Intelligence Estimate reporting significant improvement in Soviet bomber capability and during what historian Richard Leighton terms an abruptly chillier trend in the Cold War, "the President directed that the IRBM and ICBM programs should both be research and development programs of the highest priority above all others." Schriever and other like-minded ICBM advocates feared that work on an Intermediate Range Ballistic Missile could slow or even prevent completion of the ICBM. Acknowledging these concerns, Eisenhower decreed that "mutual interference

between these programs should be avoided so far as practicable, but if a conflict should occur in which strict application of paragraph a above would . . . cause major damage to the security interests of the United States, then the matter will be promptly referred to the President."[76]

In response, the Air Force Western Development Division -- and the Army, given special permission to work with the Navy on the Jupiter IRBM -- began to design and construct intermediate range missiles while the Air Force retained the responsibility to develop the ICBM. The Air Force's initial goal for an operational IRBM capability was January 1960. [77] The Navy Polaris missile was added as a key defense priority as well because it could be launched from submarines, making it more invulnerable to a nuclear first strike.[78]

The growth in number and importance of the missile programs drastically increased their costs, frustrating Eisenhower's attempts to reduce the national budget. After cutting the budget in several other areas, the Eisenhower administration began to study if it could reduce defense expenditures by cutting the technological development and production of the bomber force. When he was informed that bombers would continue to be a critical part of the defense establishment at least until 1967, the president requested another review of the missile programs in order to reduce costs.[79]

This time Gardner was not available to influence the proceedings. Gardner and several other senior Air Force representatives had requested about $500 million in additional funding for the two years and had been denied by the Secretary of Defense,

who was trying to stay in line with the President's policy of frugality. Despite the fact that he admitted that the ballistic missile program was not underfunded at the time, Gardner resigned in protest on February 10, 1956, proclaiming that other defense needs were not being met. Missile advocates keenly felt Gardner's absence soon after.[80]

As Eisenhower began to reduce costs again, Stuart Symington, a former Secretary of the Air Force under Truman and then Democratic Senator from Missouri, "accused the administration of allowing the United States to fall behind the Soviet Union in the race for the 'ultimate weapon,' the guided missile, and in general of risking national security to save money."[81] The Republican party responded by contending that cuts during the Truman administration, when Symington was Secretary of the Air Force, stopped the initial work on the Atlas program.[82] Over the protests of the Democratic congressmen and following his Secretary of Defense's advice, Eisenhower directed that the duplicative Titan program be prioritized lower than Atlas "in an effort to make substantial economies in this alternative development." He also asked the services to prioritize the IRBM programs so that they could focus on the Jupiter or Thor rather than on both of the competing projects, but this directive was overtaken by events.[83]

The Air Force launched its first Thor IRBM on January 25, 1957, one month behind schedule, but the launch failed. Five and one half months later, on June 11, the first Atlas launch suffered the same fate. While these failed launches were

disappointing, they were not completely unexpected with the new technologies. The real crisis came soon after.[84]

On August 26, 1957, the Soviet news agency TASS reported that the Soviet Union had successfully launched an intercontinental ballistic missile. The story was quickly reported in the U.S. media, but Eisenhower downplayed the event, explaining that Soviet announcements were not particularly reliable and a single missile was not militarily significant. He assured Americans that the U.S. missile program was progressing rapidly and, according to historian Robert Watson, "the public took their cue from these reassurances and showed little concern over the matter."[85]

However, the situation changed dramatically less than two months later. On October 5, 1957, the top *New York Times* headline read, "Soviet Fires Satellite into Space." The satellite the story referred to was the 184-pound Sputnik. It circled the globe transmitting audio signals, ensuring it could be both seen and heard. The *Times* quoted unnamed military experts as saying, "the satellites would have no practicable military application in the foreseeable future," but also mentioned that "the study of such satellites could provide valuable information that might be applied to flight studies for intercontinental ballistic missiles."[86]

The Soviets quickly followed the announcement about Sputnik with a second story, a proclamation that the Soviet's had tested a "mighty hydrogen bomb of new construction . . . at a great height. The test was successful."[87]

A former advisor to the president, Charles Jackson, privately declared the launch "an overwhelmingly important event -- against our side." He contended that the Soviets orchestrated the announcement of their successful ICBM test, the Sputnik launch, the almost simultaneous announcement of the hydrogen bomb test, and the predicted launch of a second, larger satellite in a thirty day period in a "skillful alternation of war and peace" was a masterful piece of psychological warfare.[88]

Eisenhower tried to maintain course. On October 10, he told his National Security Council, "There's no reason for hand-wringing, just because the Russians got there first -- they're to be congratulated . . . . But we've lost nothing of our national security, and we shouldn't change our scientific plan." He was forced to do so.[89] On October 28, *Newsweek* reported that "most Americans are in favor of a crash program to put the U.S. ahead in the missile race . . . . There was concern but no panic . . . . Above all, they understood that catching up might well be a matter of survival."[90]

By the time the Soviets launched Sputnik II, a much larger satellite on November 3, some leading Congressmen were ready to call hearings to "'speed up our [missile] program' and to convert former target dates into much earlier deadlines for achievement in the development of missiles, satellites and rockets." Senator Lyndon B. Johnson (D-Texas) declared that "target dates have been set for 1961 or 1965, while 'we ought to be talking about 1958 or '59, '60'."[91] By the end of the month, when the inquiry began, at least one newspaper declared that the committee would "smash bottlenecks that could threaten 'national survival' in the space age."[92]

Again, Eisenhower's opposition was supported by his own advisors. On April 4, 1957, concerned about protecting American civilians from nuclear attack, Eisenhower had established the Security Resources Panel of the Office of Defense Mobilization Science Advisory Committee, better known as the Gaither Committee, to determine if he should build blast shelters across the country. Although Eisenhower explicitly directed the committee to stay on task, when it presented its report on November 4, its contents proved the members had not done so.[93]

The report asserted that "by 1959, the USSR may be able to launch an attack with ICBMs carrying megaton warheads, against which SAC [Strategic Air Command] will be almost completely vulnerable under present programs." The report further proclaimed that, under a "medium weight [attack]--divided between military and civilian targets . . . , about half of the population would be casualties." Among other things, it recommended that "an integrated program of Atlas and Titan, and an IRBM program including the achievement of a significant operational capability at the earliest possible date, should be given the highest national priority." "To lessen SAC vulnerability to an attack by Russian ICBMs (a late 1959 threat)," the report recommended Eisenhower "increase the initial operational capability of our IRBMs (Thor and/or Jupiter) from 60 to 240 . . . increase the IOC of our ICBMs (Atlas and Titan) from 80 to 600." Finally, all the missiles "except for the initial Atlas group, . . . should incorporate hardening against the Soviet ICBM threat." While the Gaither

Report acknowledged that to accommodate its recommendations would cost the nation billions, the authors still pressed for their acceptance.[94]

The pressure only got worse when, on December 16, the Vanguard, a missile the administration touted as the U.S. response to Sputnik, with its own satellite, failed spectacularly after rising only two feet. The first successful launch of the Atlas, on December 17, did not significantly change this perspective because the Atlas was a military missile and thus not as well known. In addition, the Atlas only flew 530 miles and carried no satellite.[95] Even though Eisenhower declared space a separate and less important mission than military missiles, many Americans felt so strongly about the issue that the military continued efforts to launch a satellite, finally succeeding a year later, on December 18, 1958, when an Atlas entered earth orbit, relaying a Christmas message from Eisenhower for 34 days.[96]

Lyndon Johnson, as Senate Majority Leader, demanded access to both the Gaither Report and the Killian Report. The Gaither Report was classified, but on December 20, 1957, the *Washington Post* reported key contents in Chalmers Roberts' story "Enormous Arms Outlay is Held Vital to Survival" under the front-page headline "Secret Report Sees U.S. in Grave Peril," including a declaration of a "missile gap" that could not be closed before 1960 or 1961.[97] Since he had access to intelligence from the U-2 reconnaissance aircraft, Eisenhower realized there was no missile gap, but decided to debate the issue without disclosing that information rather than risk revealing the highly classified intelligence capability.[98]

Eisenhower refused to take several of the recommended actions, but he increased the defense budget by $4 billion over the next year and nine months and compromised in some areas. On the advice of his Secretary of Defense, the president accelerated the Jupiter, Thor, and Polaris IRBM programs, increasing the number of planned ICBMs to one hundred and thirty (ninety Atlas and forty Titans) and IRBMs to one hundred and eighty, even though "he feared that they would become obsolete quickly and have to be scrapped."[99] He also authorized research to begin on the solid-fueled Minuteman, a missile that could be manufactured much more cheaply than the Atlas or Titan and was safer and more reliable than either.[100]

The workers building the missiles labored at breakneck speed. Colonel Richard Jacobson later remembered being told that they "were going to deploy [the Thor intermediate range ballistic missile] as soon as you had something that would be a threat to the Soviet Union." When asked for clarification, he responded that the decision point to deploy the missiles was when 50 percent of the missiles would hit the Soviet Union -- not a specified target within the Soviet Union, but the country itself. This haste did not stop the political sniping.[101]

Both parties continued to blame the other for falling behind in the quest toward missiles. The contention increased dramatically over the next few years, egged on by newspaper columnist Joe Alsop. Alsop and other harsh critics of the Eisenhower administration frequently condemned the old general, asserting that he had allowed the Soviets to gain a deadly advantage in missiles, deemed a "missile gap" -- despite the

fact that the gap was nonexistent or favored the United States. The supposed "missile gap" developed into a major issue of the 1960 presidential election and contributed to John Kennedy become the thirty-fifth president.[102] It also forced the Air Force to place tremendous emphasis on building and incorporating ballistic missiles into their mission, even though some members of the service believed the rush, and possibly the incorporation of missiles, was detrimental to their flying mission. Only on October 21, 1961, when Kennedy's Deputy Secretary of Defense, Roswell "Gilpatrick, stated explicitly that the United States now knew that the Soviets had neither a quantitative nor a qualitative superiority in nuclear missile technology" was the issue completely diffused.[103] During this frenetic time, four of the nation's five ballistic missile systems became operational and the Jupiter IRBM's future was determined.[104] The accomplishment of this feat in such a short time and under such pressure was to have a tremendous effect on the Air Force's relationship with the new weapons and the men who controlled them and, thus, major consequences for the future of ballistic missiles in the United States.

Notes

[All references to newspapers are to Section 'A' unless indicated otherwise.]

[1] Rodger W. Bybee, "Achieving Technological Literacy: A National Imperative," *The Technology Teacher* 60 (September 2000), 25. (http://mail.iteea.org/TAA/LinkedFiles/Articles/TTTpdf/2000-01Volume60/bybee_sept00.pdf). Accessed November 26, 2014.

[2] Terry Anderson, *The United States, Great Britain, and the Cold War, 1944-1947* (Columbia: University of Missouri Press, 1981), 1, 51, 142.

[3] Robert H. Goddard, "A Method of Reaching Extreme Altitudes" *Smithsonian Miscellaneous Collections* 71(1919): 1-69, http://www.clarku.edu/research/archives/pdf/ext_altitudes.pdf (accessed 20 Feb 2014). Konstantin Tsiolkovsky described multistage rockets fueled by liquid propellant in his 1903 paper, "Exploring Space with Reactive Devices," *The Scientific Review* (a Russian journal), but it is unlikely that anyone in the United States was aware of this in 1919. Jacob Neufeld, *The Development of Ballistic Missiles in the United States, 1945-1960* (Washington, D.C.: Office of Air Force History, 1990), 7-10, begins his studies with pilotless aircraft, but this study will use the War Department division of missiles into those using aerodynamic lift and those using momentum and focus solely on those using momentum.

[4] Dr. Robert H. Goddard, American Rocketry Pioneer, NASA Website, http://www.nasa.gov/centers/goddard/about/history/dr_goddard.html (accessed 20 Feb 2014).

[5] E. Michael Del Papa and Sheldon A. Goldberg, *Strategic Air Command Missile Chronology, 1939-1973* (Offutt AFB: Office of the Historian, HQ Strategic Air Command, 1990), unpaginated, 6.

[6] Stanley Ulanoff, *Illustrated Guide to U.S. Missiles and Rockets* (New York: Doubleday, 1959), 7, indicated Wernher von Braun admitted that "everything we know we learned from him."

[7] T. D. Dungan, in *V-2: A Combat History of the First Ballistic Missile* (Yardley, PA: Westholme, 2005), 2, describes the V-2 as "the first long-range ballistic missile to be actively used in combat. This huge German missile hurtled a 1,700-pound warhead 50 miles high and hundreds of miles downrange to its target. There was no stopping it, no countermeasure to shoot it down. It traveled at supersonic speeds and slammed into the earth without the slightest warning. The V-2 was Germany's most monumental manufacturing endeavor of the war, but as with all Nazi secret weapons, its introduction was far too late to influence the final outcome of the war."

[8] Max Rosenberg, *The Air Force and the National Guided Missile Program, 1944-1950* (Washington, D.C.: USAF Historical Division Liaison Office, 1964), 12, wrote that "it was not until the V-1 and V-2 launchings that guided missiles received more than casual attention from top AAF officials." Roscoe C. Wilson, interview with Henry Bowen, October 13, 1961, Call # K239.0512-0774, IRIS # 01002224, Air Force Historical Research Agency (hereafter cited as AFHRA), 6, recalled that "the bomb was developed because of fear that the Germans would sponsor an effective atomic program and in 1944 there was fear that the V-2's were carriers of atomic warheads." Beard, *Developing the ICBM*, 46, contends that the first V-2 missile "exploded in Paris September 6, 1944." For further information on the V-2 missiles, see Dungan, *V-2* or Steven J. Zaloga, *V-2 Ballistic Missile, 1942-52* (Oxford, UK: Osprey Publishing, 2003), 3-4. See also Clayton K.S. Chun, *Thunder over the Horizon: From V-2 Rockets to Ballistic Missiles* (Westport, CT: Praeger, 2006), 52.

[9] John L. Chapman, Atlas: The Story of a Missile (New York: Harper, 1960), 31.

[10] Arnold, quoted in Neufeld, *Ballistic Missiles*, 35.

[11] Part of collection of documents that were microfilmed in the personal collection of General Henry H. Arnold, MICFILM 43804, IRIS # 01102996, AFHRA.

[12] Albert Einstein to Franklin D. Roosevelt, letter dated August 2, 1939. (http://www.fdrlibrary.marist.edu/archives/pdfs/docsworldwar.pdf) Accessed February 21, 2014. Dr. Alexander Sach testified to Congress that the letter was given to President Roosevelt in Hearings Before the Special Committee on Atomic Energy, U. S. Senate, 79th Congress, 1st Session, November 27, 1945, (HRG-1945-AES-0001), 10. See also F.G. Gosling, *The Manhattan Project: Making the Atomic Bomb* (Washington, D.C.: Department of Energy, 2010), vii.

[13] Henry L. Stimpson and George McBundy, *On Active Service in Peace and War* (New York: Harper, 1948), 613.

[14] Gosling, *Manhattan Project*, 48. John W. Dower, *Cultures of War: Pearl Harbor/Hiroshima/9-11/Iraq* (New York: Norton, 2010), 198. See also Richard B. Frank, *Downfall: The End of the Imperial Japanese Empire* (New York: Random House, 1999), 264, 283-84.

[15] Rosenberg, *Guided Missile Program*, 13.

[16] Ibid., 7. Specific quotes designating responsibility are from Lt. General Joseph McNarney, Deputy Chief of Staff, to Commanding General, Army Air Forces, memo dated October 2, 1944, Record Group 341, HQ USAF DCS/O, Assistant for General Military, Box 408 "War Department General Military Policies," File 319.1, National Archives and Records Administration at College Park, MD (hereafter cited as NARA-MD).

[17] Curtis LeMay, interview with Edgar F. Puryear, Jr., November 17, 1976, Call # K239.0512-1450, IRIS # 01053318, AFHRA, unpaginated, 142. LeMay was the Army's only

Deputy Chief of Air Staff for Research and Development. He held the position from December 1945 to September 18, 1947, when the Air Force became a separate service. For further information on the position of Deputy Chief of Air Staff for Research and Development, see Elliot V. Converse II, *Rearming for the Cold War, 1945-1960* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 2011), 215, and "Quotations by American Leaders, Here's What President Truman Was Told After World War II About Rockets and Missiles," Republican Congressional Committee, February 18, 1958, 2, Harlow Records, Box 2, File Missiles, Misc Papers [1957-1959] [1], Dwight D. Eisenhower Presidential Library, Abilene, Kansas (hereafter cited as Eisenhower Library).

[18] Lawrence Freedman, "The First Two Generations of Nuclear Strategists," in *Makers of Modern Strategy from Machiavelli to the Nuclear Age,* ed. Peter Paret (Princeton, NJ: Princeton University Press, 1986), 736.

[19] For the quote on von Braun taking a man to the moon, see Maxwell Taylor, interview with Edgar F. Puryear, Jr., March 17, 1980, Call # K239-0512-1508, IRIS # 01053461, AFHRA, 8-9. To see what the United States knew about Soviet use of German scientists to develop their own missile program, see "Briefing for Preparedness Investigating Subcommittee of the Armed Services Committee of the Senate on Soviet Guided Missiles and Related Soviet Capabilities" presented by the Director of Central Intelligence and by Dr. Herbert Scoville on 26 and 27 November 1957, Harlow Records, Box 1, File: Dulles and Scoville Comments before Senate Preparedness Investigation Committee, Missiles (Nov 1957), Eisenhower Library. For further information on the race to acquire German scientific knowledge, see Dean Acheson, Memorandum for the President, Subject: Interim Exploitation of German and Austrian Specialists in the United States, dated August 30, 1946, Record Group 340, Top Secret General Correspondence, 1956-1964, Box 3 175-56 to 1063-56, NARA-MD. For books on the same topic, see Annie Jacobsen, *Operation Paperclip: The Secret Intelligence Program that Brought Nazi Scientists to America* (New York: Little, Brown, and Company, 2014). See also Unknown author, "Early History of the Soviet Missile Program (1945-1953)," *Cryptologic Spectrum* 5, No. 3 (Summer 1975), Secret, NSA FOIA, (http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB278/17.PDF). Accessed November 17, 2014.

[20] Converse, *Rearming for the Cold War*, 210, and Chapman, *Atlas*, 26. The neglect of McNarney's directive seems to have been a common problem as all of the services complained about the others conducting work in the areas not assigned to them. For a list of the forty-eight missile projects that were begun and "cancelled, terminated, or re-oriented" between June 1943 and December 1958, see H. R. Logan, Deputy Comptroller for Budget to the Undersecretary of the Navy, the Assistant Secretary of the Army (FM), and the Assistant Secretary of the Air Force (FM), memorandum dated November 5, 1959 and attachments, Record Group 340, A1 1F, Box 406, File 386-59 Guided Missiles (General), NARA-MD.

[21] "First ICBM Order Went Out in 1945," *Air Force Times* (December 7, 1957), M16. Chapman, *Atlas*, 28.

[22] Beard, *Developing the ICBM*, 50-51. *Encyclopedia Britannica* defines a turbojet engine as "a turbine engine that passes all the air through a combustion chamber." It further notes that the "turbojet is far simpler than a reciprocating engine of equivalent power, weighs less, is more reliable, requires less maintenance, and has a far greater potential for generating power." http://www.britannica.com/EBchecked/topic/11014/airplane/64163/Jet-engines. Accessed June 1, 2015.

[23] Chapman, *Atlas*, 60.

[24] James Barr and William E. Howard, *Combat Missileman* (New York: Harcourt, Brace, and World, 1961), 28.

[25] Vannevar Bush, *Modern Arms and Free Men: A Discussion of the Role of Science in Preserving Democracy* (New York: Simon and Schuster 1949), 85-86. See also H. Guyford Stever, interview with Michael H. Gorn, April 10, 13, and 20, 1989, Call # K239.0412-1752 C.1, IRIS #01095219, AFHRA, 24.

[26] Michael H. Gorn, *Harnessing the Genie: Science and Technology Forecasting for the Air Force, 1944-1986* (Washington D.C.: Office of Air Force History, 1988), 29. Quotes from the commander of Air Material Command and the Finletter Commission express the concerns well. (Robert Frank Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907-1960,* 2 vols. [Maxwell AFB: Air University Press, 1989], Vol. 1, 225, reveals that the Finletter Commission was officially the President's Air Policy Commission, headed by Thomas K. Finletter. President Truman "charged it to make an objective inquiry into national aviation policies and problems and to assist him in formulating an integrated national aviation policy.") The AMC Commander contended that "If the Air Material Command is to continue at a sound, economical rate of development on the present guided missile program, the level of expenditures beginning in calendar year 1950 for end item guided missile projects, component developments, and the operation and procurement of the necessary technical facilities to carry on these developments must be maintained at approximately $70 million per year. This will represent approximately 20 percent of Air Force research and development funds based on the present five year research and development program. It must be recognized that the guided missile research and development program must be superimposed on the research and development program for aircraft, ground equipment and associate items. It represents a completely new job." Commanding General, AMC, to Chief of Staff, USAF, letter dated 21 July 1948, Subject: AF R&D Program on Guided Missiles," DeHaven Document Collection (attached to Ethel M. DeHaven, *Aerospace--The Evolution of USAF Weapons Acquisition Policy, 1945-1961* (Los Angeles: U.S. Air Force Systems Command, Historical Publication Series 62-24-6, 1962)), as quoted in Beard, *Developing the ICBM*, 79. The Finletter Commission argued that "From the evidence submitted, it appears that there may be some danger of over-running our basic knowledge in an effort to develop production articles too soon in order to justify the optimistic predictions of the 'push button warfare' protagonists. We must first be certain that we are on the right track and not permit ourselves to be led up blind alleys by too great impatience for results. There is a case where making haste slowly will certainly pay." President's Air Policy

Commission, *Survival in the Air Age* (Washington, D.C.: U.S. Government Printing Office, 1948), 84.

[27] Stever interview, AFHRA, 25.

[28] The most quoted example is General Leslie Groves' testimony to Congress, in Hearings Before the Special Committee no Atomic Energy, U. S. Senate, 79th Congress, 1st Session, November 27, (HRG-1945-AES-0001), 62, where he states, "I testified before the House committee, in response to a direct question on that point, that one nation could catch up and produce a bomb, if they did it in complete secrecy, probably within from fifteen to twenty years, more likely the latter. If they did it without secrecy and with a great deal of help from the United States and from England and Switzerland -- and I say Switzerland because she is a manufacturer of precision machinery -- it could be done in five to seven years, probably seven. Now that would be catching up with us to where we stand today." For other examples, see Vannevar Bush's testimony to Congress, in Hearings Before the Special Committee on Atomic Energy, U. S. Senate, 79th Congress, 1st Session, November 27, 1945, (HRG-1945-AES-0001), 175, where he contended, "I think she, [Russia] if she threw her full weight into it and if she imported freely those things which she does not herself manufacture adequately at the present time, then I think in four or five years she could have a plant in operation. On the other hand, if she did it relying entirely on her own resources and building those up as she proceeded, meaning by that that she would have to build plants to make the parts before she could use those parts, I think it would take them somewhat longer, it might take as long as twenty years, if she did the entire process that way." See also General Leslie Groves' testimony to Congress, in Hearings before the Committee on Military Affairs, House of Representatives, 79th Congress, 1st Session, on H.R. 4280, An Act for the Development and Control of Atomic Energy, October 9 and 18, 1945, (HRG-1945-MAH-0010), 18, where he argues, "I believe that for another country to do this work, if it had the power of the greatest countries left in the world, but had no particular ideas, that it would take them from 5 to 20 years, and the difference in time would depend entirely on how 'all-out' they made their efforts and how much they threw security to the winds. . . . In other words, if people are going to starve in their countries to do this project, or if they want to do it in some forest where nobody goes, it varies from 5 to 20 years."

[29] General Henry H. Arnold official Air Force biography, (http://www.af.mil/AboutUs/Biographies/Display/tabid/225/Article/107811/general-henry-h-arnold.aspx), accessed November 13, 2014.

[30] Donald L. Putt, interview with James C. Hasdorff, 1-3 Apr 1974, Call # K239.0512-724, IRIS # 01001024, 01001025, 01001026, 01001027, 01001028, 01001029, and 01001030, AFHRA, p. 150.

[31] Harkey Reiter to Bryce Harlow, undated letter, Harlow Records, Box 1, File: Missiles: Appropriations; Missiles and Research and Development [Nov 1957], Eisenhower Library. See also Beard, *Developing the ICBM*, 52-54.

[32] General Chidlaw, Engineering, AMC, to Commanding General, Army Air Forces, letter, DeHaven Document Collection, quoted in Beard, *Developing the Ballistic Missile*, 56. "AMC Participation in the AF Ballistic Missiles Program through December 1957 (Unclassified), Vol. 1--Narrative," Call # K215.18 Aug 1954-Dec 1957 v. 1, IRIS # 476794, AFHRA, 1, states that "during the five-year period of dwindling research and development funds, work on the offensive weapon slowed down to whatever Consolidated-Vultee Aircraft Corporation was willing to finance."

[33] General Thomas S. Power, Deputy Assistant Chief of Staff Operations, Commitments and Requirements, to Commanding General, Army Air Forces, memorandum dated June 12, 1947, RG 341, HQ USAF, DCS/O, Assistant for GM, Box 408, File 319.1, NARA-MD. See also Beard, *Developing the ICBM*, 58 and 57, fn 27.

[34] Neufeld, *Ballistic Missiles*, 36-37. See also Chapman, *Atlas*, p. 27-35

[35] A naturalized citizen born in Belgium in 1904, Bossart was the driving force behind the creation of the Atlas missile. He entered the United States in the late 1920s to conduct graduate work in aeronautics at the Massachusetts Institute of Technology. By 1945, he was the Chief of Structures at Convair, where he became intrigued by the possibilities of long range missiles. He is credited with conceiving the pressurized fuel tank, which dramatically reduced the weight of the missiles, and the gimbaled rocket engines, which allowed the missile to maneuver while in flight. David N. Spires, *On Alert: An Operational History of the United States Air Force Intercontinental Ballistic Missile Program*, 1945-2011 (Colorado Springs, CO: Air Force Space Command, 2012), 6, contains a full page biography of Bossart.

[36] Neufeld, *Ballistic Missiles*, 36, and Chapman, *Atlas*, 28-33.

[37] Harry S. Truman, "Statement by the President on the Hydrogen Bomb," January 31, 1950, online by Gerhard Peters and John T. Woolley, *The American Presidency Project*. (http://www.presidency.ucsb.edu/ws/?pid=13634). Accessed March 17, 2014.

[38] Beard, *Developing the ICBM*, 84-96. Roscoe C. Wilson, interview with Lt Col Dennis Smith, USAF, dated December 1-2, 1983, Call # K239.0512-1554 C.1, IRIS # 01070859, AFHRA, 111, remembered that "in the late 1940s . . . the Air Force estimated it would be 1952 before the Russians would have an atomic capability and that that was criticized as being alarmist because the Army estimated 1960 and the Navy estimated 1965."

[39] Although the conflict started on June 25 and the former general did not become Secretary of Defense until September, Marshall was responsible for most of the mobilization. Converse, *Rearming for the Cold War*, 80. See also "AMC Participation in the AF Ballistic Missiles Program through December 1957 (Unclassified), Vol. 1--Narrative," 1, as well as John Lewis Gaddis, *The Cold War: A New History* (New York: Penguin Press, 2005), 35, and Beard, *Developing the ICBM*, 129.

[40] Chapman, *Atlas*, 56-59. See also Del Papa and Goldberg, *Chronology*, unpaginated, 12, and Beard, *Developing the ICBM*, 51, 61-67, and 131. Beard cites an "interview with William Patterson, ex-Convair rocket engineer."

[41] Beard, *Developing the ICBM*, 131-32. *Encyclopedia Britannica* defines a ram-jet engine as an "air-breathing jet engine that operates with no major moving parts. It relies on the craft's forward motion to draw in air and on a specially shaped intake passage to compress the air for combustion. After fuel sprayed into the engine has been ignited, combustion is self-sustaining. As in other jet engines, forward thrust is obtained as a reaction to the rearward rush of hot exhaust gases." http://www.britannica.com/EBchecked/topic/490671/ramjet. Accessed June 2, 2015.

[42] Del Papa and Goldberg, *Chronology*, unpaginated, 13. According to Joint Publication 1-02, *DOD Dictionary of Military and Associated Terms* 08 November 2010, as amended through 15 August 2014 (http://www.dtic.mil/doctrine/dod_dictionary/data/c/3071.html, accessed November 6, 2014), the Circular Error Probable is "the radius of a circle within which half of a missile's projectiles are expected to fall."

[43] Donald A. MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1993), 114. For the cost of the contract, see Beard, *Developing the ICBM*, 132. *Encyclopedia Britannica* defines a cruise missile as a "low-flying strategic guided missile." The missiles, developed by both the USSR and US in the 1960s and 1970s, can carry nuclear or conventional warheads. Their smaller design and ability to travel at low altitude and slower speeds allows them to slip through RADAR detection to reach their targets. http://www.britannica.com/EBchecked/topic/144662/cruise-missile. Accessed June 2, 2015.

[44] John Sessums, interview with Edmund Beard, quoted in *Beard, Developing the ICBM*, 133.

[45] Del Papa and Goldberg, *Chronology*, unpaginated, 13.

[46] AFSWC Tech Note SWR 53-12, Preliminary Study of Nuclear Warheads for High Performance Missiles, 15 Sep 53, as cited by Max Rosenberg, *Plans and Policies for the Ballistic Missile Initial Operational Capability Program* (USAF Historical Division Liaison Office, February 1960), 7. See also Eric Burgess, *Long Range Ballistic Missiles* (New York: Macmillan Company, 1961), 12.

[47] Roswell Gilpatrick, Undersecretary of the Air Force, to the New Secretary and Undersecretary of the Air Force, memo dated 31 December 1952, 12, RG 341, Box 12, folder 321.1, Organization and Policy, NARA-MD.

[48] Jamie Wallace, interview with Neil Sheehan, notes from a phone interview on December 13, 1999, Box 4 of 21, Sheehan Papers (accession 23821), Manuscripts Division, Library of Congress (hereafter LOC). See also Robert Perry, *The Ballistic Missile Decisions* (Santa

Monica, CA: RAND Corporation, 1967), 9, who explained that the missiles were officially called "unmanned aircraft."

[49] Neufeld, *Ballistic Missiles*, 98, 133, notes that the position of Special Assistant to the Secretary of the Air Force was equivalent to an Assistant Secretary and that by 1955 Gardner's position became the Assistant Secretary of the Air Force for Research and Development. Trevor Gardner was confirmed in the new position in August 1955.

[50] "Month by Month: Highlights of the National Defense, " *Ordnance* (May-June 1955) and *American Aviation Daily*, 10 June 1955, as cited in Richard M. Leighton, *Strategy, Money, and the New Look, 1953-1956,* Vol. III*, History of the Office of the Secretary of Defense* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 2012), 391, 720 fn 41.

[51] Max Rosenberg, *Plans and Policies of the Ballistic Missile Initial Operational Capability Program* (Washington, D.C.: USAF Historical Division Liaison Office, 1960), 14, Call #K2624, IRIS #480640, AFHRA.

[52] Ibid, 14.

[53] Converse, *Rearming for the Cold War,* 490.

[54] Max Rosenberg, *Plans and Policies*, 5-16.

[55] Ibid. Members of the committee were Dr. John von Neumann, Clark Millikan (aeronautics professor at CalTech), Charles Lauritsen (physics professor at CalTech), Louis Dunn (director of the CalTech jet propulsion lab), Hendrik Bode (Director of Mathmatical Research at Bell Labs), Allen Puckett (head of Hughes Aircraft's aerodynamics department of the Guided Missile Laboratory), George Kistiakowsky (chair of the National Academy of Science's Committee on Science, Engineering, and Public Policy), Jerome Wiesner (director of M.I.T.'s Research Laboratory of Electronics), Lawrence Hyland (vice president and general manager of Hughes Aircraft), and Simon Ramo and Dean Wooldridge who had left Hughes Aircraft to start their own company, Ramo-Wooldridge, which would be closely associated with the Air Force development of missiles. See also Luther L. Stenvick, *The Agile Giant: A History of the Minuteman Production Board* (Seattle, WA: Boeing Company, 1966, 19.

[56] Del Papa and Goldberg, *Chronology*, unpaginated, 15. Simon Ramo to Trevor Gardner, letter dated February 10, 1954, included in Appendex 1, Neufeld, *Ballistic Missiles*, 262-65. See also "The Facts About the Air Force Ballistic Missile Program - A White Paper," included in Lt Col Snyder, AFBMD/WDGP, to Col V.T. Ford, Hq ARDC (RDGP), letter dated 9 Feb 1960, Subject: Ballistic Missile Program Chronology, Call # 168.7171-172, IRIS # 1040320, AFHRA.

[57] Otto Glasser, interview with Lt Col John Allen, USAF, Jan 5-6, 1984, Call # K239.0512-1566 C.1, IRIS # 01105111, AFHRA, 34.

[58] "Recommendations of the Strategic Missiles Evaluation Committee", 2, attached to Charles M. McCorkle, Deputy Asst Chief of Staff for Guided Missiles, to Director of Air

University, undated letter, Call # K168.15-75, IRIS # 1027472, AFHRA. In an appendix to the report, Simon Ramo, the author, attributed the first quote to "Professor von Neumann" and admitted that it had not been coordinated with the other committee members due to a lack of time. See Appendix A, Recommendations of the Strategic Missiles Evaluation Committee, attached to Simon Ramo to Trevor Gardner, letter dated February 10, 1954, included in Appendex 1, Neufeld, *Ballistic Missiles*, 262-65.

[59] "Recommendations of the Strategic Missiles Evaluation Committee", 7-8.

[60] Bruno Augenstein, *A Revised Program for Ballistic Missiles of Intercontinental Range* (Santa Monica, CA: RAND Corporation, 1954). (http://www.rand.org/pubs/special_memoranda/SM21.html). Accessed September 20, 2014. See also "Recommendations of the Strategic Missiles Evaluation Committee", 7. According to "information provided the Senate Armed Services Committee through ASD(R&D) by Secretary of the Air Force Quarles on November 15, 1955," "late in 1953 the conclusion was arrived at that an operational date could be moved up from 1963-1965 to 1958-1960 by relaxing the military requirements." Historical Material Supplemental to Guided Missile Study - February 1956: Harlow Records, 1953-1961, Box 1, File A "Chronological Brief of Selected Guided Missile Projects [February 1956]," 2, Eisenhower Library. For more information on the Von Neumann Committee using "the RAND report as source material for its own study", see Beard, *Developing the ICBM*, 142. Information on RAND can be found in "A Brief History of RAND" http://www.rand.org/about/history/a-brief-history-of-rand.html. Briefly, following World War II, the Army Air Forces, led by General Hap Arnold, recognized their need for scientific and industrial support. In October 1945, it contracted with the Douglas Aircraft Company to establish Project RAND (standing for Research and Development) to provide the needed support.

[61] H. E. Talbott to General Twining, memo dated March 19, 1954, Subject: Acceleration of the Intercontinental Ballistic Missile Program, quoted in Beard, *Developing the ICBM*, 164-66. See also "The Air Force Ballistic Missile and Space Program Chronological Highlights", February 5, 1960, 3, Bernard Schriever Papers, Box 87, Folder 6, Manuscripts Division, LOC and John Lonnquest, "The Face of Atlas: General Bernard Schriever and the Development of the Atlas Intercontinental Ballistic Missile, 1953-1960" (Ph.D. dissertation, Duke University, 1996), 2. Beard, on page 168, further quotes an Assistant for Programming, Weapon Systems Division to [Major] General [Ben] Funk, memorandum dated September 1955 which states that the Air Force agreed "in order to prevent the establishment of another Manhattan Project." Although it is doubtful that Secretary Talbott was aware of it at the time, Boris Chertok, *Rockets and People: Creating a Rocket Industry, 4* Vols. (Washington, D.C.: U.S. Government Printing Office, 2006), 2:289, reveals that "the Council of Ministers and Central Committee resolution on the development of the R-7 intercontinental missile was issued on 20 May 1954."

[62] "The Air Force Ballistic Missile and Space Program Chronological Highlights," February 5, 1960, 3, Bernard Schriever Papers, Box 87, Folder 6, Manuscripts Division, LOC.

[63] Ibid., 4. The requirement for a second system appears to stem from disagreements between Gardner and Schriever with Convair over bringing in another company, Ramo-Wooldridge, run by a close friend of Gardner, to oversee the contract. For more information on the Gardner/Ramo relationship, see Beard, *Developing the ICBM*, 157-58.

[64] For information on Lee DuBridge's recommendation, see Valerie L. Adams, *Eisenhower's Fine Group of Fellows: Crafting a National Security Policy to Uphold the Great Equation* (Lanham, MD: Rowman and Littlefield, 2006), 109. For information on threats to Eisenhower's United States, see Jim Newton, *Eisenhower: The White House Years* (New York: Doubleday, 2011), 147-185. See also George F. Lemmer, *The Air Force and Strategic Deterrence 1951-1960* (USAF Historical Division Liaison Office, December 1967), 7, National Security Archives (http://www2.gwu.edu/~nsarchiv/nukevault/ebb249/doc09.pdf). Accessed November 5, 2014.

[65] "Brief of the Report to the President by the Technological Capabilities Panel of the Science Advisory Committee," February 14, 1955. (https://history.state.gov/historicaldocuments/frus1955-57v19/d9). Accessed November 5, 2014.

[66] "Findings and Recommendations Concerning the Intercontinental Ballistic Missile." See also Rosenberg, *Plans and Policies*, 5-16.

[67] Thomas R. Phillips, Brigadier General, USA (Ret.), "The Growing Power of the Soviet Air Force," *Reporter* (June 30, 1955), 16. See also Leighton, *Strategy, Money and the New Look,* 385-386.

[68] Rosenberg, *Plans and Policies*, 15-18. For further information on the request to meet Eisenhower, see Arthur S. Flemming to Secretary Wilson, letter dated July 5, 1955, Subject: "Briefing on the Status of the ICBM Program," Special Assistant to the President for National Security Affairs, NSC Series, Briefing Notes, Box 13, Missiles and Space Programs, Eisenhower Library. See also Neufeld, *Ballistic Missiles,*134-35, and Neil Sheehan, *A Fiery Peace in a Cold War* (New York: Random House, 2009), 275-76, 299.

[69] NSC Action No. 1433. (http://www.foia.cia.gov/sites/default/files/document_conversions/18/1960-08-19a.pdf). Accessed November 6, 2014. The Millikan Committee report gives the date that Eisenhower assigned "highest national priority" as September 8, 1955. It is likely that he verbally approved the prioritization on the 8th, signing the NSC action on the 13th. Final Report of the SECAF "Management Study Committee, dated January 29, 1960, Call # K243.012-57 V.10, IRIS # 00919678, AFHRA.

[70] Converse, *Rearming for the Cold War*, 498 and Neufeld, *Ballistic Missiles*, 136.

[71] Neufeld, *Ballistic Missiles*, 141-42. The Air Force was especially concerned about integrating the missiles with aircraft so that the aircraft could never be replaced by the missiles.

For one example, see Leslie Bray, Jr., "The Role of the Rated Group in the Missile and Space Era" (Thesis, Air University, 1959), 3. When pondering the impact of unmanned missiles and space vehicles, Bray asked "Is it likely that within a relatively short period of time, Military Air Transport Service will be all that will remain of the United States Air Force?"

[72] "Recommendations of the Strategic Missiles Evaluation Committee," 3.

[73] W. M. Holiday to Mr. Fred M. Dearborn, Jr., memorandum dated October 29, 1957, Subject: Chronology of Significant Events in the U.S. Long Range Ballistic Missile Program." Harlow Records, Box 1, File: Missiles: Chronology of Long Range Ballistic Missiles (10-29-57) (2), Eisenhower Library.

[74] Draft Memorandum of Understanding, dated December 6, 1955, as quoted in Neufeld, *Ballistic Missiles*, 147.

[75] Leighton, *Strategy, Money and the New Look,* 16-17; see also unsigned Eisenhower memo to Secretary of Defense Wilson, dated December 21, 1955. Eisenhower Diary ser, Papers as President (Ann Whitman File), Eisenhower Library, quoted in Leighton, *Strategy, Money and the New Look,* 677.

[76] NSC Action No. 1484 (http://www.foia.cia.gov/sites/default/files/document_conversions/18/1960-08-19a.pdf). Accessed November 6, 2014. For information on the National Intelligence Estimate, see Peter Roman, *Eisenhower and the Missile Gap* (Ithaca, NY: Cornell University Press, 1995), 24. For Leighton's description and reasons, see Leighton, *Strategy, Money and the New Look*, 605.

[77] C. E. Wilson, Secretary of Defense, to the Secretary of the Army and Secretary of the Navy, Memorandum dated 8 November 1955, Subject: Management of the IRBM #2 Development Program. A copy is in Appendix 2 of Neufeld, *Ballistic Missiles*, 307. See also "The Air Force Ballistic Missile and Space Program Chronological Highlights", 5.

[78] Andreas Wenger, *Living with Peril: Eisenhower, Kennedy, and Nuclear Weapons* (Lanham, MD: Rowman and Littlefield Publishers, 1997), 152-53. See also Roy M. Johnson, Rear Admiral, Memorandum for the Distribution List, "Subj: Adaptation of the National Military Posture to the era of Nuclear Parity; a suggested Navy Position," 3 December 1957, Washington Navy Yard, U.S. Naval Operational Archives, Records of Strategic Plans Division, Box 354, 1957 A16-10. Copy in National Security Archives, http://nsarchive.gwu.edu/nukevault/ebb275/02.pdf. Accessed May 27, 2015. James Baar and William Howard, *Polaris!* (New York: Harcourt ,Brace, and World, 1960), 150, exclaimed, "Nine submarines, each armed with sixteen Polarises, would give the United States 145 big missiles around the Soviet Union: 145 unstoppable, all but invulnerable, ballistic missiles, each capable of destroying a city."

[79] Ibid.

[80] Leighton, *Strategy, Money and the New Look,* 619-20. Neufeld, Ballistic Missiles, 151, mentions two possible other reason for Gardner's resignation: "duplicative and competing missile programs in all of the military departments" and "disappointment at not being named the OSD Special Assistant for Guided Missiles."

[81] William White, "Ike Letting Missiles Lag, Asserts Symington as Democrats Attack," *The Atlanta Constitution*, February 11, 1956, 1.

[82] "Notes," Harlow Papers, Box 2, File: Missiles, Misc. Papers [1957-1968](2), Eisenhower Library. See also "Why the U.S. Lagged on Missiles After World War II," "Fiscal Year 1947 Funds Impounded by Truman," "Fiscal Year 1950 Funds Impounded by Truman," "Here's What President Truman was told after World War II about Rockets and Missiles," all in Harlow Records, Box 2, File: Missiles, Misc. Papers [1957-1958](1), Eisenhower Library.

[83] Quote from Memorandum of NSC meeting, 1 August 1957, *Foreign Relations of the United States, 1955-1957*, 19: 535-58, as cited in Wenger, *Living with Peril*, 152-53. For Democratic protests, see "Democrats Protest 'Secret' Budget Cut," *Dallas Morning News*, July 14, 1957, 3.

[84] "The Air Force Ballistic Missile and Space Program Chronological Highlights", 7.

[85] Robert J. Watson, *History of the Office of the Secretary of Defense: Into the Missile Age, 1956-1960, 6 Vols.* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 1997,) 6:123.

[86] "Soviet Fires Satellite Into Space," *New York Times*, October 5, 1957, 1. "Soviet Satellite Visible with Binoculars; Will Reflect Sun's Rays, Scientist Says," *New York Times*, October 5, 1957, 2.

[87] "Russians Test H-Bomb; Japan Spots Explosion," *Cornell Daily Sun*, Volume 74, Number 12, October 8, 1957. http://cdsun.library.cornell.edu/cgi-bin/cornell?a=d&d=CDS19571008-01.2.9&srpos=&dliv=none&st=1&e=-------en-20--1--txt-txIN-. (Accessed November 24, 2014). See also "Soviet Moon Lifts Aircrafts, Missiles," *Dallas Morning News*, October 8, 1957, 4.

[88] C. D. Jackson to Mr. Luce (presumably Henry Luce, Jackson's former boss at *Time* magazine), memorandum dated October 8, 1957, C.D. Jackson Papers, Box 69, Log-1957 (4), NAID #12086487, Eisenhower Library. (http://www.eisenhower.archives.gov/research/online_documents/sputnik/10_8_57_Memo.pdf). Accessed November 19, 2014. Sputnik II was launched November 3 and was significantly larger, approximately 1120 pounds, and carried a dog. See "Sputnik II and Pioneer Rider," *Life*, November 18, 1957, 43.

[89] Minutes, October 10, 1957, 339th Meeting of the National Security Council, AWF, National Security Council Series, Eisenhower Library, as quoted in Yanek Mieczkowski, *Eisenhower's Sputnik Moment: The Race for Space and World Prestige* (Ithaca, NY: Cornell University Press, 2013), 59.

[90] "The U.S., Ike, and Sputnik," *Newsweek*, Vol. 50, No. 18 (October 28, 1957), 30.

[91] Albert Riley, "Russell, Johnson To Call Hearings on Missiles Lag," *Atlanta Constitution*, November 6, 1957, 1.

[92] "Senate Quiz on Missiles Opens Today: Defense Hearings Start with Teller as First Witness," *Washington Post and Times Herald*, 25 November 1957, A1. "Stage Set for Missile Inquiries: To Probe Absence of Real War Plan," *Atlanta Constitution*, November 23, 1957, 1.

[93] Mieczkowski, *Eisenhower's Sputnik Moment*, 114.

[94] Security Resources Panel of the Science Advisory Committee, "Deterrence and Survival in the Nuclear Age," November 7, 1957, 6, 14, 20, 26. Special Assistant to the President for National Security Affairs, National Security Council Series, Policy Papers Sub-Series, Box 22, National Security Council Files 5724 (2), Eisenhower Library. (http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB139/nitze02.pdf.) Accessed November 20, 2014.

[95] For details of the Vanguard failure, see Mieczkowski, *Eisenhower's Sputnik Moment*, 116. For the successful launch of the Atlas, see Chapman, *Atlas*, 132-33, Sheehan, *Fiery Peace*, 399, and Schwiebert, *Ballistic Missiles*, 222. Although the Thor had been successfully launched on September 20, 1957, the launch was not significant because it was an Intermediate Range Ballistic Missile rather than an Intercontinental Ballistic Missile. Eisenhower tried to argue that this was not important as the IRBMs could be placed within range of the Soviet Union while the Soviet Union had no similar option, but to no avail.

[96] Periodic History of the Air Force Missile Test Center, July 1, 1958 - December 31, 1958, Call # K241.01 V.1, IRIS # 00484484, AFHRA, xiii and 170. See also "ICBM Fired Successfully," *Air Force Times* (December 6, 1958), 14.

[97] Chalmers Roberts, "Enormous Arms Outlay Is Held Vital to Survival," *Washington Post*, December 20, 1957, 1, 19. The story continues on page 19 under the title "U.S. in Gravest Danger, Gaither Report Holds." See also David Snead, "Eisenhower and the Gaither Report: The Influence of a Committee of Experts on National Security Policy in the Late 1950s" (Ph.D. dissertation, University of Virginia, 1997), 225.

