Strategic Competition: The Paradox Between the Bomber Force We Have and the Force We Need

A Monograph

by

Major Stephen J. Bressett
US Air Force

School of Advanced Military Studies
US Army Command and General Staff College
Fort Leavenworth, KS

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This monograph in military studies investigates the paradox between the bomber force we have, and the force we need. The US Air Force's fleet of convention and nuclear bombers provides Combatant Commanders with strategic firepower in times of war, and a visible deterrent in times of peace. Bomber aircraft numbers are at the lowest in the service's existence, creating a low-density high-demand asset that must be carefully managed. The research question asks can the US Air Force better manage these limited assets to ultimately provide COCOMs with the resources required to achieve their comprehensive strategy. The hypothesis of this paper is that the US Air Force has three options to restore America's bomber fleet to levels capable of competing with a peer adversary; repurpose the current fleet, build additional aircraft, and manage or change the command relationships that currently exist.

This paper is organized to guide the reader through where we have been, where we are as of 2019, and where we are going in the future of the bomber force. The first section offers a historic narrative to illuminate the rise of the bomber force to crushing prominence in World War II and its subsequent decline in the modern force. Next, we will identify problems associated with low-density high-demand platforms and their unique management and strategic use. Following that will be a recommendation for a way forward. Finally, the conclusion summarizes lessons learned throughout this research about the force we have and the force we need.

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Name of Candidate: Major Stephen J. Bressett

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Approved by:

_____, Monograph Director
John M. Curatola, PhD

_____, Seminar Leader
Aimee S. DeJarnette, COL

_____, Director, School of Advanced Military Studies
Brian A. Payne, COL

Accepted this 21st day of May 2020 by:

_____, Acting Director, Graduate Degree Programs
Prisco R. Hernandez, PhD

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Abstract

Strategic Competition: The Paradox Between the Bomber Force We Have and the Force We Need, by Major Stephen J. Bressett, USAF, 44 pages.

This monograph in military studies investigates the paradox between the bomber force we have, and the force we need. The US Air Force's fleet of convention and nuclear bombers provides Combatant Commanders with strategic firepower in times of war, and a visible deterrent in times of peace. Bomber aircraft numbers are at the lowest in the service's existence, creating a low-density high-demand asset that must be carefully managed. The research question asks can the US Air Force better manage these limited assets to ultimately provide COCOMs with the resources required to achieve their comprehensive strategy. The hypothesis of this paper is that the US Air Force has three options to restore America's bomber fleet to levels capable of competing with a peer adversary; repurpose the current fleet, build additional aircraft, and manage or change the command relationships that currently exist.

This paper is organized to guide the reader through where we have been, where we are as of 2019, and where we are going in the future of the bomber force. The first section offers a historic narrative to illuminate the rise of the bomber force to crushing prominence in World War II and its subsequent decline in the modern force. Next, we will identify problems associated with low-density high-demand platforms and their unique management and strategic use. Following that will be a recommendation for a way forward. Finally, the conclusion summarizes lessons learned throughout this research about the force we have and the force we need.

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And a final thank you to the Air Force bomber pilots who have sworn an oath to defend our great nation. I hope this work is an accurate representation of our community and its storied journey – I know either way that you will continue to resolutely shoulder the burden that the country places on you and your families every day.

Abbreviations

AEF	Air Expeditionary Force
AF	Air Force (Refers to a numbered Air Force)
AFGSC	Air Force Global Strike Command
AOR	Area of Responsibility
COCOM	Combatant Command
AMRG	Aerospace Maintenance and Regeneration Group
ATB	Advanced Tactical Bomber
BW	Bomb Wing
CBP	Continuous Bomber Presence
CENTOM	United States Central Command
CONUS	Continental United States
DoD	Department of Defense
EUCOM	United States European Command
ICBM	Intercontinental Ballistic Missile
INDO-PACOM	United States Indo-Pacific Command
JDAM	Joint Direct Attack Munition
LDHD	Low Density High Demand
NATO	North Atlantic Treaty Organization
NSC	National Security Council
NDS	National Defense Strategy
RAF	Royal Air Force
SLBM	Submarine-Launched Ballistic Missile
STRATCOM	United States Strategic Command
USSBS	United States Strategic Bombing Survey

Figures

Introduction

> Not to have an adequate air force in the present state of the world is to compromise the foundations of national freedom and independence.
>
> —Winston Churchill, *House of Commons, 1933*