[98] Mieczkowski, *Eisenhower's Sputnik Moment*, 116.

[99] David Snead, "Eisenhower and the Gaither Report," 212 and Memorandum of Discussion at the 363rd Meeting of the NSC, April 24, 1958, 2, Folder: 363rd Meeting of NSC, April 24, 1958, Box 10, National Security Council Series, Dwight David Eisenhower Papers, Eisenhower Library. See also Rosenberg, *USAF Ballistic Missiles*, 13.

[100] "Aerospace Talk 2 - Minuteman" notes, Call # K416.861-4 1964-1966, IRIS # 00502558, AFHRA.

[101] Richard K. "Jake" Jacobson to Neil Sheehan, notes from an interview on April 20, 1997, Box 4 of 21, Sheehan Papers (accession 23821), Manuscripts Division, LOC.

[102] H. W. Brands, "The Age of Invulnerability: Eisenhower and the National Insecurity State," *The American Historical Review* 94, No. 4 (October 1989), 988.

[103] Preble, *John F. Kennedy*, 184. See also Edwin M. Yoder, Jr., *Joe Alsop's Cold War: A Study of Journalistic Influence and Intrigue* (Chapel Hill: University of North Carolina Press, 1995), 164-175, and Christopher Preble, "'Who Ever Believed in the 'Missile Gap'?': John F. Kennedy and the Politics of National Security," *Presidential Studies Quarterly,* Vol. 33, No. 4 (Dec. 2003), 801-26.

[104] According to Schweibert, *Ballistic Missiles*, 113, "delivery of the first operationally configured [Thor] missile occurred on May 31, 1958, with the first launch from an operational launcher on June 4, 1958." He also documents on page 225 that "the first Strategic Air Command operational launch of an Atlas-D missile was successfully conducted, with ARDC and contractor assistance, [on September 9, 1959]. This achievement signified the successful fulfillment of objectives to attain Initial Operational Capability in the Atlas missile." On page 227, he highlights the success of Minuteman, saying, "February 1 [1961]. The first flight test of a Minuteman missile was successfully conducted with all stages and systems operating. This was the first time a first-test missile was launched with all systems and stages functioning." David Stumpf, in *Titan II*, 26, records "the first launch of a Titan I from the TF-I Complex took place on 25 September 1961." Neufeld, *Ballistic Missiles*, 186, says "Titan I and Atlas F ICBMs became operational between April and December 1962." James Grimwood and Francis Stroud, in *History of the Jupiter Missile System*, 79, 103, document that the "deliveries of the IOC [Jupiter] missiles to the Air Force began on 28 August 1958" and the first missile squadron was turned over to the Italians on 11 July 1960.

3. TURBULENCE: INTERSERVICE AND INTRASERVICE CONFLICTS

While the crises of the early Cold War intensified, exacerbating the U.S. political dissension, disagreements over missiles brewed between the military services and within the Air Force. This discord greatly influenced the reception and incorporation of ballistic missiles into the service and prejudiced the Air Force's perception of those selected to manage these powerful weapons.

Although the armed forces initially ignored missile technology, the services quickly clashed over the control of missiles when it became apparent that the new weapons would be a key part of the nation's defense. This quarrel was part of a struggle that reached back as far as the end of World War I. After the Great War, the United States drastically cut spending on the military. These reductions led to a crisis between what historian James Tate deems the "visionary" flyers who demanded "several hundred millions of dollars to acquire the newest airplanes and to train men to fly them" and the "realists" in the Army who wanted to spend the money on current needs. Brigadier General William "Billy" Mitchell became the primary voice for the flyers. Tate contends that, as the disagreement intensified, Mitchell began to perceive his non-flying antagonists as stupid or immoral, arguing that "the Army feared innovation . . . because it might curtail 'their ancient prerogatives, privileges, and authority,'" and earned himself a court-martial. Because of Mitchell's haughty antagonism, Tate asserts that Mitchell's "chief legacy to the Air Corps" was a "self-

confident, self-righteous attitude . . . . conditioning his followers and those they would later indoctrinate never to be satisfied with anything short of independence from the Army."[1] However, based on future interservice and intraservice conflicts, his primary lesson appears to have been what historian John Darrell Sherwood terms a "flight suit attitude." This attitude, explained Korean-era pilot George Berke, one of Sherwood's biographical subjects, meant, "If you could fly, we accepted you, and if you couldn't, out!!! We didn't want you around."[2]

On July 26, 1947, the "visionaries" obtained their goal of a separate Air Force with the signing of the National Security Act of 1947. This law did not completely resolve the conflict between the flyers and ground troops, however, as many roles and missions had to be divided when the two services separated. Some of these troubles traced back to the origin of the Army Air Corps, but this chapter will address the one that began in November of 1943: control of the ballistic missile.[3]

Within the Air Force, a related conflict emerged. Historian John Chapman noted in 1960 that for many officers in what would become the U.S. Air Force, Germany's V-2 missile "changed the complexion of modern war. It wiped out much of our antiquated thinking about rockets. It took the guided missile out of the artillery class and established it as a strategic weapon of devastating potential."[4] This was true for General Henry H. "Hap" Arnold, the Commander, Army Air Forces, and those like him, but others continued to adhere to the Mitchell "flight suit attitude." These sharply

differing attitudes created a friction that greatly influenced the prospects of ballistic missiles in the Air Force.[5]

The leaders of the Army Service Forces would have agreed with Chapman on the missile's potential but not its classification. Thus, they were the first to respond effectively to the new weapon. In September 1943, Army Ordnance, under the Service Forces, created a Rocket Development Branch. Two months later, Dr. Theodore von Karman, the Director of the Guggenheim Aeronautical Laboratory of the California Institute of Technology (often known as Cal Tech), submitted a proposal to develop long-range, surface-to-surface missiles. In that same month, November 1943, General Arnold directed that Army Air Forces emphasize research, development, and procurement of guided missiles. Arnold's instructions began an intraservice competition to control ballistic missiles, though the contest later expanded greatly and became more intense as the Air Force became a separate service.[6]

With their head start, in January 1944, Cal Tech scientists working for Army Ordnance began developing the Private A and Corporal missiles, tactical ballistic missiles with the capability to carry nuclear warheads less than one hundred miles. The Army launched the first twenty-four Private A rockets in December of that year and launched the Corporal the next September.[7]

The Army Air Force began its work on missiles six months after the Ordnance Department, focusing on aeronautical missiles -- missiles that remained within the atmosphere and wings -- rather than ballistic ones. In July 1944, the Army Air Force

offered Northrop Aircraft a contract to develop the JB-1, a jet-propelled pilotless aircraft more similar to the German V-1 than its ballistic counterpart, the V-2.[8] The first prototype of the JB-1 was delivered to the Army Air Force on September 8, 1944, but these missiles were plagued with problems. Therefore, General Arnold requested the production of JB-2s, a copy of the German V-1 designed by piecing together parts from exploded V-1 missiles. He wanted to produce enough JB-2s to launch one thousand per month, but the War Department countermanded this requirement, saying it would disrupt the production of essential war material.[9]

Arnold continued to press for missiles. "David Griggs, a scientific specialist attached to [Carl] Spaatz headquarters, made a tour of the front and interrogated all the top allied commanders on the subject of the JB-2 program." After the tour, "Griggs told Spaatz that the uncontrolled JB-2 would not be available in quantity until Sept[ember] 1945 [and] Spaatz took the position that if the Germans were still fighting in Sept[ember], it would only be because some new developments by the Germans had made it impossible for the allies to continue to operate the 8th Air Force on the present scale." Nevertheless, Arnold thought that the JB-2 " would not only be effective, but might well be essential to continue the air offensive." His thoughts would not prevail. "Apparently [General] Eisenhower had opposed the program, [concerned] it might interfere with the shipment of materiel needed more immediately in his theater." The contracts for the JB-2 missiles were terminated by early 1946 and none of the missiles were ever used in combat.[10]

Soon, the three organizations, Army Ground Forces, Army Service Forces, and Army Air Forces, were competing heavily to control the development and operation of missiles for the Army. Not to be outdone, the Navy struggled to assert its own control over the new weapon. Between the years of 1945 and 1950, even though Congress drastically cut service budgets after the war, naval planners prioritized the development and acquisition of an air-atomic capability and spent more money on missiles than either the Army or the Air Force. As in the Army, the Navy programs were divided between the Bureau of Aeronautics and the Bureau of Ordnance.[11]

To reduce the friction between the contentious Army organizations vying for control of missiles, Lieutenant General Joseph McNarney, the Army Deputy Chief of Staff, divided responsibilities between the contenders on October 2, 1944, based upon each organization's proven capabilities. He assigned the Army Air Forces "responsibility, including designation of military characteristics, for all guided or homing missiles dropped or launched from aircraft" and for "all guided or homing missiles launched from the ground which depend for sustenance primarily on the lift of aerodynamic forces" while giving the Army Service Forces' Ordnance Command "research and development responsibilities for guided or homing missiles launched from the ground which depend for sustenance primarily on momentum of the missile." Army Ground Forces were to develop their own requirements and provide them to either of the other two organizations. McNarney refused to give any of the three organizations operational control of missiles since there were no missiles ready for

operational use at the time and he determined that assigning operational control would "jeopardiz[e] future development."[12]

McNarney's decision did not resolve the infighting. In fact, the dispute worsened to the point that, in March 1946, Brigadier General R. C. Coupland, the Army Air Forces air ordnance officer, who had experience in two of the opposing camps, recommended creating "a single government agency similar in scope to the Manhattan Project with exclusive control over research, development, production, and operational application" to resolve the problem. In a foreshadowing of the future, the recommendation was not accepted even within the Army Air Force and it never went further.[13]

Therefore, on September 18, 1947, when Stuart Symington became the first Secretary of the Air Force, key military leaders worked quickly to establish the appropriate roles and missions for the new service, including acquisition of the new missile. Planners and commanders from both the Army and Air Force met to determine how to best separate responsibilities and resources. One month later, Secretary of Defense James V. Forrestal approved the document they hammered out, the "Army-Air Force Agreements: As to the Initial Implementation of the National Security Act of 1947." Among other things, this document redefined the relationship between the services and the missile, declaring that "strategic missiles will be assigned to the U.S. Air Force. Missiles within this category are those designed for employment against targets, the destruction or neutralization of which are normally the targets of bombers . . . ."

Tactical missiles, those "which will have a direct effect on current Army tactical operations," were assigned to the Army. However, the agreement asserted that this was "no change" to present agreements and it did little to prevent continued contention over roles and missions and duplication of efforts.[14] Vannevar Bush, Director of the Office of Scientific Research and Development, then tried to resolve the issue by creating a Guided Missiles Committee, composed of three civilians and two officers from each of the three competing services, but all three of the military services ignored the group.[15]

Consequently, when Louis Johnson became President Truman's Secretary of Defense on March 28, 1949 and reduced service budgets again, interservice struggles over who would control missiles erupted once more. The Army tried to regain control of surface-to-surface ballistic missiles by recommending that the Air Force focus on air launched missiles and the Navy control sea launched missiles, leaving the ground launched missiles to the Army. Because the services could not come to agreement, Johnson ordered a complete review of all Defense Department missile programs. The review accomplished little as the Joint Chiefs of Staff recommended that the services hold joint control rather than defining clear roles and responsibilities as Johnson had desired. Therefore, Johnson ordered Secretary of the Air Force Symington to come up with a better plan. Symington established the Special Interdepartmental Guided Missiles Board, known better as the Stuart Board after its head, Harold Stuart. Another round of bickering and finger-pointing followed, but still accomplished little.

Secretary Johnson was frustrated at the lack of cooperation. He considered bringing in someone from outside of the Defense Department to help resolve the issue, but the services did not want to lose control of this potentially valuable weapon as they had the nuclear bomb. Symington convinced Johnson to allow the Joint Chiefs of Staff one last opportunity to prioritize defense missile projects and establish order. This time, according to Air Force historians Michael Del Papa and Sheldon Goldberg, the Joint Chiefs recommended "that the Air Force be given operational responsibility for surface-to-surface missiles that replaced aircraft other than close air support aircraft" while the Navy was assigned "responsibility for surface-to-surface missiles that replaced naval aircraft" and the Army was assigned joint responsibility with the Air Force over control of "surface-to-surface missiles that replaced close support aircraft." The agreement should have reduced the antagonism, but the services continued to "study" missiles that were not within their purview, wanting to be ready if and when the guidance changed again.[16]

In the midst of all of the maneuvering, the Joint Chiefs prioritized the existing missile programs and relegated "long range strategic missiles" to eighth on their priority list. Air Force missile advocates were angry over this low ranking, but the Air Force itself had "assigned top priority to those missiles which would enhance the capabilities of its strategic bombers and second priority to air defense missiles."[17] All these disputes mattered less than it appeared as, in July 1949, the National Security Council recommended that the President set the production of the atomic bomb as the

nation's highest priority and the production of the B-36 bomber to carry it as the second highest priority. Nothing was said about the long range missile.[18]

Work on missiles waned until June 1950, when North Korea invaded South Korea and the United States entered the conflict. Increases in defense funding allowed additional research and development, so the Air Force renewed work on the intercontinental missile, including Convair's Atlas ballistic missile. Unfortunately, as some of the limited resources started to move toward missiles, a conflict arose within the Air Force that was almost as antagonistic as its interservice rivalry with the Army.

Richard Curtain, a lower ranking officer on the Air Staff at the time, explained the conflict. "Many of the people who were real airplane types .. [were] not sure that we [in the Air Force] should have these new things [missiles]. The new things might take over some of the jobs of the airplanes and so forth . . . ." Conversely, other airmen remembered the contest over roles and missions when the Army attempted to take over missiles, potentially threatening the Air Force's strategic bombing mission. Therefore, missile advocates like Curtain advised Nathan Twining, Chairman of the Joint Chiefs of Staff, and Thomas White, Air Force Chief of Staff, that the Air Force had to develop missiles or the strategic mission would be taken away from them.
If the Army controlled missiles, Curtain explained, "Why should we [the Air Force] have the mission of bombing targets 500 miles away, as opposed to the Army who said they could do it."[19]

Eisenhower, along with many others, believed that missiles would carry the burden of warfare within the decade, replacing the manned airplane for most missions.[20] Airpower advocate Gill Robb Wilson acknowledged the concern most explicitly, stating, "The Air Force could make no sadder mistake than to believe that public concern about air power is ipso facto zeal for the Department of the Air Force. The fact is that Army and Navy could quietly absorb every major role of the Air Force without enough public outcry to disturb a nursery."[21] Senior Air Force leaders remembered General Arnold's concern that "whether we have rockets, menless [sic] aircraft, or something that replaces the aircraft in its entirety, I want to be very sure that the Air Forces are not again slightly behind our enemies," and Billy Mitchell's belief that the Army was the enemy and could not be trusted with the strategic air mission. Therefore, Air Force pilots struggled fiercely to retain missiles even though many were terrified that they might replace the aircraft they loved.[22] If the Air Force controlled missiles, presumably it could ensure the new weapons would not completely replace the manned airplane. To ensure the latter did not happen, Air Force leaders began to argue that "missiles and aircraft can be combined, capitalizing on the performance and characteristics of each, to create a formidable instrument of air power considerably greater than the use of missiles or aircraft alone. The creation of such an instrument is a primary objective of the Air Force."[23] Another factor looked into the future. Several Air Force leaders presumed that missiles were an early step to space flight. Therefore,

even if manned flight was not immediately threatened, they believed the Air Force must control missiles to ensure the service's future in space flight.[24]

Historian John Lonnquest contends that, paradoxically, even though the Air Force struggled desperately to control ballistic missiles, between 1946 and 1952, Air Force leaders never prepared adequate operational concepts for the ballistic missile, refused to allocate appropriate resources, and failed to monitor the development of the ballistic missile. Ray Soper, an Air Force veteran of the time, agreed. "The Op[eration]s attitude, at the Pentagon, was to let the 'longhairs' develop the system -- they didn't take a very serious view of the ballistic missile, for it was thought to be more a psychological weapon than anything else," he remembered. "The main Air Staff support was from the Vice Chief -- later Chief of Staff, General [Thomas] White -- and from General Don Putt, the [Deputy Chief of Staff for Development]. I remember many times General White lectured the Air Staff on ballistic missiles--they were here to stay, he told them, and the Air Staff had better realize this fact and get on with it."[25]

Roy Ferguson, who was assigned to the Air Staff in 1951 as a major, reinforced Lonnquest's argument. Years later, he recalled being "the only missile enthusiast in the Directorate of Operations . . . . The Air Force then [after World War II] decided to get into missiles like Matador and Snark and Rascal.[26] And nobody had really given any thought to how they were going to use them." When he mentioned his interest in missiles, his leadership "was tickled pink because in those days . . ., the Air Force didn't want missiles" and they needed someone in the organization who cared about them.[27]

Some movement did take place, based on the actions of missile enthusiasts including White, Ferguson, and Curtain. In April 1951, Strategic Air Command published "Preliminary Plans for Activation and Employment of USAF Guided Missile Units." A year later, General White, a supporter of missiles, created a new office, the Assistant Deputy Chief of Staff, Operations (Guided Missiles), to help incorporate missiles into the service and to develop operational concepts for them. This action still did not heal the widening rift between those who supported missiles and those who did not.[28]

In January 1953, the commander of Air Research and Development Command, Lt. General Earl Partridge, complained that a lack of centralized Air Force guidance on missiles made it difficult for his command to coordinate their development. Bomber advocates, he argued, were able to push the ICBM program to the side over the objections of a "small but vigorous missile group." He then warned that if the Air Force failed to work aggressively to integrate missiles, the Air Force would split into two hostile camps: missile advocates and "old fogies," those who fought for the dominance of piloted aircraft.[29]

Partridge was not far off the mark. Ferguson later elaborated, "The Air Force didn't want missiles because any money you spent on missiles took away from the manned fleet. That's the reason General [Curtis] LeMay hated us so . . . ." He continued, "[LeMay] wanted new airplanes and lots of them. And with these missile things we were spending money that they [Air Force pilots] thought was rightfully

theirs. Not only that, they kept saying we were throwing pilots out of work . . . ." In fact, when the Air Force began awarding missile badges, Ferguson remembered taunts that "the missile badge, it was shooting down the wings, which are right above it." Soper, too, remembered LeMay saying, "You guys are going to regret everything you're doing. You're going to regret every penny spent on this damned [Atlas] missile."[30]

Eisenhower's appointment of Trevor Gardner as Special Assistant to the Secretary of the Air Force for Research and Development in 1953 greatly strengthened the lot of those who sought to incorporate missiles into the service, but it did nothing to resolve the enmity between the two groups. Instead, Gardner's appointment further exacerbated the antagonism. Ray Soper remembered a "feeling [on the Air Staff] that Gardner was out to create a personal empire, employing Air Force operational needs for ballistic missiles to further this aim."[31]

As discussed in Chapter 2, Gardner wanted a "crash" program, one unhindered by anything or anyone, to produce missiles as quickly as possible. Less than a year after the Americans demonstrated the efficacy of the hydrogen bomb, in August 1953, his missile program gained urgency and political backing as the Soviets detonated their own hydrogen bomb. By the end of the year, the Eisenhower administration made "nuclear weapons with the most advanced aerial delivery systems" the primary focus of national defense in order to reduce military costs. Gardner, with the backing of key scientists and politicians, "urged Air Force policy-makers to give over-riding priority to ballistic missiles as the most advanced nuclear weapons delivery systems."[32]

While Gardner widened the rift within the Air Force, he opened another in the contracting world as well. Even though Convair engineers had designed Atlas while the Air Force neglected ballistic missiles, Gardner did not trust that they had the scientific and engineering aptitude to create an ICBM."[33] Therefore, he selected two technological entrepreneurs who had served on the Air Force's Scientific Advisory Board, Simon Ramo and Dean Wooldridge, and wrangled a contract for them to "conduct an analytical engineering study [on] the progress of development in the strategic missile field." Not unsurprisingly, in February 1954, Ramo-Wooldridge, the company formed for the task, "expressed dissatisfaction with Convair's development efforts on the Atlas missile and recommended the establishment of a new Development Management Group which would have directorial responsibility for the entire project." Gardner immediately hired Ramo-Wooldridge to guide his missile program, "recommending that [the] group . . . have the highest priority obtainable in all matters of development, production, and support in that it would be relieved of all hindrances created by military regulations." Ramo and Wooldridge then gathered talented civilians to work on the missile project. Cherry-picking the best employees helped ensure that the new workers cared about missiles and had the capability to accomplish the job at hand, but the new organization quickly engendered the hostility of other aerospace companies and Air Force commands that lost outstanding personnel to the missile effort but were shut out of the program through classification and contracts.[34]

Since the von Neumann Committee and RAND reports on the capabilities of the thermonuclear bomb were released about the same time, in early February 1954, Gardner pushed Secretary of the Air Force Talbott to radically reorganize and accelerate the ICBM program, pressing for an emergency capability as early as 1958 in order to achieve a capability before the Soviets. Talbott agreed. Air Force Chief of Staff Nathan Twining asked the Air Force Council to determine how to best accomplish this, so on March 11 and 15, the members convened. The Council recommended that the Air Force retain the Snark, Navaho, and Atlas missile projects, but revised the payload and circular error probable standards to make them more realistic in light of the new thermonuclear capability. In addition, the Council advised that the "development and operation of [the Atlas] is a mission of the Air Force and must be under control of the Air Force."[35] A month later, on May 14, General White, as Vice Chief of Staff, directed the Air Force to assign Atlas the highest Air Force priority and to accelerate the program to the maximum extent that technology would allow.[36]

On June 21, 1954, still concerned that Gardner was creating another Manhattan Project, the Air Staff "delegated [the Air Research and Development Command] the responsibility of developing the [missile] weapon system and of recommending the logistics, operational, and personnel concepts to be applied in supporting this weapon." Air Force leaders also directed that the Command establish a new division, the Western Development Division (WDD), to work on ICBMs. Gardner accepted this development,

but ensured that General Bernard Schriever, a recognized expert on missiles and a zealot in his own right, became the division's commander.[37]

Jamie Wallace, one of the officers that worked for Schriever, remembered that "The bomber men like LeMay were in full control of the Air Force and so interest in guided missiles was low indeed." Nevertheless, a number of airmen like Wallace had become involved in the various early missile programs and acquired experience in that way, so when Schriever began to look for workers, a cadre of officers with experience in missiles existed. Wallace recalled, "When Schriever got the job a lot of us came out of the woodwork. They knew where everybody was . . . . We were delighted to finally find someone who had the misison because we knew exactly what to do."[38]

The new division was situated near the offices of Ramo-Wooldridge in California and included the company's workers, but fell under the authority of the Air Research and Development Command. A separate procurement office, responsible to the Air Materiel Command, was established to support the WDD. Schriever had developed a close relationship with Gardner and quickly began to handpick his own personnel. At the same time, he established a symbiotic relationship between Ramo-Wooldridge and the Western Development Division. In the coming years, Schriever's division competed in a tug of war with the established Air Force commands and Air Staff over the control of missiles within the Air Force.[39]

A similar struggle was occurring in the contracting world. At the beginning of 1954, Convair was the primary weapon system engineering manager, guiding all of the

contracted work on the Atlas, and expected to remain the primary weapon system contractor throughout the design and production phase. Instead, the WDD transferred the systems engineering management job to Ramo-Wooldridge during the fall of 1954. Then, in a second precedent-setting act, the division decided to only request and review subsystem designs from select companies rather than requesting designs from all qualified companies and evaluating each proposal. To introduce continuous competition into the process, Schriever convinced the Air Force to allow him to select a second contractor for each subsystem, calling the dual track program parallel development. Thus, not only did Convair not get to design and build the missile that the company had exclusively worked on to that point, but the contracts it did earn forced it to compete with other companies to earn the final sale. This new requirement was unprecedented and Convair, along with other companies infuriated by the process, complained to Congress and senior Air Force leaders. It appears that the criticality of getting a missile developed and built overrode concerns with legality or propriety. When the Air Force established a committee to review and approve the ICBM development plan, the Robertson Committee, as the committee became known, "reviewed [the process], doubted that the source-selection procedures were entirely fair . . ., but suspended judgment pending further observation."[40]

Because the Air Force did not have enough personnel to oversee all contracts in a timely manner, Ramo-Wooldridge was given authorization to guide the contractors themselves. Over the next few years, there were several legal concerns with how the

process was being carried out, but "a joint Ramo-Wooldridge/Western Development Division/Ballistic Missiles Office committee explored the problem and concluded in August [1956] that almost everyone concerned had been more interested in getting his work done fast than in observing regulations . . . . To WDD and Ramo-Wooldridge leaders, these were examples of the 'law's delay'" and such delays were not justified in slowing down the missile program.[41]

Finally, contractors complained that they were forced to reveal proprietary information to a competitor, Ramo-Wooldridge, since Ramo-Wooldridge participated in the selection of other contractors and wrote the contracts for these other companies. Because of parallel development, each company's ideas were provided to their opponents so that the programs could remain interchangable. The WDD argued that there was no issue since Ramo-Wooldridge was prohibited from building missiles itself, but this did not resolve the ill will from many companies who felt cheated by the process. [42]

All of these internal and contractual Air Force struggles did nothing to resolve the conflict with the Army, which had continued to work on ground-to-ground strategic missiles. In the early 1950s, the Army's Redstone Arsenal in Alabama developed the Redstone missile, a liquid-fueled nuclear missile with a range of up to 200 miles, clearly within the Army's designated mission area.[43] Then, advancing outside of its allocated field, the Redstone Arsenal began to promote plans for a family of missiles, including one having a range of 1000 miles.[44]

On December 2, 1954, possibly reacting to these Army advances, the Air Force established an operational requirement for a tactical ballistic missile even though Air Force historian Neufeld contends that "Headquarters USAF was not yet certain what to do with [a] shorter-range ballistic missile." [45] Ironically, in response to the new Air Force requirement "for the development of a 1,000-mile missile using existing hardware," the Army permitted the Redstone Arsenal to upgrade its Redstone missile early the next year.[46] The Air Force agreed to consider the Army proposal, but recommended breaking up the Army team and assigning portions of the team to accomplish specific tasks. The Secretary of the Army objected strenuously to this recommendation and won.[47]

Schriever hated the very idea of a medium or intermediate range ballistic missile, believing it would harm the development of the Air Force intercontinental ballistic missile. He especially feared that the government would take the opportunity to "transfer . . . responsibility to another service or, because of the high priority of ballistic weapons, [establish] a separate management group for ballistic weapons directly under the DOD."[48] In February of 1955, when the Killian Committee agreed with the von Neumann Committee that the United States must immediately create an IRBM with a 1,500 mile range in parallel with the ICBM, Schriever's fears were realized. The Army took its plans for a 1,500 mile intermediate range ballistic missile to the Department of Defense, arguing that the service also required "the ability to attack targets with nuclear warheads at an extremely long range."[49] To make matters worse

for Schriever, the Navy also offered two separate missile programs and a U.S./U.K. cooperative program was presented. The Air Force, which had previously been given control of all missiles other than those replacing close air support or on water, responded to these perceived threats immediately. It first claimed that the IRBM would be a derivative of the ICBM and then offered a separate IRBM program.[50] To determine which of the competing programs the Department of Defense would sponsor, the Secretary of Defense established a Technical Advisory Committee, led by his deputy, Reuben Robertson.

During this precarious time for the Air Force, on May 2, 1955, the Air Staff approved Gardner and Schriever's development of a second ICBM, later named the Titan, under the stipulations that they study the creation of an IRBM from this two-stage rocket and that it be produced in the central United States rather concentrating all missile development on the California seacoast.[51] Neufeld reports that in July, the Robertson Committee determined that "the IRBM was not a natural derivative of the ICBM," knocking the Titan out of consideration for DoD's IRBM. Intriguingly, the Robertson Committee used studies Ramo-Wooldridge had conducted earlier, which revealed that "the longest range expected of this type of IRBM was approximately 700 nautical miles," a much shorter range than that of the Titan, to do so.[52]

Each service argued that it was most qualified to build the IRBM. In fact, the Army offered to combine the Air Force and Navy programs and build them at Redstone Arsenal, if needed. The services also argued over which branch should control the new

shorter-range missile. Predictably, the Joint Chiefs of Staff were unable to agree. Finally, they recommended that the United States develop two intermediate range missiles: an Air Force missile and a joint Army-Navy missile, with the latter "having the dual objective of achieving an early shipboard capability and also providing a land-based alternative to the Air Force program."[53] The Secretary of Defense accepted this compromise on November 8, specifying, according to General White, that "an early operational capability will demand the utmost in cooperation between these programs." White noted that the Secretary further "stated that not only is maximum technical and managerial coordination between the two IRBM programs essential, but maximum coordination among all of the ballistic missile programs is required."[54] Soon after, "the President directed that the IRBM and ICBM programs should both be research and development programs of the highest priority above all others."[55] General Twining complained that the IRBM would be more complicated than the ICBM, would take more time to deploy, would be more vulnerable to the enemy, and more difficult to support," but Secretary Quarles rebuffed these concerns.[56]

Predictably, the services never achieved the required close cooperation. Each service viewed the task as a competition. They exchanged liaision officers, established delivery schedules for common components, and discussed mutual use of facilities, but each realized the importance of their service's success. According to Richard Jacobson, an officer who worked on the Thor program, Schriever was surprised at the way that Thor became the lynchpin of the Air Force's ICBM program. Jacobson concluded, "If

Thor had been cancelled, there is no doubt in my mind that the Army would have gotten the ICBM."[57]

The missile zealots quickly disregarded the internal and contractual discord as the interservice and political pressure to produce missiles increased. Once President Eisenhower declared ballistic missiles to be the highest national research and development priority in September 1955, Gardner and Schriever used the momentum to further speed the process of building missiles.[58]

To clarify responsibilities and to ensure his programs were not slowed by the usual Air Force bureaucracy, Gardner established the Gillette Committee, under the Air Force Deputy for Budget, Hyde Gillette, to come up with an administrative plan to ensure missiles were prioritized within the Air Force. In its "Air Force Plan for Simplifying Administrative Procedures for the ICBM", the Gillette Committee recommended the establishment of the Air Force Ballistic Missiles Committee and the reduction of the number of agencies and offices that guided ballistic missile decisions from forty-two to ten. When approved by the Secretary of Defense in November, the Gillette procedures consolidated the ten remaining approval organizations into two committees, one at Headquarters Air Force level and one at Department of Defense level. Political machinations worked both ways as the Air Staff used the Gillette procedures to block Gardner's ambitions, "real or imagined," to create another Manhattan Project by establishing special Air Force measures to integrate missiles into the Air Force. From either viewpoint, the procedures effectively bypassed the

conventional Air Force and Secretary of Defense methods for coordinating the incorporation of new missions, infuriating many who were thereby avoided.[59] Soon after, Gardner and Schriever also managed to garner a specific annex to the Air Force budget for the missile program that no one else could touch, creating more resentment among Air Force leaders who were competing with them for money.[60]

In addition to the administrative changes, the Gillette Committee also recommended establishing an initial operational capability for missiles that would be directed by the Western Development Division.[61] The division was to work with the appropriate commands to "develop a plan for employing the weapon in combat, prepare the associated logistics support plan, establish the first launching bases, and organize and train the first combat squadrons."[62] When the Secretary of Defense received these recommendations, he responded forcefully, directing the Air Force Chief of Staff on November 14, 1955 "to issue the appropriate directives which will implement the procedures and organizational arrangements contained in the plan."[63] On November 18, General White, then Vice Chief of Staff, charged the Western Development Division with achieving an initial operating capability as soon as possible. White's order expanded the Division's requirement from developing a working missile to creating, producing, manning, and basing the missiles. His directive did not dictate the required number of ICBMs or a timeline for its achievement, but he provided these specifics within the next month.[64]

To accomplish these challenging goals, Schriever and the Western Development Division became further convinced that they had to "discard the usual procedure . . . [of building] a new weapon, part by part, in a series of consecutive steps--to fashion hand-wrought prototypes before venturing into production tooling." Schriever explained that "from the earliest days we saw that our assignment would demand a new kind of specialized planning to coordinate the myriad elements involved in our program . . . . But to reduce the time cycle we decided to attack all areas of our assignment concurrently." He further clarified, "In short, we took the calculated risk of planning, programming, and spending our funds concurrently on research, development, testing, production, manpower training, base construction, and other phases of our production."[65]

"'Concurrency' -- the practice of scheduling the simultaneous conduct of various elements of the development program so as to insure the earliest possible availability of the operational weapon ...," Warren Greene explained in his formerly classified history of the Titan missile, "ran counter to the accepted -- and time honored -- sequential development process, in which the completion and proof of one step in a total system development process was an essential preliminary to commencement of the next step."[66] The concept of concurrency, hazardous under the most opportune circumstances, was made even more volatile because the missile technology itself was not fully developed, much less the conceptual theories that would be used to guide the operation of the new capabilities.

Thus, not everyone -- even missile proponents -- agreed with Schriever's decision. Lieutenant General Roscoe Wilson, Air Force Deputy Chief of Development from 1958 to 1961, revealed the opposing side's concerns. In 1961, he complained, "The weapon system concept . . . was formerly called a 'crash' program. The objective was to trade time for money. By contrast, the concurrency concept that we are employing today is useful but very wasteful. It should be employed only in extreme cases. My view is 180 degrees opposite of that of General Schriever on this. It took seven years to develop the B-52 using the prototype management approach before it was operational. We have now spent seven years on the Atlas which is still not operational. The missile program has thus been very costly." Schriever and Gardner's decision to fund and build a second, alternate missile, the Titan, using their concept of parallel development only exacerbated this frustration over cost and waste.[67]

Concurrency did allow the Air Force to accomplish its most important agenda -- to build and operate nuclear ICBMs before the Soviet Union did and before the other services could acquire the mission. However, concurrency created extremely volatile conditions for the personnel selection and training and for the development of infrastructure and operational concepts associated with missiles.[68] It also heightened the enmity of some Air Force and defense leaders who suspected that the new weapons were taking funding and support from existing military resources while only promising potential benefits after years or even decades of work and from others who

saw that their oversight of the new capability was reduced through political machinations.[69]

Those opposing Air Force control of missiles may have believed they obtained a reprieve when Gardner resigned on February 10, 1956, but General White and Congressional Democrats continued the press to achieve operational status for the missiles as soon as possible. On December 28, 1955, a little over a month after his first directive on missile initial operating capability, White added numbers and a timeline to his requirements: one wing of 120 missiles and sixty launching positions to be completed by January 1, 1960.[70] This standard required more than building missiles. White specified that the wing should be divided equally between three support bases to be located on government property in the eastern, central, and western United States and the first ten missiles were to be operational by April 1, 1959. This assignment required the Western Development Division to not only construct bases and missile sites in this compressed timeframe, but also to select and train the personnel who would operate the missiles. [71]

Roy Ferguson had been tasked to design an organization for the missiles. He remembered being given three or four days to complete the duty. After trying to compare the number of people required or the destructive capability to a standard Air Force unit, he discovered there was nothing to guide his decisions. Therefore, he decided to build the organization in a way that would allow the Air Force to launch the missiles in fifteen minutes. Because the Atlas guidance station could control three

missiles, he organized the first missile squadron to have six missiles and two guidance stations. This decision provided each squadron missile with a primary and backup guidance station. While he admitted that the organization was completely arbitrary, no one had any better ideas.[72]

When the wing was completed in 1960, White expected the new missileers at each base to be capable of launching ten missiles within fifteen minutes of an alert, ten more within the next two hours, and all forty missiles within two hours and fifteen minutes. In March 1956, he also set the initial operating capability for IRBMs: one wing of three bases in England with ten missiles ready by October 1958 and 120 missiles combat ready by July 1, 1959.[73]

The pressure was too much for even Schriever, who worried that missiles built in this short time frame would not fly. After negotiations with General White failed to sway the Vice Chief, Schriever requested help from his boss, the commander of Air Research and Development Command, General Tommy Power, and from one of Schriever's arch-nemeses, General LeMay, to help delay him. Power argued that White's timeline was so short that it would not allow Schriever to adequately test and produce the missiles, much less create training and personnel pipelines to generate the required operators. LeMay, one of the most powerful men in the Air Force at the time, backed Schriever and Power, contending that the compressed schedule would force contractors to produce the missiles before they had been adequately flight tested and preclude required modifications.[74]

In May, the two sides agreed to a still aggressive goal of twenty-five operational ICBMs by January 1, 1960, with 120 missiles (eighty Atlas and forty Titan) ready for launch by March 1961. The requirement for IRBMs had been pushed back as well, with only thirty IRBMs needing to be deployed by July 1, 1959, and the entire 120 missile wing postponed to July 1960. The new agreement reduced some of the pressure on the Western Development Division.[75]

Schriever should not have worried. The Air Force Ballistic Missile Committee, run by Secretary Quarles, refused to accept even the less compressed timetable due to financial concerns. On November 10, 1956, after all the negotiations were done, the Air Force reduced the ICBM force requirement to forty Atlas missiles and forty Titan missiles, to be in place by March 1961, with three launchers and six missiles prepared by March 1959. The IRBM schedule remained the same, with the first squadron to be ready by July 1959 and the fourth completed by July 1960, but the squadrons would now only possess fifteen missiles each, cutting the total number of missiles by 50 percent.[76]

During this same time, Air Force missile proponents won another conflict. On November 26, 1956, the Secretary of Defense assigned "operational employment of the land-based Intermediate Range Ballistic Missile system [as] the sole responsibility of the U.S. Air Force." On the other hand, the Secretary felt the need to document that "this does not, however, prohibit the Army from making limited feasibility studies in this area" and specifically mentioned that no decision had been made as to which

missile, the Jupiter or Thor, would "be used for various missions in the armed services."[77] Less than two weeks later, the solid-fuel Navy missile was added as a key defense priority because it could be safely launched from submarines, making it less vulnerable to a nuclear first strike. Therefore, on December 8, the Navy withdrew from the Jupiter program to develop its own missile, which it designated the Polaris. The competition between the services for control of ballistic missiles continued unabated.[78]

On January 11, 1957, President Eisenhower and the NSC approved the Air Force's initial operating capability plans, although Eisenhower warned that he might change the force's size or schedule. On March 28, 1957, after coordinating with the British at the Bermuda conference, which was scheduled to improve relations between the two countries after conflict over the Suez Crisis, the President agreed to retain both the number and schedule of the missiles, although he changed the wording requesting the missiles from "the earliest possible date" to "the earliest practicable date."[79] The reduced requirements and extended schedule created an opportunity for Eisenhower's critics to attack his defense policies, with former Air Force Secretary Symington leading the pack, keeping politics firmly in the equation.[80]

For much of the rest of the year, the Air Force struggled between the opposing pressures to build the missiles as quickly as possible and to reduce costs. The service obtained Camp Cooke, on the coast of California, from the Army and began developing it as Cooke Air Force Base to serve as an operational and training missile base. The service also labored to design and build the Atlas, Titan, and Thor missiles as rapidly as

it could while hurriedly determining the requirements of the servicemen -- deemed missilemen -- who would operate these missiles. Then, during the summer of 1957, to prevent the national debt from rising over its authorized ceiling, the Secretary of Defense reduced the scheduled production of missiles -- pushing the initial operational capability [IOC] date back by months -- and ordered the Air Force to cut overtime costs. In July, in response to further economic pressure, Secretary Wilson reduced the priority of Titan and suspended production of both Thor and Jupiter until a single IRBM program could be selected for continuation. On August 6, the missile advocate, General White, who had become the Air Force Chief of Staff in July, appealed to the new Secretary of the Air Force, James Douglas, to intercede against further cuts, but if the cuts could not be prevented, at least to allow the Air Force to determine where to take the cuts.[81]

The timing could not have been better for the missile advocates. Two days earlier, the Soviet Union had launched Sputnik and the United States was beginning to react. Congressional inquiries and immense public pressure began to motivate Eisenhower's administration to revise its priorities. Neil McElroy, who replaced Wilson as Secretary of Defense on October 9, had his new Director of Guided Missiles, William Holaday, order the Army and Air Force to produce and deploy four squadrons each of the Thor and Jupiter missiles, with the first squadrons to be operational by December 31, 1958, and the last by March 1960. Soon after, Holaday approved an Air Force request to increase the number of Atlas missiles by five squadrons and to increase the

rate of production in order to complete this task by March 1963. He also returned the Titan to operational status, but did not agree to the Air Force request to double the production of that missile. These new demands intensified the pressure to select and train the new missileers.[82]

Another significant change happened within the Air Force itself. On November 27, 1957, the key leaders involved in the production and use of missiles (Power, now at SAC; Schriever; Edwin Rawlings of Air Materiel Command; Samuel Anderson, now commanding Air Research and Development Command; and Ben Funk of the Ballistic Missile Office) agreed that the Air Force should "transfer to SAC . . . all IOC training and operational responsibilities, units, and bases."[83]

Of course, everything was far from perfect. Following the Gaither Committee report, Secretary McElroy turned to the Joint Chiefs of Staff for help determining clear ICBM requirements. Once again, the JCS failed to find consensus. General White pressed for more ICBMs while Admiral Arleigh Burke wanted to increase the number of the Navy's Polaris missiles. On the other hand, General Maxwell Taylor, the Army Chief of Staff, declared that the military had too many nuclear weapons and needed to focus on non-nuclear forces.[84]

McElroy declared that the Air Force would control all land-based missiles, including ICBMs and IRBMs. The Western Development Division, now called the Air Force Ballistic Missile Office, transferred the new missiles and associated bases and personnel to the Strategic Air Command, but many Air Force pilots remained unsure of

these new weapons, especially if they were going to replace the manned airplane. The rush to quickly develop and deploy the new missiles, exacerbated by the political and interservice pressures, was creating havoc within the Air Force.[85]

Notes

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[1] James P. Tate, *The Army and Its Air Corps: Army Policy toward Aviation, 1919-1941* (Maxwell AFB, AL: Air University Press, 1998), 2-3. See also William Mitchell, *Winged Defense: The Development and Possibilities of Modern Airpower--Economic and Military* (New York: G. P. Putnam and Sons, 1925), viii; Eugene Beebe, "The Reminiscences of Eugene Beebe (1959-1960)," Oral History Collection, Columbia University; and Ira Eaker, "The Reminiscences of Ira Eaker (1959-1960)," ibid. MItchell was not alone in his remonstrations. Major General Mason Patrick, chief of the Air Service in the 1920s, when testifying before the President's Aircraft Board, claimed the Army's leaders were hidebound Neanderthals who failed to recognize the potential of airpower. "United States President's Aircraft Board, Testimony of General M. M. Patrick, Maj. W. J. Hilner, Maj. T. G. Lamphier and others before Morrow Board," 21 September 1925, 53, Call # 248.211-61V, IRIS # 00159949, AFHRA. For more Air Corps vitriol against the Army, see Peter R. Faber, Lt. Col., USAF, "Interwar U.S. Army Aviation and the Air Corps Tactical School: Incubators of American Airpower," in Phillip S. Meilinger, Col., USAF, ed., *Paths of Heaven: The Evolution of Airpower Theory* (Maxwell AFB, AL: Air University Press, 1997), 204.

[2] John Darrell Sherwood, *Officers in Flight Suits: The Story of America Air Force Fighter Pilots in the Korean War* (New York: New York University Press, 1996), 51. While Sherwood is primarily dealing with fighter pilots, on page 66, he states a common perception that "when the student pilot finally graduated from Advanced training, he gained more than the title of Air Force 'pilot,' he gained immeasurable status as well. Only he had the 'rated' title; all other officers were 'nonrated,' in other words, insignificant."

[3] Steven L. Rearden, *The Formative Years, 1947-1950*, 6 vols., *History of the Office of the Secretary of Defense* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 2012), 1: 25. For further information on the National Security Act creating interservice rivalry, see Amos Jordan, William Taylor, Jr., and Lawrence Korb, *American National Security: Policy and Process* (Baltimore, MD: Johns Hopkins University Press, 1981), 160-61.

[4] John L. Chapman, *Atlas: The Story of a Missile* (New York: Harper, 1960), 26. See also H. Guyford Stever, interview with Michael Gorn on April 10, 13, and 20, 1989, unpaginated, 23-24, Call # K239.0512-1752, IRIS # 1095219, AFHRA. Eric Burgess, *Long-Range Ballistic Missiles* (New York: MacMillan, 1962), 6, explains that the "V-2 was the first of the long-range ballistic missiles. It depended upon a large-thrust, liquid-propellant rocket engine to accelerate a payload of about one ton of the high-explosive Amatol to a speed of about 3,500 miles per hour . . . . The vehicle rose about 100 miles above the earth's surface before falling back along the downward leg of an elliptical trajectory to impact on a target about 200 miles from the launching point." He further states, "the first two operational V-2's were fired against Paris on 6 September 1944, and an attack on London followed two days later. When the V-2 offensive came to an end in March 1945, over 1,300 long-range rockets had been fired against London and Norwich, and over 1,700 on the Continent, mainly against Antwerp."

[5] Mitchell flew for his entire career. Conversely, Arnold spent many of his influential years dealing with science and technology rather than sitting in a cockpit. For further information on Mitchell's career, see Alfred Hurley, *Billy Mitchell: Crusader for Air Power* (1964; Bloomington: Indiana University Press, 1975). For further information on Arnold's career, see Dik Daso, *Hap Arnold and the Evolution of American Airpower* (Washington, D.C.: Smithsonian Institution Press, 2000).

[6] E. Michael Del Papa and Sheldon A. Goldberg, *Strategic Air Command Missile Chronology, 1939-1973* (Offutt AFB: Office of the Historian, HQ Strategic Air Command, 1990), unpaginated, 7. A note in the personal collection of General Henry H. Arnold also reveals that "at a conference held in Arnold's office among his key Air Staff members, including [Edwin] Perrin, [Barney] Giles, [Benjamin] Chidlaw, [Grandison] Gardner, the conferees agreed to start using aircraft rockets. The tests were to be made by [Claire] Chennault in the 14th Air Force, [Clayton] Bissell in the 10th Air Force and [George] Kenny [sic] in the 5th Air Force." Part of collection of documents that were microfilmed in the personal collection of General Henry H. Arnold, MICFILM 43804, IRIS # 01102996, AFHRA. Max Rosenberg, *The Air Force and the National Guided Missile Program, 1944-1950* (Washington, D.C.: USAF Historical Division Liaison Office, 1964), 12, reveals that General Arnold assigned overall management authority to the Air Communications Office.

[7] Del Papa and Goldberg, *Chronology*, unpaginated, 6-8.

[8] The *National Museum of the US Air Force* "German V-Weapons: Desperate Measures" (http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=8092) explains "V-weapons included the self-guided V-1 Buzz Bomb and the V-2, the world's first rocket-powered long-range ballistic missile." It reveals that "the V-1 Buzz Bomb's pilotless, self-guided aircraft features reappeared in later cruise missiles, and the V-2, as the first practical rocket-guided ballistic missile, pointed the way toward nuclear-armed ballistic missiles." (Accessed March 31, 2015.)

[9] Jacob Neufeld, *The Development of Ballistic Missiles in the United States, 1945-1960* (Washington, D.C.: Office of Air Force History, 1990), 12-13.

[10] Del Papa and Goldberg, *Chronology*, unpaginated, 6-8. All quotes regarding Griggs and Spaatz are from part of a collection of documents that were microfilmed in the personal collection of General Henry H. Arnold, MICFILM 43804, IRIS # 01102996, AFHRA. For background on the JB-1, the JB-2, and the JB-10, see Neufeld, *Ballistic Missiles*, 12-13.

[11] Robert J. Watson, *Into the Missile Age, 1956-1960,* 6 vols., *History of the Office of the Secretary of Defense* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 1997), 4: 388-389, and Neufeld, *Ballistic Missiles*, 52.

[12] Watson, *Into the Missile Age*, 7. Specific quotes designating responsibility are from Memo, Lt. General Joseph McNarney, Deputy Chief of Staff, to Commanding General, Army Air Forces, October 2, 1944, File 319.1, Box 408, "War Department General Military Policies," HQ

USAF DCS/O, Assistant for General Military, National Archives and Records Administration (NARA), as cited in Edmund Beard, *Developing the ICBM: A Study in Bureaucratic Politics* (New York: Columbia University Press, 1976), 20.

[13] Memo from Brigadier General R. C. Coupland, AC/AS-4 to AC/AS-3, Guided Missiles Division, dated March 6, 1946, File "AAF GM Policy 1946," Box "A-7 Catapults," HQ USAF, DCS/D, GM Branch, NARA, as quoted in Beard, *Developing the ICBM*, 29.

[14] "Army-Air Force Agreements: As to the Initial Implementation of the National Security Act of 1947," compiled by the Offices of the Deputy Chief of Staff and the Deputy Commander Army Air Forces, 11. This portion is in Section IV, Agreements on Organization, Mobilization and Training Functions, *Combined Arms Research Library Digital Library*. https://server16040.contentdm.oclc.org/cdm4/item_viewer.php?CISOROOT=/p4013coll11&CISOPTR=1974&CISOBOX=1&REC=5. (Accessed March 5, 2014).

[15] Neufeld, *Ballistic Missiles*, 51-52. According to Jonathan Stevenson, *Thinking Beyond the Unthinkable: Harnessing Doom from the Cold War to the Age of Terror* (New York: Viking, 2008), 11, Bush had previously served as the civilian coordinator of the Manhattan Project.

[16] Del Papa and Goldberg, *Chronology*, unpaginated, 12-13. See also Neufeld, *Ballistic Missiles*, 17 and 53-56. On page 53, Neufeld contends that, in the first Joint Chiefs of Staff study, "although the JCS omitted to mention long-range surface-to-surface missiles, it was understood that, so long as the Air Force retained responsibility for strategic bombardment, it remained the logical user." See also Herbert York, *Race to Oblivion: A Participant's View of the Arms Race* (New York: Simon and Schuster, 1970), 98.

[17] Neufeld, *Ballistic Missiles*, 55-56.

[18] Harry S. Truman*, Memoirs: Years of Trial and Hope*, 2 *vols.* (Garden City, NY: Doubleday, 1956), 2:305.

[19] Richard D. Curtin, interview with Neil Sheehan, June 16, 2000, 15-16, Box 15 of 21, Sheehan Papers (accession 23821), Manuscript Division, Library of Congress (hereafter LOC). See also Neil Sheehan, notes from a telephone interview with Richard D. Curtain, August 5, 1997, Box 15 of 21, Sheehan Papers (accession 23821), Manuscript Division, LOC.

[20] Peter Roman, "American Strategic Nuclear Force Planning, 1957-1960: The Interaction of Politics and Military Planning" (Ph.D. dissertation, University of Wisconsin - Madison, 1989), 267.

[21] Gill Robb Wilson, "The Public View of the Air Force," *Air University Quarterly Review,* 6, No. 4, (Winter 1953-54), 3. Wilson's belief was backed by others, like journalist Bob Glaves, who, after the Sputnik launch, predicted "The satellite has tolled the doom for the military plane, and with it the Air Force and the Naval air arm. Aircraft for troop transports and

observation -- yes; as weapons? -- Sputnik has beeped its warning horn." Bob Glaves, "End Is in Sight for Military Jet," *Dallas Morning News*, October 11, 1957, 7.

[22] Part of collection of documents that were microfilmed in the personal collection of General Henry H. Arnold, MICFILM 43804, IRIS # 01102996, AFHRA.

[23] "The USAF Policy on Missile Development and Employment," attachment to Memorandum for Members of the Armed Forces Policy Council, dated November 26, 1956, Subject: Clarification of Roles and Missions to Improve the Effectiveness of Operation of the Department of Defense, an attachment to "AMC Participation in the AF Ballistic Missiles Program -- Vol. II, Supporting Documents Nos. 1-64 (1953-1956) (Unclassified)," Call # K215.18 Aug 1954-Dec 1957 V.2, IRIS # 0476795, AFHRA.

[24] Bernard Schriever, "ICBM - A Step toward Space Conquest," speech given at the Astronautics Symposium, San Diego, California, in February 1957, in David N. Spires, ed., *Selected Documents in Air Force Space History* (Peterson AFB, CO: Air Force Space Command, 2004), 20-26. See also Claude E. Putnam, "Missiles in Perspective," *Air University Quarterly Review* 10, No. 1, (Spring 1958), 10, where Putnam specifically states, "Man is headed for outer space, and the missile is just another step in the long process of evolutionary development which will allow him to get there. Just as the evolution of the airplane furnished the basic technology for the missile, so will the art of missilery make important contributions to the development of the space vehicle." He later continued, "[the airman] should direct his aspirations toward the higher achievements and never lost sight of the farther horizons." Colonel Putnam, the Deputy for Evaluation, Air War College, wrote the article under the auspices of the Air War College. The document specifically does not have the disclaimer that his article does not represent the views of the Air Force. The thought is repeated by General Clarence Irvine in Congressional testimony, "the ballistic missile is only a short step in the evolution of a weapon system; . . . out of it comes things like a ballistically boosted manned machine, whether this is made as an airplane to not quite go in orbit, or whether it is a true orbital type machine." Quoted from "The USAF Reports to Congress: A Quarterly Review Staff Report," *Air University Quarterly Review* 10, No. 3, (Spring 1958), 39.

[25] John Lonnquest, "The Face of Atlas: General Bernard Schriever and the Development of the Atlas Intercontinental Ballistic Missile, 1953-1960" (Ph.D. dissertation, Duke University, 1996), 41. Harry C. Jordan, Memorandum: Notes transcribed from an interview conversation with Colonel Ray E. Soper, Vice Comdr Ballistic Systems Division, on the final day of his service with USAF before retirement, dated 29 November 1966, Call # K239.0512-783, IRIS # 1000339, AFHRA.

[26] The Matador, Snark and Rascal missiles were extremely short-lived aerodynamic missiles used by the Air Force to carry nuclear payloads.

[27] For the impact of the Korean War on missile development, see "AMC Participation in the AF Ballistic Missiles Program through December 1957 (Unclassified), Vol. 1--Narrative," 1,

Call # K215.18 Aug 1954-Dec 1957 v. 1, IRIS # 0476794, AFHRA. For the Air Force failure to develop operational concepts, see Lonnquest, "The Face of Atlas," 41. For further information about the level of interest for missiles on the Air Staff, see Roy Ferguson, interview with Neil Sheehan, April 26, 2002, Box 15 of 21, Sheehan Papers (accession 23821), Manuscript Division, LOC. Ferguson retired from the Air Force as a lieutenant colonel.

[28] Del Papa and Goldberg, *Chronology*, unpaginated, 13.

[29] Lonnquest, "The Face of Atlas," 42, and Eugene Callahan, Colonel, USAF, to Samuel Brentnall, Major General, USAF, Subject: Guided Missile Policy, dated November 3, 1953, citing a January 1953 letter from Partridge to White, 1-2, Record Group 341, Air Force Office of Guided Missile (AFCGM) Records, Accession 61A1643, Box 2, Folder "Organization - 1953", National Archives and Records Administration, at College Park, MD (hereafter NARA-MD).

[30] Roy Ferguson, interview with Neil Sheehan, April 26, 2002, 3-4, Box 15 of 21, Sheehan Papers (accession 23821), Manuscripts Division, LOC. Ray Soper, interview with Neil Sheehan on September 10, 1997, Sheehan Papers (accession 23821), Manuscript Division, LOC.

[31] Harry Jordan Memorandum, 29 November 1966, 4, AFHRA.

[32] "AMC Participation in the AF Ballistic Missiles Program," 4.

[33] Neil Sheehan, *A Fiery Peace in a Cold War* (New York: Random House, 2009), 200.

[34] Quotations from Anthony Krieg to General Ben Funk, memorandum dated September 1955, Subject: SM-65 Missile (Atlas), attachment to "AMC Participation in the AF Ballistic Missiles Program -- Vol. II, Supporting Documents Nos. 1-64 (1953-1956) (Unclassified), 1-2, Call # K215.18 Aug 1954-Dec 1957 v. 2, IRIS # 0476795, AFHRA. See also David M. Fleming, interview with Robert Mulcahy on April 5, 2001, 3, Call # K239.0512-2395, IRIS # 01143416, AFHRA. Fleming wrote the initial contract for Ramo-Wooldridge. He mentioned that Ramo and Wooldridge were angry that he wrote their contract in a way that ensured that they could not select their company to both guide and complete the work. Fleming also noted that "anyone who didn't hop to it when they wanted to get something done was an obstructionist."

[35] Council report quoted in Beard, *Developing the ICBM*, 169. See also Elliot V. Converse II, *Rearming for the Cold War, 1945-1960,* 2 vols., *History of Acquisition in the Department of Defense* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 2011), 1: 490.

[36] "Historical Material Supplemental to Guided Missile Study - February 1956: Chronological Brief of Selected Guided Missile Projects," 14, Harlow Records 1953-1961, Box 1, File A: Chronological Brief of Selected Guided Missile Projects (February 1956), Eisenhower Presidential Library, Abilene, Kansas. See also "The Air Force Ballistic Missile and Space Program Chronological Highlights" dated 5 February 1960, 3, Bernard Schriever Papers, Box 87, Folder 6, Manuscript Division, LOC, and Beard, *Developing the ICBM*, 171 fn 34.

[37] Krieg to Funk, memorandum dated September 1955, 1-2, Subject: SM-65 Missile (Atlas), AFHRA. Krieg's memorandum stated that the directive was written by the Deputy Chief of Staff, Materiel, but does not mention his name. Conversely, Neufeld, in *Ballistic Missiles*, 107, claims that General Putt, the Deputy Chief of Staff, Development, authored the document. Edmund Beard, in *Developing the ICBM*, appears to take both sides of the issue, quoting Krieg's memo on page 168 and then declaring that the decision was made by General Putt on page 171. Putt's support for the ballistic missile is well known and his position would have placed him in an appropriate position to have written the guidance, but without further documentation, I have chosen not to take a side. Intriguingly, Krieg and Beard agree that the decision was made because the Air Staff was concerned about Gardner, but Neufeld, in *Ballistic Missiles*, 104, concludes that Gardner "envisioned" and recommended the organization. All references indicate friction between Gardner and members of the Air Staff and it is likely that there was considerable maneuvering over the organization before someone finally made the decision.

[38] Jamie Wallace, telephone interview with Neil Sheehan on December 13, 1999, Sheehan Papers (accession 23821), Manuscript Division, LOC.

[39] Beard, *Developing the ICBM*, 170, "AMC Participation in the AF Ballistic Missiles Program," 10-12, and Converse, *Rearming for the Cold War*, 493.

[40] "AMC Participation in the AF Ballistic Missiles Program," 175-80. For further information on the aircraft industry frustration with the process, see Neufeld, *Ballistic Missiles*, 119. For more information on the Robertson Committee, see Neufeld, *Ballistic Missiles*, 136-37.

[41] "AMC Participation in the AF Ballistic Missiles Program," 183-84.

[42] Ibid., 184-85.

[43] U.S. Army Aviation and Missile Life Cycle Management Command, "Redstone Missile," history.redstone.army.mil/miss-redstone.html. (Accessed January 1, 2015).

[44] James Grimwood and Frances Strowd, *History of the Jupiter Missile System*, 2-3 http://heroicrelics.org/info/jupiter/jupiter-hist/History%20of%20the%20Jupiter%20Missile%20System.pdf. (Accessed January 1, 2015).

[45] Neufeld, *Ballistic Missiles*, 115. Later in the book, on page 145, Neufeld states that the "Air Staff encouraged ARDC to solicit industry proposals for studying the tactical ballistic missile" on May 9, 1955. The later date does not make sense as the Army would not have proposed a missile to meet a requirement that the Air Force had not yet solicited. Either way, Neufeld, in *Ballistic Missiles*, 145, contends that "General Power instructed Schriever [that] . . . 'it should be clearly understood that the Air Force is making no commitment for follow on contractual action.'"

[46] CONARC (Continental Army Command) to OCRD (Office of the Chief of Research and Development), memo dated April 2, 1955, subject: Surface-to-Surface GM Requirements for Support of Corps and Larger Units, cited in Department of the Army (DA) Pamphlet 70-10, *"Chronological History of Army Activities in the Missile/Satellite Field, 1943-1958*," 38. See also Grimwood and Strowd, *History of the Jupiter Missile System*, 4-6.

[47] Grimwood and Strowd, *History of the Jupiter Missile System*, 10.

[48] Neufeld, *Ballistic Missiles*, 115.

[49] CONARC (Continental Army Command) to OCRD (Office of the Chief of Research and Development), memo dated April 2, 1955, subject: Surface-to-Surface GM Requirements for Support of Corps and Larger Units, cited in DA Pamphlet 70-10, 38. See also Grimwood and Strowd, *History of the Jupiter Missile System*, 5-9 (quote on page 6).

[50] Grimwood and Strowd, *History of the Jupiter Missile System*, 5-9.

[51] "AMC Participation in the AF Ballistic Missiles Program through December 1957 (Unclassified), Vol. 1--Narrative," 130, AFHRA. See also Neufeld, *Ballistic Missiles*, 130.

[52] Neufeld, *Ballistic Missiles*, 145.

[53] Thomas White, Vice Chief of Staff, to Commander, Air Research and Development Command, letter dated November 18, 1955, Subject: Priority of the ICBM and IRBM Programs, Supporting Document # 314 to Call # K220.01 V.6, IRIS # 477049, AFHRA. For more information, see unnamed paper from SECAF to CSAF, Attn: Gen Brentnall, dated March 2, 1956 on the long range ballistic missile program, File 471.6, Box 20 General Files 3340C - Country Files - Cuba 471.6, 1957 Top Secret Folder for Retirement by ISA/R&C, 44B, Entry UD-UP, Record Group 330, NARA-MD. See also and Grimwood and Strowd, *History of the Jupiter Missile System*, 11-13 and Neufeld, *Ballistic Missiles*, 146.

[54] Thomas White, Vice Chief of Staff, to Commander, Air Research and Development Command, letter dated November 18, 1955, Subject: Priority of the ICBM and IRBM Programs, Supporting Document # 314 to Call # K220.01 V.6, IRIS # 477049, AFHRA.

[55] NSC Action No. 1484 (http://www.foia.cia.gov/sites/default/files/document_conversions/18/1960-08-19a.pdf). Accessed November 6, 2014. See also Chief of Staff, USAF to Commander, ARDC, letter dated November 18, 1955 (appears to have been transmitted January 23, 1956), attached to Chief of Staff, USAF to the Deputy Chiefs of Staff, dated December 2, 1955, Subject: Responsibilities for ICBM and IRBM Programs, Call # K220.01 V.6, IRIS # 477049, AFHRA.

[56] Neufeld, *Ballistic Missiles*, 151.

[57] Richard "Jake" Jacobson, interview with Neil Sheehan dated April 20, 1997, Sheehan Papers (accession 23821), Manuscripts Division, LOC. Jacobson retired as a colonel. See also

Neufeld, *Ballistic Missiles*, 151, and "AMC Participation in the AF Ballistic Missiles Program through December 1957 (Unclassified), Vol. 1--Narrative," 374.

[58] Jeffrey Bair, "An Examination of Intercontinental Ballistic Missile Development within the United States from 1952-1965" (MAS Thesis, US Army Command and General Staff College, 2003), 25-26.

[59] Harry Jordan Memorandum, 4. The Ballistic Missile and Space Systems Panel, Weapons Systems Management Working Group reported on December 19, 1959 that establishing a separate organization with extraordinary power and authority did not solve the problem of Air Force bureaucracy, but led to a division of responsibilities, duplication of functions, and conflict of authority. Ballistic Missile and Space Systems Panel, "Weapon Systems Management, The Decision-Making Process," December 19, 1959, Headquarters, United States Air Force, Washington, D.C., 12, as cited in Donald Lepard, "Missiles, Men, and Management: Do USAF Policies and Directives Insure Adequately Trained Personnel to Maintain and Operate the Missile Force?" (Thesis, Air War College, 1963), 6.

[60] Sheehan, *Fiery Peace*, 302.

[61] Sheehan, *Fiery Peace*, 300-01. See also Neufeld, *Ballistic Missiles*, 120; "AMC Participation in the AF Ballistic Missiles Program," 12; and Max Rosenberg, *USAF Ballistic Missiles*, 1958-1959 (Washington, D.C.: USAF Historical Division Liaison Office, 1960), 6, http://www2.gwu.edu/~nsarchiv/nukevault/ebb249/doc01.pdf. (Accessed January 15, 2015).

[62] "AMC Participation in the AF Ballistic Missiles Program," 12-13.

[63] Quoted in "AMC Participation in the AF Ballistic Missiles Program," 13.

[64] Neufeld, *Ballistic Missiles*, 141-42.

[65] Bernard Schriever, "The USAF Ballistic Missile Program," in Lt. Col. Kenneth Gantz, ed., *The United States Air Force Report on the Ballistic Missile* (Garden City, NY: Doubleday and Company, 1958), 31.

[66] Warren E. Greene, *The Development of the SM-68 Titan* (Andrews AFB, MD: Historical Office, Deputy Commander for Aerospace Systems, Air Force Systems Command, August 1962), 62.

[67] Roscoe Wilson, interview with Henry L. Bowen on 13 October 1961, 1, Call # K239.0512-774, IRIS # 1002224, AFHRA.

[68] Baar and Howard, *Combat Missileman*, 53, 61-62. See also George L. Ingersoll, "Discipline and Morale of Missile Alert Forces" (Thesis, Air University, 1961), 8.

[69] Neil Sheehan, *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon* (New York: Random House, 2009), 251-252.

[70] Air Force Instruction 38-101 "Air Force Organization" dated 16 March 2011, defines the organizational entities of the Air Force as such: "squadrons are the basic 'building block' organizations in the Air Force, providing a specific operational or support capability . . . . A squadron has a substantive mission of its own that warrants organization as a separate unit based on factors like unity of command, functional grouping and administrative control, balanced with efficient use of resources." A Group is the "level of command between wings and squadrons. Groups bring together multiple squadrons or other lower echelon units to provide a broader capability." The instruction also explains that "a wing is usually composed of a primary mission group (e.g., operations, training) and the necessary supporting groups. By pulling together the mission and support elements, a wing provides a significant capability under a single commander."

[71] Neufeld, *Ballistic Missiles*, 143. Air Force Instruction 38-101, "Air Force Organization," dated 16 March 2011, defines a wing as having "a distinct mission with significant scope. A wing is usually composed of a primary mission group (e.g., operations, training) and the necessary supporting groups. By pulling together the mission and support elements, a wing provides a significant capability under a single commander. . . . Wings will have a minimum adjusted population of at least 1000 . . . ."

[72] Roy Ferguson, interview with Neil Sheehan dated April 26, 2002, Box 15 of 21, Sheehan Papers (accession 23821), Manuscripts Division, LOC.

[73] Max Rosenberg, *USAF Ballistic Missiles*, 7-8, and Neufeld, *Ballistic Missiles*, 152.

[74] Neufeld, *Ballistic Missiles*, 154.

[75] Neufeld, *Ballistic Missiles*, 154-55. See also Rosenberg, *USAF Ballistic Missiles*, 8. For details of the IRBM IOC requirements, see C.E. Wilson, Secretary of Defense, to the Secretary of the Army and Secretary of the Navy, Memorandum dated 8 November 1955, Subject: Management of the IRBM #2 Development Program. A copy is in Appendix 2 of Neufeld, *Ballistic Missiles*, 307. See also "The Air Force Ballistic Missile and Space Program Chronological Highlights," 5.

[76] Rosenberg, *USAF Ballistic Missiles*, 9.

[77] Secretary of Defense to Members of the Armed Forces Policy Council, letter dated November 26, 1956, Subject: Clarification of Roles and Missions to Improve the Effectiveness of Operation of the Department of Defense, Supporting Document 336 to Call # K220.1 V. 6, IRIS # 477049, AFHRA. See also A. G. Waggoner, Acting Director of Guided Missiles, Memorandum for the Secretary of the Army, Subject: Jupiter Program, File 1306-58, IRBM/ICBM Deployment of Squadrons and Units, Box 280, A1 1F, Record Group 340, NARA-MD and "Wilson Gives USAF Lead Role For Missiles Development, Use," *Air Force Times* (December 1, 1956), 45. Del Papa and Goldberg, *Chronology*, (unpaginated) 20 also reveals details of the decision.

[78] Grimwood and Strowd, *History of the Jupiter Missile System*, 34-36 and Andreas Wenger, *Living with Peril: Eisenhower, Kennedy, and Nuclear Weapons* (Lanham, MD: Rowman and Littlefield Publishers, 1997), 152-53.

[79] Eisenhower quoted in Rosenberg, *USAF Ballistic Missiles*, 9. For more on the Bermuda Conference, see Matthew Elderfield, "Rebuilding the Special Relationship: the 1957 Bermuda Talks," *Cambridge Review of International Affairs* 3, No. 1 (1989), 14-24.

[80] William White, "Ike Letting Missiles Lag, Asserts Symington as Democrats Attack," *Atlanta Constitution*, February 11, 1956, 1.

[81] Neufeld, *Ballistic Missiles*, 165-67.

[82] Rosenberg, *USAF Ballistic Missiles*, 12-15.

[83] Max Rosenberg, *Plans and Policies for the Ballistic Missile Initial Operational Capability Program* (USAF Historical Division Liaison Office, February 1960), 93, Call # K2624, IRIS # 480640, AFHRA. Although many attribute this decision to the desperate need to have an operational mission (see beginning of chapter 4), Maurice "Cris" Cristadoro believed there was a more sinister motive, claiming that "ARDC was to run the operational aspects of missiles until LeMay decided he wanted to control them -- when Schriever started to get into the target assignments." Maurice Cristadoro, interview with Neil Sheehan, Box 15 of 21, Sheehan Papers (accession 23821), Manuscripts Division, LOC. Cristadoro, who served under Schriever as the program director for Atlas, remained focused on engineering and development until his retirement from the Air Force as a brigadier general on February 1, 1970.

[84] Rosenberg, *USAF Ballistic Missiles*, 15. Taylor's attitude reflected the concepts of Flexible Response that he later refined in his book, *The Uncertain Trumpet,* as discussed in chapter 5, endnote 5.

[85] "Air Force in Control," Air Force Times (March 15, 1958), 8. "SAC to Control Strategic Missiles," *Air Force Times* (December 7, 1957), 4.

4. RUSH TO ALERT: INTENSIFYING MISTRUST AND ENMITY[1]

U.S. Air Force Colonel Thomas McGehee contended in his 1955 Air War College thesis, that "in any race for qualitative weapons superiority the advantage gained is apt to be temporary and even lost if the weapon system is not operational almost simultaneously with its scientific development."[2] Many Americans, including some political leaders, agreed with him. Thus, after the Soviets launched Sputnik 1 and Sputnik 2 in November 1957, "a form of 'mass hysteria' coupled with frustration . . . spread rapidly over the political, military and scientific circles throughout this country. The public began to clamor for drastic emergency action in a desperate struggle to overcome our seemingly secondary position in technological development."[3]

The Air Force fiercely contended with the other services to maintain control of the ballistic missile throughout this turbulent time. Malcolm MacIntyre, Under Secretary of the Air Force from 1957 to 1959, remembered, "Sputnik went off in October 1957 and there was great criticism about our missiles not being in place. As a matter of fact, around that time we had about six failures with the Atlas. There was a great cry to cancel the Atlas program [and give the ballistic missile program to another organization], which we [the Air Force] resisted."[4]

Due to this intense political and social pressure, the Air Force began the process of making the ballistic missile operational even though it had not yet successfully completed a full range launch. Gary Alkire, a young lieutenant at the time,

remembered that the Atlas was "not ready to go." The Air Force, he contended, pushed Atlas into operational service because it desperately needed a squadron of missiles that the service could call operational.[5] Therefore, on October 31, 1959, following a successful long-range launch, General Thomas Power declared the Atlas missiles at California's Vandenberg Air Force Base to be the first operational ICBMs.[6] His decision would have long term, negative repercussions on the credibility of missiles in the Air Force. The Atlas and other early liquid fueled missiles were very unreliable and quite dangerous because of the requirement for liquid oxygen. Between June 1, 1963 and May 14, 1964, four separate Atlas F sites, three at Walker AFB, NM, and one at Altus AFB, OK, had explosions traced to liquid oxygen, leading to the liquid fueled missiles being removed from service after only a few years and providing a rationale, no matter how thin, for Air Force pilots to denigrate and disregard later missiles.[7]

Power's declaration began a year of frustration for Air Force missileers. After the general deemed the Atlas operational, Bernard Schriever's team could not consistently replicate the successful launch. Major Benjamin Bellis, who worked for Schriever during this time and later retired as a lieutenant general, observed that when a missile was launched without problems, "we didn't have a record of how we made it successful . . . . So we were having random success, the worst thing that can happen to you because you know you got it right but you can't repeat it."[8]

Random success also created credibility problems for other Air Force missiles. As noted previously, the Air Force rushed the Thor and Jupiter IRBMs into operation

and so these missiles, like Atlas, struggled with credibility issues. Colonel Bill Large, a highly decorated pilot who was then serving as the Assistant Commander-in-Chief, Strategic Air Command, for Missiles, recalled taking the members of a SAC commander's conference to a Thor missile launch. After a leak in the missile system caused the launch team to cancel the launch, Large remembered that "all of the SAC guys said, 'We told you so. Missiles are no good, are not here to stay.'"[9] Some missile crewmembers expressed similar concerns with the Atlas' capabilities, although they did not attempt to be so prophetic. Staff Sergeant Donald Glantz, who served as a missile guidance technician at Vandenberg from 1958 to 1964, remembered that the Air Force "eventually worked out most of the bugs and we had many successful launches, but it was not a reliable military weapon." He also believed "these missiles were more of a symbolic deterrent than a credible threat."[10]

The decision to place the Thor and Jupiter IRBMs in the hands of American allies created other difficulties as well. On March 25, the last day of the 1957 Bermuda Conference, President Dwight Eisenhower and British Prime Minister Harold MacMillan announced an agreement to deploy Thor missiles to England. Six months later, in September, the Air Force successfully launched the first Thor in the United States. The Air Force transported the first Thor to England by air on September 19, 1958, but the Thor missile was not declared operational until December 16, three months later, when a Strategic Air Command crew successfully launched one from a site at Vandenberg.[11] Even then, the Thor was not fully ready. The first squadron was to be operational in

December, 1958; the second in June 1959, the third in October, and the fourth in March 1960. Nevertheless, the Air Force did not turn over a complete Thor squadron to the United Kingdom until June 6, 1959, six months behind schedule.[12]

The delays in Thor's operational status created friction between the United States and Great Britain, but this discord was nothing compared to the problems the Jupiter missile created with other American allies. The United States had originally planned to place Jupiter squadrons in several allied nations belonging to the North Atlantic Treaty Organization, including three in France, but Charles DeGaulle's government refused to accept the missiles on French soil despite the fact that France had previously requested U.S. nuclear missiles. Since the missiles were already designed and being constructed, the United States worked to coordinate new locations for the IRBMs in the Far East and on the European continent or North Africa. Concerned that the State Department might not find allies willing to accept the missiles on U.S. terms, the Department of Defense selected Elmendorf AFB, Alaska, as the fallback option.[13] Diplomats finally worked out deals with Italy, in August 1959, and Turkey, in late October of the same year, to place Jupiter missiles in these countries, but political and technical struggles pushed back operational dates and further damaged the missiles' credibility.[14]

When historians asked several former SAC generals about integrating early missiles into the force, General David Burchinal recalled, "We covered all their targets with manned airplanes initially; Thors and Jupiters, I think, were all backed up with

manned airplanes." After General Leon Johnson agreed, Burchinal continued, "One never counted on them as an independent strike force sufficiently reliable in themselves." Atlas did not fare much better in their minds. Curtis LeMay remarked, "The accuracy of the first missiles was nothing to jump up and down about." General Jack Catton recapitulated the theme, "These idiots pulled me down into the basement there and started explaining to me that we were going to shoot this rocket, that was going to go 5,000 miles and it was going to be within . . . I guess about a mile of the target." Catton continued, "There you are, shooting a rocket like a cannon, and it is going to go 5,000 miles and be within a *mile* of the aiming point. That was just hard for me to comprehend. That makes you apprehensive. Then there was General LeMay's point about being tested fully, and being *sure* you know what you are doing." He did not say, but it was likely that all of the ICBMs were 'backed up" by manned aircraft as well since most of LeMay's "bomber men" refused to trust missiles. Tellingly, in 1958, LeMay remarked, "Initially, strategic missiles will *augment* our offensive striking forces. As we learn more about them and know that they will be able to accomplish the job they are designed to do, they will replace a portion of our manned bomber force." He continued, "However, as far into the future as I can see, I feel we must have integrated forces of both piloted and unpiloted systems to give us greater flexibility in our operations."[15]

To make matters worse, Schriever had employed a concept he labeled concurrency to complete the missiles as quickly as possible. Previous work on

aerodynamic missiles used what Major Bellis "called the three-step stage. We would do some handmade prototypes, and then we would come out with an experimental model. After we had demonstrated that, then we would go into a production prototype. What happened between the X version and the Y version is that we would take the new technology that was now available and incorporate it and literally create something new."[16] Only after validating the concept would the engineers move on to production.

Richard Jacobson, a veteran of Schriever's process, later explained how concurrency was different. "You develop and produce all at the same time, and you deploy as quick as you can though you may not have finished development."[17] Colonel McGehee explained the reasoning behind the change, contending that in aircraft development, "the maximum efficiency of the system is gained after a period of trial and error in which experience of personnel is increased, equipment is modified or augmented and operational concepts are tried and adopted or discarded." On the other hand, McGehee argued, "in an ICBM system there is no opportunity for this trial and error period. The components of the system must be managed so as to guarantee simultaneous availability of missiles, warheads, operational and maintenance personnel, supplies and equipment, logistics concepts, launching sites and operational concepts and plans."[18]

Concurrency was not a new concept. According to Department of Defense historian Elliot Converse, the Army had tried the idea "to support the war in Korea and

to ready the Army for a possible war with the Soviet Union . . ., but the acceleration complicated production and resulted in some inadequately tested systems that performed poorly in the field."[19] The Air Force had used the concept as well, in World War II, with the B-24, the B-26, and the B-29 bombers, but Converse contends that "accelerated acquisition allowed little or no time for testing the system prior to the initiation of production. Changes to improve performance or correct deficiencies were made after production had begun or was completed, and special modification centers were established for this purpose."[20]

The initial iterations of concurrency involved known technologies produced en mass during a war, but had still struggled with problems. Major Bellis described how using concurrency for missiles created even more concerns: "In the development part of the program, the problem of quality control was the harshest we had ever really gotten into because in the manned aircraft, the pilot can work it out. If the anomalies of the thing do not work out, we have a pilot to fix it; not so on ballistic missiles." He further admitted that, "the quality just has to be to a 'T', plus we had not set up a system test area to test the whole system. We had tested the propulsion system; we had tested the reentry; we had tested the subsystems, but we didn't have a system test area." After putting the system together, Bellis recounted, the designers found "that the subsystems looked fine, but wouldn't play as the test system."[21] When the Air Force began building the missile launch centers, the problem worsened. Contractors who were used to building to specifications defined in inches were now given standards

measured in thousands of an inch. Since it was very unlikely that any of the construction workers had even seen a missile, they found it difficult to understand these tight tolerances. The workers' frustration with these exacting standards, added to complaints over the rushed timeline and sometimes perplexing leadership, led to conflicts between labor unions and government overseers and several unions began strikes over the issues.[22]

Another problem with concurrency was the ever-changing requirements. "The engineers kept finding new things in ballistic missiles that they wanted to make sure they got in that first operational site . . . ," Bellis recalled. "What we found was that we had been approving changes to go into the Thor from the test experience, from the development experience, from the technology advancement experience, and so we were directing the contractors to put changes into the program, into the missiles and then the corresponding changes into the ground support equipment," he commiserated, "--all the testers and evaluators and controls and all those kinds of things that go with it, and the depot tooling, and the spare parts, and the tech manuals. You try to keep them all coming together. We found nobody was keeping it together."[23]

To resolve the difficulties, Bellis enacted what he later termed configuration control. "We went back and got into a specification program to define more specific detail so we could have a configuration baseline and then keep changing that baseline as we went along and know that the change was going to change at a certain numbered

missile." The baseline allowed the Air Force to define "where the modification would be done and who was going to do it; the spare parts that had already been produced versus the new spare parts; and the tech manuals and the change sheets to the tech manuals, because we were going to have both configurations in the field at the same time . . . . Then you get changes on top of changes on top of changes on top of changes."

Because this process still did not work as Bellis had hoped, he later amended the system to what he called configuration management, but "found out we had no knowledge of what the status was with respect to all of these change decisions. We would find some change kits going in ahead of schedule because they had shorter leadtime [sic] than earlier approved changes. So we had stuff that wouldn't fit because the earlier change hadn't been put in that gave you the required fit." After many adjustments, Bellis' team was finally able to develop a more effective system.[24]

Nevertheless, Bellis found the Atlas missile program struggled with the same problems that he had seen in the Thor, except the situation was even more flawed. Because the Air Force decided to upgrade the Atlas at the same time as it placed the missiles at operational sites, the service began building three different configurations of Atlas missiles at the same place at the same time, compounding the problems.[25]

Bellis complained, "We had lost control of the Atlas. We were installing systems in Cheyenne at Warren Air Force Base for the Atlas D, which was [a] soft, horizontal [deployment] like a Thor. Now the E was a different configuration, and then the F was

the hard silo vertical configuration." All were being placed into operation at the same time. What Bellis found astounded him. "We found the part numbers were wrong; we found the discipline of dash number--you have a part number and then the dash 1 or dash 3 or dash 5 tells you the change configuration. The log books were not up to date. They didn't even tell you what [change configuration or part] was there." This uncontrolled mish-mash led to the random success that infuriated Bellis, further hurting the credibility of the missiles in the minds of many key Air Force leaders as well as those assigned to operate the missiles.[26]

The rush to put missiles on alert led to other problems as well, including the selection and training of personnel. In early 1958, Colonel Allen Stephens, the Chief of Staff for the 1st Missile Division, expressed the common worry from his organization that "all missilemen must be in the genius category." Many who were planning the missile enterprise for the Air Force had the same concerns. Lieutenant Colonel Leroy Ferguson once asked a group of General Schriever's missile planners, "Do we need a bunch of Ph.D.'s to fire this thing?" The response was not encouraging. Otto Glasser, program director for the Atlas quipped, "If you do, we've failed."[27]

James Baar and William Howard, in *Combat Missileman*, quoted an unnamed Air Force officer as saying "Our research people and the factory people still wanted each crew made up of nine stars, every man [equal to] a Ted Williams [one of the greatest hitters in baseball history]." The officer continued, "but you can't find nine Ted

Williamses, and even if you could, you couldn't pay 'em. So we had a lot of give and take and ended up with some more reasonable requirements."[28]

After discussing the concern with Jim Dempsey, Convair's chief engineer for the Atlas program, Colonel Stephens was reassured that the Air Force was tailoring the missiles to meet the "personnel qualifications and limitations" of the thousands of airmen already serving to maintain and operate the current bomber fleet. Glasser agreed with Dempsey. "There is no real reason why the missile should be any more complicated than an airplane," Glasser said. "It isn't learning to fly that makes a good pilot. Learning to fly is easy. It's judgment that is important. It's who can make the right decision quickly. This is what you can't put into a machine, but what the combat missileman is going to have to be able to do."[29]

Glasser was right about judgment being a necessity. The people selected to operate the new missiles would hold a position very different from any other. While they would hold the power to devastate large areas of land, killing or maiming almost everyone in the target area and destroying most of the buildings and natural habitat, they would hold no authority to determine when their weapon was used and often were not aware of the target that their missile or missiles were aimed toward. In addition, because of their isolation, missileers had little contact with the outside world and thus could not verify or prepare themselves for, other than through official channels, any situation leading to a launch command. Alerts were tedious, preparing for and awaiting a dreadful command that they hoped would never come, but knowing

that they must be prepared to respond to if it came. The bomber pilots held a similar responsibility, but would at least have a few hours of flight time to reflect on their awesome duty and to ensure their mission was ethical before launching their bombs.

General Power, in a message to the first missileers, expounded on the problem of finding the right people: "Not only because of the complexity of the weapon systems involved but primarily because of the unprecedented nature of combat missile operations, our main problem . . . is the manning of our rapidly expanding missile force with personnel who meet the stringent qualifications demanded of SAC missile combat crews."[30] Power detailed additional specifications required of the new missileers. "They must be thoroughly trained in the highly technical aspects of a revolutionary new science. They must possess the superior physical, mental and moral attributes required of the military man, especially in this day and age, and above all," he declared, "they must be imbued with an exceptional degree of maturity and dedication in order to be worthy of the unparraled [sic] responsibilities which are assigned to them."[31]

Since the pilots who had flown and fought in World War II and Korea had proven themselves capable in many of these aspects, as had the enlisted aircraft maintainers, Strategic Air Command turned to them to fill the billets. Colonel William S. Rader, the first commander of the Air Force's first missile wing, strongly recommended this action, stating, "The operation of this mixed force [of manned and unmanned strategic weapons in the Air Force] will pose many problems. . . . Obviously, the man trained into missiles with the most experience and best background in the

flying game should be the best qualified to solve these problems." Rader further advised, "These factors dictate a need for manning policies whose criteria provide for rated personnel in all key missile management functions and a minimum of 50% rated personnel for all officer positions exclusive of the combat support group and medical group functions."[32] General Power levied the necessary airmen from the Strategic Air Command units around the world. He requested volunteers, but volunteer status was not a requirement. The key requirement was "excellence," meaning that, for officers, the selectee had to be evaluated as "outstanding" or "very fine officer," the top half of a four level rating system that the Air Force used at the time. Non-commissioned officers who were selected must have been assessed as above average and "demonstrated leadership and superiority." All volunteers were to be career servicemen, not in their first enlistment.[33]

This decision resolved one problem and a considerable one at that, but it created others. Taking large numbers of rated officers and qualified non-commissioned officers from the bomber fleet entailed losing valuable resources from what the Air Force considered their most critical mission--flying. Initially the Air Force planned to find "compatible [people], capable of accepting the most uniform behavior pattern" who would serve in missiles their entire career. Lieutenant Colonel Anderson advised, "The launch officer will find his exercise of ingenuity largely restricted. The target is preselected. Weather is no longer a major factor. Where once military leaders implemented battle doctrine even at small unit level by varying their techniques, there

is no requirement for this in ballistic systems. All this will mean a loss of the customary incentives." He further predicted, "The missile man will be a student of standard methodology. The highly individualistic personality, capable but unorthodox, loses his special value in this rigid situation. There is a new market for the compatible person, capable of accepting the most uniform behavior pattern. Monotony should flourish in this atmosphere . . . ." There was a concern that not many pilots would "flourish" in such a monotonous environment, which proved true.[34]

Instead of resolving the potential concerns, the Air Force moved flyers into the missile field, but only on a rotational basis to give the pilots career broadening experience, not as a new career. Moreover, because unit commanders selected the new missileers, it is doubtful that they sent their absolute best. Strategic Air Command wanted good men in missiles, but the command's leaders would not consider losing volunteers to missiles as an excuse for a flying wing performing poorly on an exercise or inspection and the wing commanders who were selecting the new missileers knew this. Colonel Rader acknowledged this problem, complaining to his boss that "there have been cases where the officers were assigned primarily so that they, or a member of their families, might be in close proximity to a general hospital, . . . due to grounding action for physical reasons, . . . [and because an officer] was close to mandatory retirement."[35]

To prevent or at least reduce losing skilled rated and maintenance personnel from the Strategic Air Command flying community, General Power's staff then decided

that the flyers selected to rotate through missiles would come from overseas or school assignments, on their way back to the flying career field. Others were pulled from units with outdated aircraft that were intended to be deactivated. This way, the command retained their best flyers and maintainers in important operational units, but were able to man the new missile units.[36] Robert Kelchner, who retired as a Chief Master Sergeant, reflected on his personal experience as a knowledgeable radar technician with more than two years remaining on his enlistment. "When I was identified for missile training in June 1961, I had been on active duty for over five years. The SAC personnel at Offutt AFB [in Nebraska were] in the process of fielding a huge weapons system. The Minuteman ICBM was to have at least six wings at six different bases. To man these bases, the Air Force had decided to shut down all the medium bomber B-47 wings." He then explained the reasoning behind the process, "The transfer of all these personnel to Minuteman was to get their experienced operations and maintenance people. It was a delicate balance of maintaining operational bombers until the Minuteman became operational."[37]

Concerned over losing such a large percentage of the flying force, even temporarily, the Air Force again revised the standards for selecting missileers. The service began to recruit young engineers to serve as deputy missile combat crew commanders, who would work under the guidance of a more senior crew commander.[38] The Air Force also developed and began giving aptitude tests to recent enlistees to weed out unproductive or undesirable personnel from the service. The

service used these new tests to select enlisted personnel with backgrounds and aptitudes in electronics for important missile positions.[39] Frank Dlugas, who worked as an Electro-Mechanical Technician for the Atlas F in 1961, remembered that he was selected for missile training after he scored very highly on the general aptitude test and almost 100 percent on the mechanical and electrical portions.[40]

The new engineers reduced the need for personnel with operational flying experience to serve in missiles, but the change did not imply that Air Force leaders no longer wanted rated missileers. Howard Tarleton, who began working in missiles in 1963 after seven years as a navigator, recalled, "They [Strategic Air Command leaders] were trying to get people with operational backgrounds. Although many of the assignees were non-rated, they hoped to get experienced people (rated) to bring knowledge and leadership to the Minuteman program."[41] Leon Hojegian remembered that, at Plattsburg Air Force Base in New York, all key leadership positions were filled by rated officers, leaving no leadership opportunities for the non-rated missileers.[42]

The debate over whether missile units should be filled with rated officers or not raged for years. However, the Air Force never considered making missiles a rated position, which would have presumably given missiles the same status in the Air Force as aeronautical positions, even though it would never have achieved the glamour of flying.[43] Either way, the result was the same. Most rated officers who served in missiles did not consider themselves missileers. Rather, like Colonel Floyd Wikstrom, the first wing commander at Malmstrom AFB, Montana, who "considered myself a

rated officer with missile experience," the flyers remained focused on flying.[44] The situation was made worse as all rated officers had to maintain their flight qualifications during missile duty, but missile leaders above the crew level were not required to be trained on missile operations.[45] Thus, most Air Force personnel equated the leadership of missile units with that of "support" units rather than operational units as the Air Force required all leaders in flying units to be flight qualified.[46] The overall impact of this unsettling standard was that many of those who did consider themselves missileers saw themselves as less viable for promotion than their flying peers, not an unreasonable view. In fact, Colonels William Brooksher and Jimmy Scott, in a survey of missileers conducted for a National War College study, discovered that "there is practically no demand for general officers who are not rated. Within the operations field in SAC, rated officers are a prerequisite for command . . . . As long as the operations command structure combines both missiles and rated organizations the demand for missile general officers will continue to be negligible." Therefore, when the Congressional and public pressure to build and operate missiles diminished after the Cuban Missile Crisis, these new missileers found very few powerful allies in the Air Force.[47]

Once selected into missiles, the first missileers faced many difficulties. Duty with the Thor and Jupiter IRBMs presented the most frustrating duty. Because the IRBMs would be deployed on foreign soil, the U.S. government agreed to allow NATO allies to operate them, leaving U.S. Strategic Air Command personnel responsible for

control of the nuclear warhead, but without the opportunity to operate the missiles on a daily basis.[48]

The initial state of affairs for missileers in the United States was not much better. The first missileers traveled to their new assignment to discover that the missiles they were to oversee had not yet been built. Moreover, the Air Force had not finalized plans for operations, so the service had no training program in place. For these reasons, many missileers sat in the offices of their new squadrons for several months with no real mission. In some instances, they were allowed to visit the construction sites where their missile silos were being built, but this was not always the case.[49]

The first missileers learned their profession by watching and listening to the engineers who were designing and building the missiles. When the Air Force did begin instruction, it paid Convair, Douglas, Burroughs, General Electric, and other missile contractors to conduct training programs at the manufacturers' factories. The instructors prepared training manuals as the courses progressed, updating them as the missiles evolved and changed. After the missileers studied the basics of how the missiles worked, spending up to three months at one or more of the plants, and the particulars of their duty position, they would be assigned to a crew. The crew traveled to Vandenberg AFB together where they learned to operate the missile as a team.[50]

Major John Merriman's experience illustrates the training early missileers endured. A decorated bomber pilot with combat experience in both World War II and

Korea, Merriman volunteered for missiles and was assigned to the Atlas program at Wyoming's F. E. Warren AFB. After traveling to the base, he was ordered to attend missile training at the Convair plant in San Diego. He found that the school was actually located in the former Bernard Street Grammar School.[51] Once in the school, Merriman worked to master the material, even attending the night classes held for the non-commissioned officers that would be working with him in addition to his own coursework. Still, Merriman struggled with the advice that one of his instructors gave him. "Everything that I'm telling you . . . will be true about the [training] missiles you will work [with] at Vandenberg [AFB]. But watch out. It won't be true necessarily about the [operational] missiles at Warren [AFB]." The Atlas that the students were working with every day was an A model, but the models they would be working with in the field would be the D model, for all practical purposes a completely different missile. Furthermore, because the missiles were being upgraded daily, the instructors could not keep up with the changes.[52]

Once the contracted instructors deemed the new missileers competent on the system itself, the graduates were assigned to a crew and transitioned to Integrated Weapon System Training at Vandenberg AFB. There the recently assembled crew learned how to operate and maintain the missile. Major James Brewer developed the training program for both the Thor and Atlas programs. He struggled with the same problem that the contracted trainers did -- developing training for weapon systems that

the Air Force was still developing and still determining how they would fit into operational plans.[53]

Before he was given this difficult assignment, Brewer was a pilot flying in England. He "understood that 'Missiles' had something to do with putting mice or dogs into capsules and launching them toward space." Arriving at Vandenberg, he was made Chief of Thor Integrated Weapon System Training. He complained that he knew nothing about missiles or missile training, but Brewer recalled that his new boss replied, "Don't worry. No one else knows anything about missile training either. We are all learning here for the first time."[54]

Brewer quickly ascertained that "some eight different missile systems, each completely different but each with many missiles and extensive manning, was already in or planned for the [training] pipeline; and each missile had an inflexible deadline to become operational." His first duty was to instruct the launch crews and maintenance teams at Vandenberg. These newly qualified missileers then trained the crews assigned to manage the Air Force's operational missiles. Brewer recalled that, under the concept of concurrency, "development step number fifty could not wait for number forty-nine to be completed -- indeed not even for step nine." Consequently, "the inevitable problems and changes [did not] cause ripples--they cause[d] shock waves!" One of these shock waves included the missile blowing up during a training simulation, destroying the launch pad that Brewer had planned to use for future training. To ensure the personnel could become trained and proficient and appropriate

documentation prepared in spite of such problems, he and his two person staff worked fourteen hour days, seven days a week.[55]

Brewer's reward for creating a successful training program for the Thor missile was a second assignment to develop a missile training program -- this time for the three Atlas missiles, models D, E, and F. The Air Force now called the program Operational Readiness Training. Brewer discovered that, although the missiles all carried the name Atlas, "they were as different as any three different types of bombers." Since he was to create the three training programs concurrently, he was now allowed a staff of four--two captains, a sergeant, and a secretary. Brewer believed this number was not adequate to accomplish the job, so he coordinated with the Ramo-Wooldridge contractors to provide four additional personnel. As he had learned with the Thor program, "slow and painful progress was [often] wiped out in an instant by a change of design, change in priority for use of a facility, or a facility disaster."[56]

Since concurrency forced the Air Force to also test and refine the missile systems during training launches, "on every launch the Launch Control Center (LCC) was crowded with [senior leaders] from SAC or some other headquarters, to the detriment of students and training." As a result, Brewer's own assessment of his training efforts were "nothing to brag about. There were simply too many people to be trained, too short a time, too few launch facilities available for training, and too many other demands and problems on the launch facilities available." Thus, the decision to rush

missiles into operation before they were ready continued to frustrate the Air Force's incorporation of the new weapons.[57]

Even after the new missileers moved to their operational squadrons, they faced unique problems with training. As previously noted, technical documentation was atrocious.[58] Moreover, there were no qualified personnel to provide the continuous training and evaluation that the Air Force determined was required at the squadron level. Lawrence Hasbrouck remembered his first experience as a missileer in the 66th Strategic Missile Squadron at Ellsworth AFB in 1962. "I was selected as an instructor because I was told to 'pick a desk.' The one I chose was manned by a Lt. Colonel, who immediately said, 'Captain, welcome to the 66 SMW. You are an instructor!' I replied, 'Of what, sir?' He answered, 'Of this new weapon system.' My next question was, 'What if I had chosen one of the other desks?' If I chose the middle desk, I would have become an evaluator; [if] the last desk, just a crew member." Because no one had any experience, instructors and evaluators were often chosen at random and had no better qualifications than the average crew member. This situation improved as the manning situation got better, but it presented another concern over the quality of training and the credibility, as well as the capability, of the overall missile program.[59]

In *History of the Jupiter Missile System*, Army historians Grimwood and Stroud contend that the effort to create the training plan for Jupiter was even more grueling than either the Thor or Atlas. "Not only did the Agency have to struggle to get a training plan formulated, but they [sic] had to fight for the very life of the JUPITER

program." Then, in 1959, when the United States decided to have allied forces control the missiles, the Army had to remove all Restricted Data, highly classified material that had been an integral part of the training, from the program and try to make the training comprehensible to non-native English speakers.[60]

The rushed deployment and confusion caused by concurrency also wreaked havoc with the initial operations of the missiles. Staff Sergeant Glantz recalled that "the original Tech[nical] Orders and operational and maintenance procedures were so bad that new ones had to be written from scratch. It was a very lengthy, expensive operation with teams of engineers, tech[nical] writers and airmen working [twenty four hours a day, seven days a week]."[61] Ronald Bishop, a captain at the time, agreed that "in the early missile days . . ., 'growing' pains . . . included incomplete tech data, checklist errors, some evaluation issues resulting from the noted problems, a steep learning curve for not only the crew members but [also for] the squadron and wing senior staff officers who were aircraft oriented, and for all new SAC members, an initial shock at the standards that required mistake free performance."[62]

An early history of the 706th Strategic Missile Wing, the first Atlas wing, reveals that the rush to deploy the first ICBM squadrons caused even more complications. In May 1956, the Air Force decided to place one and one half of the four Atlas squadrons at Cooke AFB (renamed Vandenberg AFB on October 4, 1958), with the remainder to be assigned to the next base chosen. The next May, in 1957, the Army's Fort F. E. Warren was chosen for redesignation as an Air Force base and as the home of the other two

and one half squadrons. Shortly after this decision, the Air Force Ballistic Missile Division (AFBMD), formerly the Western Development Division, determined that dividing an operational squadron across over 1,500 miles was not as efficient or feasible as it first seemed. Since the Air Force chose to increase the number of Atlas squadrons at about the same time, the AFBMD authorized Warren AFB to receive four complete squadrons rather than leaving a squadron divided.[63]

The wing began preparing to build its first Atlas D missile site as Major Ferguson planned, in what became known as a two by three design. In this configuration, the goal was to place everything the squadron needed in the same operating location, reducing logistics and maintenance problems. Two launch control complexes -- where the missileers would control their missiles -- were situated about seven miles from one another. Each launch control complex controlled three missiles that surrounded the control complex. The plan included storing four additional missiles nearby so that, after launching an attack, missileers would be able to emplace and prepare at least three additional missiles for a second launch sequence. While Army Corps of Engineers began building the missile site, however, the Air Force decided to cut costs by reducing the distance between the control centers to 1,000 feet and consolidating some of the structures.[64]

Soon after, Air Force leaders grew concerned that placing the missiles so close to each other left them vulnerable to destruction from a single Soviet missile. Therefore, in May 1958, a year after the process began but before significant work on

the first squadron's missile complex had even started, the Air Force changed the Atlas squadron configuration again. From May on, all squadrons were to be built in a three by three concept: three launch control centers, built on separate sites, each controlling three missiles apiece. Therefore, each missile control center would be placed in separate plots of land, separated from the other launch control centers by fifteen to eighteen nautical miles. The new concept reduced the chances of the site's missiles being destroyed in a single attack, but sacrificed the capability to provide a backup guidance facility for the missiles.[65]

Although the reasoning is not documented, the Air Force chose to retain the original two by three orientation for the 564th Strategic Missile Squadron, so Strategic Air Command built the 564th missile site as originally designed rather than reducing its size. Not long after, Air Force leaders determined that trying to deploy and launch a second round of missiles was unrealistic, so the extra missiles and support equipment for this purpose were consolidated with other wing assets instead of being placed with the 564th's missile site. Therefore, despite the fact that they controlled the same missiles, Warren AFB's first two missile squadrons were built to completely different specifications, controlled different numbers of missiles, and had differing operating procedures.[66]

In another stunning change, the Air Force decided to begin co-locating single Atlas squadrons with Strategic Air Command bomber wings -- the first near Omaha and Spokane -- in order to reduce the costs of personnel and support facilities rather than

continuing to build separate Atlas missile wings. Bewilderingly, at the same time, service leaders elected to place four Titan squadrons, with missiles in hardened silos, near Lowry AFB in Colorado to ease logistical support from the contractor's plants. Consequently, as the Air Force separated the Atlas squadrons to assimilate them into the larger Air Force organization, it segregated Titan under a single leadership structure.[67]

The 706th Strategic Missile Wing historians reflected their wing leadership's frustration, noting that "the concept of concurrency . . . was apparently causing a great deal of confusion . . . . Day to day changes in various projects were frequent. Pending actions were equally commonplace. In short, then, everything was in a rapid state of flux."[68] Lieutenant Gary Alkire, assigned to the base as a civil engineer during this time, remembered that the change orders to the missile sites were as thick as the original contract.[69]

To continue the inadvertent trend of differentiating each squadron of missiles from the others, the Air Force decided to build a third Atlas squadron at Warren AFB, but scattered the nine missiles of this squadron, the 549th SMS, hundreds of miles apart. The dispersal was not the only difference. The wing's first two squadrons used the initial Atlas D missile, but the third squadron was assigned the newly developed Atlas E missile. The new missile eliminated the need for the earlier missiles radio towers and guidance buildings by means of a better guidance system, but once again considerably changed the operations and maintenance requirements.[70]

The constant changes meant that each squadron had slightly differing operating methods and capabilities. The wing's first squadron stored its missiles horizontally in a "coffin-shaped" concrete structure that was raised for launch after sliding the roof of the coffin away from the building on steel railings. The second squadron's "coffins" opened more quickly as the roof separated in the middle and the two halves slid to the side before raising the missile. In the third, Atlas E squadron, the missiles remained horizontal, but placed just underground so that the roof of their "coffin" was surface-level. For the third squadron, the Air Force also upgraded the launch control center, placing it in a heavily reinforced underground room near the launcher rather than in an above ground block house like those in the original two squadrons."[71]

In late 1959 and early 1960, the lack of standardization became even more problematic as the Air Force rushed the Titan and the smaller, solid-fueled Minuteman into production, even though neither had yet been successfully tested.[72] Then, in December 1961, the service upgraded the Atlas to the F model, the third iteration since the missile was declared operational twenty-five months earlier. The Atlas F allowed missileers to store the RP-1 (Rocket Propellant) fuel in the missile rather than in nearby tanks. A concrete lined cylindrical hole--an underground silo--now protected the missile and allowed it to remain upright even when it was below the surface while a subterranean tunnel connected the missile to the nearby launch control center.

Each of these advancements helped to better protect the missiles and to improve their operational capability, but they also ensured that each squadron had

unique requirements that prevented crew members from moving from site to site without retraining. The rush to place the missiles in operation as early as possible had prevented the Air Force from implementing these critical changes until after the first missiles were installed, thus costing missileers the benefit of standardized training and operations.[73]

The constant changes, along with labor union strikes and other difficulties, delayed the building of the missile squadrons by up to six months. In part because of Congressional concerns, General LeMay, now Vice Chief of Staff, inspected the new missile sites in June 1960. He discovered a management nightmare. "Lines of authority crossed and recrossed in an administrative maze. There was no single recognized authority at any level. Construction contractors were receiving conflicting instructions from as many as seven separate agencies. Decisions that should have been made on the spot were in process for weeks." Stepping in decisively, LeMay established a Site Activation Task Force, under the control of a single Air Force colonel, at each site to correct the problems, but missiles dropped further in the influential general's esteem.[74]

Both LeMay and General Thomas Power, his successor as commander of SAC, had helped in the development of missile technology, LeMay early on as the Air Force's Deputy Chief of Staff for Research and Development and Power as commander of the Air Research and Development Command.[75] Thus, both knew the earliest missiles used untested technologies and were notoriously faulty, rarely reaching their target successfully. LeMay explained, “We ha[d] never fired a missile with an atomic warhead

on it. In other words we have never gone through the whole cycle. So there [was] always some question: will they work? We [had] done everything humanly possible to ensure they [would], and they probably will, but we have never done it."[76] Remembering his experiences from World War II, he continued, "Here again, in the back of one's mind, is that first outfit going into combat the first time and screwing up the mission. We practiced in SAC. We ran our war plan time and time again. The crews spent hours and hours and made hundreds of bomb runs on their target in the trainer. So we had confidence, but we didn't have quite that same confidence in the missiles."[77]

Missiles were not alone in their struggle for credibility. The B-52 bomber, entering the inventory in 1955, suffered from structural failures during high speed, low level flights, the exact mission that the aircraft had to perform since the Soviets had built a strong anti-aircraft system to defend against high altitude attacks. Significant problems, both strategic and engineering, plagued the Air Force's other bombers. With the manned strategic bomber already struggling to hold its position as the crucial element of the nation's strategic nuclear component, the Air Force tried to develop a supersonic bomber capable of carrying nuclear weapons, the B-70, but George Kistiakowsky, Eisenhower's Special Assistant to the President for the Science and Technology, argued that "it is not clear what the B-70 can do that ballistic missiles can't -- and cheaper and sooner at that."[78] Eisenhower was even more blunt. His staff secretary, General Andrew Goodpaster remembered "he [Eisenhower] was convinced

that the age of aircraft for actual use over enemy territory [was] fast coming to a close . . . [and the nation's leaders] were talking about bows and arrows at the time of gunpowder when [they] spoke of bombers in the missile age." The difference was that the political leaders sided with missiles, whereas LeMay and many other senior Air Force generals were "bomber men" and resisted the push to missiles. Experienced pilots themselves, they were not convinced of the bomber's obsolescence and did not want to replace bombers with the new missiles.[79]

The rush to bring missiles to operational status, while politically imperative, thus threatened the status of the bomber and created more doubts about the efficacy of missiles in the minds of Air Force leaders like General LeMay. The decision to rapidly develop, build, and man the new weapon systems concurrently created unnecessary confusion and discord while the perceived political bias favoring missiles over the Air Force's beloved bomber caused long-standing enmity. Rated officers, temporarily thrust into missiles during the new weapon's stormy launch, struggled with erroneous and ever-changing guidance, variable standards, and a perceived loss of status. Thus, when LeMay became Chief of Staff of the Air Force in July 1961, many Air Force leaders who followed him into significant leadership positions were not supportive of the new weapons, causing enduring and negative repercussions.[80]

Notes

[1] In terms dealing with nuclear weapons, a missile on alert refers to a missile armed with a nuclear warhead that is prepared for launch upon valid orders from the national command authority (the president).

[2] Thomas McGehee, "The Case for a Separate USAF Guided Missiles Command" (Thesis, Air War College, 1955), 17.

[3] Noel T. Cumbaa, "Training and Training Facilities for Strategic Missile Forces" (Thesis, Air War College, 1958), 3. See also John B. Hudson, "The ICBM Race" (Individual Research Paper, National War College, 1960), 1, who contends: "To say that the U.S. was shocked is a gross understatement. The overall psychological impact was such that it was probably a pleasant surprise to the people in the Kremlin who never for a moment lose sight of their political and psychological objectives." Both Cumbaa and Hudson were colonels in the U.S. Air Force when they authored their studies.

[4] Malcom A. MacIntyre, interview by George M. Watson, Jr. on September 26, 1983, USAF Oral History Program, MacIntyre, Malcolm, Box 1, File Air Force Oral History 1985, Eisenhower Presidential Library, Abilene, Kansas, 12. According to his military assistant, Eisenhower had considered taking the ballistic missile out of the military altogether and creating another Manhattan Project-like organization because of the earlier interservice rivalry. See Andrew Goodpaster, "Memorandum of a Conference With the President: October 8, 1957," *Foreign Relations of the United States, 1955-1957*, Vol. 14 (Washington, D.C.: United States Government Printing Office, 1990), 613.

[5] Gary Alkire, interview with the author on January 28, 2015. Alkire continued serving in the Air Force for 33 years, retiring in 1990 as a major general.

[6] John Bohn, *Unclassified History of SAC from 1946-1971* (Offutt AFB, NE: Office of the Historian, Strategic Air Command, 1972), 77, Call # K4318, IRIS # 502339, AFHRA. Bohn contends that "on 9 September [1959], a crew of the 576th Strategic Missile Squadron, which was assigned to the 1st Missile Division, launched the first Atlas missile, a 'D' model, from Vandenberg. The shot traveled approximately 4,300 miles at 16,000 mph. General Power, who regarded the shot as a 'tremendous milestone,' declared the Atlas to be operational." Bohn then documented that "the first Atlas D was placed on alert at Vandenberg on 31 October," less than two months after the launch.

[7] Charlie Simpson, "LOX and RP-1 - Fire Waiting to Happen," *AAFM [Association of Air Force Missileers] Newsletter* 14, No. 3 (September 2006), 1-6. George Watson, Jr., *The Office of the Secretary of the Air Force, 1947-1965* (Washington, D.C.: Center for Air Force History, 1993), 198, reveals that "early Atlas missiles had an 18 percent reliability factor." See also "Frostbite, Burns Among Hazards of AF Missile Handlers," *Air Force Times* (February 28, 1959), 11. Lieutenant Colonel J. W. Anderson, Jr., "What Reliability Means to SAC," in Department of Defense, *Proceedings, 6th Joint Military-Industrial Guided Missile Reliability Symposium*, 15-17

February 1960, 1-7 and 1-8, reveals some of the complexity of determining the reliability factor in several paragraphs.

[8] Bellis is quoted in Sheehan, *Fiery Peace*, 407. Bellis rose through the ranks to become a lieutenant general, serving in both research and development and leadership positions, including command of the Electronic Systems Division. He entered the Air Force in 1946 and retired in 1981 as the vice commander in chief of U.S. Air Forces in Europe.

[9] William Large, interview with Neil Sheehan dated May 26, 1998, Box 14 of 21, Sheehan Papers (accession 23821), Manuscripts Division, LOC. Large became the first wing commander of the 706th Strategic Missile Wing.

[10] Donald Glantz, email to the author dated May 2, 2014. Staff Sergeant Glantz served as a Missile Guidance Technician in the 576th Strategic Missile Squadron until he left the Air Force after his six year enlistment.

[11] Robert Perry, "The Atlas, Thor, and Titan," *Technology and Culture* 4, No. 4 (Autumn 1963), 474.

[12] Max Rosenberg, *USAF Ballistic Missiles, 1958-1959* (United States Air Force Historical Division Liaison Office, July 1960), 41-43 http://www2.gwu.edu/~nsarchiv/nukevault/ebb249/doc01.pdf. (Accessed November 6, 2013).

[13] For information on placing IRBM wings in Europe, North Africa, and/or Asia, see Donald Quarles, Memorandum for the Secretary of Defense, Subject: Air Force Requirements for Intermediate Range Ballistic Missile (IRBM) Bases in the U.K., Box 3, A1 1F, Record Group 340, NARA-MD. For the decision to use Elmendorf AFB, Alaska as an alternate location, see W. M. Holaday, Director of Guided Missiles, Memorandum for the Secretary of the Air Force, Subject: Future Deployments of the JUPITER IRBM Squadrons, dated May 9, 1958, and Charles McCorkle, Maj Gen, Assistant Chief of Staff for Guided Missiles, Coordination Sheet Subject: IRBM Deployment Site in Alaska, dated June 17, 1958, both located in File 1306-58, IRBM/ICBM Deployment of Squadrons and Units, Box 280, A1 1F, Record Group 340, NARA-MD. See also Rosenberg, *USAF Ballistic Missiles*, 40.

[14] James Grimwood and Frances Strowd, *History of the Jupiter Missile System* (Redstone Arsenal, AL: History and Reports Control Branch, Management Services Office, U.S. Army Ordnance Missile Command, 1962), 93-104. http://heroicrelics.org/info/jupiter/jupiter-hist/History%20of%20the%20Jupiter%20Missile%20System.pdf. (Accessed January 1, 2015).

[15] Richard H. Kohn and Joseph P. Harahan, eds., *Strategic Air Warfare: An Interview with Generals Curtis E. LeMay, Leon W. Johnson, David A. Burchinal, and Jack J. Catton* (Washington, D.C.: Office of Air Force History, U.S. Air Force, 1988), 102-03. During the time in question, Burchinal served as Chief of Staff, 8th Air Force, Deputy Director of Operations on the Joint Staff, and Deputy Director, then Director of Plans for the Air Staff. Leon Johnson, who had won the Medal of Honor during World War II, was the Air Deputy to the Supreme Allied Commander

Europe. LeMay was Commander in Chief of Strategic Air Command, then Vice Chief of Staff of the Air Force. Jack Catton served as chief of staff for 8th Air Force, commander of the 817th Air Division, and then commander of the 822nd Air Division. "The Big Hanger," *Air Force Times* (April 19, 1958), 8.

[16] Benjamin Bellis, interview by David C. Ladd dated January 10-11, 1985, 64, Call # K239.0152-1629 CY. 1, IRIS # 01070943, AFHRA.

[17] Richard "Jake" Jacobson, interview #4 with Neil Sheehan, April 20, 1997, Box 14 of 21, Sheehan Papers (accession 23821), Manuscripts Division, LOC. After working for Schriever, Jacobson continued his career with the Air Force, retiring at the rank of colonel.

[18] McGehee, "The Case for a Separate USAF Guided Missiles Command," 24. See also "Missiliers [sic] Trained Concurrently With Development of the Weapon," *Air Force Times* (December 8, 1962), 26.

[19] Converse, *Rearming for the Cold War*, 171.

[20] Ibid., 233.

[21] Bellis, interview by Ladd, 90.

[22] Harry Goldsworthy, "ICBM Site Activation," *Aerospace Historian* 29, No. 3 (Fall/September 1982), 160. Goldworthy's comments have additional credibility as he was not a historian, but one of the original Site Activation Task Force commanders. He served for thirty-three years before retiring as a lieutenant general from the position of Air Force Deputy Chief of Staff for Systems and Logistics.

[23] Bellis, interview by Ladd, 90-91.

[24] Ibid., 92.

[25] Ibid., 93.

[26] Ibid., 93. See also "ICBMs Held Least Tested of All Top U.S. Weapons," *Air Force Times* (May 15, 1963), 3.

[27] Allen Stephens, "Missilemen--Present and Future," *Air University Quarterly Review* 10, No. 3, (Spring 1958), 16. The article was incorporated as chapter six of Kenneth Gantz, ed., *The United States Air Force Report on the Ballistic Missile: Its Technology Logistics and Strategy* (Garden City, NY: Doubleday and Co., 1958), 99-108. Ferguson and Glasser quotes are from James Baar and William Howard, *Combat Missileman* (New York: Harcourt, Brace, and World, 1961), 37. Glasser was a lieutenant colonel or colonel at the time of the conversation.

[28] Baar and Howard, *Combat Missileman*, 55.

[29] Stephens, "Missilemen--Present and Future," 16. Glasser quoted in Baar and Howard, *Combat Missileman*, 37.

[30] General Thomas Power, unclassified message dated 301500Z ZFF6, "For all missile combat crews," in the personal collection of John M. Kiereck, Rochester, New York. Airman Kiereck served as an Electrical Power Production Technician in the 550th Strategic Missile Squadron in Schilling AFB, KS from April 1961 to July 1964 and obtained the message while on missile duty.

[31] Ibid.

[32] William Rader, letter to Lieutenant General Archie Olds, dated 18 September 1959, attachment to 706th Strategic Missile Wing Program Progress Report for the month of November 1959, Volume 2, , Call No. K-WG-706-HI V. 2, IRIS #0459767, AFHRC.

[33] "Missile 'Handful of Men' Myth Hit," *Air Force Times* (September 7, 1957), 1, 12. Baar and Howard, *Combat Missileman*, 57-58.

[34] William Anderson, Lt Col, USAF, "Organizing and Manning Ballistic Missile Units," *Air University Quarterly Review* 9, No. 3, (Summer 1957), 81, 85. Anderson served as the Deputy Director of Personnel, 1st Missile Division. The article was incorporated as chapter four of Gantz, ed., *Report on the Ballistic Missile*, 81-90. "Fewer Mistakes Now in Picking Missilemen," *Air Force Times* (September 18, 1963), 24, acknowledged that "pilots used to going places and doing things found it hard to adjust to the relatively stable life of the missile crew."

[35] William Anderson, Lt Col, USAF, "Officers and Missiles," *Air University Quarterly Review* 10, No. 3, (Spring 1958), 73-81, in his second article on the topic (see endnote 31), strongly recommended the use of transitioning rated personnel through missiles and back to the cockpit to give pilots and navigators experience. He contended on page 78 that such a transitional force would provide future staff officers with a knowledge of missiles without creating "a fissured officer corps. This could be doubly unfortunate, since interim missile developments may be quite uncharacteristic of the future." He did acknowledge, on page 77, that "actual missile operation does not require a rated officer," but believed it "essential to consider the role of the rated officer above the crew level of missile operations." Howard Tarleton, a navigator for seven years before entering missiles, in an email to the author dated October 17, 2014, recalled that "when I entered the missile force in 1963, we had very little expectation of remaining in the missile force as most of us were there to receive our MBAs." Military exercises and inspections are methods the military uses to practice its planned operations for combat. William Rader, letter to Lieutenant General Archie Olds, dated 18 September 1959, attachment to 706th Strategic Missile Wing Program Progress Report for the month of November 1959, Volume 2, Call No. K-WG-706-HI V. 2, IRIS #0459767, AFHRC.

[36] Jerome Martin, Command Historian, USSTRATCOM, phone call to the author dated December 12, 2014. The information was based upon historical Strategic Air Command

meeting minutes in the USSTRATCOM archives. See also Barr and Howard, *Combat Missileman*, 58.

[37] Robert Kelchner, email to the author dated January 19, 2015. Chief Kelchner, who served in the missile field from 1962 to 1980, began his missile career working on a Targeting and Alignment field team.

[38] Personal accounts from missile combat crew members include Leon Hojegian, interview with the author dated October 15, 2014; Ronald J. Bishop, Jr., letter to the author dated April 1, 2014; and Robert Wycoff, interview with the author dated October 17, 2014. Hojegian served four years as a lieutenant working with the Atlas missiles in Plattsburgh AFB in the early 1960s. He left the service after his stint in missiles, believing he had no chance at promotion because he was not a flyer. Bishop, who entered missiles in 1958, retired in 1982 after serving as the commander of the 308th Strategic Missile Wing at Little Rock AFB, Arkansas. Wycoff's story is particularly interesting as he received his bachelor's degree in English, but the Air Force shortened the designator to "ENG" on his personnel records. He was mistakenly selected as a missileer and when the Air Force discovered their mistake, they let him continue to the assignment.

[39] "Tab C: Method of Selecting Enlistees," of M. Smith, SAF/MP, Memorandum for the Assistant Secretary of Defense (Manpower, Personnel, and Reserve), Subject: Better Selectivity of Enlistees, dated November 12, 1957, Folder Mil. 9-3 Selective Recruiting 1959, Box 1, UD-UP 343, Record Group 341, NARA, MD. This document sets the standard for "Nuclear Weapons Mech. Sp., Missiles Guidance, Electronic Systems" enlistees in the 80th percentile in Electronics. See also Brigadier General Jerry Page, "Tooling up for the Ballistic Missiles Training Program," *Air University Quarterly Review* 10 No. 4 (Winter 1958-59), 14-16. When he wrote the article, General Page was the Deputy Chief of Staff, Plans and Operations, Headquarters Air Training Command and, as such, was also the project officer for ballistic missiles training. Joe Andrew, in a November 3, 2014 email to the author, further elaborated on the enlisted testing requirement, saying "In June 1959 during basic training at Lackland AFB, TX we were given the Air Force Aptitude Test, the results of which determined the career fields you would be offered in the service . . . . I scored over 80 in the electronics area which resulted in me being offered the choice of working in guided missiles." Bruce Raleigh, in a February 6, 2015 email to the author, remembered a similar situation, earning a spot in missiles because of his high aptitude test in electronics.

[40] Frank Dlugas, interview with the author dated March 2, 2014.

[41] Howard Tarleton, email to the author dated October 17, 2014. Tarleton served as a Deputy Missile Combat Crew Commander.

[42] Leon Hojegian, interview with the author dated October 15, 2014.

[43] In addition to Anderson's article, "Officers and Missiles," several Air Force officers produced Air University theses on the topic. Some of these include Colonel Leslie W. Bray, Jr.,

"The Role of the Rated Group in the Missile and Space Era" (Thesis, Air War College, 1959); Major Roger G. Conant, "The Use of Rated Officers in the Minuteman Missile System" (Research Study no. 0295-70, Air University, 1970); Major David E. Freeman, "An analysis of the need for rated officers in missile operations" (Research study no. 0505-70, Air University, 1970); and Major John Bacs, "Missile unit commanders: Rated versus nonrated officers" (Thesis, Air Command and Staff College, 1972). Designating missiles a "rated" field is not as unlikely as it may seem. Colonel Lawrence Spinetta, USAF, email to the author dated March 7, 2015, acknowledged that the Air Force later designated Unmanned Aerial Vehicles as a rated field, requiring pilots to operate them. Spinetta entered the Air Force in 1993 and has worked with unmanned aerial vehicle units since 2008, first commanding a Predator squadron and later commanding the 69th Reconnaissance Group.

[44] Floyd Wikstrom, email to author dated May 26, 2014. Colonel Wikstrom was the first commander of the 90th Strategic Missile Wing, responsible for Minuteman missiles. He commanded the unit from 1963 to 1965.

[45] Joe Brown, interview with the author dated August 23, 2014. Brown served in Atlas F and Titan missiles from 1962 to 1973. He retired from the service as a Master Sergeant. Since missileers worked together as a crew, those assigned at "crew level" were the missile officers and enlisted men who operated and maintained the missiles. This level included instructor and evaluator crews, but did not include the managers in the squadron and wing who did not work directly with the missiles.

[46] William Brooksher and Jimmy Scott, "A Study of the Intercontinental Ballistic Missile Operations Career Field," (Individual Research Paper, National War College, 1973), 63. The Air Force defines support units as any unit supporting the operational units. Operational units are defined as those who conduct operations against the enemy, when required.

[47] Ibid., 61. Brooksher and Scott's findings are supported by the "United States Air Force Statistical Digest," Table 121, which revealed that non-rated general officers were extremely rare. The older digests have been digitized and can be found at http://www.afhso.af.mil/usafstatistics/. (Accessed August 27, 2014). Leon Hojegian, interview with the author dated October 15, 2014. Ronald J. Bishop, Jr., letter to author dated April 1, 2014. Melvin Driskill, email to the author dated February 8, 2015. After his missile tour, Driskill returned to the supply career field and retired as a lieutenant colonel. Joe Brown, interview with the author dated August 23, 2014. Brown served on both Atlas and Titan missile crews between 1962 and 1972. He remembered that "guys without wings on their chests did not rank as high." Lawrence Hasbrouck, email to author dated 21 May 2014. Hasbrouck mentioned that the complete hold by rated officers over missile leadership positions began to change in the early 1970s. He became one of the first non-rated squadron commanders and later became a Deputy Commander for Operations before moving into military education.

[48] Appendix "B" Revised Draft Agreement on Deployment of the United States Intermediate Range Ballistic Missile in the United Kingdom, dated October 4, 1957, 1188-91,

File CCS 334 GMC (1-16-45) Sec. 21, Box 18, UD 22, Record Group 218, NARA-MD. The U.S. serviceman held a second launch key to ensure the British did not launch without the approval of the United States, but Bill Young, a squadron leader in command of the missile launch pads in Shepherd's Grove, Sussex, in "Silent Sentinals," *Fly Past*, No. 225 (April 2000), 36, contended that the British quickly discovered that they could launch the missile without the second key. Therefore, the Strategic Air Command personnel assigned with the Thor squadrons really never held any value except to soothe national pride. The latter job was critical, however. On February 3, 1960, Senator Clinton Anderson (D-NM), the Chairman of the Joint Committee on Atomic Energy, reminded everyone that "when the present law was adopted in 1958 (P.L. 85-479) the officials testifying to the Joint Committee time after time stated that it was not intended and that the law, . . . , would not permit completed nuclear weapons or the nuclear components of weapons to be transferred to a foreign country or to get beyond the custody of the United States forces." Office of the Assistant to the Secretary of Defense (Atomic Energy), *History of the Custody and Deployment of Nuclear Weapons (U) July 1945 Through September 1977*, February 1978, 70, http://www.dod.gov/pubs/foi/Reading_Room/NCB/306.pdf. (Accessed July 3, 2015).

[49] John Kiereck, undated letter provided to author on October 16, 2014.

[50] Baar and Howard, *Combat Missileman*, 56. See also Cumbaa, "Training and Training Facilities for Strategic Missile Forces," 25-26, and Page, "Tooling Up for the Ballistic Missiles Training Program," 17. See also Robert B. Landry, Maj Gen, USAF, Assistant Deputy Chief of Staff, Personnel, memorandum for Asst Secretary of the Air Force (Manpower, Personnel, and Reserve Forces), Subject: Thor/Jupiter Training, dated April 10, 1958, File Military Construction Program 27-58 Vol. II, Box 259, A1 1F, Record Group 340, NARA-MD, which documents that "the bulk of training is now being conducted by the contractor (Douglas Aircraft) at Santa Monica. In May, this training will move to the Douglas plant Tucson, Arizona. Facilities at the Edwards AFB and Sacramento, California, test sites are also being utilized."

[51] Merriman's experience is related in Baar and Howard, *Combat Missileman*, 59-64. Page, "Tooling Up for the Ballistic Missiles Training Program," 17, acknowledged that "Type 1 training for the Thor missile is being accomplished by the Douglas Aircraft Company in a World War II aircraft plant in Tucson, Arizona, and by the AC Spark Plug Company in a former brewery in Milwaukee. Similar training by Convair on the Atlas missile is being given in the Bernard Street Public School building in downtown San Diego." General Page further explained, on the same page, that "while these conditions leave much to be desired from a training viewpoint, the concurrent phasing of research and operational developments dictates that the initial training be conducted as close as possible to the source of equipment and modifications."

[52] Merriman's unnamed instructor is quoted in Baar and Howard, *Combat Missileman*, 62.

[53] James Brewer, *Mules, Missiles and Men: An Autobiography* (Grant, AL: Brewco, 1988), 347-48.

[54] Ibid.

[55] Ibid., 348-49. To provide a better understanding of the magnitude of the effort required, Brigadier General Jerry Page, the Deputy Chief of Staff for Plans and Operations, Headquarters Air Training Command, documented that "223 separate courses must be conducted for these three [Atlas, Titan, and Thor] weapon systems alone." See Page, "Tooling Up for the Ballistic Missiles Training Program," 16.

[56] Ibid., 354-55.

[57] Ibid., 359.

[58] Glantz, email to the author dated May 2, 2014.

[59] Hasbrouck, email to the author dated May 21, 2014.

[60] Grimwood and Stroud, *History of the Jupiter Missile System*, 87, 91-92. See also Office of the Assistant to the Secretary of Defense (Atomic Energy), *History of the Custody and Deployment of Nuclear Weapons (U) July 1945 Through September 1977*, February 1978, 74.

[61] Glantz, email to the author dated May 2, 2014. Because the Technical Orders were written before the missiles were finalized, they were incomplete and, in many cases, incorrect.

[62] Bishop, letter to the author dated April 1, 2014. Bishop served as a maintenance officer on early Bomarc missiles, aeronautical missiles, and then as a missile combat crew commander at Whiteman AFB. He retired as a colonel after commanding the Titan missile wing at Little Rock AFB, Arkansas.

[63] William Kurtz and Blanche Johnson, "The History of the 706th Strategic Missile Wing (ICBM-Atlas), Francis E. Warren AFB, Wyoming, June 1958," 5-6, Call # K-WG-706-HI, IRIS # 00459751, AFHRA. The information quoted from this source comes from Colonel E. A. Swanke, Chief AFBMD Field Office, who was interviewed by W. S. Kurts at F. E. Warren AFB on August 5, 1958. Max Rosenberg, *USAF Ballistic Missiles, 1958-1959*, 14, reveals that the Western Development Division was redesignated as the Air Force Ballistic Missile Division on June 1, 1957.

[64] Kurtz and Johnson, "The History of the 706th Strategic Missile Wing (ICBM-Atlas), Francis E. Warren AFB, Wyoming, June 1958," 8-9. The fourth additional missile was required because it was assumed at one of every ten Atlas missiles would be undergoing maintenance at any time. In a 2002 interview, Lt. Col. Roy Ferguson, who designed the missile configuration, admitted that his decision to base the missiles in a two by three configuration was "purely arbitrary," but designed that way so that the missileers could launch the missiles in fifteen minutes. By placing two guidance systems back to back, each could launch a missile every five minutes and they could provide a backup to the other. Roy Ferguson, interview with Neil Sheehan on April 26, 2002, 12-14, Box 15 of 21, Sheehan Papers (accession 23821), Manuscripts Division, LOC.

[65] Kurtz and Johnson, "The History of the 706th Strategic Missile Wing (ICBM-Atlas), Francis E. Warren AFB, WY, June 1958," 9-10. According to the Aircraft Owners and Pilots Association Flight Training blog, the Federal Aviation Administration began transitioning the aeronautical industry to nautical standards in 1969 since aeronautical charts were printed in nautical scale. See "The Knotty Truth," http://blog.aopa.org/flighttraining/?p=411. (Accessed March 23, 2015.)

[66] Kurtz and Johnson, "The History of the 706th Strategic Missile Wing (ICBM-Atlas), Francis E. Warren AFB, WY, June 1958," 13. All of this occurred before the first Atlas D was deployed, on September 28, 1959. Date from Henry M. Narducci, ed., *SAC Missile Chronology, 1939-1988* (Offutt AFB, NE: Office of the Historian, HQ Strategic Air Command, 1990), 23.

[67] James B. Douglas, Secretary of the Air Force, Memorandum for the Secretary of Defense, Subject: ICBM Siting, dated April 12, 1958, File 735-58 Guided Missiles Base Sites, Box 279, A1 1F, Record Group 340, NARA-MD. See also W.M. Holaday, Director of Guided Missiles, Memorandum for Chairman, Air Force Ballistic Committee, Subject: Ballistic Missile FY 1958 Supplemental Military Construction Program, dated July 21, 1958, File 27-58 Military Construction Programs, Box 274, A1 1F, Record Group 340, NARA-MD. Major General Charles McCorkle, Assistant Chief of Staff for Guided Missiles, had recommended in "Command and Control of Ballistic Missiles," *Air University Quarterly Review* IX, No. 3, (Summer 1957), 74-76, that the Air Force initially disperse the Atlas to protect them as it was much cheaper to disperse them than to harden the missiles against attack. After the missiles were operational, he said, the Air Force could harden them. He also recommended that the Atlas sites be placed near SAC bases, but not near enough that a near miss would destroy the base and the missiles. Finally, McCorkle felt that incorporating the missiles into other Numbered Air Forces, a high level of command and control, would allow other Air Force personnel to become familiar with the capability during the transition period from aircraft to missiles. McCorkle's article was incorporated as chapter three of Gantz, ed., *Report on the Ballistic Missile*, 71-80.

[68] William Kurtz and Blanche Johnson, "The History of the 706th Strategic Missile Wing (ICBM-Atlas) and 389th Air Base Group, July through September 1958," 2, Call # K-WG-706-HI V. 1, IRIS # 00459752, AFHRA.

[69] Gary Alkire, personal interview with author on January 28, 2015. Concerns about numerous changes and items in final documents that were known to require revisions are also detailed in "Comments on Procedures," Record Group 340, A1 1F, Box 377, loose papers, NARA, MD.

[70] Baar and Howard, *Combat Missileman*, 46-47, 131-32.

[71] Ibid., 132. In a March 15, 1961 briefing to Congress, General Thomas Gerritty, Commander, Ballistic Systems Division, remarked on "the rapid evolution of the ATLAS configuration. The first squadron is a 3 by 2, radio inertial guidance, and two additional squadrons with 3 by 3, radio guidance, but the primary force, three squadrons, coffin

configuration, 25 p.s.i. hardened, and six squadrons of the silo configuration . . . . These are the highlights of development milestones for 1961." Secret transcript [excised portions restored], "Missile Procurement, Air Force," 522, Item #NH00728, Digital National Security Archives. See also Convair (Astronautics) Division, General Dynamics Corporation, *Atlas Base Activation*, 7. This pamphlet is from the personal collection of Charles Simpson, executive director of the Association of Air Force Missileers.

[72] "The Air Force Ballistic Missile and Space Program Chronological Highlights," dated 5 February 1960, Folder 6, Box 87, Bernard Schriever Papers, Manuscripts Division, LOC. See also Goldsworthy," ICBM Site Activation," 159, where he reveals that "all of the silos for the Titan I, for example, were being built before the missile had been test flown. Minuteman facility drawings were in the hands of construction contractors before it had been proved that the missile could be fired from its underground silo."

[73] Baar and Howard, *Combat Missileman*, 131-132. Jim Widlar, an APCHE technician with the Atlas D provided more information about the inability of technicians to work on differing Atlas versions. He said that propellant loaders and other people with related jobs could accomplish their tasks on any of the missiles, but the crew members were only trained and qualified to work on a specific version of the missile. Widlar also explained that early Atlas D missiles required a seventeen person crew, but the number was reduced to 11 after Golden Ram modifications to the missile system. The Atlas D reduced the crew further, requiring only a five person crew. Jim Widlar, telephone interview with the author on January 30, 2015. Baar and Howard reveal in *Combat Missileman*, 57, that the original crew requirements were set at 31 members per crew, although this was quickly reduced to the seventeen that Widlar was familiar with.

[74] Goldsworthy, "ICBM Site Activation," 155-157. Goldsworthy, one of the SATAF commanders himself, observed that all of the SATAF commanders were "pilots who had spent their careers with combat aircraft units. They were entering alien territory, and their immediate reaction was one of bewilderment over the magnitude and complexity of the job." See also "AMC Picks Missile Site Commanders," Air Force Times (August 6, 1960), 18.

[75] Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1945-1960* (Washington, D.C.: Office of Air Force History, 1990), 8 and 107.

[76] LeMay quoted in Kohn and Harahan, *Strategic Air Warfare*, 101.

[77] Ibid., 101-102.

[78] Concerns with the bombers are discussed in Peter J. Roman, "American Strategic Nuclear Force Planning, 1957-1960: The Interaction of Politics and Military Planning" (Ph.D. dissertation, University of Wisconsin - Madison, 1989), 249 and 312. For Kistiakowsky's concern, see George Kistiakowsky to Eisenhower, memorandum dated February 12, 1960, subject: Problems of the B-70 Project, Folder: Kistiakowsky (2), Administration series, ACW file, Eisenhower Library.

[79] Eisenhower's quotes can be found in Andrew Goodpaster, Memorandum of Conference with the President, November 18, 1959 - Augusta, Papers as President of the United States, 1953-1961 (Ann Whitman File), DDE Diaries, Box 45, Staff Notes, Nov. 1959 (2), Eisenhower Presidential Library. Information on LeMay's attitude toward missiles can be found in Brigadier General Maurice Cristadoro, interview with Neil Sheehan, Box 15 of 21, Sheehan Papers (accession 23821), Manuscripts Division, LOC. See also LeMay's quotes favoring bombers over missiles in Kohn and Harahan, *Strategic Air Warfare*, 101-102.

[80] For further analysis of the problems created by concurrency and the resulting concern over the viability of missiles, see Bernard C. Nalty, *USAF Ballistic Missile Programs, 1962-1964* (Washington, D.C.: USAF Historical Division Liaison Office, 1966), 33-38. On page 34, Nalty acknowledges that "although this practice [concurrency] did save time, it also increased costs, often resulted in unrealistic training, and turned out weapon systems that, though theoretically operational, still might require extensive alteration and refinement." He then contends that "the Strategic Air Command thus found itself involved in extensive training, testing, and modification programs while at the same time trying to keep as many missiles as possible on alert."

5. APOGEE: AN INTERNATIONAL CRISIS FOMENTS CHANGE[1]

While the Air Force raced to build and staff the new ballistic missile units through the late 1950s, the political struggle that fueled the race intensified. Politicians and journalists continued to amplify the threat of Soviet nuclear missiles through the 1960 presidential election and to insist that the United States immediately build its own missiles to remain ahead of this existential threat. These pressures continued well into the Kennedy administration, although the level of intensity began to drop as it became clear that the United States held a commanding lead in developing and producing nuclear armament. Then, immediately following the Cuban Missile Crisis, the Kennedy administration's political will to use nuclear missiles radically diminished, leaving the missiles and missileers vulnerable to unsympathetic Air Force leaders who strongly preferred manned aircraft. Lyndon B. Johnson's administration, including many members of the Kennedy administration, retained the new outlook on nuclear conflict. Without the strong political pressure to support the development and operation of missiles that had been applied during the late 1950s and very early 1960s, the promising potential of the Air Force nuclear missile community dissipated significantly.

On October 10, 1958, in a speech to the Wood County, West Virginia, Democratic Committee, Senator John F. Kennedy (D-MA) asserted, "We are rapidly approaching that dangerous period which General [James M.] Gavin and others have called the 'gap' or the 'missile lag period' -- a period, in the words of General Gavin, 'in

which our own offensive and defensive missile capabilities will lag so far behind those of the Soviets as to place us in a position of great peril.'" After defining "the most critical years of the gap" as 1960 to 1964, he continued the withering criticism of President Dwight Eisenhower's defense policies,

> "Our peril is not simply because Russian striking power during the years of the gap `will have a slight edge over us in missile power -- they will have several times as many: Intermediate range missiles to destroy our European missile and SAC bases; intercontinental missiles to devastate our own country installations, and Government; and history's largest fleet of submarines, and possibly long-range supersonic jet bombers, to follow up this advantage. If by that time their submarines are capable of launching missiles, they could destroy 85 per cent of our industry, 43 per cent of our 50 largest cities, and most of the nation's population."[2]

After Kennedy launched his candidacy for the 1960 presidential election on January 2, 1960, he continued the verbal assault on Eisenhower's record. The Democratic Platform Committee followed his lead, proclaiming that "our military position today is measured in terms of gaps--missile gap, space gap, limited war gap."[3] To resolve the "gaps," Kennedy promised to increase production of the Atlas missile, to accelerate the Titan program, to increase the numbers of the Minuteman missile, which was undergoing final testing at the time, to build more of the planned supersonic B-70 bombers, and to provide more of the Navy's Polaris missiles.[4] He tied these military increases, along with stronger conventional forces and enhanced airlift capabilities, into his Flexible Response security strategy.[5] Eisenhower, maintaining his quest for a balanced budget, argued that such increases were wasteful. In fact, in his 1959 State of the Union address, Eisenhower warned that "we must guard against

feverish building of vast armaments to meet glibly predicted moments of so-called 'maximum peril.'" He reminded listeners that "in these days of unceasing technological advance, we must plan our defense expenditures systematically and with care . . . . The defense budget for the coming year has been planned on the basis of these principles and considerations." [6] Even so, as the second generation Polaris and Minuteman missiles proved themselves more reliable and militarily useful, and less vulnerable to a first strike from the Soviets, he did increase the planned nuclear arsenal by authorizing more of these second generation missiles.

Although the election was close, Kennedy won the presidency. During the campaign, he convinced many voters that there was an existential nuclear threat to America. Therefore, after Kennedy's inauguration in 1961, these Americans expected him to quickly escalate defense spending, including the construction of new missiles.[7] Eisenhower left the new president with 12 operational Atlas intercontinental ballistic missiles and 60 Thor intermediate range ballistic missiles stationed in the United Kingdom, but had also directed the production of newer model Atlas, Titan, Minuteman, and Jupiter missiles, all quickly moving toward operational status. In his proposed budget for 1962, Eisenhower authorized over 1,100 ballistic missiles (255 Atlas and Titan missiles, 450 silo-based Minuteman missiles, 90 mobile Minuteman missiles, and 304 Polaris missiles to be placed on nineteen submarines, in addition to the sixty Thor and forty-five Jupiter missiles stationed overseas). By contrast, the

Soviets had 248 launchers in the summer of 1960, but these were all intermediate range missiles and none had a long enough range to hit the United States.[8]

Kennedy selected Robert McNamara, the former president of Ford Motor Company and a Republican, as his Secretary of Defense. McNamara "immediately made it [his] top priority to determine the size of the [missile] gap and the remedial action required to close it."[9] He explained that the new administration needed to review the Eisenhower administration's 1962 budget, but "this reconsideration . . . involved a reappraisal of strategy . . . . This reappraisal had to take into consideration what the Russians were doing."[10] Within days of assuming his new position, McNamara requested and received a briefing from the Weapon System Evaluation Group on Report #50, entitled "Evaluation of Strategic Offensive Weapons Systems." The evaluation, started in September 1959 and completed in December 1960, was a "comprehensive report on the optimal U.S. strategic force structure . . . . [and] implicitly rejected the possibility of a missile gap."[11] McNamara and key aides also "spent days with the air force's assistant chief of staff for intelligence, personally reviewing hundreds of photographs of Soviet missile sites that had been the basis for the air force report." McNamara became convinced by the available evidence that the missile gap actually favored the United States rather than the Soviet Union. When he informed reporters of this fact on February 6, 1961, they published the statement and it created quite a furor.[12]

By this time, Kennedy knew for certain that the missile gap did not exist. Nevertheless, after contending during the campaign that the Eisenhower administration was lax on national security precisely because it had allowed a "missile gap," Kennedy realized that immediately negating the gap would create a credibility problem and exacerbate concerns over his planned defense spending. Therefore, on February 8, Kennedy asserted in a news conference that "Mr. McNamara stated that no study had been concluded in the Defense Department which would lead to any conclusion at this time as to whether there is a missile gap or not."[13] McNamara backtracked as well, testifying in Congress on Friday, April 7, 1961, that "based on the intelligence estimates available to me," there was a missile gap and "based on the intelligence estimates, there is evidence that a missile gap may exist up to and through 1963."[14]

After dispelling the public's questions over the reality of the missile gap, the Kennedy administration increased the 1962 defense budget by 10 percent. The President built up the conventional forces and enhanced the readiness of the Air Force bomber fleet, but he also strengthened the missile forces. Strategic Air Command had successfully launched a Minuteman in early February 1961 and Kennedy found that the new missiles were much more reliable, less dangerous, and less vulnerable to surprise attack than the early iterations. Therefore, rather than increasing the number of Atlases or Titans, as he had promised to do during the presidential campaign, Kennedy accelerated the production of the new Air Force Minuteman and Navy Polaris missiles.

In fact, rather than speeding up the Titan program, he cut the last two squadrons of Titan missiles, instead using the funds planned for the Titans to double the production capabilities of Minuteman missiles. He also increased the construction of Polaris submarines by 10, increasing the total submarines from 19 to 29, even though the first of this new group was not scheduled for delivery until June 1963.[15]

The increases in the defense budget did nothing to reduce the continuing struggle with the Soviet Union. Kennedy met Soviet Premier Nikita Khrushchev in early June 1961 at a summit in Vienna to reduce tensions between the two countries, but the conference failed to resolve the discord. Soon after the meeting, Khrushchev demanded that England, France, and the United States, which retained control of West Berlin after World War II, withdraw all western troops from the city within six months or face war.[16] Khrushchev had made the same threat to Eisenhower, but backed down when Eisenhower refused to respond. Knowing this, Kennedy, rather than backing out of Berlin, increased the size of the Army, the Air Force, and the Marine Corps and also called up 150,000 reservists to prepare for war. This time, Khrushchev increased his military budget as well, but, believing the Allies were militarily stronger and willing to fight, he again dropped the threat of war. Instead, Khrushchev approved an East German plan to build a wall that would isolate the Western occupied portion of Berlin. Construction began on August 13, 1961.[17]

Concerned that Khrushchev might continue to threaten and cajole the United States as long as he believed Kennedy thought that the Soviet Union had a

preponderance of nuclear weapons, the Kennedy administration decided to reveal publicly that the missile gap did not exist. Kennedy selected Roswell Gilpatric, the Deputy Secretary of Defense, to disclose the information since he was important enough to convince the Soviet leaders that he represented the Kennedy administration, but not so important as to appear to be threatening to them.[18]

In Gilpatric's speech, given to the Business Council in Hot Springs, Virginia, on October 21, he exclaimed that "Berlin is the emergency of the moment, because the Soviets have chosen to make it so . . . . But our real strength in Berlin . . . . is based upon a sober appreciation of the relative military power of the two sides." Gilpatric then explained that "Our forces are so deployed and protected that a sneak attack could not effectively disarm us. The destructive power which the United States could bring to bear even after a Soviet surprise attack upon our forces would be as great as -- perhaps greater than -- the total undamaged force which the enemy can threaten to launch against the United States in a first strike."[19]

In July 1962, Krushchev responded in a way very few expected, coordinating an agreement with Fidel Castro of Cuba to place Soviet nuclear missiles in Cuba. These weapons not only provided a tangible nuclear threat to the United States, but responded to the United States' failed attempt to overthrow Castro during Kennedy's April 1961 Bay of Pigs debacle.[20] On May 24, 1962, the Soviet Defense Council approved Khrushchev's plan to place ballistic nuclear missiles in Cuba, along with Soviet bombers capable of delivering nuclear weapons, supporting fighter planes, cruise

missiles, and ground forces. Castro agreed to host the Soviets soon after. Unlike the American deployment to Europe of the Thor and Jupiter missiles, the Soviets planned to retain operational control of their missiles in Cuba, at least at the start of the deployment.[21]

Khrushchev intended to deploy the arsenal quietly and announce their presence after the November elections in America.[22] However, the United States had been spying on Cuba through photographic and electronic surveillance since spring of 1962, monitoring the buildup of Soviet military capabilities on the island. Thus, on October 14, a U-2 aircraft flown by Air Force Major Richard Heyser photographed what intelligence analysts identified the next day as "three Medium Range Ballistic Missile (MRBM) sites near San Cristobal[, Cuba]."[23] These missiles threatened every U.S. city south and east of a semi-circle bounded by Washington, D.C., Cincinnati, Ohio, and St. Louis, Missouri. (See Figure 1.) However, the CIA also revealed that the Soviet's longer range Intermediate Range Ballistic Missiles (IRBM), presumed to be in Cuba as well, could reach almost as far as San Francisco, threatening almost every major city in the United States.[24]

Figure 1. Official map showing threat rings for Soviet missiles in Cuba.

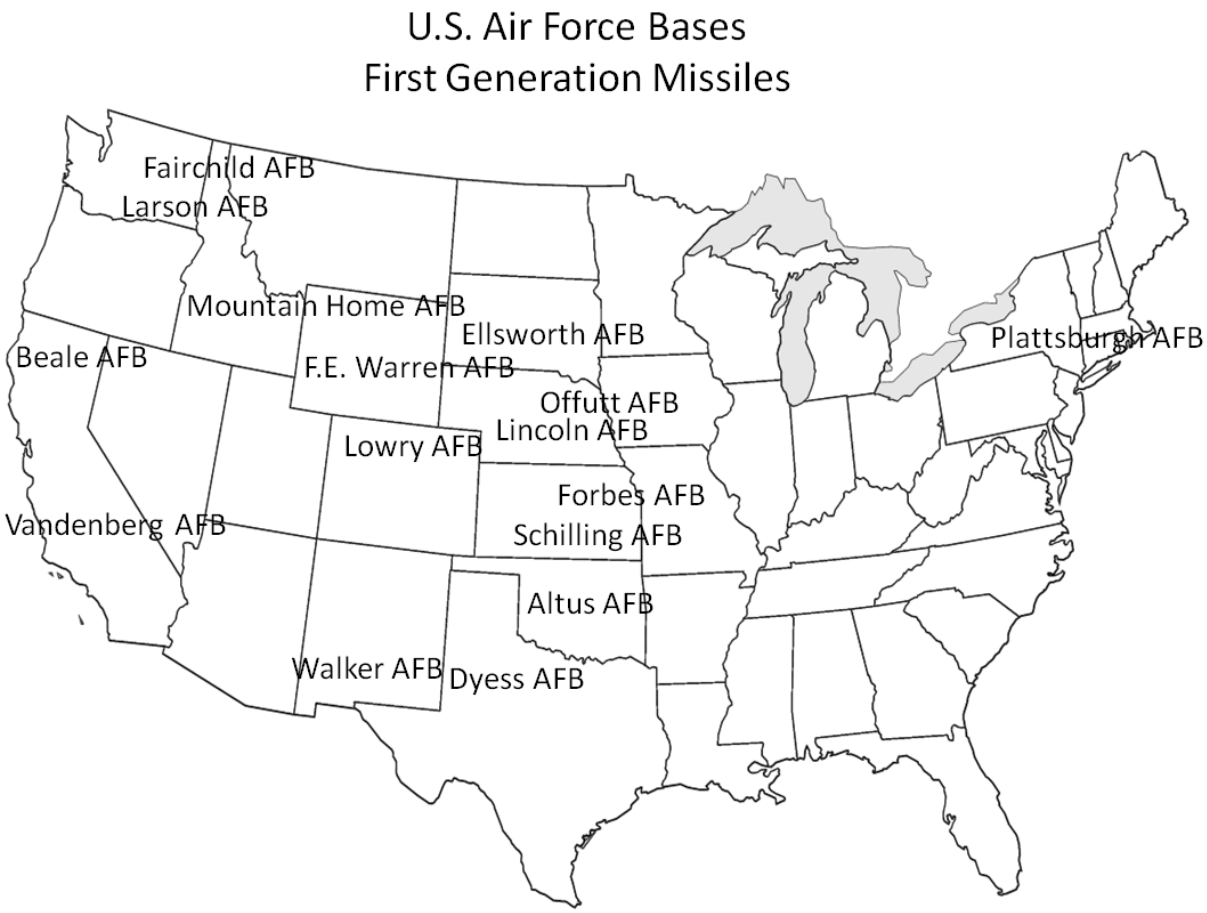
Aghast at the implications, the President gathered several key advisors, a group he titled the Executive Committee of the National Security Council, or ExComm, to guide the nation's response. After considering and deciding against a surgical strike to destroy the missiles, the ExComm recommended a naval blockade -- renamed "quarantine" to sound less bellicose -- to prevent the Soviets from shipping more missiles to Cuba. Then, on October 22, at 7:00 p.m. eastern time, six days after he learned of the threat, the President spoke to the nation, warning of the danger and reassuring both the American people and the world that he had a prudent plan to have the missiles removed. His actions initiated what became known as the Cuban Missile Crisis.[25]

Kennedy's speech was the first that many of the Air Force missileers had heard about this new Soviet threat in Cuba. After reviewing a draft of the President's speech, General Curtis LeMay, Chief of Staff of the Air Force, recommended that General Maxwell Taylor, Chairman of the Joint Chiefs of Staff, "direct DEFCON 3 worldwide at noon [on October 22] to place U. S. forces worldwide in an increased readiness posture" and "direct SAC to generate its forces toward a maximum readiness posture, also at noon today." By doing so, LeMay explained, "the strategic air forces will be in maximum readiness by noon tomorrow, and the force generation should not be apparent until after the President's speech tonight." Furthermore, he declared, the action "comprises a clear warning to the Sino-Soviet Bloc and should serve as a powerful deterrent to any major counteraction. Additionally, such a posture will

provide maximum flexibility to the President in choosing further actions, should Sino-Soviet belligerence or active counter-measures so warrant." General Taylor decided to direct the forces to DEFCON 3 when the President established the blockade.[26]

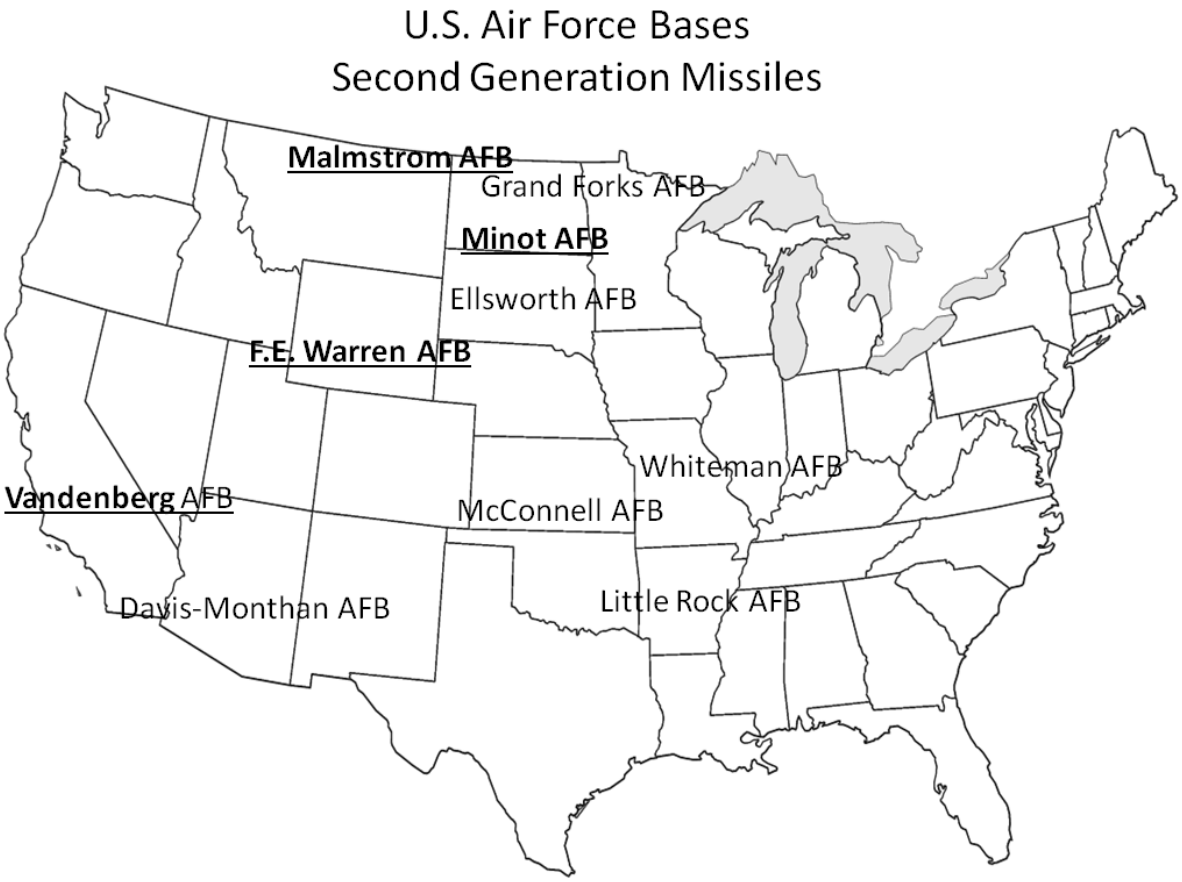
General Thomas Power, who had replaced LeMay as Commander in Chief of Strategic Air Command, responded prior to the directive's time frame. Two days before President Kennedy addressed the nation, Power ordered that all aircraft and missiles not ready for alert be covertly made ready. He also placed two bombers per squadron and the aircraft designated to refuel the bombers on standby status, ready for immediate launch. He ensured that his commanders and staff realized these actions did not mean a change in DEFCON status, although their actions would have been the same if it had.[27]

Lieutenant Charlie Simpson was one of the first Air Force officers to respond. On October 20, while overseeing the testing of new Titan 1 missiles at Mountain Home AFB in Idaho, he received a call directing that the squadron "return the missile to alert immediately, no questions asked and no explanation." (See locations of U.S. Air Force bases with missiles in figures 2 and 3.) Then, over the weekend, his supervisors cancelled all passes and leaves and started planning for the maintenance shops to work 24 hours a day. He saw bomber and tanker aircraft deploying to predetermined dispersal locations, but did not know why. On Monday, as the president delivered his speech, the Joint Chiefs of Staff ordered all U.S. forces worldwide to DEFCON 3 and



Altus AFB, OK	Lincoln AFB, NE
- Atlas F - 1962-65	- Atlas F - 1962-65
Beale AFB, CA	Lowry AFB, CO
- Titan I - 1961-65	- Titan I - 1961-65
Dyess AFB, TX	Mountain Home AFB, ID
- Atlas F - 1962-65	- Titan I - 1961-65
Ellsworth AFB, SD	Offutt AFB, NE
- Titan I - 1960-65	- Atlas D - 1961-64
Fairchild AFB, WA	Plattsburgh AFB, NY
- Atlas E - 1961-65	- Atlas F - 1962-65
FE Warren AFB, WY	Schilling AFB, KS
- Atlas D - 1960-64	- Atlas F - 1962-65
- Atlas E - 1961-65	Vandenberg, CA
Forbes AFB, KS	- All missiles (training)
- Atlas E - 1961-65	Walker AFB, NM
Larson AFB, WA	- Atlas F - 1962-65
- Titan I - 1961-65	

Figure 2. Map of Air Force bases with first generation missiles.



Davis-Monthan AFB, AZ
- Titan II - 1962-84

Ellsworth AFB, SD
- Minuteman I - 1963-73
- Minuteman II - 1971-94

FE Warren AFB, WY
- Minuteman I - 1964-74
- **Minuteman III - 1973-2015**
- Peacekeeper - 1987-2005

Grand Forks AFB, ND
- Minuteman II - 1965-73
- Minuteman III - 1972-98

Little Rock AFB, AR
- Titan II - 1962-87

Malmstrom AFB, MT
- Minuteman I - 1962-69
- Minuteman II - 1967-96
- **Minuteman III - 1975-2015**

McConnell AFB, KS
- Titan II - 1962-86

Minot AFB, ND
- Minuteman I - 1962-72
- **Minuteman III - 1972- 2015**

Vandenberg, CA
- **All missiles (training)**

Whiteman AFB, MO
- Minuteman I - 1963-67
- Minuteman II - 1966-95

* Current Missile bases bolded and underlined

Figure 3. Map of Air Force bases with second generation missiles.

Simpson's unit followed suit, upgrading to the higher level of readiness. The weekend's activities became clear.[28]

Sergeant Bob Kelchner, on a targeting and alignment team for the new Minuteman missiles at Vandenberg AFB, also received early notification of the new requirements. On Sunday, October 21, his supervisor called to say that he was coming to pick up Kelchner for an emergency meeting on base. At the meeting, Kelchner remembered that they were briefed that Strategic Air Command was preparing for "higher alert conditions," then sent home to wait "on 15-minute standby telephone alert." The next morning, each member who worked with Kelchner ensured his equipment was in top shape and, on October 23, the team traveled to the missile sites "with classified targeting tapes, side arms and orders not to return until our site was on 'alert.'" Kelchner reminisced that, before this crisis, the team "had never seen a loaded/live missile in the new launch facilities, nor an operational Guidance and Control System (G&C), nor a live reentry vehicle (RV)."[29]

Captain Willard "Stan" Stanley got the message as well. Working in the Air Force Ballistic Systems Division's Reentry Vehicle (RV) Directorate, he was ordered "to get as many MK 5 RV shells and fuzes to [the new Minuteman missile wing in Malmstrom AFB,] Montana in the shortest amount of time." He worked around the clock for the next several days to ensure the nuclear warheads were expedited to their operational location and able to be readied for launch. After he finished the stressful

assignment, he recalled stopping at the officer's club for a stiff drink and watching "the 'super hyped' news anchors on the TV reporting."[30]

Not everyone heard about the crisis so quickly. Lieutenant Philip Moore, an Atlas F crew member stationed near Roswell, New Mexico, remembered learning that Strategic Air Command had been ordered to DEFCON 3 two days after the event occurred, when he arrived on base for his next alert. He had been placed on telephone standby, meaning he had to remain near his phone 24 hours a day, ready to respond to a call, but had not known why. He recalled the tenseness in the air as crew members escorted maintenance teams around the missile site to fix critical equipment problems, now knowing they were at DEFCON 3.[31]

Airman First Class Michael Kenderes, at the Titan wing near Denver, Colorado, learned of the change while deer hunting. Returning to their camp just before dusk, the hunters discovered a piece of paper on the truck radio aerial. The paper read, "This is from the game warden! Report back to base immediately! This is NOT an exercise!" They returned home and Kenderes called his supervisor, who informed him that the base had been ordered to DEFCON 3 and he needed to report for duty as soon as possible. He was also told to expect to be in the missile field[32] for an indefinite time as the Soviets were "causing some trouble down in Cuba." Kenderes returned to Lowry AFB and learned his mission was to keep the squadron's nine missiles on alert. He reviewed the unit's maintenance files to identify high failure items, then traveled to the supply building, where he picked up the items he believed he might need most. When

ready, he gathered the security codes that allowed him access to the missile sites and drove to the missile site as the sun rose. After determining the missiles were all working fine, he took a quick nap to make up for the long night.[33]

Strategic Air Command quickly attained all DEFCON 3 requirements, primarily because General Power had directed the command to work toward the standards before the heightened state of readiness was ordered. Even though the first operational missile in the U.S. Air Force had only been declared ready for launch on October 31, 1959, less than three years earlier, and only twenty-two missiles were on alert in January 1962, by October 19, 1962, Strategic Air Command had placed 112 missiles on alert. These missiles included seventy-seven Atlas D, E, and F missiles and thirty-five Titan I missiles. Nevertheless, this phenomenal feat was nothing compared to the achievement accomplished over the next three days, as the command tried to achieve DEFCON 3 requirements. Pushed the critical nature of the threat, Strategic Air Command missileers, both those operating the missiles and those maintaining them, added another twenty missiles to the nuclear arsenal, bringing the number of operational missiles to 132, ninety-one Atlases and forty-one Titans.[34]

The missileers accomplished this astonishing exploit in various ways. Missileers, including Harry Birmingham, who conducted maintenance on the Atlas missiles near Walker AFB, New Mexico, labored through numerous twelve hour shifts, or longer, fixing critical problems that prevented missiles from operating correctly. Simpson's squadron, and others like it, stopped critical validation tests in order to ensure that

their missiles were prepared for immediate launch.[35] Some of the change, though, was brought about by teams struggling intensely to bring new missiles on alert. Airman Nelson "Pete" Turner recalled arming new Atlas missiles that "had only very recently been delivered to their respective silos and were only then being installed and debugged."[36]

Thus, only 39 hours later, when President Kennedy imposed the naval quarantine and the Joint Chiefs of Staff directed the command to DEFCON 2, the highest level America's military has ever attained, the missileers stood ready. Once again, General Power had prepared Strategic Air Command forces before the order was given and the command accomplished the task swiftly but covertly, as ordered.[37]

Airman Second Class John McLaughlin, serving on an Atlas F crew at Schilling AFB, Kansas, at the time, remembered "being directed to maintain a green 'ready to launch' status on the launch control console at all times in case a launch was ordered . . . . The briefings escalated in intensity and the messages over the Primary Alerting System from SAC headquarters seemed endless. When we went to DEFCON 2, it seemed like the next message could be coded in red."[38]

Patrick Spellman, a missile facilities technician for the 578th Strategic Missile Squadron, an Atlas F squadron near Abilene, Texas, remembered having a similar feeling. Away from the command console area when he heard the Primary Alerting System, he returned to see "the commander erasing the 3 [representing the current DEFCON] and replacing it with a 2." When he asked what was happening, his

commander directed him to stand at his position and then began giving orders to the rest of the crew. Spellman remembered everyone "standing by their positions and wondering what [was coming] next."[39]

Airman Second Class Lucius Morgan, also working with the Atlas squadron at Dyess AFB, near Abilene, revealed the acts that made the time so harrowing. "When we reached DEFCON 2, Major [Truman] Grady told me to start the number 2 generator . . . .," he remembered. Then, "he and Lt [Charles] Hancock took their guns out, cocked them and laid them on the launch console. Next, they took their keys and unlocked both [launch] buttons. The commander told us our job was to get the missile in the air. He said it was what we were trained to do and we would do everything in our power to do just that."[40]

Lieutenant Herb Gordon, the Deputy Missile Combat Crew Commander at Atlas E Site 7 near Nunn, Colorado, recalled that "during our first duty shift following the DEFCON change, General Power . . . broadcast a message to all SAC bomber and missile crews . . . . He made it clear he wanted every effort to be made to launch all missiles [if the president directed]."[41] In the speech, the general proclaimed,

> "This is General Power speaking. I am addressing you for the purpose of reemphasizing the seriousness of the situation the nation faces. We are in an advanced state of readiness to meet any emergencies, and I feel that we are well prepared. I expect each of you to maintain strict security and use calm judgment during this tense period. Our plans are well prepared and are being executed smoothly. If there are any questions concerning instructions which by the nature of the situation deviates from normal, use the telephone for clarification. Review your plans for further action to insure that there will be no mistakes or confusion. I expect you to cut out all nonessentials and put yourself

in a maximum readiness condition. If you are not sure what you should do in any situation and if time permits, get in touch with us here."[42]

Power did not exclude himself from the task of putting the command in "maximum readiness condition." On October 24, two days after Kennedy's speech signaled the beginning of the blockade and General Taylor ordered Strategic Air Command to DEFCON 2, Power gained control over another thirty-six missiles. According to command historians, he accomplished this feat by invoking an agreement between the Air Force Systems Command and Strategic Air Command that gave the latter operational control of all missile launch complexes "in which a missile could be launched on an E[mergency] W[ar] Order mission with strategic warning" if the Joint Chiefs declared DEFCON 2 or higher. Not one of the 36 missiles (9 test and training missiles at Vandenberg AFB and 27 others being emplaced at four new missile sites) was prepared for immediate launch.[43]

To ready the training missiles for wartime use rather than just testing or training, airmen like David Burcham rushed "to get a live nuclear weapon mated to each flyable missile." Then, teams like the one Sergeant Kelchner served on realigned the missile's guidance system so that the missiles would launch north rather than west, allowing the missiles to be aimed toward authentic targets. Finally, the teams placed the new targeting data into the now operational Minuteman missiles.[44]

Staff Sergeant Rodolpho Armenta conducted similar work on the Air Force's Atlas training missiles. He recalled traveling to a missile site with a guidance control

technician and a second lieutenant, who had just flown in with targeting information in a briefcase handcuffed to his wrist and a Colt .45 pistol strapped to his side. The technician tried to insert the card into the missile, but the process failed to work. Armenta remembered, "The technician yanked the card out, rubbed it on his pants, reinstalled the card and gave the [missile] a few hard taps to make sure it was seated. At this point, I looked over at the lieutenant and noticed the flap on his .45 holster was now opened."[45]

"Because we had deviated from our stated installation procedures," Armenta clarified, "I immediately informed the guidance technician to stop his trouble shooting techniques, explaining my concern that the lieutenant was about ready to go Wyatt Earp on us. We then requested permission from the control center to install the card in slot 'B' to verify if the card was bad or if it was the slot." They received permission and accomplished the task, Armenta recalled joyfully, without the lieutenant adding "any notches on his gun."[46]

The 27 new missiles Power garnered from Air Force Systems Command required a similar level of effort to become operational. Captain Melvin Driskill, a Deputy Combat Crew Commander at Plattsburgh AFB at the time, remembered that "because our squadron was just being activated in Fall of '62, there were only three sites alert qualified and only a handful of crews operationally qualified for alert."[47] His crew was on their first alert when President Kennedy declared the blockade. Thus, while some teams toiled feverishly to get the new missiles ready for alert, the operational crews

controlling the new missiles "worked 24 hours on and 24 hours off for the first several weeks of the crisis" to keep their missiles ready.[48]

Strategic Air Command leaders recognized the strain they had placed upon the Plattsburgh AFB missileers by adding the new missiles, with the official history acknowledging that "this unit's capability would have been marginal even without a crisis situation." For this reason, staff officers at Headquarters, Strategic Air Command, directed that Second Air Force temporarily send four combat ready missile crews who were qualified to work on the Atlas F to the 556th Strategic Missile Squadron between October 29 and November 20 to alleviate the personnel problems. On November 1, the command temporarily moved five more crews to support the new squadron, including an instructor crew from Vandenberg AFB.[49]

The new Minuteman missiles transferred from Air Force Systems Command at Malmstrom AFB created their own difficulties. The Air Force had sent the missiles to the base in September but had not yet certified them for alert. Therefore, when General Power implemented the Emergency Combat Capability Plan, the agreement for Air Force Systems Command to surrender the missiles to Strategic Air Command, the transfer ran into complications. The field commander who controlled the missiles for Air Force Systems Command refused to transfer the missiles because Air Force Systems Command remained in DEFCON 3, not DEFCON 2 as he understood that the agreement required. Thus, the only way that the Strategic Air Command wing commander was able to comply with his command's guidance to take control of the missiles was to sign

waivers, saying that Strategic Air Command accepted responsibility for the missiles as they were, acknowledging that the Air Force Systems Command was no longer responsible for testing or validating the missiles.[50]

Because the missiles had not been readied for launch, the systems still had several anomalies. Engineers had designed the Minuteman missile to require two separate launch commands from two separate control centers before launch to ensure a missile was not launched without proper authorization. However, at the time of the Cuban Missile Crisis, only one launch control center was completed and ready for use. Thus, the wing leadership placed a second missile crew "on standby" with a second launch control panel. If directed to launch the missile, the on-duty crew would send a launch command with the original panel, then the second crew would replace the installed panel with their "standby" panel and send the required second launch signal to fire the missile.[51]

In addition, because the site activation task force had never completed a required safety test on the new missiles, Strategic Air Command kept each missile's safety control switch manually locked in the safety position, preventing the missiles from being launched without reconfiguring the switch. Chris Adams, an officer who served in the command for many years, retiring as a major general, acknowledged that crews and maintainers used workarounds to bring the sorties to alert, resulting "in critical wiring and connection errors in implacing the missiles in the silos and readying

them for launch," thus necessitating the safe configuration, although this was not known at the time.[52]

The command used informal steps to get the crews to combat ready status as well. Strategic Air Command historians recorded that the 3901st Strategic Missile Evaluation Squadron "surveyed" the crews to determine if they were ready to man the missiles. If a crew had completed the two phases of initial training and passed a standardized test, the evaluators deemed them "capable." Sam Goodwin, a new captain at the time, illustrated his experience. "We went to Vandenberg AFB, CA, for crew training in October and had almost completed it when the Cuban Missile Crisis occurred. We quickly returned to Malmstrom AFB, MT. After a few sessions with the instructor crews, wing scheduling scheduled us for alert on Thanksgiving." He also recalled, "I soon heard from my squadron commander, Col[onel] Jim Farley, about going on alert prior to being evaluated and deemed qualified and without his knowledge."[53]

Other problems plagued the Air Force's effort to ready their missiles for employment. Strategic Air Command had never prepared its entire missile force for war at one time. Therefore, on October 20, as the command placed several new missiles on alert and prepared them for launch, SAC leaders discovered the Air Force did not have enough liquid oxygen, one of the two vital ingredients used to fuel the Atlas and Titan missiles.[54] On October 21, the command quietly attempted to procure enough liquid oxygen to meet its requirements, but found that the process would take

twelve days, which the command did not have. The next day, the command requested the federal government establish a national priority to provide the required liquid oxygen supplies to Strategic Air Command missiles. The government responded immediately. Every government and commercial plant worked to provide the critical fuel. Finally, on October 25, Strategic Air Command acquired the needed liquid oxygen to bring all of its missiles to mission-ready status.[55]

Through this phenomenal level of effort and sacrifice, Strategic Air Command missileers increased the number of ballistic missiles ready for wartime service from 132 on October 22, to 147 on October 24. Astonishingly, by October 28, when Khrushchev notified the world that "the Soviet government . . . has given a new order to dismantle the arms which you [Kennedy] describe as offensive, and to crate and return them to the Soviet Union," the missileers had prepared 171 missiles for combat use.[56] When the Air Force missileers reached their peak readiness on November 4, sixteen days after General Power had begun preparing for war, the missile crews and maintainers had added 74 combat ready missiles to their arsenal, increasing the number of nuclear missiles ready for launch from 112 to 186. During this same time, on October 10, the Navy added an additional ballistic missile submarine, carrying 16 Polaris missiles, to the 6 submarines that were operational at the beginning of the crisis, and added a second less than a month later, on November 7. Strategic Air Command historians emphatically noted that "while SAC was in Defcon 2 posture, 92.5 per cent of its weapons systems were ready to launch within one hour."[57]

While October 28 ended the most threatening part of the Cuban Missile Crisis, the Kennedy administration retained both the quarantine and the heightened military alert status until November 20, when the Soviet missiles had been removed and Khrushchev agreed to also withdraw the nuclear-capable bombers that had been transported to Cuba.[58]

By November 15, though, the increased level of Strategic Air Command operations had begun to degrade the capabilities of both the bomber and the land-based missile forces, so the command entered a "modified DEFCON 2 allowing for critical maintenance" and training. Then, as tensions began to ease further, on November 21, the Joint Chiefs directed the command to drop back to DEFCON 3.[59] A week later, the command returned to normal operations and dropped its requirement for every missile to be continuously readied for launch.[60] Command historians declared the organization's effort to bring "ICBMs to alert status was eminently successful." They observed that the Cuban Missile Crisis had "provided the command a singular opportunity to determine exactly how far it had progressed toward an adequate missile capability. The results were encouraging."[61]

However, the event that was arguably the crowning success for the missileers facilitated their becoming a political pariah to national leaders and their descent into perceived insignificance within the Air Force. Most people not associated with missiles were completely unaware of the remarkable level of effort the missileers exerted or the consequence they believed their missiles had. Doug Turner remembered that

"although the crisis was receiving lots of attention in the news media, I think the local population saw our activities as business-as-usual since launch crews and maintenance teams continued to commute to and from the missile sites. We were directed not to do or say anything that might alarm the civilian community."[62] Captain Jim Peck, a B-47 pilot at the time, acknowledged that even the command's pilots were not cognizant of the specific activities of the missileers. They knew that the missileers had attained a higher state of readiness, as the bomber pilots had, and were prepared to launch against their targets, but most did not know exactly what that entailed.[63]

Even more important to the future of missiles and missileers in the Air Force, General LeMay still refused to fully support the new missiles. In 1965 Congressional hearings, he declined to accept Secretary of the Air Force Eugene Zuckert's statement that "we have achieved the point where our missiles, most particularly POLARIS and MINUTEMAN, can be depended upon to perform that part of the war plan our planners have assigned them." LeMay later contended that "like any machine, they don't always work" and that he did not think "that you are ever going to get to the point where you have the same confidence in the missile as you have in manned systems."[64]

Finally, the Kennedy administration, which had previously supported a robust buildup of missiles instead of bombers, began to question the value of missiles as actual weapons, rather than just a deterrent, and reduced their strong sponsorship of the new systems. Roger Hilsman, Kennedy's Assistant Secretary of State for Intelligence and Research, later contended that "one of the longer-range effects [of the

crisis] was to change attitudes toward nuclear weapons." This change allowed Air Force leaders like General LeMay to relegate the new weapons to a less significant role in the service's operations and to de-emphasize their operations.[65]

It is doubtful that Kennedy ever agreed with Eisenhower's assessment that "in ten years he saw missiles carrying the burden of warfare," especially since defense analyst Lawrence Freedman contends that "the basic guidelines for the strategic doctrines of the Kennedy administration were derived from the critique of the strategy of 'massive retaliation' as it had evolved during the 1950s."[66] In fact, it is possible that some members of the Kennedy administration never supported the use of nuclear missiles as strongly as they appeared to have. As early as 1945, key scientists from the Manhattan Project had joined together to warn against "any effort to formulate our [U.S.] foreign policy on the basis of a temporary superiority in atomic weapons" which they claimed would "force other nations as well as ourselves into an atomic armaments race, thereby creating a world of fear and hatred in which both great and small nations will face sudden destruction."[67] Political scientist Nina Tannenwald argues that by the late 1950s, the Eisenhower administration's attempts to persuade Americans and their allies that tactical nuclear weapons should be treated as conventional weapons had failed. She writes, "Starting in 1954, American public opinion began shifting against initiating the use of nuclear weapons, where it has remained ever since . . . . In 1955, 67 percent of those asked supported the United States making an agreement with the

Soviet Union that if war broke out the United States would not use atomic or hydrogen bombs if other countries did not."[68]

Daniel Ellsberg supported this mindset in his memoirs, contending that McNamara had decided not to use nuclear weapons before the Cuban Missile Crisis, "inferr[ing McNamara's] position from the way he talked with me in a private lunch at his desk in 1961."[69]

However, historian Lawrence Wittner warns that while some Kennedy advisors were more supportive of the anti-nuclear position than Eisenhower's staff, "the importance of this political transition [from the Eisenhower administration to the Kennedy administration] should not be exaggerated." It is very likely that members of the administration were influenced against nuclear warfare at the same time as many of the nation's citizens, following the Cuban Missile Crisis, rather than before. Arthur Schlesinger, Kennedy's special assistant, later explained that "the Kennedy administration welcomed pressure from domestic arms control groups as an offset against the pro-arms-race pressure from Congress and the military, . . . [but] the administration valued these groups for political reasons rather than as a source of ideas."[70]

Kennedy had campaigned on Eisenhower's missile gap and entered office focused on reducing that gap and preparing a strong nuclear missile force. This engaged concentration only began to wane after the Cuban Missile Crisis as the administration reconsidered whether the United States could really effectively use

nuclear missiles as weapons. In a message to Congress just seven months before the Cuban crisis, Kennedy argued that "in the event of a major aggression that could not be repulsed by conventional forces, we must be prepared to take whatever action with whatever weapons are appropriate." On August 9, 1962, General Maxwell Taylor reiterated the administration's position on the first use of nuclear weapons, warning, "In my judgment, if an attack on Western Europe comes, we must use whatever weapons and forces are necessary to defeat it. To meet a massive attack today, because of the lack of adequate conventional forces in the West, it would be necessary to resort to atomic weapons early in the conflict."[71]

McNamara, in a June 1962 commencement address at Ann Arbor, Michigan, had said: "The U.S. has come to the conclusion that to the extent feasible basic military strategy in a possible general nuclear war should be approached in much the same way that more conventional military options have been approached in the past. That is to say, principal military objectives, in the event of a nuclear war stemming from a major attack on the Alliance, should be the destruction of the enemy's military forces, not his civilian population." This counterforce doctrine required the United States to build enough missiles to destroy enemy offensive weapons, since missiles could be better protected than bombers and launched more quickly. Paul Nitze, the Assistant Secretary of Defense for International Security Affairs, explained further, "The President's first step was to strengthen our second-strike capability by accelerating our Minuteman and Polaris programs . . . . The effect of this decision, . . . , was to reduce dependence for

survival of our strategic force on early warning and a quick response. While our B-52 bombers continued to rely on warning and alertness for their survival, our Minutemen in their hardened silos and Polaris missiles in their submarines, at that time, did not."[72]

Thus, while McNamara said during the same speech that he "look[ed] forward to the prospect that through arms control the actual use of these terrible weapons may be completely avoided", he continued to increase the number and quality of ballistic missiles. He also revised the Single Integrated Operations Plan (SIOP), the plan to use nuclear weapons, to make it less rigid and continued to prepare for nuclear war, including a first strike capability. The revised SIOP, implemented in July 1962, focused U.S. nuclear attacks on Soviet military forces rather than its cities in order to limit the weapons able to be used against the United States, to convince the French that they did not need an independent nuclear force and to convince the Soviets to do the same, but the plan's aim was still to win a nuclear conflict.[73]

However, by the end of the Cuban Missile Crisis, the key leaders of the administration had begun to change their perspectives on preparations for nuclear war. Historian Gregg Herken quotes McNamara as warning Kennedy during the crisis, "If one of these . . . things was launched against New York, Washington, or Miami . . . it would destroy so many people that you, Mr. President, would never want to accept the risk" and later musing, "If that was the case with one, think what a limited nuclear war would look like."[74] David Ormsby-Gore, Lord Harlech, recalled the president bursting out during a private conversation they had during the crisis, "You know, it really is an

intolerable state of affairs when nations can threaten each other with nuclear weapons. This is just so totally irrational. A world in which there are large quantities of nuclear weapons is an impossible world to handle. We really must try to get on with disarmament if we get through this crisis . . . because this is just too much."[75]

Clark Clifford, Kennedy's Chairman of the President's Foreign Intelligence Advisory Board, remembered that "after October 1962, . . . , the leaders of both sides [Soviet and American] having experienced the bitter taste that comes from thinking the unthinkable, shied away from any repetition of that experience." In Clifford's mind, "The Missile Crisis had served the same function as an inoculation against a dread disease: there was never another confrontation as dangerous as that nuclear face-off between the two superpowers, which taught both sides how dangerous it was to go to the brink face to face, eyeball to eyeball."[76]

"The Cuban Missile Crisis marked the beginning of a long, slow trend away from the threat of nuclear war. War games, crisis planning, and a massive (and wasteful) military buildup on both sides would continue for another quarter century," Clifford asserted, "but after the Missile Crisis, even though the two sides continued their worldwide competition, neither side again flirted with a direct nuclear showdown."[77] McGeorge Bundy declared similarly that ". . . the preeminent meaning of the Cuban missile crisis, for participants and observers alike, and for the quarter century of history that followed, is that having come so close to the edge, the leaders of the two governments have since taken care to keep away from the cliff."[78]

Historian Gregg Herken agreed, contending that McNamara's "reflections upon the crisis in Cuba convinced him that the hope of fighting a limited nuclear war was both futile and dangerous."[79] Henry Rowan, McNamara's Deputy Assistant Secretary of Defense for International Security Affairs from 1961 to 1964, further substantiated the perception. Rowan recalled that McNamara's memorandums to the President on nuclear strategy abruptly shifted from the idea of fighting or controlling a nuclear war to the idea of deterring conflict.[80]

If there were any further doubt, McNamara himself cleared it up in his book, *Blundering Into Disaster*, writing "I do not believe we can avoid the serious and unacceptable risk of nuclear war until we recognize -- and until we base all our military plans, defense budgets, weapons deployments, and arms negotiations on recognition -- that nuclear weapons serve no purpose whatsoever." He continued, "They are totally useless -- except to deter one's opponent from using them. This is my view today [in 1986]. It was my view in the early 1960s." He then clarified his outlook as Secretary of Defense. "At that time, in long private conversations with successive Presidents -- Kennedy and Johnson -- I recommended, without qualification, that they never initiate, under any circumstances, the use of nuclear weapons. I believe they accepted my recommendations."[81]

Paul Nitze noticed the change after the Cuban Missile Crisis, although he offered a different reason for it. In his revealing memoir, *From Hiroshima to Glasnost*, he argued that "the size of the budgetary requirement for a controlled and flexible nuclear

strategic force oriented toward an effective counterforce capability soon cooled McNamara's ardor after the Cuban Missile Crisis of 1962. By then the danger of a nuclear confrontation with the Soviet Union appeared to have diminished and the costs of meeting it . . . were thought to be greater than he had originally assumed." Nitze continued, "Therefore, because of the requirements of building up our conventional forces and his concerns in 1963 that the country would not meet the cost of a ballooning defense budget, he [McNamara] changed his goals concerning our nuclear strategy and force structure." Although Nitze did not agree with the change, McNamara's viewpoint prevailed.[82]

Therefore, in December 1963, according to historian Andreas Wenger, McNamara advised Kennedy that "the central objective for the strategic nuclear forces was to assure U.S. ability to destroy, after a well-planned and well-executed Soviet surprise attack on U.S. strategic forces, 'the Soviet government and military controls, plus a large percentage of their population and economy." The Kennedy administration then significantly revised both its war plans and military arsenal, including the cache of nuclear ballistic missiles, switching from the counterforce strategy to mutual assured destruction.[83]

McNamara called his nuclear strategy Mutually Assured Destruction to show the futility of nuclear conflict. Although his source is not documented, he may have borrowed the concept from the book, *The Ultimate Weapon*, edited by Bernard Brodie in 1946. In Brodie's book, Arnold Wolfers contended, "In the atomic age the threat of

retaliation in kind is probably the strongest single means of determent. Therefore, the preparation of such retaliation must occupy a decisive plan in any over-all policy of protection against the atomic danger." He then applied it to the situation that McNamara faced: "Neither we nor the Russians can expect to feel even reasonably safe unless an atomic attack by one were certain to unleash a devastating atomic counterattack by the other." Brodie agreed, proposing "If the aggressor state must fear retaliation, it will know that even if it is the victor it will suffer a degree of physical destruction incomparably greater than that suffered by any defeated nation of history, incomparably greater, that is, than that suffered by Germany in the recent war. Under those circumstances," he continued, "no victory, even if guaranteed in advance--which it never is--would be worth the price. The threat of retaliation does not have to be 100 per cent certain; it is sufficient if there is a good chance of it, or if there is a belief that there is a good chance of it." Historians Gerard Clarfield and William Wiecek contend that Mutually Assured Destruction was McNamara's admission that fighting a limited nuclear war within defined boundaries, a key goal of the Flexible Response and counterforce strategies, was impossible.[84]

The change in perspective on nuclear war was not limited to the Kennedy administration. Khrushchev, too, changed his rhetoric, telling Norman Cousins, the leader of the Committee for a SANE Nuclear Policy, in mid-December 1962, "Peace ... is the most important goal in the world. If we don't have peace and the nuclear bombs start to fall, what difference will it make whether we are Communists or Catholics or

capitalists or Chinese or Russians or Americans? Who could tell us apart? Who will be left to tell us apart?"[85] American citizens recognized the change in relations between the two superpowers. In October, 1961, Snell Putney and Russell Middleton conducted a study of college student attitudes toward war. At that time, 72 percent of respondents agreed that "the U.S. must be willing to run any risk of war which may be necessary to prevent the spread of Communism" while only 34 percent agreed that "the U.S. has no moral right to carry its struggle against Communism to the point of risking the destruction of the human race."[86] After the Cuban Missile Crisis, though, American citizens "emerged from the crisis like convicted felons who received a reprieve after being strapped into the electric chair: they sighed with relief but could not shake the near-memory of sudden death."[87] For a few months after the crisis, people remained concerned. However, by April 1963, the percentage of people who believed a world war would occur in the next five years dropped to the lowest point recorded in the 1950s and 1960s and, by July 1964, only 1% of respondents responded to a Gallup poll question on "the most important problem facing the country today" with communism or communist infiltration while 34% mentioned racial discrimination/civil rights and integration and 17% mentioned unemployment. Just two months later, when asked if the Russian leaders would refuse to risk launching a nuclear war *no matter what the U.S. did*, a surprising 29% agreed.[88]

McNamara's Mutually Assured Destruction policy appears to have continued into the Lyndon Johnson administration, along with Kennedy's foreign policy advisors

and Secretary of Defense. Johnson, himself, in a September 16, 1964 speech at the Peace Arch in Seattle, Washington, proclaimed, "We have worked consistently to bring nuclear weapons under careful control, and to lessen the danger of nuclear conflict . . . . I do not want us to fight a war that no one ever meant to begin." The Johnson administration had "expanded and modernized our conventional forces . . . . [so] we do not need to use nuclear power to solve every problem."[89]

McGeorge Bundy, Johnson's National Security Advisor, proclaimed that "by 1964 he [Johnson] was entirely clear in his own mind that he would have no interest whatever in ordering the use of even one [atomic] bomb, ever, except in the context of some overwhelmingly dangerous and direct confrontation with open Soviet aggression." Johnson, Bundy believed, saw atomic weapons as "a danger so much greater that one must think of any use of it not in the terms of a battle or a campaign, or even a war won or lost, but rather in terms of the long-term effect of any such use on the survival of man. It is not wrong, I believe, to conclude that for Johnson the use of the bomb in Vietnam was quite literally unthinkable."[90]

The war in Vietnam is a perfect example of the Johnson administration's decision not to use nuclear forces as weapons. Political scientist Nina Tannenwald contends that because "the United States sustained large losses in men, money and materiel at tremendous political cost [and] U.S. officials repeatedly declared that the United States could not tolerate the loss of Southeast Asia to Communism, and that the war was vital for American interests, prestige, and security," she believes, "one of the

remarkable features of the Vietnam War is how little serious consideration US leaders gave to nuclear options. Although they made some veiled nuclear threats, top political leaders did not come close to using nuclear weapons." Tannenwald argues persuasively that "while nuclear weapons might have been militarily useful in the war, it was clear that, by the time the war was fought, they were politically unusable, and for some officials, even morally unacceptable."[91] This remarkable change in attitude toward nuclear conflict among influential American leaders and politicians had significant and long-term influence on U.S. defense posture and allocations for military forces after 1963, particularly on Air Force missiles and missileers.

Notes

[1] Apogee refers to the highest point of a missile's flight path before it begins to fall.

[2] John F. Kennedy, "Speech to Wood County, West Virginia Democratic Committee" as quoted in the *Parkersburg Sentinel*, October 10, 1958. *West Virginia Division of Culture and History*, West Virginia Archives and History, Battleground West Virginia: Electing the President in 1960, http://www.wvculture.org/history/1960presidentialcampaign/newspapers/19581010parkersburgsentinel.html. (Accessed February 16, 2015).

[3] "Democratic Party Platform of 1960," July 11, 1960, online by Gerhard Peters and John T. Woolley, *The American Presidency Project*, http://www.presidency.ucsb.edu/ws/?pid=29602. (Accessed February 18, 2015). See also Meenekshi Bose, *Shaping and Signaling Presidential Policy: The National Security Decision Making of Eisenhower and Kennedy* (College Station, TX: Texas A&M University Press, 1998), 49.

[4] The Air Force designed the proposed B-70 bomber to fly at Mach 3 for short distances and to cruise at altitudes of over 70,000 feet so that it could overcome the Soviet Union's new anti-aircraft defenses, but it was plagued by many problems. See Peter Roman, "Strategic Bombers over the Missile Horizon, 1957-1963," *Journal of Strategic Studie*s 18, No. 1 (March 1995), 204. The Polaris missile was a two-stage solid fueled missile designed by the Navy to be fired from a submarine. The missile provided a protected second-strike capability, deterring attacks by remaining a hidden target, prepared to launch a follow-on attack if needed.

[5] Christopher A. Preble, *John F. Kennedy and the Missile Gap* (Dekalb: Northern Illinois University Press, 2004), 112, 162. "Flexible Response" was a direct reaction to Eisenhower's "New Look" approach. Kennedy believed that Eisenhower's budget conscious military options forced him into an all or nothing stance, so he devised "Flexible Response" to provide flexibility in nuclear responses and an increased conventional capability to deal with threats that did not require a nuclear response. However, Francis J. Gavin, in "The Myth of Flexible Response: American Strategy in Europe during the 1960's," *International History Review* 23, No. 4 (December 2001), 847-875, argued that the two strategies were much closer than the rhetoric would suggest. The name of the strategy came from Maxwell Taylor, *The Uncertain Trumpet* (New York: Harper, 1959), 6, where Taylor remarked, "The strategic doctrine which I propose to replace Massive Retaliation is called herein the Strategy of Flexible Response." He then explained that, "this name suggests the need for a capability to react across the entire spectrum of possible challenge, for coping with anything from general atomic war to infiltrations and aggressions such as threaten Laos and Berlin in 1959."

[6] Dwight Eisenhower, "Annual Message to the Congress on the State of the Union, January 9, 1959," http://www.eisenhower.archives.gov/all_about_ike/speeches/1959_state_of_the_union.pdf. (Accessed February 17, 2015). For Eisenhower's decision to increase spending on the

Minuteman and Polaris missiles, see Peter Roman, *Eisenhower and the Missile G*ap (Ithaca: Cornell University Press, 1995), 191.

[7] After Kennedy revealed that the missile gap did not exist, Representative Frank Osmers (R-NJ) condemned Kennedy, saying that his campaign rhetoric "that the Eisenhower administration had been derelict in permitting a missile gap to develop between Russia and the United States . . . was probably the greatest single factor in his winning the election by a few thousand votes." U.S. Congress, House, *Congressional Record*, March 21, 1962, 4701. Kennedy appears to have believed the topic was important to the election as well, as in his inaugural address, he warned that "we dare not tempt [the nations who would make themselves our adversary] with weakness. For only when our arms are sufficient beyond doubt can we be certain beyond doubt that they will never be employed." John Fitzgerald Kennedy, "Inaugural Address," 20 January 1961, *American Presidency Project,* http://www.presidency.ucsb.edu/ws/?pid=8032. (Accessed June 18, 2015).

[8] During this time, each missile was capable of carrying one nuclear warhead. There was also a Snark missile wing with thirty aeronautic intercontinental missiles that could carry a nuclear warhead 6,325 miles, although one of Kennedy's first actions related to defense was to "immediate[ly] phase out . . . the subsonic Snark . . . , which is now considered obsolete and of marginal military value." For this quotation, see John F. Kennedy, "Special Message to the Congress on the Defense Budget," March 28, 1961, *Public Papers of President John F. Kennedy 1961* (Washington, D.C.: U.S. Government Printing Office, 1964), 238. The mobile Minuteman missiles would not be placed in a silo, but would be transported around the country by train, making them harder to locate and destroy. Numbers for the American intercontinental missiles, including the Snark, were found in J. C. Hopkins and Sheldon Goldberg, *The Development of the Strategic Air Command, 1946-1986* (Offutt AFB, NE: Office of the Historian, HQ, Strategic Air Command, 1986), 89, 94, and in Desmond Ball, *Politics and Force Structure: The Strategic Missile Program of the Kennedy Administration* (Berkeley: University of California Press, 1980), 46. The number of Thors and Jupiters are discussed in Philip Nash, *The Other Missiles of October: Eisenhower, Kennedy, and the Jupiters, 1957-1963* (Chapel Hill: University of North Carolina Press, 1997), 68. Each of the missiles had one warhead. Steven Zaloga, *The Kremlin's Nuclear Sword: The Rise and Fall of Russia's Strategic Nuclear Forces, 1945-2000* (Washington, D.C.: Smithsonian Institution Press, 2002), 64, provided the number of Soviet missiles for comparison. However, no one in the United States was aware of this number at the time. For more information on the mobile Minuteman missiles, see Steven Pomeroy, "Echoes that Never Were: American Mobile Intercontinental Ballistic Missiles, 1956-1983," (Ph.D. dissertation, Auburn University, 2006).

[9]Robert McNamara with Brian VanDeMark, *In Retrospect: The Tragedy and Lessons of Vietnam* (New York: Random House, 1995), 20. The decision to immediately look into the missile gap is also revealed in Christopher Preble's notes from a phone interview with Robert McNamara dated April 10, 2003, which Preble kindly provided to the author.

[10] Jack Raymond, "Memo from Jack Raymond on the McNamara backgrounder," February 6, 1961, 1, Robert McNamara File, Box 40, Krock Papers, Mudd Manuscript Library, Princeton University.

[11] Ball, *Politics and Force Structure,* 34-38.

[12] McNamara, *In Retrospect*, 20. Jack Raymond's "Memo from Jack Raymond on the McNamara backgrounder," revealed that, in response to a question on the missile gap, McNamara replied that "we should not talk about missile gaps, but destruction gap[s], ... 'There's no missile gap.' Wait a minute, a reporter said, the missile gap is a reference to the numbers of missiles we have compared with the number they could have produced . . . . 'There's no missile gap today even in the narrow sense of the term,' Mr. McNamara said." For Raymond's published article, see Jack Raymond, "Kennedy Defense Study Finds No Evidence of a 'Missile Gap'," *New York Times*, February 7, 1961, 1, 21. For more on the interview that led to Raymond's story, see Preble, *Kennedy and the Missile Gap*, 154-59. Although Preble admits that McGeorge Bundy and Adam Yarmolinsky both "claimed that Kennedy was not seriously upset by the gaffe," Preble argues that "Kennedy allegedly blasted McNamara over the phone." In a phone call with the author, Preble explained that his argument is based on Richard Reeves' biography, *President Kennedy: Profile of Power* (New York: Simon and Schuster, 1993), 58-59, and Raymond's notes of a later conversation. In these notes, Raymond alludes to a hostile reaction when he later "suggested that Mr. McNamara be shown the President's recommendation of renewed backgrounders, and a public relations man observed, 'Listen, when your eyes are bloody, it's a little hard to see the flowers on your desk.'" The possibility of a hostile reaction is even more credible since Ted Sorensen, in *Counselor: Life at the Edge of History* (New York: Harper-Collins, 2008), 299, remembered that Kennedy "called up [State Department spokesman] Lincoln White personally to reprimand him sharply" for quoting a Kennedy speech without obtaining approval.

[13] Kennedy, "Annual Message to the Congress on the State of the Union," January 30, 1961, *Public Papers of the Presidents*, 25. See also John F. Kennedy, *The Kennedy Presidential Press Conferences* (New York: Earl M. Coleman Enterprises, 1965), 24.

[14] U.S. Congress, House, Committee on Appropriations, *Hearings on Department of Defense Appropriation for 1962*, 87th Congress, 1st Session, part 3, April 7, 1961, 59-60. While Secretary McNamara did express that there was a missile gap, it was only after Representative George Mahon (D-TX) defined "missile" as an intercontinental ballistic missile, specifically Atlas, Titan, and Minuteman, and "explicitly excluding the POLARIS, MACE, SNARK, and any similar missile or weapon which the opponent or we may have" and limited the information to that in official "intelligence estimates." McNamara told Christopher Preble, in an April 10, 2003 interview, that it was obvious that there was no missile gap in early February 1961. In addition, Jerome Wiesner, Kennedy's science advisor, informed historian Gregg Herken in a February 1982 interview that he had briefed Kennedy that there was no missile gap in early February. For further information on the interviews, see Preble, *Kennedy and the Missile Gap*, 153-54, 157, 215-16.

[15] Kennedy, "Special Message to the Congress on the Defense Budget," March 28, 1961, *Public Papers of the Presidents*, 238. See also Ball, *Politics and Force Levels*, 122-23. Lawrence Kaplan, Ronald Landa, and Edward Drea, *The McNamara Ascendancy, 1961-1965*, Vol V, *History of the Office of the Secretary of Defense* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 2006), 59, contends that the money saved from the last two Titan squadrons could pay for "approximately 100 Minuteman missiles dispersed and hardened." The production of the Polaris missiles and associated submarines was later speeded up and some were ready by the Cuban Missile Crisis.

[16] Following the Allied victory over Germany, the United States, France, England, and the Soviet Union jointly occupied the defeated nation, including the capital Berlin. They divided the nation up into occupation zones with England, France, and the United States planning for the nation to be reunified after resolving the concerns caused by the war. However, the Soviet Union, which controlled the section containing Berlin, wanted to retain control of the section it occupied indefinitely, either leaving the nation divided or dominating the entire country after the other Allies left. The occupied city of Berlin infuriated the Soviets because it allowed the other nations access to the eastern portion of the country and because it allowed the Germans from the eastern section to escape to the west as conditions worsened in the east.

[17] Alain C. Enthoven and K. Wayne Smith, *How Much is Enough?: Shaping the Defense Program, 1961-1969* (Santa Monica, CA: RAND, 1971), 167; Lawrence Freedman, *Kennedy's Wars: Berlin, Cuba, Laos, and Vietnam* (New York: Oxford University Press, 2000), 64-75. Fred Kaplan contends that Kennedy also prepared for a nuclear strike if the crisis intensified, but other sources suggest this was just military planning to determine possible options. Fred Kaplan, "JFK's First-Strike Plan," *Atlantic* (October 2001), www.theatlantic.com/magazine/archive/2001/10/jfks-first-strike-plan/37642/. (Accessed April 9, 2015).

[18] Roger Hilsman, *To Move a Nation: The Politics of Foreign Policy in the Administration of John F. Kennedy* (Garden City, NY: Doubleday and Co., 1967), 163. See also Ball, *Politics and Force Levels*, 97, citing an interview with Roswell Gilpatric on January 30, 1973; Roger Hilsman, *The Cuban Missile Crisis: The Struggle Over Policy* (Westport, CT: Praeger, 1996), 7; and "Interview with Roswell Gilpatric, 1986 [3]," dated March 7, 1986, *Open Vault,* http://openvault.wgbh.org/catalog/wpna-5c1293-interview-with-roswell-gilpatric-1986-3. (Accessed February 20, 2015).

[19] Roswell Gilpatric, "Address before the Business Council at the Homestead, Hot Springs, Virginia," Press Release, October 21, 1961, *Digital National Security Archives*, Collection: Berlin Crisis, Item # BC02573 and # CC00115, http://nsarchive.chadwyck.com.lib-ezproxy.tamu.edu:2048/quick/displayMultiItemImages.do?Multi=yes&queryType=quick&&ResultsID=14B0E0B74FD&QueryName=cat&ItemNumber=1&ItemID=CBC02573&imageNumber=3#imageTop. (Accessed February 20, 2015).

[20] During the Eisenhower administration, the CIA had devised a plan to help anti-Castro Cubans invade Cuba with the goal of overthrowing Castro and creating a government friendly to the United States. After his election, Kennedy authorized the plan, but several factors not only ensured that the invasion was a complete failure, but embarrassed the new Kennedy administration and the United States. Recalling the event in Nikita Khrushchev, *Khrushchev Remembers*, translated and edited by Strobe Talbott, with an introduction and notes by Edward Crankshaw (Boston: Little, Brown, and Co., 1970), 493, Khrushchev revealed, "We had to think up some way of confronting America with more than words. We had to establish a tangible and effective deterrent to American interference in the Caribbean. But what exactly? The logical answer was missiles." Khrushchev tied the U.S. threats to Cuba with his threats to Berlin in *Foreign Relations of the United States, 1961-1963*, Vol. VI, *Kennedy-Khrushchev Exchanges*, Document 56, ed. Charles S. Sampson (Washington: Government Printing Office, 1996), "Message from Chairman Khrushchev to President Kennedy," 159. For further discussion of the Soviet reasons for placing nuclear missiles on Cuba, see James Blight and David Welch, *On the Brink: Americans and Soviets Reexamine the Cuban Missile Crisis* (New York: Hill and Wang, 1989), 116 and 335. An alternate interpretation of events is John Lewis Gaddis, who argues in *The Cold War: A New History* (New York: Penguin Press, 2005), 75, that the real reason for the deployment was "to spread revolution throughout Latin America."

[21] Freedman, *Kennedy's Wars*, 163. For further information on the crisis, see Michael Dobbs, *One Minute to Midnight* (New York: Alfred A. Knopf, 2008) and David Coleman, *The Fourteenth Day: JFK and the Aftermath of the Cuban Missile Crisis* (New York: W.W. Norton and Co., 2012). Although both provide astonishing details of the crisis, neither deals with the actions of the missileers during the crisis.

[22] Ibid., 163.

[23] Robert Kipp, Lynn Peake, and Herman Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis of 1962* (Historical Study No. 90), Vol. 1 (Offutt AFB, NE: HQ, Strategic Air Command, 1963), 1, 7, 11. This study noted that "during the crisis a member of the SAC historical staff was on duty in the operations war room 24 hours a day, seven days a week. There he was able to follow events through the displays, briefings, informal discussions with battle staff personnel, and by examination of hundreds of messages which flowed in and out of the combat reports center. On a daily basis he was responsible for compiling a chronology of events for the Chief of Staff." Although much of volume 1, the narrative history, has been declassified through Freedom of Information Act requests, the volumes containing the original documentation behind the narrative remain classified. For more information on the Soviets placement of the missiles and the responding U.S. intelligence collection, see Freedman, *Kennedy's Wars*, 169.

[24] Declassified CIA map in "The World on the Brink: John F. Kennedy and the Cuban Missile Crisis," *John F. Kennedy Presidential Library and Museum,* http://microsites.jfklibrary.org/cmc/oct16/. (Accessed May 30, 2015.) Nikita Khrushchev, in *Khrushchev Remembers*, trans. and ed., Strobe Talbott (Boston: Little, Brown, and Co., 1970),

496, stated that "we had installed enough missiles already to destroy New York, Chicago, and the other huge industrial cities, not to mention a little village like Washington."

[25] Sorensen, *Counselor*, 286-300.

[26] Curtis LeMay to Maxwell Taylor, letter dated October 22, 1962, subject: Additional Decisions, Taylor File, Box 6, October 1962, *Digital National Security Archives*, http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB397/docs/doc%206%2010-22-62%20LeMay%20memo%20on%20SAC%20readiness.pdf. (Accessed February 20, 2015). According to Ruud van Dijk, William Glenn Gray, Svetlana Savranskaya, Jeremi Suri, and Qiang Zhai, eds., *Encyclopedia of the Cold War* (New York: Routledge, 2008), 237, "'The DEFense CONdition' (DEFCON) alert system of the United States was formulated by the U.S. Joint Chiefs of Staff . . . at the height of the Cold War in November 1959 and is used to coordinate the readiness level of U.S. military and intelligence forces . . . . The DEFCON system is a series of gradated alert levels designed to harmonize the response of the U.S. to a variety of threats. There are five levels starting with DEFCON 5, the lowest level of alert, to DEFCON 1, the highest level of alert. While the DEFCON system has been raised as high as DEFCON 2 (during the Cuban Missile Crisis), it has never been raised to DEFCON 1, despite being in existence during periods of incredibly high military tension both during and after the Cold War."

[27] Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 34.

[28] Simpson quoted in David Bath, ed., *Air Force Missileers and the Cuban Missile Crisis: A Collection of Personal Reminiscences from Missileers and Others who Experienced the Cuban Missile Crisis of 1962* (Breckenridge, CO: Association of Air Force Missileers, 2012), 7, 88-89.

[29] Kelchner quoted in ibid., 64. Kelchner, in a July 14, 2015 email to the author, explained that the targeting team was a three man team that loaded the classified targeting information into nuclear missiles. The teams consisted of a missile systems analyst certified in electronics, a missile mechanic certified in the mechanical workings of the missile, and a junior officer required to control the classified targeting material. The classified targeting tapes were the best technology at the time to place the targeting data into the early computers that were on the missiles. Gary Hoselton, in an email to the author dated November14, 2014, explained that "targets came on reels of punched mylar tape, which was read into the Univac Athena guidance computer and then stored in a safe." Any time the crews carried this targeting material, they were required to carry weapons to protect the critical targeting data. Since Vandenberg AFB was primarily a training base by this time, the crews were used to working with training missiles that would be launched into the Pacific Ocean without a live nuclear warhead. This time, however, the missileers worked with a live "reentry vehicle" containing a nuclear warhead and "real" guidance and control data targeting a location on the potential enemy's soil rather than a designated location in the Pacific. Hoselton worked with the Titan 1 missile at Mountain Home AFB, Idaho from 1962 to 1965. He left the Air Force "to go to engineering school before Vietnam could grab [him] because [he] had aircraft skills."

[30] Stanley quoted in ibid., 90-91.

[31] Ibid., 76.

[32] The missile field refers to the large area that contains all of the missiles and launch control centers for a single wing. It often covers hundreds of miles and is away from the supporting Air Force base.

[33] Kenderes quoted in Bath, ed., *Air Force Missileers*, 66-67.

[34] Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 62. See also Bernard Nalty, *USAF Ballistic Missile Programs, 1962-1964* (Washington, D.C.: USAF Historical Division Liaison Office, 1966), 1. A copy of Nalty's work can be found in the *National Security Archives*, http://www2.gwu.edu/~nsarchiv/nukevault/ebb249/doc03.pdf. (Accessed February 27, 2015).

[35] Bath, ed., *Air Force Missileers*, 25-26, 88-89.

[36] Ibid., 97.

[37] Message from JCS to ALT COMNELM, JACE AFLOAT, and JACE AIRBORNE, *Digital National Security Archives*, document 8, "10-23-62 JCS Message to CINCSAC," http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB397/docs/doc%208%2010-23-62%20JCS%20%20message%20to%20Cincsac.pdf (Accessed February 27, 2015). See also Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 35, 55.

[38] McLaughlin quoted in Bath, ed., *Air Force Missileers*, 74.

[39] Patrick Spellman, email to author dated November 20, 2014.

[40] Morgan quoted in Bath, ed., *Air Force Missileers,* 78.

[41] Gordon quoted in ibid., 44.

[42] Power's speech is quoted in Bath, ed., *Air Force Missileers*, 8. Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 63, provide even greater clarity, documenting that Strategic Air Command ordered missileers "to deviate from normal technical data procedures in bringing ICBMs to rapid readiness configuration. Units would not check out systems or verify readiness, except when needed for personnel or equipment safety." This guidance "was rescinded three days later," mainly "because of safety considerations."

[43] Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 64-66. According to Robert S. Norris, "The Cuban Missile Crisis: A Nuclear Order of Battle, October/November 1962," A Presentation at the Woodrow Wilson Center, October 24, 2012, http://www.wilsoncenter.org/sites/default/files/2012_10_24_Norris_Cuban_Missile_Crisis_Nuclear_Order_of_Battle.pdf, (Accessed February 25, 2015), 13, eleven other missiles at

Vandenberg AFB remained under the control of Air Force Systems Command. Almost unbelievably, one of the missiles that remained, an Atlas D, was launched during the height of the crisis, at 4 am (PST) on October 26, 1962. A second was launched on November 14. Thomas Reed, who later became Secretary of the Air Force, recalled test launches in Bath, ed., *Air Force Missileers*, 84, admitting "the fact that something important was going on in Florida and Cuba was lost on all of us. We continued to fire large thermonuclear weapons right through the missile crisis of late October, oblivious to the spurious signals we were sending into the most tense negotiations then in process half a world away." Chris Adams, who served as the Deputy Chief, Control Division, in the Ramsey AFB, Puerto Rico command post during the Cuban Missile Crisis and retired as a major general, also mentioned the scenario, along with potential repercussions in Christopher S. Adams, *Ideologies in Conflict: A Cold War Docu-Story* (Bloomington, IN: iUniverse, 2001), 426.

[44] David Burcham and Kelchner quoted in Bath, ed., *Air Force Missileers*, 32, 62. Ed Gill, in ibid., 40, provides more information on the process of reorienting the missiles.

[45] Rodolfo Armenta, quoted in ibid., 16-17.

[46] Ibid. Wyatt Earp is an American gunslinger and lawman best known for a gunfight at the O.K. Corral in Tombstone, Arizona in 1881. The allusion, along with the term "notches on his gun" are meant to suggest that the Lieutenant may have been more willing to shoot the two technicians than Armenta would have liked.

[47] Melvin Driskill, email to author dated February 8, 2015. The official history, Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* contends that there were only two missiles originally, with twenty-two combat ready crews (including the crews that were granted waivers) to operate the missiles on October 22. (The history does not address the number of crews that did not require a waiver). However, on October 28, the squadron had seven ICBMs and only twenty-three crews, a significant increase in responsibility.

[48] Melvin Driskill, email to author dated February 8, 2015.

[49] Combat ready crews were fully trained and certified to work on and launch the missiles. According to the official history, the instructor crew was not used for "normal alert tours," but was used "as needed to cover maintenance problems," which the waivered crews were not allowed to do, and to provide training to the untrained crews. The four combat ready crews returned to their normal duty stations on November 18, after the height of the crisis, but the instructor crew did not return to Vandenberg AFB "until relaxation of DEFCON 2." Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 74-75.

[50] Adams, *Ideologies in Conflict*, 426-27; Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 72.

[51] Information from Sam Goodwin in Bath, *Air Force Missileers*, 42. Goodwin was a captain during the Cuban Missile Crisis. He retired from the Air Force as a colonel.

[52] Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 72; Adams, *Ideologies in Conflict*, 427.

[53] The evaluation process is quoted in Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 74. For Goodwin's account, see Bath, ed., *Air Force Missileers*, 42. He mentioned that his "crew was the first to be combat ready in the 12th SMS."

[54] Liquid oxygen mixed with RP-1, or Rocket Propellant-1, provided the thrust to send the rockets to their designated targets.

[55] Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 64. The history specifically names the three field petroleum offices in St. Louis, Missouri, Houston, Texas, and Maywood, California, as well as the Middletown Air Materiel Area logistics facility in Pennsylvania, as organizations that helped provide the liquid oxygen. See also Joseph W. Angell, Jr., ed., *The Air Force Response to the Cuban Missile Crisis* (Redacted) (Washington, D.C.: USAF Historical Division Liaison Office, 1963), 19.

[56] For the numbers of missiles, see Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 66. For the contents of the Khrushchev letter, see "Letter from Chairman Khrushchev to President Kennedy, October 28, 1962," *John F. Kennedy Presidential Library and Museum Reading List*, October 28, 1962. http://microsites.jfklibrary.org/cmc/oct28/doc1.html (Accessed February 25, 2015.)

[57] Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 66, 71, 58. Information on the Navy submarines is from Norris, "The Cuban Missile Crisis."

[58] Kennedy, *Kennedy Presidential Press Conferences*, 401-02. See also Angell, ed., *The Air Force Response to the Cuban Missile Crisis*, 12. David G. Coleman, in *The Fourteenth Day: JFK and the Aftermath of the Cuban Missile Crisis* (New York: Norton and Company, 2012), 167, reveals that, even though Khrushchev promised Kennedy on November 20th that "'[a]ll of the nuclear weapons have been taken away from Cuba,'". . . . the tactical nuclear warheads [missiles that could not reach the United States] did not actually leave Cuba until the following month." David Coleman took the above Khrushchev quote from *Foreign Relations of the United States, 1961-1963*, Vol. 11, *Cuban Missile Crisis and Aftermath*, Document 196, "Message From Chairman Krushchev to President Kennedy," dated November 20, 1962, 496. Coleman further contends, in *The Fourteenth Day*, 165-66, that the Joint Chiefs "repeatedly raised the issue . . . between November 1962 and February 1963, arguing that the weapons were a threat to Guantanamo," but the Kennedy administration did not think they were that important.

[59] Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 70 and Angell, ed., *The Air Force Response to the Cuban Missile Crisis,* 11.

[60] The sources do not agree on the date that the command returned to DEFCON 4. Angell, ed., *The Air Force Response to the Cuban Missile Crisis,* 11, contended it occurred three days after November 21, making it November 24, but Kipp, et. al., *Strategic Air Command*

Operations in the Cuban Missile Crisis, asserted it was on November 27. Charlie Simpson, in Bath, *Air Force Missileers*, 89, provided a plausible explanation for the difference, noting that command leadership "was concerned that if they let us all of for a long holiday weekend, they might lose a few of us in auto accidents" so retained the higher alert level until after the weekend was over.

[61] Kipp, Peake, and Wolk, *Strategic Air Command Operations in the Cuban Missile Crisis,* 77, 71, 62.

[62] Doug Turner, email to author dated November 21, 2014. Airman Turner served as a member of a Mobile Automatic Programmed Checkout Equipment Team for the Atlas D missiles at Warren AFB, WY during the Cuban Missile Crisis. He separated from the Air Force after one enlistment.

[63] Jim Peck, interview with the author on March 3, 2015. Peck entered the Air Force in 1951 and retired in 1979 as a colonel.

[64] LeMay and Zuckert quoted in Senate Hearings before the Subcommittee on DoD and the Committee on Armed Services , 88th Congress, 2nd Session, *DoD Appropriations, 1965*, pt 1, 307, 753-54, 722. Although LeMay's memoirs and biographies are mostly silent about missiles, Thomas Coffey, *Iron Eagle: The Turbulent Life of General Curtis LeMay* (New York: Crown Publishers, 1986), 358-59, reveals a second LeMay quote that is similar to that in the text. When asked if he approved of any program reducing manned bombers, LeMay responded, "I think it is fair to say, however, that for some time to come, the bulk of the combat potential is in the manned system rather than in the missile system. . . . [The missiles] are not as good as we were hoping for . . . ." See also Nalty, *USAF Ballistic Missile Programs*, 47-48.

[65] Hilsman, *The Cuban Missile Crisis, 151-52.* Hilsman, on page *137,* revealed that, in the aftermath of the Cuban Missile Crisis, "what President Kennedy really wanted was to use the crisis as a stepping-stone to a lessening of tensions in the world and a detente with the Soviet Union." Hilsman postulated further, "Quite clearly, he was already thinking of what became his great American University speech that proposed a nuclear test ban treaty -- which he hoped would be only the first step toward worldwide nuclear disarmament." Hilsman conducted research for then Senator Kennedy when Hilsman worked for the Congressional Research Service.

[66] Eisenhower quoted in Andrew Goodpaster, "Memorandum of Conference with the President," November 18, 1959 - Augusta, Papers as President of the United States, 1953-1961 (Ann Whitman File), DDE Diaries, Box 45, Staff Notes, Nov. 1959 (2), Eisenhower Presidential Library. See also Peter Roman, "American Strategic Nuclear Force Planning, 1957-1960: The Interaction of Politics and Military Planning" (Ph.D. dissertation, University of Wisconsin - Madison, 1989), 267. Lawrence Freedman, *The Evolution of Nuclear Strategy* (New York: St Martin's Press, 1981), 230.

[67] Hollywood Independent Citizens' Committee of the Arts, Sciences and Professions, "Statement of the Federation of Atomic Scientists," 1945. Published Papers and Official Documents. *Linus Pauling and the International Peace Movement*. http://scarc.library.oregonstate.edu/coll/pauling/peace/papers/peace4.012.7-statement.html. (Accessed June 25, 2015.)

[68] Nina Tannenwald, *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons Since 1945* (New York: Cambridge University Press, 2007), 181-82. Her figures come from Thomas Graham, *American Public Opinion on NATO, Extended Deterrence and the Use of Nuclear Weapons: Future Fission?* CSIA Occasional Paper No. 4 (Center for Science and International Affairs, Harvard University, 1989), 70.

[69] Daniel Ellsberg, *Secrets: A Memoir of Vietnam and the Pentagon Papers* (New York: Penguin, 2002), 57-60. Ellsberg acknowledged that the 1961 conversation had no impact on U.S. nuclear policy and even admits that "after we left McNamara's office, Adam [Yarmolinksy, McNamara's assistant] took me into his small adjoining room and said, 'You must tell no one outside this room what Secretary McNamara has told you.'" Ellsberg joined the Department of Defense in 1964, after drafting the Secretary of Defense Guidance to the Joint Chiefs of Staff on nuclear conflict as a strategic analyst at RAND.

[70] Lawrence Wittner, *Resisting the Bomb: A History of the World Nuclear Disarmament Movement, 1954-1970* (Stanford, CA: Stanford University Press, 1997), 359. Schlesinger quoted in *Wittner, Resisting the Bomb*, 377.

[71] Kennedy, "Special Message to the Congress on the Defense Budget," March 28, 1961, *Public Papers of the Presidents*, 232. Admittedly, Kennedy was no advocate of nuclear war. Just a month and a half earlier, he argued, "Now, if someone thinks we should have a nuclear war in order to win [against the Soviets], I can inform them that there will not be winners in the next nuclear war, if there is one, and this country and other countries will suffer heavy blows." John Kennedy, "The President's News Conference of February 14, 1962," *Public Papers of the Presidents*, 141. U.S. Congress, Senate, Committee on Armed Services, *Congressional Record*, August 9, 1962, Citation: HRG-1962-SAS-0020, 4. Maxwell Taylor had served as Army Chief of Staff under President Eisenhower. However, he disagreed with Eisenhower's reliance on nuclear weapons and retired, authoring a book that aligned closely with Kennedy's thoughts on defense. Therefore, after the Bay of Pigs invasion of Cuba failed, Kennedy asked Taylor to determine what happened. During this time, Kennedy and Taylor became friends. Kennedy recalled Taylor to active duty to serve as his military representative, then appointed Taylor as Chairman of the Joint Chiefs of Staff.

[72] Address is printed in Robert McNamara, "Defense Arrangements of the North Atlantic Community," *Department of State Bulletin* XLVII, No. 1202 (July 9, 1962): 64-69. The quote is taken from page 67. Nitze quote from Paul Nitze, with Ann Smith and Steven Reardon, *From Hiroshima to Glasnost: At the Center of Decision* (New York City: Grove Weidenfeld, 1989), 248. Nitze helped draft the Gaither report, which criticized Eisenhower for allowing a

"missile gap." He then advised Kennedy on national security affairs during the 1960 presidential campaign. Following Kennedy's election, Nitze became the Assistant Secretary of Defense for International Security Affairs.

[73] McNamara, "Defense Arrangements of the North Atlantic Community," 64-69. See also Lawrence Freedman, "The First Two Generations of Nuclear Strategists," in Peter Paret, *Makers of Modern Strategy from Machiavelli to the Nuclear Age* (Princeton: Princeton University Press, 1986,) 767, and Gregg Herken, *Counsels of War* (New York: Alfred A. Knopf, Inc., 1985), 163-165. For a detailed discussion of McNamara's counterforce strategy, see Gerard H. Clarfield and William M. Wiecek, *Nuclear America: Military and Civilian Nuclear Power in the United States, 1940-1980* (New York: Harper and Row, 1984), 245-254. The Kennedy administration asked SIOP 63 planners to provide "a broad spectrum of attack options which the President may elect to execute in a careful, deliberate, controlled attack, presumably allowing for pauses to negotiate with the enemy for terms on which to end the war." *History of the Directorate of Plans, Deputy Chief of Staff, Plans and Programs, HQ USAF,* Vol. 22, 1 July 1961-31 December 1961, 117, Item #CC 00127, Digital National Security Archives.

[74] McNamara quoted in Herken, *Counsels of War*, 167.

[75] David Ormsby-Gore, Lord Harlech, in recorded interview by Jean Stein, April 30, 1970, 11, Stein Papers, as quoted in Schlesinger, *Robert Kennedy and His Times* (Boston: Houghton Mifflin, 1978), 530. Lord Harlech became friends with John Kennedy when Kennedy was a student at the London School of Economics and Joseph, Kennedy's father, served as the American ambassador to Great Britain. Aware of the close relationship, the British Prime Minister named Ormsby-Gore the British Ambassador to the United States in 1961.

[76] Clark Clifford with Richard Holbrooke, *Counsel to the President: A Memoir* (New York: Random House, 1991,) 380. Clifford first served in government as a naval aide to President Harry Truman. After guiding Truman's reelection, Clifford was named General Counsel to the President. In this position, he helped author the National Security Act. During the Eisenhower administration, Clifford advised Stuart Symington and John Kennedy. When Kennedy was elected, Clifford acted as Kennedy's liaison with the Eisenhower administration, then served on Kennedy's Foreign Intelligence Advisory Board.

[77] Ibid.

[78] McGeorge Bundy, *Danger and Survival: Choices About the Bomb in the First Fifty Years* (New York: Random House, 1988), 462. Bundy, who considered himself a Republican, grew disillusioned with Richard Nixon, so supported Kennedy during the 1960 election campaign. He was appointed Special Assistant to the President for National Security.

[79] Herken, *Counsels of War*, 167, 169-170.

[80] Henry Rowan, "The Evolution of Strategic Doctrine," in Lawrence Martin, ed., *Strategic Thought in the Nuclear Age* (Baltimore: Johns Hopkins University Press, 1979), 135.

See also Clarfield and Wiecek, *Nuclear America*, 257, where the interview between McNamara and journalist Stewart Alsop is used to "suggest that dramatic changes were taking place inside the Department of Defense. For more than a year, McNamara and his aides had devoted themselves to developing the capability to wage nuclear warfare. But the events of 1962 had forced them to reconsider their purposes."

[81] Robert McNamara, *Blundering Into Disaster: Surviving the First Century of the Nuclear Age* (New York: Pantheon Books, 1986), 139. See also Robert McNamara, "The Military Role of Nuclear Weapons: Perceptions and Misperceptions," *Foreign Affairs* 62, No. 1 (Fall 1983), 79. See also McNamara's quote in Errol Morris' film, *The Fog of War*, "The major lesson of the Cuban missile crisis is this: the indefinite combination of human fallibility and nuclear weapons will destroy nations. Is it right and proper that today there are 7500 strategic offensive nuclear weapons, of which 2500 are on 15 minute alert, to be launched by the decision of one human being?" Transcript at http://www.errolmorris.com/film/fow_transcript.html. (Accessed April 15, 2015). The first part of the quote is also in James Blight and Janet Lang, *The Fog of War: Lessons from the Life of Robert S. McNamara* (Lanham, MD: Rowman and Littlefield, 2005), 59.

[82] Nitze, *From Hiroshima to Glasnost*, 249.

[83] McNamara, *Blundering Into Disaster*, 46-47. Andreas Wenger, *Living with Peril: Eisenhower, Kennedy, and Nuclear Weapons* (Lanham, MD: Rowman and Littlefield, 1997),311.

[84] Robert McNamara, "Mutual Deterrence Speech" given in San Francisco on September 18, 1967, http://www.atomicarchive.com/Docs/Deterrence/Deterrence.shtml or http://astro.temple.edu/~rimmerma/mutual_deterrence.htm. (Accessed March 3, 2015.) Arnold Wolfers, "The Atomic Bomb in Soviet-American Relations" and Bernard Brodie, "Implications for Military Policy" in Bernard Brodie, ed., *The Absolute Weapon: Atomic Power and World Order* (New York: Harcourt, Brace, 1946), 134-35, 74. Clarfield and Wiecek, *Nuclear America*, 259-260.

[85] Khrushchev quoted in Wittner, *Resisting the Bomb*, 416.

[86] Snell Putney and Russell Middleton, "Some Factors Associated with Student Acceptance or Rejection of War," *American Sociological Review* 27 (October 1, 1962), 658 (Table 1).

[87] Alice George, *Awaiting Armageddon: How Americans Faced the Cuban Missile Crisis* (Chapel Hill: University of North Carolina Press, 2003), 5.

[88] USAIPO1963 0668, taken in February 1963, revealed the concerns about nuclear war while USAIPO1964 0695, taken in July 1964, revealed the responses to the most important problem facing the country today. USIISR1964 633POS, taken in September 1964, revealed responses to Russia's willingness to launch a nuclear war. 52% disagreed while 19% said they did not know. Gallup poll details taken from the Roper Center.

http://www.ropercenter.uconn.edu.ezproxy.library.tamu.edu/CFIDE/cf/action/catalog/catalogResult.cfm?keyword=&keywordOptions=&country=1&organization=gallup+and+organization&fromDate=01%2F01%2F1935&toDate=&paging=true&type=&queryId=10383958&sortBy=BEG_DATE_ASC&perPage=100&filterDecade1960s=. (Accessed September 30, 2015.) See also Tom W. Smith, "Trends: The Cuban Missile Crisis and U.S. Public Opinion," *The Public Opinion Quarterly* 67, No. 2 (Summer 2003), 268. 265-93.

[89] Lyndon Johnson, "Remarks in Seattle on the Control of Nuclear Weapons," The American Presidency Project. www.presidency.ucsb.edu/ws/?pid=26506. (Accessed April 7, 2015).

[90] Bundy, *Danger and Survival*, 538.

[91] Nina Tannenwald, "Nuclear Weapons and the Vietnam War," *Journal of Strategic Studies* 29, No. 4 (August 2006), 675-677.

6. FREEFALL: THE AIR FORCE RESPONSE

Roger Hilsman, Kennedy's Assistant Secretary of State for Intelligence and Research in 1962, contended that, "before the Cuban missile crisis, most of the American officials who later participated in the crisis deliberations accepted Churchill's notion of a balance of terror." He explained, "They assumed that to keep the peace all that the United States needed to do was to make certain that its nuclear forces were adequate, to maintain the will and determination to use those weapons if the worst came to the worst, and to take appropriate steps to ensure that the other side understood all this." Hilsman then revealed how the crisis changed that perspective. "For many people involved in the crisis the lesson . . . was that the risk of an inadvertent escalation during a crisis was unavoidable and that in a nuclear age such risk was unacceptable. The leaders of both the Soviet Union and the United States had gazed down the gun barrel of nuclear war and had shrunk back from the holocaust they saw there."[1]

The first casualties of the Kennedy administration's new attitude toward nuclear conflict were the Thor and Jupiter intermediate range ballistic missiles.[2] It is doubtful that Allied leaders on either side of the Atlantic ever considered these missiles as a long-term defense measure as they were created to be a stop-gap measure until the Atlas missile could become operational. Following the Cuban Missile Crisis, the United States quickly removed both IRBMs from Europe, planning to upgrade them in the

future with improved land-based medium range ballistic missiles when such were ready to fulfill their mission. Until then, the Navy would fill the gap with submarine-launched Polaris missiles.[3]

In February 1963, General Curtis LeMay testified before Congress that the British "never were very enthusiastic about Thor as a weapon system . . . . [and] felt they would rather put their money into something else." In fact, during the height of the Cuban crisis, on October 26, British Prime Minister Harold MacMillan told Kennedy that he would dismantle the Thor missiles in England in a quid pro quo for the Cuban missiles. The first Thor squadron was closed early in 1963 and the last shut down in August of the same year.[4]

The Kennedy administration's new perspective on potential nuclear conflict quickly sealed the fate of the Jupiter missiles as well. In the spring of 1961, even before the squadrons in Italy and Turkey had become operational, Department of Defense representatives consulted with NATO authorities about the need to replace the missiles, which they deemed obsolete. Therefore, in January 1963, soon after the crisis over Cuba was settled, the United Kingdom, Italy, and Turkey announced that they would be phasing out their IRBMs.[5] In late February 1963, in response to a Congressional question on why he was removing the missiles so quickly, McNamara contended that the Jupiters were too vulnerable and expensive. He testified, "Our invulnerable or near invulnerable missile force, of course, is expanding very rapidly, and as it expands, it seems unwise to use to maintain these highly vulnerable weapons

subject to sabotage, subject to attack, which are costing us substantial sums to maintain." He further exclaimed, "It costs us roughly $1 million per year per missile simply to maintain the missile in Turkey, and we pay that, and we see no need to continue that expenditure for such an ineffective weapon." Less than two months later, in April 1963, the Air Force had dismantled the last Jupiter squadron.[6]

A month later, in May 1963, McNamara decided to remove the liquid-fueled Atlas and Titan I missiles from the Air Force inventory as well. These weapons suffered from some of the same problems as the Thor and Jupiter. They were also extremely hazardous as the large missiles required thousands of gallons of liquid oxygen to lift the warhead, providing more reason for the Defense Department to retire them. The liquid oxygen reacted explosively to contact with organic materials, so it had to be stored in insulated tanks at -297 degrees Fahrenheit and could not be loaded into the missiles until shortly before launch. Missiles loaded with liquid oxygen could not remain on alert for an extended time as, at room temperature, the liquid oxygen would return to its gaseous state and "burn off." Furthermore, if the missile crews and maintainers did not keep the missile area completely clean, any released oxygen had a tendency to cause fires or explosions. These dangerous and volatile conditions caused several accidents during training and operations, including four accidents at operational sites during 1963 and early 1964, costing millions in damages.[7]

Tests of the integrated Atlas system showed that the frenzied development caused several hundred problems in the missiles. The Air Force conducted an eight

month retrofit program to correct the known problems,[8] but still only hoped to achieve 50 to 75 percent reliability. For this reason, in the spring of 1963, an Air Staff study group recommended that the Air Force retire the Atlas D and E models, along with the Titan I.[9] The Department of Defense also grew concerned over the poor showing of the Atlas F, a missile even less reliable than its predecessors since it had been rushed into production for the Cuban Missile Crisis.[10]

Thus, when the new Minuteman missile proved safer, cheaper, and more dependable than the old, notoriously unreliable, liquid fueled missiles, defense officials decided to replace the old missiles with the new Minuteman. The new missiles could also be launched more quickly, protecting them from a sneak attack. An additional benefit for the Kennedy administration was that the new missiles carried much smaller warheads than the earlier missiles, allowing the administration to contend that they were building larger numbers of missiles without increasing the real explosive power.[11] Consequently, in May 1964, McNamara decided to retire all liquid-fueled missiles. By July 1964, the Air Force had begun replacing Atlas and Titan I missiles with Minuteman missiles and thirteen months later they were gone.[12]

McNamara's decision to retire the Atlas and Titan I missiles so quickly had a sudden and harsh impact on the missileers, especially the enlisted personnel. A single crew of two officers could oversee ten of the new Minuteman missiles while the older missiles each required a larger crew, including several enlisted members. Therefore, when the Air Force retired the Atlas and Titan I missiles, the only enlisted personnel in

missile operations were assigned to 2 posts per crew on the 54 Titan II missiles, along with a small number of instructors and evaluators. Over 5,000 Atlas and Titan I crew members, primarily enlisted personnel, were told to retrain to another career field, return to their previous occupation years behind their peers, or separate from the Air Force.[13]

The situation was only slightly better for the officers serving on Atlas and Titan I crews. Many World War II pilots were retiring and younger pilots were separating to join the growing and high-paying civilian airline industry, so the Air Force grew concerned about pilot retention. Therefore, in March 1964, the Air Force directed 1,700 qualified pilots working in non-rated assignments back to aviation duties. The pilots were reassigned to flying billets over the next year through the normal assignment process rather than all at one time, similar to what had happened to the bomber personnel transferred into missiles during the previous three years. Those who remained had to retrain into the very different Minuteman and Titan II weapon systems, leave the career field, or separate from the Air Force. In consequence, the nascent missile career field lost almost all of its experienced cadre.[14]

In 1964 and 1965, the conflict in Vietnam began to command more attention, making the personnel problems even more challenging for missile operations. In August 1964, after a Navy destroyer reported being fired upon in the Gulf of Tonkin, President Lyndon Johnson, with Congressional support, escalated combat operations in Southeast Asia. The Johnson administration, including McNamara, proscribed the use

of nuclear weapons during the conflict in Vietnam, so the Department of Defense focused its attention on developing and augmenting its conventional forces.[15] General Earl Wheeler, Army Chief of Staff, in testimony to Congress, quoted McNamara's important change in perspective on nuclear weapons as given to NATO ministers in 1963: "the forces that were the cutting edge of the action [in the Cuban crisis] were the non-nuclear ones. Nuclear force was not irrelevant but it was in the background. Nonnuclear forces were our sword, our nuclear forces were our shield."[16]

Struggling with nearly overwhelming requirements, the Air Force decided that providing combat support to Vietnam was more important than manning missiles with experienced personnel, a significant change in perspective, and transitioned many non-rated missile officers who had worked in other fields back to their previous duties. The majority of Atlas and Titan I missile officers had previously served as rated pilots, navigators, and support officers, so the Air Force viewed the retirement of these missiles as a windfall for its combat requirements in Southeast Asia rather than retraining them to work in the growing Minuteman arsenal.[17]

Due to the increasing demands of the Vietnam War, the Air Force increased its personnel requirements in Southeast Asia and extended combat tours from six months to one year. By 1965, the Air Force returned about 75 percent of pilots working in non-rated positions like missiles back to their cockpits. Two years later, the number of pilots working in non-rated positions dropped even further, from about 15,000 in 1965 to about 5,000. By 1969, the number was reduced to about 2,700.[18]

To fill the gaping holes in the missile field created by the wholesale transfer of personnel to Southeast Asia during the height of the buildup of the new Minuteman missiles, the Air Force began assigning newly commissioned officers, many from Air Force ROTC detachments, to missiles. Consequently, in just a few years, the missile community changed from a notable group of mostly rated, mid-level officers to a very junior group composed almost entirely of non-rated officers with less than four years in the Air Force. While the service also recruited many new pilots for service in Vietnam, Colonel Vance Mitchell acknowledged that "even in 1967, after most of the World War II pilots had retired, only 20 percent of the pilots were under thirty, while nearly 40 percent were over forty."[19] Donovan Bowe, in a 1969 research report, documented that the rate of second lieutenants, the most junior rank in the officer corps, rose from 5 percent of the Minuteman crew force in 1963, to 47 percent in 1968. He further asserted that by 1969, 75 percent of Minuteman missileers were lieutenants and almost all of the other 25 percent were junior captains, almost all of whom were under 26 and had been in the Air Force less than 5 years.[20]

The new Air Force attitude toward this new cadre was a drastic change from Lt. Col. William Anderson's 1957 directive that, "*the missile crew must be brought to realize that it is the foremost element in the defense structure*." Many missileers who had not realized it before now understood that the Air Force did not consider them as valued warfighters, much less the future of the Air Force.[21]

The missileers were further demeaned by the increased automation of the Minuteman missile system because the new system left little opportunity for ingenuity or innovative thought. Chaplain Arthur Engell asserted in a 1964 thesis that "as we approach perfection in the push-button stage of our weapons system, with less and less effort required for maintenance and operation, the more difficult it becomes to provide useful and meaningful activity that will motivate and keep a man on the job." Captain Pierce Smith agreed: "As improved missile systems were phased into our strategic forces, advanced technology made crew duty much less demanding. This is especially true in the Minuteman system, where sophisticated equipment has greatly simplified crew duties."[22]

In other words, the missileers' daily work routine became more tedious, but the tedium did not mean the job was easy. Major Thomas Gilkeson, citing Strategic Air Command Manuals 55-66, Vol. 1, and 23-9, revealed that

> "the primary responsibility [of a missile crew member] . . . is to be fully proficient in the use of the E[mergency] W[ar] O[rder] Documents, checklists, and procedures necessary to implement the SAC EWO. In addition missile crews must be on alert, monitoring the safety, security, and reaction capability of their weapon system until receipt of an execution order, upon such receipt they must properly interpret, authenticate, and react to effect a proper launch."[23]

Smith then described actual duty for the command's Minuteman crew members: "The average work week for a missile crew is far in excess of the normal 40-hour week. They average at least 300 hours per month . . . . The duty and tasks performed during the actual alert tour . . . . are to monitor and report the status of the

ten missiles in their flight by observing an array of color-coded lights on electronic panels." He added, "This routine of monitoring and reporting is continued throughout the tour, interrupted occasionally by practice launch messages or other routine calls over the communications network. These . . . functions are closely regulated by various publications and directives."[24]

Major Donald Sherman, in a research report for the Air Command and Staff College, explained how the directives made the daily tasks difficult: "There [was] no room for initiative or applying an individual's own systems knowledge in solving malfunctions or even in accomplishing the most routine tasks . . . . The most serious discrepancy a crew member can make is deviating from prescribed procedures." He then revealed that some crew members chose to obey incorrect guidance because they "may blow up the missile by following technical data as prescribed, but at least [they] won't be court-martialed for not following it." Not everyone followed this mindset, but the pressure to conform was constant and intense.[25]

Continuous evaluations increased the stress that missile duty imposed on the missileers. The Air Force determined that evaluating each crew by launching a missile was too expensive, so Strategic Air Command tested its missile crews through written exams and simulations. The command demanded perfection, scores of 100 percent on several specified tests and scores of at least 90 percent on all others. Evaluations occurred several times each month, adding additional pressure to an already stressful profession and removing any opportunity to excel, leading Colonel Max Henney, Vice

Commander of the 341st Strategic Missile Wing, to report, "The combat crew lives in an artificial environment -- strict, tight, closely controlled. They face rigorous examinations regularly on which they have to make perfect scores, and yet the tests are not really challenging, just demanding. Some of the men can't do it. A few have simply resigned their commissions and left the Air Force." Any discrepancies were resolved through immediate corrective action and individual who failed to display the required excellence or showed a chronic weakness was removed from the missile assignment and, often, the Air Force. The pressure was even more intense during performance assessments since evaluators conducted these tests at operational missile sites, forcing the crews to determine whether to prioritize real world status or the simulated status. In at least one case, this decision caused an entire wing to fail an inspection, an extremely rare and catastrophic event that ended the careers of all of the wing's leadership.[26] The continuous pressure actually led to stress related diseases for some of the missileers.[27]

Yet another factor can be seen to have related to stress and morale factors for missile personnel. The Air Force intentionally situated missile wings away from populated areas and placed the missile sites miles away from their supporting Air Force bases. The isolation further increased the missileers' frustration and boredom as they spent much of their days driving through rural terrain or sitting alone in the missile launch facility.[28] Because missile squadrons were often undermanned, the missileers were tasked with additional work, magnifying these concerns and dissatisfaction.[29]

Colonel Donovan Bowe summarized the situation in a 1969 research report: "Arduous duty, isolated work environment, lack of glamour, inability to see the fruits of productivity, and lack of opportunity for the challenging work that produces job satisfaction are all factors that combine to make missile combat crew duty less than a rewarding experience." E. S. Ewart had identified many of these problems as far back as 1958, before the first missile was declared operational, in his study, "A Survey of Potential Morale, Motivation, and Retention Problems at Ballistic Missile Sites," but eleven years later, they remained critical concerns.[30]

In the same year, author Robert Rodwell acknowledged that "nobody has yet come forward with a palliative for what we feel will be a basic root of discontent with future service life, that is the sense of complete frustration that life in a missile force will engender among its personnel." He then defined the primary problem, "Basically , inactivity will be the cause of this frustration -- not inactivity in the sense that there will be little to occupy the serviceman's working day, but the inactivity of the force as a whole. It will be a sterile, static force, prevented by its very nature from ever being fully exercised."[31]

Finally, Rodwell predicted what was readily apparent by the early 1960s: "There will be no indication to officers or airmen [in missile units] that their combined efforts are achieving anything. They will be denied the satisfaction derived from a job well done." In its rush to deploy the missiles as quickly as possible, the Air Force had chosen

to ignore these concerns about morale as they arose, presuming that somehow good leadership might resolve the situation.[32]

The extremely negative impact of the problems remained hidden for several years. From October of 1959 through the end of 1961, the Air Force had only placed twenty-seven ballistic missiles in operational units. Thus, 1962 was the first year that numerous airmen began working with missiles, primarily in Atlas and Titan I units. The first missileers were almost all volunteers and saw themselves as the vanguard of a new concept in military operations. The enlisted missileers maintained the missiles and support equipment, but were designated as operational personnel, a rare honor in the Air Force. Since the early missiles were rife with problems, this provided them with constant work and they were able to see the fruits of their labor. Almost all of the officers were rated personnel who were temporarily reassigned to missiles from flying units. These early missileers had retained their aeronautical status and, in addition to their operational responsibilities, they guided and supervised the enlisted personnel, similar to their actions in the flying community.[33]

Even when the Air Force began recruiting some non-rated personnel into the career field, in 1962, missileers still had reason to believe that ICBMs were the future of the Air Force. The Air Force, under political pressure, terminated all new long range bomber production in October of that year -- the beginning of fiscal year 1963. This was the first year that the Air Force did not have a bomber in production since 1946 and senior leaders from the service were desperate to obtain new bombers for a

"mixed force." Despite the decision of the Kennedy administration to scale back its reliance on nuclear weapons, in 1963, strategic missile forces continued to increase *in number and in relative percentage as compared to nuclear-capable bombers*, if not in explosive power, because the Air Force completed work on the missiles begun over the previous several years while it retired older bombers such as the B-17, the B-29 and the B-47. Therefore, although manned bombers still formed the bulk of Air Force strategic power until April 21, 1964 -- the first time there were as many missiles on alert as bombers, the new missileers were willing to deal with the hardships of missile life, believing conditions would improve as missiles replaced bombers as the primary weapon system of the Air Force.[34]

However, the missileers did not foresee the impact of the administration's new focus on limited war. While McNamara refused to procure new bombers, he requested and received approval to increase the Air Force's tactical fighter wings from 16 to 21, and to increase reconnaissance wings from 14 to 20. The Air Force bomber pilots would have fought this change except that the Army had established the Howze Board to investigate whether it should create its own tactical air force. In light of the Army threat and not perceiving fighter aircraft as a risk to Air Force's strategic mission, the bomber generals, led by LeMay, helped to build their service's tactical air force.[35]

Only in 1965, as Air Force leaders pulled pilots, navigators, and more senior support officers for assignments to Southeast Asia and replaced them with newly minted lieutenants or those who failed out of flight school did the nation's disregard for

ballistic missiles become obvious. By then, most of the early missileers had left the career field and the few who remained required retraining to enter the new Minuteman or Titan II systems. Thus, it cost the Air Force very little to replace them with new officers if the experienced officers separated from the service.[36]

Missileers struggled with another stigma. Even though sizable numbers of pilots and navigators had been pulled from operational missile jobs, the rated officers continued to be assigned to command and senior leadership positions in missiles, positions that many missileers did not believe these officers were qualified to fill. For example, Major Robert Luckett, a former missileer studying at Air Command and Staff College, contended, "High level command and key staff positions in the missile wings were occupied by rated personnel. No one questioned the need for these personnel initially. However, they were not attuned to the problems and irritants of their assigned personnel." Luckett continued, "Some of these same people had not visited a launch control center since it became operationally ready. Not a single commander or staff member had ever spent a full alert tour at a control center to witness and experience firsthand what crew members were trying to convey when airing complaints [about the stresses of the assignment]."[37]

The situation was even more frustrating to the missileers since it violated a long-standing belief in the Air Force flying community -- that "operators," those who conducted the operational mission of the Air Force, would only be led by someone who held the same qualifications. Colonel Lloyd Brauer, in a 1956 *Air University Quarterly*

Review article, acknowledged that the Air Force "established a . . . policy requiring that all Air Force activities having flying as their primary mission be commanded by a rated pilot. That the rated pilot who is serving or may serve in command and operational positions must continue active flying to maintain the 'cockpit viewpoint' has been argued exhaustively . . . ." Brauer contended, "Regardless of current assignment an officer expected to command or control flying activities must stay abreast of aviation advances, know the capabilities and limitations of the flyers and their machines, and most important of all, gain and maintain the respect and confidence of the men he is to lead." Melvin Deaile, a former SAC pilot, put it more succinctly, "leaders flew and fliers led." Yet, Air Force leaders chose not to apply a similar policy in the case of missiles.[38]

By 1967, because the Department of Defense had focused on building fighters while retiring the World War II bombers and replacing the large Atlas and Titan I missiles with larger numbers of the smaller Minuteman missiles -- decisions made in the late 1950s and early 1960s, there were more than two times as many missiles as there were bombers in the U. S. Air Force.[39] Nonetheless, the Air Force still granted the key leadership positions to the flyers either by regulation or fiat. Thus, the non-rated missileers became convinced that they were needed to operate missiles, but would never be offered upward mobility as the promotable positions were almost all designated for rated personnel. Furthermore, because the new missile officers were entering missile duty as young lieutenants, they finished their assignment in missile operations as young captains. Unlike their pilot contemporaries, only those designated

as the very best were even able to get potentially promotable staff positions, while the rest were placed in local jobs with little promotion potential or transferred out of the career field. Since the Department of Defense uses an "up or out" promotion policy for retention, most of those assigned to jobs with minimal potential would eventually be forced to leave the service because they were not promoted.[40] Even in 1971, when 625 missileers from five bases responded to a survey on morale, "40 percent of those surveyed considered missile duty a 'dead-end' for career progression, while only 14 percent viewed it as a positive career opportunity."[41]

The lack of career potential was demoralizing, but another action taken by the Air Force infuriated the missileers just as much. Colonels William Brooksher and Jimmy Scott conducted a survey of current and former missileers, who responded that the Air Force practice of labeling missile personnel as *support personnel* in "statistical reports, such as promotion analyses, and other publications detract[ed] from both the prestige and image of the career field. To them," exclaimed the colonels, "it is inconceivable that personnel charged with one-third of the Triad [the title for the three legs of U.S. nuclear defense: ICBMs, bombers, and submarine-launched missiles] could be considered or listed as 'support' personnel for any reason. As one officer put it, 'Who do we support? . . . Missile operations officers are <u>not</u> support officers!"[42]

A mid-level officer in the study contended, "M[issileers] should receive as much recognition as other AF combat specialties. That would be vastly more than they receive now. It appears to be AF policy to classify them [missile combat crew

members] as support troops." Another officer, a senior leader of a missile wing argued, ". . . the missile combat crew member is generally looked upon by his non-missile combat crew contemporaries as the dumbest 'weinie' in the force and, as such, he is considered to be an inferior breed . . . ." He explained further, "His flight officer contemporary receives his flight [pay and benefits] in addition to his normal military pay for doing a similar job, while his non-rated, non-missile contemporary is working his good old eight to five job, five days a week and is not betting his career about four times a month."[43]

The study revealed that missileers believed they were "treated as second class citizens compared to rated personnel. This applies to prestige, pay, [and] considerations around the base." In one example of blatant discrimination, Lieutenant Hojegian remembered trying to enter the Plattsburgh AFB Officers Club in his missile uniform, as he had seen numerous pilots do in their flight suits. Nevertheless, he was turned away, told that missileers could not enter the club in their duty uniform.[44]

The Air Force policy toward the missileer's badge and request for special pay also reflected this discrimination. Even before the Air Force had become a separate service in 1947, Army Air Force pilots were awarded badges that represented their aeronautical status.[45] This tradition became a symbol of pride and was transferred to the Air Force. As the Air Force formed new missile units, missileers began to request their own badge. On April 28, 1958, , General White ordered the service to devise a new badge for the missile operators. However, unlike the flyer's "wings" which were

specifically designed to show the exact type of aeronautical rating that a flyer held (pilots, navigators, flight engineers, bombardiers, flight surgeons, and other aircrew members), the Air Force designed a single badge for everyone associated with the new field. (See Figure 4.) That same day, the Air Staff directed that "the design [was] not to include wings of any type . . . . It should be no larger than the pilot wings and some smaller designs are requested."[46]

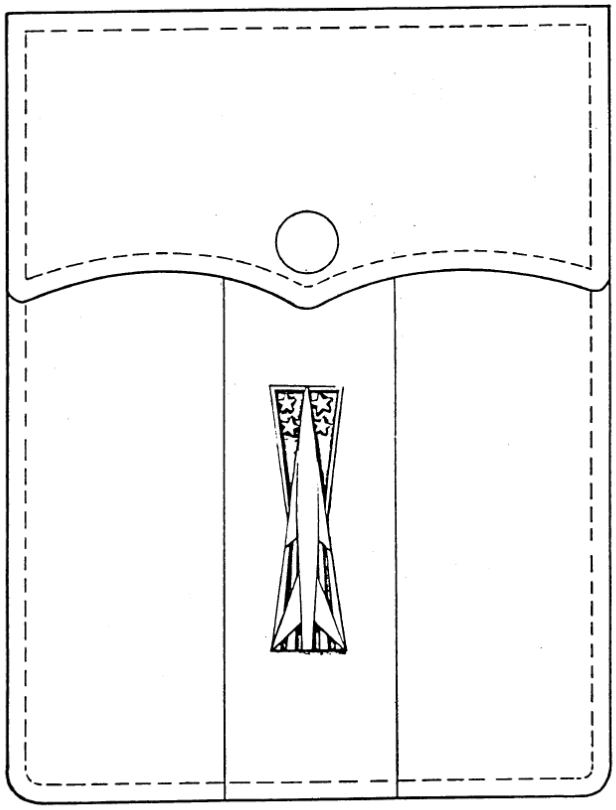


Figure 4. Official U.S. Army Heraldic Division image of guided missile insignia.

On May 23, 1958, Air Force Regulation 35-5 was published, authorizing a missile badge for wear by any person "with a direct and distinctive role in the command, maintenance, operation, or guidance of the missile and/or its related ground equipment . . . [or] to a position with primary duty directly associated with guided missiles." Thus, all of the personnel that oversaw, guided, developed policy for, or worked closely with missiles were authorized to wear the badge, including the rated commanders, whether they had operational experience with missiles or not. Further, an airman only needed to perform duty associated with the new weapons for 3 months before earning the badge. The explicit differentiation between the standards of the two badges frustrated the missileers, who believed they deserved a specific badge for their operational experience, like that of their rated peers. This may seem a trivial concern, but it underscored and reflected the accumulating perception of discrimination against missile operations.[47]

A similar frustration developed over the Air Force's refusal to provide missileers with additional pay to compensate for the difficult duties. Once more, the missileers compared their situation to their flying brethren and questioned why the pilots not only earned aviation incentive pay but also received other bonuses related to flying as well as promotion and other benefits. The missileers reminded the Air Force that Congress had authorized responsibility pay as part of the Military Pay Act of 1958, designated for officers occupying positions of unusual responsibility. Since they controlled one third of the nation's nuclear capability and, with it, held the capability to

destroy significant portions of any enemy's territory, people, and infrastructure, the missileers believed they had earned the pay for unusual responsibility. Colonel Henney, a fighter pilot who served as the Vice Wing Commander at Malmstrom, agreed, remarking, "In the history of warfare, in the history of the world, no junior officers have ever before been called on to take such responsibility." Still, the Air Force, while arguing strenuously to continue aviation incentive pay, never authorized any additional pay for missileers until 2014.[48]

In 1973, Brooksher and Scott quoted another mid-level missileer as saying, "most of the crew members, I believe, are crying out for recognition. Nothing sticks in my throat more than 'The mission of the Air Force is to fly and fight and don't you forget it.' With the missile fleet carrying the portion of the SIOP [Single Integrated Operations Plan -- the nuclear war plan] load that it does it would seem they are vastly underrated and [under]recognized."[49]

Howard Tarlton, an active navigator for seven years before he joined the missile career field, acknowledged that the perception was real: "I sensed the operational [flying] part of the Air Force thought the ICBM mission really belonged to the Army. They believed that ICBMs were necessary but the strategic mission was best carried out by aircraft bombardment and airborne missiles." Therefore, even though the Air Force had struggled bitterly with the Army to control ballistic missiles from the service's beginning in 1947 to the transition of the Jupiter missile to Air Force control in 1956, after the service had garnered complete control of the new weapons and the missiles

no longer threatened the service's strategic bombing mission, it chose to treat the exceptionally powerful weapons and those who controlled them as a secondary mission at best, as Secretary McNamara earlier described nuclear weapons as a whole, as a shield rather than the sword.[50]

Study after study tied the abject frustration of the missileers with their perceived neglect to poor retention rates, concerning the Air Force leadership greatly, but the service's leaders refused to respond in any meaningful way to the missileer's concerns. The situation only grew worse as fighter pilots, who had won recognition for conventional warfighting in Southeast Asia, began to earn positions of leadership and influence. These flyers, frustrated over years of their own neglect from Strategic Air Command bomber pilots, denigrated all nuclear operations, especially missileers, who could not show what novelist Thomas Wolfe called the "code of the right stuff: . . . courage, skill, coolness, and eagerness for combat."[51]

The Air Force did made incremental improvements to the Minuteman missile, as long as the costs did not reduce funding for flying operations. However, technologies designed and deployed in the late 1950s and early 1960s remained the backbone of missile operations for the next two decades. In fiscal year 1963, the Air Force began researching an advanced ICBM. Some concepts considered for use in the new missile included a "cold launch," whereby compressed gases would expel the missile from its silo before the missile's rockets ignited, and an improved guidance system. Congress authorized $15.5 million in 1964 and $15 in 1965, but Secretary of Defense McNamara,

by then focused heavily on conventional fighting in Vietnam and averse to anything that would increase the risk of nuclear conflict, reduced actual allocations to $8 million and $3 million respectively. The new technologies appeared promising, but none were actually used for two decades. In 1965, the Air Force determined that the Minuteman missiles would need to be replaced by 1973. Advanced development of the next missile did not begin until late 1973 and the missiles, known as the Peacekeeper, did not become operational until 1986, considerably after the time frame of this study. Even then, only fifty Peacekeeper missiles were ever deployed and these remained operational only until 2005, when the last one was deactivated under the terms of the Strategic Arms Reduction Talks. Thus, the U.S. Air Force ballistic missile force in 2015 consists of 450 Minuteman III missiles, designed and built in the early 1960s.[52]

In 1957, Brigadier General Charles McCorkle, the Air Force's Assistant Chief of Staff for Guided Missiles, had warned that the Air Force that "even without a great deal of study it becomes apparent that we cannot treat the command and control of missiles as though we were simply integrating additional bombers into our forces."[53] The Air Force complied with McCorkle's advice, although not in the manner he intended. As long as the service feared that political leaders would take the Air Force's long-range strategic mission from the bombers and give it to missiles, its senior leaders worked vigorously to show that they were quickly and efficiently incorporating the mission into the service. However, it was evident that Air Force leaders never fully accepted the new weapon, seeing it as a threat to the flying mission they loved.

Therefore, once McNamara and other political leaders stopped pressing the service to quickly incorporate and integrate missiles into operations, service leaders placed the bulk of their money, personnel, and emphasis back in the areas they preferred -- flying and mission support for flying operations. As political and service attention became more devoted to limited war, Air Force missiles entered a long tenure of benign neglect.

Notes

All citations to newspapers are to section 'A' unless otherwise indicated.

[1] Roger Hilsman, *The Cuban Missile Crisis: The Struggle Over Policy* (Westport, CT: Praeger, 1996), 151-52. For a brief description of Hilsman, see chapter 5, note 64.

[2] Arguably, the Jupiter missiles should not be included in this discussion as they were traded away during the Cuban Missile Crisis. Lawrence Freedman, in *Kennedy's Wars: Berlin, Cuba, Laos, and Vietnam* (New York: Oxford University Press, 2000), 222, contends that Kennedy wanted to remove the obsolete missiles prior to the crisis, but had been prevented by Turkish resistance. Numerous Kennedy officials testify to this as well, including Robert McNamara, *In Retrospect: The Tragedy and Lessons of Vietnam* (New York: Random House, 1995), 97; Ted Sorensen, *Counselor: A Life at the Edge of History* (New York: HarperCollins, 2008), 302; Paul Nitze, *From Hiroshima to Glasnost: At the Center of Decision* (New York: Grove Weidenfeld, 1989), 219-220; and Hilsman, *The Cuban Missile Crisis*, 129-130. McGeorge Bundy, *Danger and Survival: Choices about the Bomb in the First Fifty Years* (New York: Random House, 1988), 428, makes the argument that not even President Dwight Eisenhower wanted the Jupiter missiles in Turkey, but that he too was pressured by NATO concerns. For a more detailed understanding of the background of the trade, see Barton Bernstein, "The Cuban Missile Crisis: Trading the Jupiters in Turkey?" *Political Science Quarterly* 95, No. 1 (Spring 1980), 98.

[3] Charles Donnelly, Senior Specialist in National Defense, Legislative Reference Services, Library of Congress, Document 155 "Compilation of material relating to U.S. Defense Policies in 1962," 30, in 88th Congress, 1st Session (Jan 9-Dec 30, 1963), *House Documents, Vol. 3, Miscellaneous (Washington, D.C.: U.S. Government Printing Office, 1963-64)*, reveals "When the defense budget for fiscal year 1963 was presented to Congress, Secretary McNamara said that funds had been included for the development of 'a new mobile, quick

reacting, medium-range ballistic missile,' which would fill the range gap between the Pershing and the ICBM's. The missile was to be adapted for transport on a road net; in other words, it would be truck transported instead of rail transported as in the case of the mobile Minuteman. When asked why the Defense Department was proposing to develop this missile when it had just abandoned the mobile Minuteman concept, the answer was that the MMRBM was in response to a requirement for an all-weather attack capability in overseas theaters. Since this weapon would be small enough to be hauled in a furniture van, it would be much cheaper than the mobile Minuteman; it would also have a high degree of survivability, great accuracy, a nuclear warhead and could be fired quickly from any point." However, in *Congressional Record*, Committee on Armed Services, House of Representatives, "Hearings on Military Posture and H.R. 2440, to authorize appropriations during Fiscal Year 1964, for Procurement, Research, Development, Test, and Evaluation of Aircraft, Missiles, and Navy Vessels for the Armed Forces, and for other purposes," January 30, 1963, HRG-1963-ASH-0009, 282, McNamara said the Thor

missiles were British and so the U.S. had nothing to do with their replacement. Apparently, McNamara changed his mind as the Department of Defense never built the new MRBMs. Instead, the Navy increased the number of Polaris submarines, increasing the number from 20 in 1964 to 41 in 1967, where it stayed until 1979. *Natural Resources Defense Council*, "Table of U.S. Ballistic Missile Submarine Forces." www.nrdc.org/nuclear/nudb/datab5.asp. (Accessed July 14, 2015.)

[4] *Congressional Record*, *Hearings before a Subcommittee of the Committee on Appropriations, House of Representatives, "Department of Defense Appropriations for 1964*," HRG-1963-HAP-0021, *February 26, 1963,* 463. See also Robert Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1961-1984* (Maxwell AFB, AL: Air University Press, 1989), 81, and Freedman, *Kennedy's Wars*, 207.

[5] Although unknown to almost everyone in the nation at the time, including many members of the Kennedy administration, the removal of the Jupiter missiles in Turkey were also part of a "quid pro quo" to remove the Soviet missiles in Cuba for the removal of the Jupiter missiles in Turkey. John Lewis Gaddis, *The Cold War: A New History* (New York: Penguin Press, 2005), 78.

[6] McNamara is quoted in the *Congressional Record*, Senate Committee on Armed Services*, Military Procurement Authorization FY64*, February 21, 1963, HRG-1963-SAS-0002, 313. See also Sorensen, *Counselor*, 302, and *History of the Joint Strategic Target Planning Staff: Preparation of SIOP-64* [Single Integrated Operational Plan 64], 39, Item # NH00030, Digital National Security Archives. Extract from Annual Report of the Secretary of the Air Force, July 1, 1962 to June 30, 1963, 248, Item # CC03198, Digital National Security Archives. Futrell, *Ideas, Concepts, Doctrine*, 81. Herbert York, a contemporary American physicist who worked on the Manhattan Project, contended that the Jupiter should never have been built. Herbert York, *Race to Oblivion: A Participants View of the Arms Race* (New York: Simon and Schuster, 1970), 99-101. At the time, 1963-64, nothing was said about Khrushchev's request to remove the missiles in Cuba in exchange for removing the missiles in Turkey or Kennedy's agreement to remove the Jupiters after the Cuban Missile Crisis was over. Even as late as 2008, senior Kennedy aides like Ted Sorensen continued to downplay the agreement. See Sorensen, *Counselor*, 302-304. Intriguingly, LeMay, in his book, *America is in Danger*, contended that he "did not accept the explanation that the missiles had become obsolete so quickly, nor did any other military man [he knew]." Curtis LeMay with Dale Smith, *America is in Danger* (New York: Funk and Wagnalls, 1968), 140.

[7] Simpson, "LOX and RP-1 - Fire Waiting to Happen," 1-6. As noted previously, Simpson was a lieutenant working in missiles in the early 1960s and served as the Executive Director for the Association of Air Force Missileers after his retirement from the Air Force. See also Nalty, *USAF Ballistic Missile Programs, 1962-1964*, 5, and Eugene Zuckert, Memorandum for the Secretary of Defense dated January 2, 1964, Record Group 340, A1 1F, Box 899, File 5-64, NARA-MD.

[8] During the retrofit, the Air Force incorporated many new technologies and parts that were not available when the missiles were first built in order to improve efficiency, reliability, and safety.

[9] George M. Watson, Jr., *The Office of the Secretary of the Air Force, 1947-1965* (Washington, D.C.: Center for Air Force History, 1993), 198, reveals that "early Atlas missiles had an 18 percent reliability factor." See also David Spires, *On Alert: An Operational History of the United States Air Force Intercontinental Ballistic Missile Program, 1945-2011* (Colorado Springs, CO: Air Force Space Command, 2012), 51, and Nalty, *USAF Ballistic Missile Programs, 1962-1964*, 5, 218.

[10] Nalty, *USAF Ballistic Missile Programs, 1962-1964*, 35 and Spires, *On Alert*, 51..

[11] Thus, the temporary continued growth in numbers of ballistic missiles should not be taken as a sign that McNamara's perspective on nuclear conflict had not changed after the Cuban Missile Crisis. General Earl Wheeler, Army Chief of Staff, in testimony to Congress, revealed McNamara's thoughts on nuclear weapons as given to NATO ministers in 1963 in Congressional testimony. He quoted McNamara as saying, "Nuclear force was not irrelevant but it was in the background. Nonnuclear forces were our sword, our nuclear forces were our shield." See the *Congressional Record*, Senate Committee on Armed Services*, Military Procurement Authorization FY64*, February 27, 1963, HRG-1963-SAS-0002, 507. The Minuteman missiles' explosive capability was much smaller than either the Atlas or the Titan I missiles which they replaced. According to Nuclear Weapon Archive (nuclearweaponarchive.org), the total of explosive yield in U.S. nuclear weapons has *dropped* since its height in 1960, when it was estimated at 20,491 megatons. Congress had authorized 800 Minuteman missiles by 1963, and the 1964 budget, created in 1962, had authorized another 150 Minuteman missiles. The missiles being added to the Air Force in 1963 and 1964 were authorized well before this time. At the same time that McNamara disposed of the Atlas and Titan missiles, he *reduced* the proposed Minuteman force from 1,200 to 1,000. For more information on this topic, see Lawrence Kaplan, Ronald Landa, and Edward Drea, *The McNamara Ascendancy*, 1961-1965, Vol V, *History of the Office of the Secretary of Defense* (Washington, D.C.: Historical Office, Office of the Secretary of Defense, 2006), 493. Kennedy was facing election and nuclear security was still a topic that Congressional opponents could use against him, especially since Kennedy had come into office vehemently accusing Eisenhower of weakening national security. Relations between the Kennedy administration and Congress, especially Representative Carl Vinson (D-GA), the respected Chairman of the Armed Services Committee, were extremely poor because of the administration's refusal to fund the proposed B-70/RS-70 nuclear capable bomber. See also York, *Race to Oblivion*, 187.

[12] Nalty, *USAF Ballistic Missile Programs, 1962-1964*, 29. John Arnold, "A Revised Training and Evaluation Program for SAC Minuteman Missile Combat Crew Members" (Research Study, Air Command and Staff College, 1971), 14. John Finney, "Less For Defense: Four -Year Expansion of Military Services is Leveling Off," *New York Times*, January 26, 1965, 1. Jacob Neufeld, *The Development of Ballistic Missiles in the United States Air Force, 1945-1960*

(Washington, D.C.: Office of Air Force History, 1990), 237-38. See also "SAC Will Bear Brunt of Defense Cutbacks," *Air Force Times* (December 2, 1964), 22.

[13] "Operation 'High Train' Disclosed, 5000 Missile Men Transferred," Air Force Times (July 21, 1965), 7. History extract, Strategic Air Command History, Jan-Jun 1964, 430-437, per Mr. Donald Koser, Air Force Global Strike Command Historian. The history remains classified Top Secret. Since there were only fifty-four operational Titan II sites between 1963, when the Titan II began operations, and 1981, when President Ronald Reagan decided to take them off alert, there were very few billets for enlisted personnel. In September 1977, the Air Force opened billets on the Titan II to women as well as men; this was the first time women were allowed to serve in missile operations.

[14] Vance Mitchell, *Air Force Officers: Personnel Policy Development, 1944-1974* (Washington, D.C.: Air Force History and Museums Program, 1996), 243-247.

[15] Nina Tannenwald, *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons Since 1945* (New York: Cambridge University Press, 2007), 206-207. In a September 7, 1964 speech, Johnson proclaimed, "For 19 peril-filled years no nation has loosed the atom against another. To do so now is a political decision of the highest order. And it would lead us down an uncertain path of blows and counterblows whose outcome none may know. No President of the United States can divest himself of the responsibility for such a decision." "Remarks in Cadillac Square," *Public Papers of the Presidents: Lyndon B. Johnson, 1963-64*, vol. 1 (Washington, D.C.: Government Printing Office, 1965). For further information on the Johnson administration's taboo on nuclear weapons, see Nina Tannenwald, "Nuclear Weapons and the Vietnam War," *Journal of Strategic Studies* 29, No. 4, (August 2006), 675-722. For information on the Tonkin Gulf Affair, see George Herring, *America's Longest War: The United States and Vietnam, 1950-1975* ([1979]; New York: 4th ed., McGraw-Hill, 2001), 133-37, and Stanley Karnow, *Vietnam: A History* (New York: Viking Press, 1983), 365-76, 395-96.

[16] *Congressional Record*, Senate Committee on Armed Services*, Military Procurement Authorization FY64*, February 27, 1963, HRG-1963-SAS-0002, 507.

[17] Harry Williams, "ICBM Career Management: The Impact of Advancement" (Research Study, Air Command and Staff College, 1972), 46. Joe Brown, interview with author on August 23, 2014. Brown served in both Atlas and Titan missile operations before leaving the career field because of the continuous stress. He retired from the Air Force as a master sergeant.

[18] Mitchell, *Air Force Officers*, 242-43, 247-248.

[19] Ibid, 249. Williams, "ICBM Career Management," 46.

[20] Donovan Bowe, "Retention of Junior Officers in the Minuteman Missile Crew Force" (Research Report, Air War College, 1969), 9-10, 38. See also Spires, *On Alert*, 83.

[21] William Anderson, "Organizing and Manning Missile Units," *Air University Quarterly Review* 9, No. 3 (Summer 1957), 85. Anderson was the Director of Personnel for the 1st Strategic Air Division in 1957. Joseph Andrew, email to author dated October 20, 2014. Italics added for emphasis.

[22] Arthur Engell, "The Morale of the Missileer: A Study of the Minuteman Launch Control Officer" (Thesis, Air Command and Staff College, 1964), 2. Pierce Smith, "Motivation of Minuteman Missile Crews" (Thesis, Air Command and Staff College, 1965), 5.

[23] Thomas Gilkeson, "Missile Crewmember -- His Needs and Job Satisfaction" (Research Study, Air Command and Staff College, 1972), 13.

[24] Smith, "Motivation of Minuteman Missile Crews," 18.

[25] Donald Sherman, "Boredom and Monotony: Their Effect on Titan II Crew Morale" (Research Report, Air Command and Staff College, 1969), 30-31. Williams, "ICBM Career Management: The Impact of Advancement," 19, quotes Air Force Technical Order 21M-LGM25C-1 "Model LGM-25C Missile Weapon System Operations" (Washington, D.C.: Department of the Air Force, 1967), 7-1 to clarify the reasoning: "Unusual operations or configurations are prohibited unless specifically covered herein. Clearances must be obtained from the authorized commander before attempting any operation not specifically permitted in this manual, other technical orders, or SAC CEM [Civil Engineering Manual] manuals. All crew functions must be performed as specified in this manual or other technical orders."

[26] Colonel Henney is quoted in Murray Morgan, "The Loneliness of the Missile Attendant," *Esquire* (July 1964), 50. See also Edward Osborne, "An Analysis of the Morale of the Titan II Missile Combat Crews" (Thesis, Air Command and Staff College, 1967), 17; Vincent Maes, "Career Satisfaction: A Focus on Missile Launch Officer Retention" (Research Study: Air Command and Staff College, 1971), 19. John Paolucci, "Making Minuteman Missile Combat Crew Duty a Challenge -- A Radical View" (Research Study, Air Command and Staff College, 1977), 22-23. Robert Luckett, "People Problems in the SAC Missile Force and What is Being Done to Correct These Problems" (Research Study, Air Command and Staff College, 1972), 25-26. Bowe, "Retention of Junior Officers in the Minuteman Missile Crew Force," 49. David Driscoll, "Missile Combat Crew Morale: Its Impact on Officer Retention" (Research Study, Air Command and Staff College, 1972), 13-15. Several students at Air War College or Air Command and Staff College quoted James Baar and William Howard, in *Combat Missileman* (New York: Harcourt, Brace, and World, 1961), 165, "If a missile combat crew commander makes an improper decision while in charge of his launch complex, or if he fails in one of the many evaluations to which he or his crew are subjected, the consequences may be serious. Failure to execute an Emergency War Order during an Operational Readiness Inspection satisfactorily not only invariably brought instant removal from command, but also generally ended all hope of a successful career in the Air Force. There were no second chances. As a system it was hard. It was unfailing. It was barely human. But it was very effective, and it was absolutely necessary."

[27] Kenneth Holden, "A Study of Motivational Behavior of Missile Combat Crews" (Thesis, Air Command and Staff College, 1966), 22. Captain Holden cited Harold W. Dietz, *Human Problems in Missile Launching* (Vandenberg AFB, CA: 392nd Aerospace Medical Group), 1963, reporting that 20 percent of missileers suffered from "stress" diseases, although this author has been unable to obtain a copy of Dietz's study.

[28] Roger Conant, "The Use of Rated Officers in the Minuteman Missile System" (Research Study, Air Command and Staff College, 1970), 6; Luckett, "People Problems in the SAC Missile Force and What is Being Done to Correct These Problems," 34.

[29] Holden, "A Study of Motivational Behavior of Missile Combat Crews," 95. Holden reviewed official RCS:10-T12 Reports from for 1962-1964 to determine the unit manning strength.

[30] Bowe, "Retention of Junior Officers in the Minuteman Missile Crew Force," 3. E. S. Ewart, "A Survey of Potential Morale, Motivation, and Retention Problems at Ballistic Missile Sites" (Wright-Patterson AFB, OH: Air Research and Development Command, 1958). Copy found at AFHRA. Spires, *On Alert*, 81-82, revealed that "In May 1971, ... questionnaires from 625 captains and lieutenants assigned to missile duty at five bases revealed that the same irritants present when the Atlas and Titan I first went on alert continued to trouble missile officers a decade later."

[31] Robert Rodwell, "Morale in a Missile Force," *Aeronautics* 38, No. 1 (March 1958), 66.

[32] Ibid., 66. See also Spires, *On Alert*, 82, 124-125.

[33] J. C. Hopkins and Sheldon Goldberg, *The Development of Strategic Air Command, 1946-1986* (Offutt AFB, NE: Office of the Historian, HQ Strategic Air Command, 1986), 96. Joseph Andrew, email to author dated October 20, 2014. Airman Andrew entered the missile career field, and the Air Force, in 1959 and served as a launch crew member with the Matador missiles before transitioning into Minuteman missile maintenance in 1962.

[34] John Richard McCone, "The Manned Bomber and the Ballistic Missile: Problems of Strategy and Politics" (Master of Public and International Affairs Thesis, University of Pittsburgh, 1962), 42. Extract from Annual Report of the Secretary of the Air Force, July 1, 1962 to June 30, 1963, 246-247, Item # CC03198, Digital National Security Archives. Melvin Deaile, "The SAC Mentality: The Origins of Organizational Culture in Strategic Air Command, 1946-1962" (Ph.D. Dissertation, University of North Carolina at Chapel Hill, 2007), 296-97. Joseph Andrew, email to author dated October 20, 2014. James M. Lindsay, *Congress and Nuclear Weapons* (Baltimore: Johns Hopkins University Press, 1991, 148, contends that McNamara continued to build 1,000 Minuteman missiles "because he believed it was the smallest number that Congress would accept." David Halberstam, *The Best and the Brightest* (New York: Random House, 1972), 72, revealed that "at that point [early 1961], the United States had 450 missiles; McNamara was asking for 950, and the Joint Chiefs of Staff were asking for 3,000." Halberstam quotes Kennedy as asking, "why the nine hundred and fifty, Bob?", to which

Halberstam says McNamara responded, "Because that's the smallest number we can take up on the Hill without getting murdered." Mike Worden, in *Rise of the Fighter Generals*, commented that 1962 was "the apex of SAC and bomber influence within the Air Force," although he correctly contended that fighter pilots, not missileers, replaced the bomber pilots as the leadership of the Air Force. The B-17 Flying Fortress and B-29 Superfortress were four-engine bombers used extensively in World War II, while the B-47 Stratojet was a six-engine bomber built in 1951. All three were retired in the late 1950s and 1960s.

[35] *Foreign Relations of the United States, 1961-1963*, Vol. VIII, *National Security Policy*, Document 115, ed. David W. Mabon (Washington: Government Printing Office, 1996), "Draft Memorandum from Secretary of Defense McNamara to President Kennedy" dated December 3, 1962. Worden, *Rise of the Fighter Generals: The Problem of Air Force Leadership, 1945-1982* (Maxwell AFB: Air University Press, 1998), 139-140. See also "Arms Funds Shift to 'Small War'," Air Force Times (February 1, 1967), 1, 4. As revealed in chapter 3, endnote 70, Air Force Instruction 38-101, "Air Force Organization," dated 16 March 2011, defines a wing as having "a distinct mission with significant scope. A wing is usually composed of a primary mission group (e.g., operations, training) and the necessary supporting groups. By pulling together the mission and support elements, a wing provides a significant capability under a single commander. . . . Wings will have a minimum adjusted population of at least 1000 . . . ."

[36] Bowe, "Retention of Junior Officers in the Minuteman Missile Crew Force," 9-10, 38. See also Gilkeson, "Missile Crewmember -- His Needs and Job Satisfaction," 14.

[37] Robert Wycoff, email to the author dated November 14, 2014. David Freeman, "An Analysis of the Need for Rated Officers in Missile Operations" (Research Study, Air Command and Staff College, 1970), 33. Robert Luckett, "People Problems in the SAC Missile Force and What Is Being Done to Correct These Problems" (Research Study, Air Command and Staff College, 1972), 14. One of the first missile commanders, Colonel Bill Erlenbusch, was non-rated. However, Col. Erlenbusch was placed in command of the Jupiter squadron just after Secretary of Defense Neil McElroy moved the missile from Army control to the Air Force and the squadron was still assigned to the Army's Redstone Arsenal. A newspaper article of the time described Erlenbusch as an Air Force Trojan horse and Erlenbusch admitted that he and his family were "apprehensive" about moving "into this center of antagonism to the Air Force." Although Erlenbusch appears to have done a great job with the unit under trying circumstances, the Jupiters were never operationalized under U.S. command, so he never actually commanded an operational missile unit. Douglas Larsen, "Air Force Colonel is "Trojan Horse'," *Victoria Advocate* [Victoria, TX] (March 8, 1958), 4.

[38] Lloyd Brauer, "Chairborne Minutemen," *Air University Quarterly Review* 9 No. 1 (Winter 1956-57), 70. When he wrote the article, Colonel Brauer was serving as a member of the Air War College faculty. He was a pilot who flew in both World War II and Korea. In the article, he was not recommending that the same standard hold true for missileers. Air Force Regulation 35-54, "Rank, Precedence, and Command" (Washington, D.C.: Department of the Air Force, 1970), 8.1, directed that all personnel who command or direct flying activities were

required to be rated (on flying status). Melvin Deaile, "The SAC Mentality: The Origins of Organizational Culture in Strategic Air Command, 1946-1962" (Ph.D. Dissertation, University of North Carolina at Chapel Hill, 2007), 308.

[39] Worden, in *Rise of the Fighter Generals*, 124, reminded his readers that "investment in ICBM procurement . . . never exceeded money spent on aircraft. But money spent on ICBMs fielded may weapons systems quickly, with high alert rates at relatively low cost." On page 139, Worden noted that while McNamara stopped funding bombers, he increased the number of fighter wings from 16 to 21.

[40] See endnote 38 for regulatory requirements. Williams, "ICBM Career Management: The Impact of Advancement," 44, contends that in 1971, there were "only twenty-one missile staff positions authorized on the Air Staff, a ratio of one staff position for every 159 field authorizations. This is one of the lowest Air Staff to field representations within the Air Force." See also Brooksher and Scott, "A Study of the Intercontinental Ballistic Missile Operations Career Field," 61, 117; Bowe, "Retention of Junior Officers in the Minuteman Missile Crew Force," 47; Allan R. Scholin, "Aerospace World," *Air Force and Space Digest* 50, No. 1 (December 1964), 24; John Bacs, "Missile Unit Commanders: Rated Versus Non-Rated Officers" (Research Study, Air Command and Staff College, 1972), 2.

[41] Spires, *On Alert*, 82, providing information from Strategic Air Command, History of the Strategic Air Command, 30 July 1971-30 June 1972, Historical Study No. 121, Vol. 1, 630-632. The historical study itself was downgraded from Top Secret to Secret on February 7, 1984, but remains classified.

[42] Brooksher and Scott, "A Study of the Intercontinental Ballistic Missile Operations Career Field," 83. Emphasis in original. Although the authors do not say when the survey was conducted, because the survey was used in their thesis, it seems very likely that the survey would have been conducted during the year they were in the National War College, 1972-73.

[43] Ibid., 63, 125.

[44] Ibid., 83. Leon Hojegian, personal interview with the author on October 14, 2014.

[45] Greg Ogletree, *The Missile Badge: A Not So Brief History* (Breckenridge, CO: Association of Air Force Missileers, 2002), 1, asserts that the "US military aviators added a distinctive aviation badge to their uniforms the same year the first US tactical aviation unit was organized (1913)."

[46] Ogletree, *The Missile Badge*, 1, asserts that missileers had discussed the need for a specific designator to recognize missileers from the early 1950s, although the earliest written record was a 2 page memo dated September 25, 1956. A memorandum responding to a request for a new Air Policeman's Badge, dated June 6, 1958, reveals the abhorrence that senior Air Force leaders, all pilots, had toward allowing any insignia other than aeronautical wings. Memorandum for Assistant Vice Chief of Staff, Subject: Air Policeman's Badge, dated

June 6, 1958, Record Group 341, UD-UP Military Personnel, 1948-1959, Box 2 HQ USAF/AFPDP, Entry 63 A1531, Folder A.4.10 Awards and Decorations, NARA-MD.

[47] Ogletree, *The Missile Badge*, 2. Air Force Regulation 35-5 *Guided Missile Insignia* (Washington, D.C.: Department of the Air Force, 18 July 1960), 1, Record Group 341, UD-UP 80, Box 3, NARA-MD. Luckett, "People Problems in the SAC Missile Force and What is Being Done to Correct These Problems," 32-33. See also Edward Osborne, "An Analysis of the Morale of the Titan II Missile Combat Crews" (Thesis, Air Command and Staff College, 1967), 23.

[48] Osborne, "An Analysis of the Morale of the Titan II Missile Combat Crews," 24. See also "Special Pay for Officers Holding Positions of Unusual Responsibility," *Military Compensation Background Papers* (Washington, D.C.: Undersecretary of Defense for Personnel and Readiness, 2005), 279. See also Spires, On Alert, 82, who revealed that a Missile Management Working Group, established by General Bruce Holloway, the Commander-in-Chief of SAC in 1971, determined "incentive pay would be a major factor in retaining missile officers and that the predicted number of officers retained would offset the cost of the bonus." The Air Force never seriously considered paying additional money to missileers until Secretary of the Air Force Deborah Lee James authorized the special duty pay for nuclear career fields on October 1, 2014, but the missileers' request for pay under the Military Pay Act of 1958 would not have helped much, as it did not apply to lieutenants, the vast majority of the missile crew force. By comparison, see George Watson, *The Office of the Secretary of the Air Force, 1947-1965* (Washington, D.C.: Center for Air Force History, 1993), 199, revealing "the Air Force's extreme reluctance [in July 1960] to accept any reduction in its number of rated officers . . . . General [Thomas] White had made it clear . . . that the grounding of a large number of rated officers would cause severe morale problems by denying the right to fly to many who wanted it." Colonel Henney is quoted in Morgan, "The Loneliness of the Missile Attendant," 110.

[49] Brooksher and Scott, "A Study of the Intercontinental Ballistic Missile Operations Career Field," 63. Peter Pringle and William Arkin, in *SIOP: The Secret U.S. Plan for Nuclear War* (New York: W.W. Norton, 1983), 11, explain the "Single Integrated Operations Plan -- single because it is the only contingency plan that accounts for the nuclear weapons of all three branches of the United States military, and integrated because it embraces all the nuclear contingency plans of the United States' regional commands in the Pacific, the Atlantic, and Europe, plus the lesser forces of America's closest and only real nuclear ally, Britain."

[50] Howard Tarleton, email to author dated October 17, 2014.

[51] Wolfe's quote is in the preface for Jack Broughton, *Going Downtown: The War Against Hanoi and Washington* (New York: Orion Books, 1988), x, which he wrote. Wolfe is also quoted in Worden, *Rise of the Fighter Generals*, 186.

[52] Bernard Nalty, *USAF Ballistic Missile Programs, 1965* (Washington, D.C.: USAF Historical Division Liaison Office, 1967), 45-46. Donald MacKenzie, *Inventing Accuracy: a Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1993), 225-226,

contends that, in late 1973, the Air Force started the advanced development of a new land-based missile capable of carrying ten nuclear warheads, the MX or Peacekeeper missile, but Congress defunded the program in 1976. Restarted under President Jimmy Carter in 1979, the MX missiles struggled to gain political support and only fifty were deployed, beginning in 1986. The Defense Department retired the Peacekeeper missiles in 2005, leaving the Minuteman as the only ballistic missile in the Air Force inventory. By then, Minuteman had been operational for 44 years.

[53] Charles McCorkle, "Command and Control of Ballistic Missiles" *Air Force Quarterly Review* 9, No. 3 (Summer 1957), 70. Brigadier General McCorkle was the Assistant Chief of Staff for Guided Missiles when he wrote the article.

7. SUMMARY AND CONCLUSIONS

During the 1950s, when scientists and engineers designed and created ballistic nuclear missiles, they were marketed as the ultimate weapon, the future of warfare. A unique confluence of several critical events, including the incorporation of the thermonuclear bomb into the ballistic missile, the beginning of the Cold War, and the creation of the U.S. Air Force and the Department of Defense, combined to provide the nuclear ballistic missile with seemingly unlimited potential.

U.S. Air Force leaders and their supporters, concerned that the ballistic missile would replace the strategic bomber and eliminate the need for their newly independent service, struggled to control the new weapon system, even though many of the force's pilots wanted nothing to do with it. The differing perspectives about missiles led to a struggle within the Air Force between those who saw the potential of the new missiles and those who saw them only as a threat to manned strategic air operations. Once the Air Force garnered responsibility for the new missiles, the service's missile proponents quickly built a substantial force, concurrently designing, building, deploying and manning the new weapons. The rush to build the "bomber's replacement" further incited those who worried about the future of manned aircraft. The haste of construction also created problems with the first missiles' reliability and standardization, as well as generating concerns over personnel selection and training and significantly increasing operating costs. Many of these troubles were overcome as

the Air Force built the second iteration, but some problems inherent to missile duty remained unresolved.

Although the generals recognized many innate problems with missile crew duty, they chose to downplay these in the hurry to put missiles into operation. Then, following the Cuban Missile Crisis, when the political leaders who had sponsored the build-up of nuclear missiles determined that the United States should move away from a nuclear buildup and became enmeshed in the Vietnam conflict, the service replaced their operationally savvy missileers with inexperienced second lieutenants. Focused on the requirements to support the conflict in Vietnam, Air Force leaders and the rated officers in command of the new missile wings continued to ignore the festering concerns of the new missileers. These decisions resulted in substandard missiles being quickly fielded and replaced at a cost of billions. They also contributed to long-lasting consequences of perpetuating a single-mission focused Air Force that subsumed politically supported missions to protect the dominance of manned flight. Moreover, the decisions produced a dysfunctional missile community that struggled with low morale, little sense of mission, and operationally inexperienced leadership.

When Congress established the Air Force in 1947, the new service prioritized a single primary mission -- strategic bombing -- rather than several cohesive and cooperative roles for air power, such as supporting ground troops, transporting critical supplies, or even ensuring control of the airspace. By 1942, even before the Air Force became an independent service, instructors at the Air Corps Tactical School, the

primary school for military aviation, "began to graft the concept of the primacy of the bomber onto the concept of air warfare and strategic air operations." The struggle to become a separate service from the Army made Air Force pilots even more convinced that they must control strategic bombing. They proclaimed that the Army could not understand nor control the strategic air mission, wanting to disperse Air Force aircraft to support the ground battle rather than allowing a united force to strategically destroy the enemy's industrial base and demoralize its population. In fact, during World War II, General Carl "Tooey" Spaatz, who would become the first Chief of Staff of the Air Force, refused to provide heavy bombers to support British Army General Bernard Montgomery in the battle for Caen, France because "if he helped the Army, the U.S. Air Force would never become independent of them."[1]

The invention of nuclear bombs only heightened the primacy of the bombing mission, especially since the Air Force's heavy bombers were the only effective delivery system for atomic weapons during the first decade after the atomic bomb was created. Although, as historian Andrew Erdmann contends, President Dwight D. Eisenhower did not want to use the "horrible" weapon, "he grimly accepted nuclear weapons as an inescapable and significant element in post-war defense planning." Apprehensive that establishing a large defense structure would damage the U.S. free market economy and turn the nation into a garrison state, Eisenhower decided to build his defense structure around the nuclear bomb and the Air Force's strategic bombers. Therefore, by the end of its first decade, the Air Force was the preeminent military service, dominating U.S.

security policy. It received almost half of the nation's defense budget and held the key to national defense policy -- the nuclear bomb.[2]

The creation of the nuclear-capable ballistic missile threatened this domination. The ballistic missile was believed to be an almost unstoppable weapon that could carry a nuclear bomb anywhere in the world in minutes. The aggressive competition that festered between the United States and the Soviet Union in the 1950s caused U.S. national leaders to believe that America had to build and deploy this new weapon before the Soviet Union could do so. Otherwise, some politicians alleged, the Soviets would use the weapon to destroy the United States.[3]

The Soviet launch of the satellite Sputnik in 1957 created social repercussions in the United States like those following the Japanese attack on Pearl Harbor, greatly increasing this impetus to build missiles. Politicians from both major political parties scrambled to show their concern for national defense, with Senator Lyndon B. Johnson (D-TX) exclaiming, "the country is in grave danger -- a danger that will last for many years to come."[4] The Soviets had been advancing their atomic capabilities faster than the United States, testing their atomic bomb four years after the Americans but exploding a hydrogen bomb less than a year following that of the United States. Therefore, many U.S. leaders overestimated the impact of the Sputnik launch. Backed by their constituents, key Congressmen demanded that the military services respond to this crisis and quickly build a nuclear capable ballistic missile. Both Democrats and Republicans attempted to prove their support for missiles while the military services

competed to gain control of this new weapon, along with its funding and status. Although Eisenhower tried to quell the fear, John F. Kennedy was elected as president, in part, on fears that Eisenhower's administration had not done enough to protect the nation from a purported "missile gap."[5]

Of the U.S. military services, the Air Force worried most about garnering control of this new military capability. Due to its speed and ability to deliver an atomic weapon into the enemy heartland, the missile directly threatened the Air Force's primary mission, less than ten years after the service's establishment.[6] Bob Glaves, a reporter for the *Dallas Morning News*, declared in 1957, "The Sputnik is linked directly to space flight, and when you speak of space flight you speak of the missile. And when you control space, you control the land beneath it." He then proclaimed, "Everything else, in a military sense, is rudimentary and embryonic. By the very existence of Sputnik, the jet plane, a valuable deterrent to aggression since World War II, suddenly is obsolete. The interceptor, the fighter, the bomber . . . are doomed. As dictated by this satellite, the United States is going for missiles. It is build such a force or be destroyed."[7]

Reporters were not the only ones predicting the demise of the Air Force's strategic bombers. Eisenhower, arguably one of the most prestigious military figures of his time and, certainly, as President, the most powerful, believed that missiles should replace bombers in the foreseeable future.[8] Many key leaders and other influential analysts held the same view, believing that missiles should be the principal military weapon of the future.[9] As Kennedy's administration came to power, the new

president's key advisors espoused the same viewpoint. For example, Secretary of Defense Robert McNamara proclaimed on December 11, 1961, "The introduction of ballistic missiles is already exerting a major impact on the size, composition, and deployment of the manned bomber force, and this impact will become greater in the years ahead. As the number of . . . ballistic missiles increases, requirements for strategic aircraft will be gradually reduced."[10]

The Air Force first responded to these predictions by downplaying the capability of the ballistic missile. Later, as it became apparent that the missile was going to play a significant role in U.S. military capabilities, the Air Force attempted to tie the missile to strategic airpower and bombing. The Air Force, under pressure from Assistant Secretary of the Air Force Trevor Gardner and other political leaders and motivated by interservice and corporate rivalries, quickly built three major missile systems, two intercontinental ballistic missiles (ICBMs) and an intermediate range ballistic missile (IRBM). At the same time, the Army created an IRBM of their own. General Thomas Power, the Commander in Chief of Strategic Air Command, declared the Atlas missile operational after a single successful long range launch, but this haste to deploy created severe problems, both for the missiles and those who would control and use them.[11]

The hurried construction and duplicative efforts in building the missiles cost the nation billions of dollars. The three variants of the Atlas missile cost over $31.59 billion dollars, with the "backup" Titan I system adding another $20.32 billion to the bill. The intermediate range Thor program cost an additional $9.44 billion and the Jupiter $5.16

billion more. Yet, the missiles were part of the U.S. defense structure for less than eight years, from the date the first Atlas was declared on alert to the time the last liquid fueled missile was retired. Since the first solid-fuel Minuteman and Polaris missiles were operational by 1962, the same year that many of the liquid-fueled missiles were completed, the older missiles became an extremely expensive short-term solution.[12]

Part of the problem was the political difficulty of selecting just one missile. Foreign policy expert Michael Armacost quotes an unnamed Assistant Secretary for Defense grousing in 1958 that, "if the Defense Department suggested canceling the Air Force's Thor program, a Congressional delegation from California would be down our necks. And elimination of the Army's Jupiter program would have half the Alabama delegation plus a couple of representatives from the Detroit area fighting us." A second major reason for the extreme cost of missiles was the decision to complete missiles as soon as possible.[13]

The hurried and concurrent development created cost overruns. It also prevented the contractors and their overseers from adequately testing the new missiles, creating concerns with reliability, and leading to several variants of the same missile. The missile variants, in turn, generated a requirement for multiple training programs and prevented the Air Force from establishing uniform standards. Since the IRBMs were built without coordinating with the U.S. allies who would be required to host the new missiles, the urgency to complete the missiles and deploy them also led to international problems with allies. Furthermore, since the liquid fuel used to launch

the missiles was extremely volatile, Department of Defense leaders determined as early as December 1960 that the Atlas and Titan I were too dangerous and costly to operate and maintain, replacing them with the Minuteman, Titan II, and Polaris.[14]

As long as national political and social pressure continued to promote missiles, Air Force leaders strove to publicly assimilate the new weapon into the Air Force, no matter what their personal attitudes towards the weapons were. Service leaders created missile squadrons and placed them into operation. They also assigned pilots temporarily into the missile squadrons to conduct the modified strategic air operation -- and to ensure that the new missileers adopted the strategic air mindset and cultural traditions. Soon the Air Force had a strong and viable missile force that grew to be as potent as the manned bomber force.[15]

Nonetheless, service leaders and their Congressional allies argued that the nation should not move too quickly to sole reliance on missiles and contended that bombers offered greater flexibility than missiles: "they [bombers] could seek out targets, . . . bring back reconnaissance reports, . . . be recalled, and so forth." Even General Thomas White, the Air Force Chief of Staff, after remarking that the ICBM had "the potential of becoming one of the most formidable weapons of all time," said he believed the new weapons must be balanced by manned aircraft because missiles could not meet every combat and support requirement effectively.[16]

In addition, single-minded bomber supporters like General Curtis LeMay remained focused on the manned strategic bombers, refusing to fully accept the new

missiles or to place them on par with strategic bombing. Bomber pilots had influence far beyond their numbers, holding 59 percent of the four star general positions in the Air Force in the early 1960s.[17]

While they professed publicly to wanting to incorporate missiles into a blended aerospace mission, these bomber men quietly continued to treat missiles as a capability that should only be accorded secondary importance. Key members of LeMay's leadership team admitted that they backed up missile targets with bombers because they did not trust the missiles to accurately destroy the target. Further diminishing the status of missile forces, the bomber commanders declined to award missileers with an aeronautical rating and required any rated flyers who served as missileers to maintain their flight status by flying a prescribed number of hours while serving in missiles, as if they were serving in a support position. Moreover, when the Air Force created statistical records, missileers were placed with the support personnel rather than with the "operational" pilots.[18] Finally, neither Air Force leaders nor SAC leaders prioritized resolving the pervasive problems unique to missile crew duty: isolation; sterile, monotonous, and tedious work; an inability to see the results of one's labor; and the stressful, exacting standards that held no benefit to the crewmember or the mission.[19]

The bomber pilots who controlled the Air Force claimed that missiles would be fully accepted once they were proven, but contended that the only acceptable proving ground was combat. Scientists and engineers had tested and validated both key parts of the nuclear missile, including repeated tests of the detonating mechanism during

actual launches, but skeptics claimed that "our only knowledge of the actual workability of an ICBM fired in anger is in textbooks and laboratories."[20] As late as 1971, long after missiles had become a part of the nuclear triad, LeMay asserted, "The airplane has been tested in battle; the missile is an unknown quantity. We don't know exactly how reliable they are or what they can do." General Bernard Schriever, while at the Western Development Division, had considered expanding ballistic missiles into a non-nuclear mission. This would have provided the ballistic missile an opportunity to prove itself in combat and increased its value to the service and to the nation, but the Air Force does not appear to have ever seriously considered the concept. Frankly, LeMay's problem with missiles was not their lack of reliability. In a 1965 interview with Colonel Bill Peck, another SAC pilot, LeMay acknowledged that "I certainly don't foresee the time where we can build a sense of loyalty or judgment into missiles and mechanical gadgets that you have in man."[21]

Billy Mitchell had declared, "It is probable that future wars will be conducted by a special class, the air force, as it was by the armored knights in the Middle Ages . . . . [In this future,] the whole population will not have to be called out in the event of a national emergency, but only enough of it to man the machines that are the most potent in national defense." Although missileers now controlled the most potent machines for national defense, Colonel Melvin Deaile, a former SAC bomber pilot, explained that they "could not program their flying pilotless bombers with 'guts.' . . .

Pilots could not understand the chivalry of missiles passing each other in flight," so the pilots did not accept them as a part of their special class of warriors.[22]

Following the Cuban Missile Crisis, as the Kennedy administration dropped its vocal advocacy for missiles, the disconnect between the Air Force leaders and the missileers grew more disconcerting. The Department of Defense replaced the dangerous and unreliable Atlas and Titan I missiles with Minuteman missiles. While this improved the strategic capability of missiles, it added to the difficulties of missile duty because it reduced the crew's ability to interact with the system while expanding their responsibilities. The Air Force, led by LeMay after June 8, 1961, replaced the veterans in the missile units with young second lieutenants who did not have their predecessor's broader understanding of the Air Force.[23] At the same time, the service leaders failed to ensure that squadron and wing leadership were experienced missileers, who would have understood the trials and tribulations of missile crew duty and could have offered the opportunity of upward mobility to the crewmembers.[24]

The Air Force's leadership learned an important, though possibly detrimental lesson, from their experience with nuclear missiles. During its formative years, the early years of the Cold War, the Air Force focused almost solely on the strategic nuclear air assignment. Pilots who flew fighters and other aircraft struggled unsuccessfully to expand this single-minded focus.[25] Then, discerning and farsighted leaders like Henry "Hap" Arnold, Thomas White, and Bernard Schriever -- generals who all spent the majority of their careers in non-flying assignments -- attempted to broaden the

service's focus by expanding into missiles, a mission they perceived as critical to the future of the service as well as U.S. defense capabilities. With the political support and oversight of men like Assistant Secretary Trevor Gardner, Senator Henry Jackson (D-WA), and Senator Clinton Anderson (D-NM), the Air Force moved quickly and forcefully into the new enterprise. The Air Force desperately fended off efforts by the other services to share or take the assignment, but it never lost its resolute focus on strategic air. Therefore, when the Air Force leaders saw the opportunity to reduce their attention on missiles and return the service's primary focus to strategic air operations, they believed that they had defeated the Department of Defense's attempt to expand the service's mission in any meaningful way.[26]

The next contest was not long in coming. As the national focus changed from nuclear preparation to the conflict in Vietnam, Air Force leaders attempted to use the same methodology to defeat what they perceived as the new threat to strategic air. Within three months of his promotion to Chief of Staff, LeMay had replaced all of the fighter generals in senior leadership positions in the U. S. Air Forces in Europe and in Tactical Air Command with bomber pilots. By October 1, the majority of the air staff leadership and all major operational commanders were LeMay's bomber protégés. To meet the increasing need for pilots to support the ongoing conflict, SAC pilots were trained to fly fighters, transports, and other aircraft and sent on tours to the combat zone.[27]

This time the results differed from the missile experiment. As pilots flying missions over Vietnam gained combat experience, the pilots most capable at flying fighters earned respect, medals, and promotions based on their combat exploits, just as the bomber pilots of World War II had, while those who perceived themselves as bomber pilots returned to nuclear alert. Thus, the fighter pilots began to move into key leadership positions after LeMay retired, positioning themselves to take over the Air Force in the decades to come. Although the victors were different, the lesson learned was the same. The fighter pilots retained the singular focus on a particular undertaking -- this time, fighter operations, and the Air Force established a trend of focusing on a single primary mission rather than several cohesive and cooperative assignments. Charles Gabriel, a fighter pilot became Chief of Staff of the Air Force in 1982. A decade later, all nuclear forces were transferred to the newly created Air Combat Command, run by fighter pilots, and SAC was disestablished. By 2001, even though fighter pilots constituted only 5.3 percent of the Air Force, they occupied two-thirds of the Air Force's four-star general positions and commanded 63 percent of the service's major commands.[28]

The impact to the long term health of the Air Force was the same as when the bomber pilots had controlled the service. The senior leaders of America's newest military service continued to focus on a single mission to the detriment of all other capabilities. Early theories in aviation created a reflexive drive to have a man in a cockpit rather than allowing leaders to consider new concepts to best to control the

airspace. When a new and politically supported defense commitment appeared to threaten the Air Force flying mission, the Air Force took immediate action to incorporate the capability into the service. Once the Air Force leaders effectively gained control of the new capability, they tied it closely to manned flight and then, as political oversight wanes, assimilated it as a subsidiary of the flying mission. Other Air Force aviators have seen the trend as well and have speculated on when and if a new breed of flyers will take the helm of the Air Force.[29]

A second example of this mindset is the remotely piloted aircraft (RPA) or unmanned aerial vehicle (UAV) program. According to Rebecca Grant, the Director of the General Billy Mitchell Institute for Airpower Studies, Secretary of Defense Robert Gates complained that "in 1992," while he was the director of the CIA, "the Air Force would not co-fund with CIA a vehicle without a pilot."[30]

Nevertheless, as had occurred with missiles, interservice rivalry created Air Force interest. The Office of the Secretary of Defense created the Predator UAV, then offered both the Air Force and Navy the opportunity to operate the new capability in Bosnia in 1995. Both services refused, so an Army military intelligence battalion flew operations over the Balkans. "Suddenly, the Air Force made an all-out bid to be the 'lead service' for Predator," Ehrhard declared, " [because] combat operations over Bosnia had caused a stir and had crystallized Congressional support. Air Force Chief of Staff [Ronald] Fogelman could see that due to its success in Bosnia, Predator was going to be fielded and he wanted to control the UAV for doctrinal reasons."[31] Fogelman

successfully garnered control of the newly revealed weapon system, with the Army Chief of Staff ceding the mission after Air Force assurances that they would respond effectively to Army requirements. On April 9, 1996, the Secretary of Defense approved the Air Force as the lead service for UAV operations and, less than six months later, on September 2, 1996, the Air Force took control of Predator operations over Bosnia with experienced pilots who were transferred to the 11th Reconnaissance Squadron.[32]

By June 2011, Congressional and defense leaders had to remind the Air Force to take care of their new mission as it was still critical to ongoing defense operations. Promotion rates to major for the pilots who flew the service's remotely piloted aircraft had fallen from 96 percent to 78 percent, well below that of other airmen. Secretary Gates "directed the Air Force to 'increase opportunities for highly skilled members of the UAS [unmanned aircraft systems] military community to reach senior leadership positions,' emphasizing that 'General Officers originating from this community are critical to our institutional goals."[33]

By 2015, the Air Force had not effectively addressed Gates' requests. Struggling to retain its qualified RPA pilots, the Air Force loses about 240 or 25 percent each year. The Air Force acknowledged that the low retention numbers add incredible stress to the lives of the RPA pilots, who are required to serve on average 14 hour days, 6 days a week, but the pilots expressed another concern as well -- the humiliation of being scorned by other Air Force pilots who view them as second-class citizens. Brandon Bryant, a former RPA pilot, explained in an interview with *Democracy Now*, "Everyone

else thinks that the whole program or the people behind it are a joke, that we are video-game warriors, that we're Nintendo warriors. And that's—that's really not the case. And these—the people that do the job are just as legit and just as combat-oriented as anyone else."[34]

The RPA pilots are not alone in their frustration. The missileers did not escape their experience of entering the Air Force unscathed either. While the pilots who ran the Air Force demanded that an experienced pilot lead other pilots and looked upon extensive flying experience as a badge of honor, they chose not to apply a similar standard to missile units. At first, there were no Air Force leaders with missile experience to place into these leadership positions, but even after the first mid-level officers finished their missile crew experience, the Air Force chose to continue placing rated pilots in the key leadership positions. Therefore, missileers took a very different lesson from their experience in Strategic Air Command. Rather than valuing operational experience controlling the missiles, the commanders of missile units began to behave as if those who served in the missile field were less capable than those who did not. Although the practice changed in 2014, for years the leaders of missile units selected their instructors and evaluators from very inexperienced crew members. These personnel spent very little time monitoring the missiles, but were then promoted into leadership positions while those who had remained in operational positions were held in lower esteem and often left the missile community or the Air Force itself.[35]

The devaluation of experience actually operating the missiles meant that missileers had to be differentiated in some other way. The differentiator became monthly test scores. Lieutenant General James Holmes revealed in a "Report of Commander-Directed Investigation" that "all MCCMs [missile combat crew members] receive periodic training to maintain the operational readiness required to perform their alert missions. This training consists of classroom and simulator instruction and is given on a monthly basis. Every month, a missileer must attend recurring classroom training in weapon system . . ., codes handling . . ., and E[mergency] W[ar] O[rder operations]. Additionally, every month a missileer must take and pass a 20-30 question knowledge test in each of those three subject--with a minimum passing score of 90 percent on each test."[36]

However, these tests had become the single differentiator between success and failure, Holmes' investigation revealed that "leaders placed too much emphasis on monthly test scores. Although the required passing score is 90 percent, crewmembers felt pressured to score 100 percent on each and every test. Leaders lost sight of the fact that execution in the field is more important than what happens in the classroom."[37]

In 2014, Secretary of the Air Force Deborah Lee James expressed alarm over this poor leadership, stating, "The drive to always score a hundred percent on exams when 90 percent was the standard, and the use of these scores in some cases as the sole differentiator on who got promoted and who didn't, just seemed inappropriate to me,"

so she changed the standard.[38] Nevertheless, this standard had applied to missileers all the way back to at least 1964, when Colonel Max Henney, Vice Commander of the 341st Strategic Missile Wing, reported to an *Esquire* writer, "The combat crew lives in an artificial environment -- strict, tight, closely controlled. They face rigorous examinations regularly on which they have to make perfect scores."[39]

Other frustrations expressed by missileers in 2014 reflected similar ones revealed by missileers from the 1950s and 1960s. Author Jeffrey Smith, in a 2014 article, wrote that the missileers' "day-to-day enemy, for decades, has not so much been another superpower, but the unremitting boredom of an isolated posting that demands extreme vigilance, while also requiring virtually no activity. . . . paired with the military's sky-high expectations for their workplace performance."[40] This complaint resembled those addressed by numerous missileers, including Pierce Smith, who described missile crew duty in 1965 as "long, monotonous hours in an isolated environment, a high degree of tension and stress, and (in the Minuteman system) greatly simplified tasks to perform."[41]

Finally, missileers, like the RPA pilots, reached the conclusion that the Air Force designated them as second class citizens.[42] Complaints heard after 2010 sounded strongly like those expressed by crew members from earlier decades. After news reports surfaced revealing problems in the missile career field, Charlie Simpson reminded former missileers, that "there have been periods where those of us who

were missileers felt we were the 'second class' part of the Air Force," especially when all of the leaders wore wings.[43] After fighter pilots disestablished Strategic Air Command in 1992 and then replaced it with the less influential Global Strike Command in August 2009, missileers expressed uneasiness that the top Air Force reduced the top nuclear commander from a four star general to a three star, a significant reduction. In 2014, Secretary James upgraded the position to four-stars, like the other major operational commanders. The person that she sent to fill the position was not a missileer though--he was a fighter pilot. James dismissed the concern, emphasizing, "I think he is just the ticket. . . . It would have been great if he also had the nuclear experience, but in this case we didn't have somebody immediately in the wings who was ready to take that on at that level, who had the experience."[44] Thus, nearly sixty years after General Thomas Power declared the first Atlas missile operational, pilots remained in command of missiles, confirming William Brooksher and Jimmy Scott's findings from 1973 that "as long as the operations command structure combines both missiles and rated organizations the demand for missile general officers will continue to be negligible."[45]

In 1957, as the first ballistic nuclear missile sat on alert, many Americans thought its potential, and that of the men who would control it, were limitless. Less than ten years later, the nation had returned to non-nuclear, limited war and the missileers were relegated to secondary status in their own service. In part, this drastic change resulted from the missile being oversold as the "ultimate weapon" during the

early Cold War, when many Americans believed that a nuclear war was not only likely, but preferable to domination by the communist Soviet Union. That the missiles' development also occurred as the newly established Air Force was at the height of its power ensured that the Air Force would struggle strenuously to take on the new capability, if for nothing else than to ensure that the missile did not replace the strategic bomber. Finally, the Kennedy administration's decision to return emphasis to conventional conflicts and to shift away from the ballistic missile allowed the Air Force leadership to push the missiles and their missileers into relative obscurity. Problems with missile duty that were recognized in the late 1950s were left to fester into the early 21st century while the Air Force maintained a singular focus on its flying mission.

Notes

All citations to newspapers are to section 'A' unless otherwise indicated.

[1] Robert T. Finney, *History of the Air Corps Tactical School* (Washington, D.C.: Air Force History and Museums Program, 1998), 57. (Original document produced in 1955 by Research Studies Institute, USAF Historical Division, Air University.) In his book, Finney further explains, on page 56, that "one of the first Americans to champion an independent air mission, [Brigadier General William] Mitchell was also among the first to recognize bombardment as the basic arm of the air force." For a more critical view of the Air Corps Tactical School, see Peter R. Faber, "Interwar U.S. Army Aviation and the Air Corps Tactical School:: Incubators of American Airpower," in Phillip Meilinger, Col., USAF, ed., *Paths of Heaven: The Evolution of Airpower Theory* (Maxwell AFB: Air University Press, 1997), 211-12. The Air Force's perception of its most effective use came from Italian airpower theorist Giulio Douhet. For more information on Douhet's theories, see Michael J. Eula, "Giulio Douhet and Strategic Air Force Operations: A Study in the Limitations of Theoretical Warfare," *Air University Review* (September-October 1986). http://www.airpower.maxwell.af.mil/airchronicles/aureview/1986/sep-oct/eula.html. (Accessed August 8, 2015.) Spaatz is quoted in Morris Janowitz, *The Professional Soldier: A Social and Political Portrait* (Glencoe, IL: The Free Press, 1960), 25.

[2] Andrew Erdmann, "'War No Longer Has Any Logic Whatever': Dwight D. Eisenhower and the Thermonuclear Revolution," in John Lewis Gaddis, Philip H. Gordon, Ernest R. May, and Jonathan Rosenberg, eds., *Cold War Statesmen Confront the Bomb: Nuclear Diplomacy since 1945* (New York: Oxford University Press, 1999), 94-97. For the influence of nuclear bombs on bombing primacy, see Karl P. Mueller, "Strategic Airpower and Nuclear Strategy: New Theory for a Not-Quite-So-New Apocalypse," in Meilinger, *Paths of Heaven*, 282. Phillip Meilinger, *Bomber: The Formation and Early Years of Strategic Air Command* (Maxwell AFB, AL: Air University Press, 2012), xv-xvi. Dudley Sharp, Secretary of the Air Force under Eisenhower, revealed more of the Eisenhower administration's thought process in a 1961 interview, contending, "We had to put all our technical resources and monetary resources that we could get our hands on to do the number one thing which was to defend us against an attack by the Soviets either on us or -- either against us or against our ally. And if we hadn't put this much emphasis on it we might have lost that race." Dudley C. Sharp, Interview #790, with Arthur Marmor, dated May 29, 1961, USAF Oral History Program, Call # K239.0512-790, IRIS #01000352, Air Force Historical Research Agency (AFHRA), Maxwell AFB, Alabama.

[3] Neil Sheehan, *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon* (New York: Random House, 2009), 293-299. NSC Action No. 1433. (http://www.foia.cia.gov/sites/default/files/document_conversions/18/1960-08-19a.pdf). Accessed November 6, 2014. See also undated "Memorandum to Major USAF Commands", IRIS # 1040232, MICFILM # 35258, AFHRA.

[4] Walter McDougall, *The Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985), 142. Allen Duckworth, "Johnson Urges Steps to Counter Missiles," *Dallas Morning News*, December 11, 1957, 1.

[5] James Lebovic, *Flawed Logics: Strategic Nuclear Arms Control from Truman to Obama* (Baltimore, MD: Johns Hopkins Press, 2013), 24. Preble, *Kennedy and the Missile Gap*, 4-5.

[6] Gill Robb Wilson, "The Public View of the Air Force," *Air University Quarterly Review,* 6, No. 4, (Winter 1953-54), 3. See also Melvin Deaile, "The SAC Mentality: The Origins of Organizational Culture in Strategic Air Command, 1946-1962" (Ph.D. Dissertation, University of North Carolina at Chapel Hill, 2007), 317.

[7] Bob Glaves, "End is in Sight For Military Jet," *Dallas Morning News*, October 11, 1957, 7.

[8] Andrew Goodpaster, Memorandum of Conference with the President, November 18, 1959 - Augusta, Papers as President of the United States, 1953-1961 (Ann Whitman File), DDE Diaries, Box 45, Staff Notes, Nov. 1959 (2), Eisenhower Presidential Library. See also Peter Roman, "American Strategic Nuclear Force Planning, 1957-1960: The Interaction of Politics and Military Planning" (Ph.D. dissertation, University of Wisconsin - Madison, 1989), 267.

[9] Glen Segell, ed., *Nuclear Strategy: The Jim King Manuscripts* (London: Glen Segell, 2006), 145. See also "Yarborough Assails GOP for Missile Lag," *Dallas Morning News*, October 23, 1957, 13, where the author quoted Senator Ralph Yarborough (D-TX) as contending, "Our bombardment planes are not obsolete, but they are in much the same position that wooden ships occupied the morning after the battle between the ironclad Monitor and Merrimac in Hampton Roads in the War Between the States." The unattributed article "Missiles vs. Bombers: Congressional Committees Express Some Doubt," *Science* 133, No. 3464 (May 19, 1961), 1586, further revealed that "the controversy over the bombers extends into the Air Force itself. The Air Force's civilian operations analysts at the Rand Corporation have shown little sympathy for the bombers, and there is a faction in the Air Force which agrees with the easily encountered view of Air Force critics that the predilection for bombers is in good part a psychological quirk." See also discussion in Chapter2.

[10] Robert McNamara quoted in *The Development of Strategic Air Command, 1946-1971*. IRIS # 00502339, Call # K416.052-6, AFHRA, 94. The McNamara quote is also in L. Douglas Keeney, *15 Minutes: General Curtis LeMay and the Countdown to Nuclear Annihilation* (New York: St Martin's Press, 2011), 259. For further corroboration of McNamara's perspective, see Robert E. Hunter, "The Politics of U.S. Defense 1963: Manned Bombers versus Missiles," *The World Today* 19 No. 3 (March 1963), 99.

[11] John Bohn, *Unclassified History of SAC from 1946-1971* (Offutt AFB, NE: Office of the Historian, Strategic Air Command, 1972), 77, Call # K4318, IRIS # 502339, AFHRA.

[12] The Thor and Jupiters had a much shorter operational life. The Air Force turned over the first Thor missile to the Royal Air Force on June 6, 1959 and completed the last squadron on April 22, 1960. Since the last Thor was removed from alert on August 15, 1963, the Thor on alert the longest was only operational for just over four years. The Jupiter missiles were ready for launch for even less time, with the first missile in Italy becoming operational on July 15, 1960 (and the first in Turkey not operational until June 1, 1961). Since the Air Force dismantled the last Jupiter missile in April 1963, these missiles were operational for less than three years. David K. Stumpf, *Air Force Missileers* (Paducah, KY: Turner Publishing, 1998), 23.

[13] Robert Norris, Steven Kosniak, and Stephen Schwartz, "Deploying the Bomb," in Stephen Schwartz, ed., *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons Since 1940* (Washington, D.C.: Brookings Institution Press, 1998), Table 2-3 "U.S. Missiles, 1945-97" on 149. Michael Armacost, *The Politics of Weapons Innovation: The Thor-Jupiter Controversy* (New York: Columbia University Press, 1969), 177.

[14] Desmond Ball, *Politics and Force Structure: The Strategic Missile Program of the Kennedy Administration* (Berkeley: University of California Press, 1980), 36. See also David Stumpf, *Titan II: A History of a Cold War Missile Program* (Fayetteville, University of Arkansas Press, 2000), 4. See also the discussion of McNamara's retirement of the liquid fueled missiles in Chapter 4.

[15] Deaile, in "The SAC Mentality," 244, ties SAC concerns with incorporating missiles to the Army's failure to assimilate pilots, contending that "When pilots were the subculture of the Army, they became a counterculture and sought their independence. . . . SAC took active measures to make sure this new SAC subculture espoused the same values and beliefs as the organization. Missileers would be indoctrinated into the 'SAC Mentality'." See also the discussion of the SAC mindset in Chapter 4.

[16] One method of downplaying the missiles' capabilities was to establish standards based on the areas the bombers could excel while ignoring the areas that the missiles were better. See Donald A. MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1993), 114. Quote from "Missiles vs. Bombers: Congressional Committees Express Some Doubt," *Science*, 1586. White quote from Thomas White, "USAF's Ten Top Priorities," *Air Force Magazine* 43, No. 9 (September 1960), 52-53.

[17] Mike Worden, *Rise of the Fighter Generals: The Problem of Air Force Leadership, 1945-1982* (Maxwell AFB, AL: Air University Press, 1998), 103-04. Worden also reveals that the next highest proportion of generals were fighter pilots, holding 20.5 percent of the positions. Worden, *Rise of the Fighter Generals*, 79, explains further that "LeMay held tremendous power and influence. During LeMay's time as Commander in Chief of Strategic Air Command, he selected personnel he believed were the best in the Air Force for his command and refused to release them to any outside assignment, including professional military education or Air Staff positions. This narrowed their perspective, but ensured that men who thought like LeMay were promoted. Worden clarifies that he could do this because, "as a [SAC] commander, he

was operationally responsible only to the JCS and the president. But LeMay held substantial clout even over the JCS and the Air Staff because he determined operational limits and strategy."

[18] Richard H. Kohn and Joseph P. Harahan, eds., *Strategic Air Warfare: An Interview with Generals Curtis E. LeMay, Leon W. Johnson, David A. Burchinal, and Jack J. Catton* (Washington, D.C.: Office of Air Force History, U.S. Air Force, 1988), 102-03. Deaile, "The SAC Mentality," 278, reveals that "initially, ICBMs were seen as an aid to penetrating bombers holding little capability to actually destroy entire target complexes." Recognizing the refusal of Air Force leaders to allow change, Colonel Robert Richardson III, a fighter pilot, expressed concern that "the Air Force's reputation as the source of young and new ideas, tactics, and defense policies has steadily declined. There is a status quo attitude in the officer corps -- a growing tendency to hold what we have rather than risk untested organizational and doctrinal changes." He then compared this attitude to the "Navy's attitude toward battleship and cruiser divisions in World War II," a very damning criticism from an Air Force officer. Robert Richardson III, "In the Looking Glass," *Air University Quarterly Review* 9 No. 4 (Winter 1957-58), 46-47.

[19] Deaile, "The SAC Mentality," 281-82. Deaile reveals that part of the motivation behind this act was to ensure the missileers never vied for their own service, as the air corps had done while a part of the Army. The systemic problems of missile duty were identified in Robert Rodwell, "Morale in a Missile Force," *Aeronautics* 38, No. 1 (March 1958), 66; E. S. Ewart, "A Survey of Potential Morale, Motivation, and Retention Problems at Ballistic Missile Sites" (Wright-Patterson AFB, OH: Air Research and Development Command, 1958); and Arthur Engell, "The Morale of the Missileer: A Study of the Minuteman Launch Control Officer" (Thesis, Air Command and Staff College, 1964), 2; as well as several other contemporary studies.

[20] "Missiles vs. Bombers," *Science*, 1585. During the tests of the detonating mechanism, the anonymous author admits that inert material was substituted for fissionable material so critics were technically correct that the entire system had not been tested from an operational launch site.

[21] "Interview/Discussion with General Curtis E. LeMay," Attachment 27 to Donald Emery, "History of 4315th Combat Crew Training Squadron, January - March 1971," IRIS #434458, Call # K-SQ-TNG-4315-HI, AFHRA. Curtis LeMay, Oral History, Interview # 785, March 1965, conducted by Colonel Bill Peck, IRIS # 00904859, Call # K239.0512-785 AFHRA.

[22] William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power -- Economic and Military* (Tuscaloosa: University of Alabama Press, 2009), 19. Deaile, "The SAC Mentality," 318.

[23] On June 8, 1961, Kennedy officially swore LeMay in as Air Force Chief of Staff. This promotion, by itself, indicates the influence of the "bomber mafia." According to Roswell Gilpatric, a Deputy Secretary of Defense in the Kennedy administration, "Every time the

President had to see LeMay, he ended up in a sort of fix. I mean he would just be frantic at the end of a session with LeMay because, you know, LeMay couldn't listen or wouldn't take in, and he would make what Kennedy considered . . . outrageous proposals that bore no relation to the state of affairs in the 1960s." He explained that LeMay was appointed because Kennedy thought the Air Force would revolt if LeMay had not been selected. LeMay and McNamara discounted this, but the fact that a key member of the administration would say it speaks volumes. Roswell Gilpatric oral history, June 30, 1970 (Digital Identifier: JFKOH-RLG-03), Kennedy Presidential Library, Boston, Massachusetts. See also Warren Kozak, *LeMay: The Life and Wars of General Curtis LeMay* (Washington, D.C.: Regnery Publishing, 2009), 334.

[24] Donovan Bowe, "Retention of Junior Officers in the Minuteman Missile Crew Force" (Research Report, Air War College, 1969), 9-10, 38. See also Thomas Gilkeson, "Missile Crewmember -- His Needs and Job Satisfaction" (Research Study, Air Command and Staff College, 1972), 14.

[25] Worden, *Rise of the Fighter Generals*, 85, reveals that the fighter community only produced one new aircraft between 1955 and 1964. James Ruehrmund, Jr. and Christopher Bowie, *Arsenal of Airpower: USAF Aircraft Inventory 1950-2009* (Washington, D.C.: Mitchell Institute Press, 2010), appear to support Worden's contention, revealing that the F-5 was added to the Air Force inventory in 1963. He contends that "SAC had complete dominance in the selection of new technologies, and usually the best TAC [Tactical Air Command] could do was to accept SAC rejects." On page 81, Worden quotes LeMay, as Vice Chief of Staff, arguing that the United States "could no longer afford the luxury of devoting a substantial portion of our Air Force effort to support ground forces."

[26] Neil Sheehan, *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon* (New York: Random House, 2009), 272-73.

[27] Kozak, *LeMay*, 335. Worden, *Rise of the Fighter Generals*, 89. See also Thomas Coffey, *Iron Eagle: The Turbulent Life of General Curtis LeMay* (New York: Crown Publishers, 1987), 357. Deaile, "The SAC Mentality," 297

[28] Worden, *Rise of the Fighter Generals*, 171, 186. Deaile, "The SAC Mentality," 298. William Bruce Danskine, Major, USAF, *Fall of the Fighter Generals: The Future of USAF Leadership* (Thesis, School of Advanced Airpower Studies, 2001), viii.

[29] For detailed examinations of this speculation, see Danskine, *Fall of the Fighter Generals* and Laura L. Lenderman, Lt. Col., USAF, *The Rise of Air Mobility and Its Generals* (Maxwell AFB, AL: Air University Press, 2008). Danskine argues that the Delphic tribe, a group that he defines as those who "build the battlespace picture," should next take the lead of the Air Force while Lenderman contends that the next group of leaders should come from the mobility airlifters. However, both acknowledge that changing the group that controls the Air Force is a difficult process fraught with difficulties.

[30] Rebecca Grant, "Preface," in Thomas P. Ehrhard, *Air Force UAVs: The Secret History* (Arlington, VA: Mitchell Institute for Airpower Studies, 2010), 2.

[31] Ehrhard, *Air Force UAVs*, 50.

[32] Ibid, 51.

[33] Gates, to General Norton Schwartz, memorandum, subject: Continued Growth of Unmanned Aircraft Systems, dated 29 June 2011, quoted in Lawrence Spinetta, Lt Col, USAF, "The Glass Ceiling for Remotely Piloted Aircraft," *Air & Space Power Journal* (July-August 2013), 102.

[34] Kate Brannen, "Air Force's Lack of Drone Pilots Reaching 'Crisis' Levels," *Foreign Policy* (January 15, 2015), http://foreignpolicy.com/2015/01/15/air-forces-lack-of-drone-pilots-reaching-crisis-levels/. Accessed July 31, 2015. Pratap Chatterjee, "Drone Pilots Are Quitting in Record Numbers," *Mother Jones*, March 5, 2015, http://www.motherjones.com/politics/2015/03/drone-pilots-are-quitting-record-numbers. Accessed July 31, 2015. Brandon Bryan quote from "A Drone Warrior's Torment: Ex-Air Force Pilot Brandon Bryan on His Trauma from Remote Killing," *Democracy Now* (October 25, 2013).

[35] Air Force Regulation 35-54, "Rank, Precedence, and Command" (Washington, D.C.: Department of the Air Force, 1970), 8.1, directed that all personnel who command or direct flying activities were required to be rated (on flying status). Colonel Lloyd Brauer, "Chairborne Minutemen," *Air University Quarterly Review* 9 No. 1 (Winter 1956-57), 70 contended, "Regardless of current assignment an officer expected to command or control flying activities must stay abreast of aviation advances, know the capabilities and limitations of the flyers and their machines, and most important of all, gain and maintain the respect and confidence of the men he is to lead." David Freeman, "An Analysis of the Need for Rated Officers in Missile Operations" (Research Study, Air Command and Staff College, 1970), 33. Robert Luckett, "People Problems in the SAC Missile Force and What Is Being Done to Correct These Problems" (Research Study, Air Command and Staff College, 1972), 14. Manning Brown, a missile crew member from 1988 to 1993, in an interview with author dated July 30, 2015 revealed his perception that those who held more experience on missile crew were less valued. R. Jeffrey Smith, in "Aiming High," reflects this perspective when quoting recent Air Force focus groups as claiming that what missileers "most want to do is to sit 'fewer alerts'." R. Jeffrey Smith, "Aiming High." *Slate* (April 14, 2014) http://www.slate.com/articles/news_and_politics/politics/2014/04/air_force_s_nuclear_missile_corps_is_struggling_millennial_missileers_suffer.html. (Accessed July 30, 2015.) See also Adam Lowther, "A Year Later: Responding to Problems in the ICBM Force," *Bulletin of the Atomic Scientists* (February 12, 2015), http://thebulletin.org/year-later-responding-problems-icbm-force7984. (Accessed July 31, 2015.)

[36] A former missileer, quoted in Mark Thompson, "Are You Smarter than a Nuclear Launch Officer," *Time* (February 13, 2014), contends, "Many missileers were bad test takers and

thought to be bad missileers, but they were the best. . . . These tests are supposed to determine whether you're fit to be a leader, an instructor, or an evaluator, but it has nothing to do with real leadership." http://time.com/8530/are-you-smarter-than-a-nuclear-launch-officer/. (Accessed July 29, 2015.) James Holmes, Lt Gen, USAF, "Report of Commander-Directed Investigation," 26 February 2014, C-3. http://archive.greatfallstribune.com/assets/pdf/G1220326327.PDF. (Accessed July 31, 2015.)

[37] Air Force investigation report, as provided to *Time* by Lt Gen Stephen Wilson, commander of AF Global Strike Command as quoted in Mark Thompson, "Air Force Applies a Band-Aid to a Sucking Chest Wound," *Time* (March 27, 2014), http://time.com/41088/air-force-cheating-scandal/. (Accessed July 30, 2015.) Daniel Sharp, a missileer at Warren AFB in 2014, concurred, explaining, "When I first came here leadership that was in place told me that the minimum passing score for my test was a 90 percent, but if I was making 90s I was a D student. And I would be treated that way." Daniel Sharp, interview with Leslie Stahl, transcript in "Who's Minding the Nukes?" *60 Minutes*, http://www.cbsnews.com/news/whos-minding-the-nuclear-weapons/. (Accessed July 29, 2015.)

[38] Secretary James is quoted in Thompson, "Air Force Applies a Band-Aid to a Sucking Chest Wound."

[39] Colonel Henney is quoted in Murray Morgan, "The Loneliness of the Missile Attendant," *Esquire* (July 1964), 50.

[40] Smith, "Aiming High."

[41] Pierce Smith, "Motivation of Minuteman Missile Crews" (Thesis, Air Command and Staff College, 1965), 4. See also Roger Conant in 1970, "The Use of Rated Officers in the Minuteman Missile System" (Research Study, Air Command and Staff College, 1970), 6, and Donald Robb, "An Analysis of the Probable Effects of an Underground Environment Upon Men Assigned to Hardened Missile Sites" (Special Study, Air Command and Staff College, 1961), 25-26.

[42] Joe Pappalardo, "A Disgraced Air Force General's Last Interview," *Popular Mechanics* (January 6, 2014), http://www.popularmechanics.com/military/a9924/a-disgraced-air-force-generals-last-interview-16341301/. (Accessed July 30, 2015.) See also Noah Shachtman, "Bosses Nuked, Some Air Force Missileers Cheer," *Wired* (June 6, 2008), http://www.wired.com/2008/06/defense-secreta-2/. (Accessed August 4, 2015.)

[43] Charlie Simpson, "Missileers, Inspections, Morale," *Air Force Missileers* 21, No. 2 (June 2013), 8.

[44] Robert Burns, "'Just the Ticket'" 4-Star Solution to Nuclear Air Force Ills," Associated Press (July 27, 2015), http://hosted.ap.org/dynamic/stories/U/US_NUCLEAR_MISSTEPS?SITE=AP&SECTION=HOME. (Accessed August 1, 2015.)

[45] William Brooksher and Jimmy Scott, "A Study of the Intercontinental Ballistic Missile Operations Career Field," (Individual Research Paper, National War College, 1973), 61. Since 1957, the Air Force has promoted only two missileers to a fourth star. Lance Lord commanded Air Force Space Command from 2002-2006 and Robert Kehler commanded Air Force Space Command from 2007 to 2011 and U.S. Strategic Command from 2011 to 2014.

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