As the sun split the horizon on the early morning of 25 July 1943, a dense smoke rose from the German industrial city of Hamburg. Only hours earlier, the Royal Air Force (RAF) began Operation Gomorrah with a night assault composed of 791 aircraft intending to hammer key war supporting targets.[1] The night strike, executed between 0100 and 0200, delivered 2,300 tons of both explosive and high incendiary bombs.[2] RAF bombing practices called for lead bombers to drop markers so that the following formations would know where to release their weapons in the dark. Hamburg resident Johann Johannsen, who was manning a flak battery that night, recalled his experience of being directly underneath one such marker:

> High above us we could hear the drone of the enemy machines. Suddenly countless flares were above us, so that the whole city was lit up in a magically bright light...With incredible swiftness the disaster was suddenly upon us. Before and behind our battery heavy chunks of metal were striking. Howling and hissing, fire and iron were falling from the sky. The whole city was lit up in a sea of flames![3]

At 1400 on the afternoon of 25 July, the second wave approached Hamburg - it was the US Army Air Force's (USAAF) turn. The famous 8th Air Force (AF), with a formation of 109 B-17 bombers and fighter escorts, emerged on the horizon.[4] The objective remained Hamburg - Germany's second largest city and largest port; containing gas works, oil refineries, port

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[1] See appendix 1.

[2] Rebecca Grant, "Operation Gomorrah," *Air Force Magazine,* (March 2007), accessed 15 August 2019, http://www.airforcemag.com/MagazineArchive/Pages/2007/March%202007/0307gomorrah.aspx.

[3] Peter C. Chen, "Bombing of Hamburg, Dresden, and Other Cities," *World War II Database*, accessed 15 July 2019, https://ww2db.com/battle_spec.php?battle_id=55.

[4] Roger A. Freeman, *Mighty Eighth War Diary* (New York: Janes Publishing Company Limited, 1981), 77.

installations, locomotive sheds, submarine slips and hundreds of factories. These targets were chosen in response to the *Pointblank* bombing directive developed earlier in the year by General Henry "Hap" Arnold and General Ira Eaker.[5]

The *Pointblank* directive was an air strategy that identified six enemy target systems encompassing seventy-six precision targets, the destruction of which would greatly impair the Nazi war effort.[6] RAF Air Chief Marshal Sir Arthur T. "Bomber" Harris was the commanding General of all Allied Bomber Command units stationed at High Wycombe in England, including the USAAF. He recently ordered the analysis and planning for a raid on Hamburg, issuing guidance to execute a maximum effort, codename "Goodwood," strike against Hamburg with a zero hour after midnight.[7] The Hamburg raid was officially put into effect on 24 July 1943 when Harris muttered the code words, "Hamburg, Goodwood, late."[8]

Lieutenant Kermit D. Wooldridge, 525th Bomb Squadron, 379th Bomb Group, 8th Air Force took to the skies that day in his B-17 and described the battle in his personal diary:

> Mission No. 4
> 25 July 1943
> 0700
> We were rather tired after the long raid yesterday but this was an all-out affair so we had to go today too. Same bomb load, target Hamburg, Germany. We met fierce fighter opposition as soon as we crossed the channel and fought a running battle all the way to the target. The RAF has been bombing Hamburg...to wipe it off the map and when we arrived we saw that they had just about done it. There was a small section left though and we took care of that. They seemed to have plenty of flak guns left though and they made it plenty rough on the run. We ran into fighters again as soon as we left the smoldering ruins and they stayed with us until we reached the channel.[9]

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[5] Douglas L. Kenny, *The Pointblank Directive: Three Generals and the Untold Story of the Daring Plan that Saved D-Day* (Oxford, UK: Bloomsbury Publishing, 2014).

[6] Tami D. Biddle, *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas About Strategic Bombing, 1914-1945* (Princeton: Princeton University Press, 2002).

[7] Gordon Musgrove, *Operation Gomorrah: The Hamburg Firestorm Raids* (New York: Jane's Publishing Company Limited, 1981), 1.

[8] Ibid.

[9] Kermit Wooldridge, *Diary of Kermit Wooldridge*, 25 July 1943, accessed 13 August 2019, https://sites.google.com/site/ww2pilotsdiary/.

German fighters imposed a heavy cost on the American bombers, particularly because the Mighty Eighth was forced to fly during day light. They trained and practiced during the day, and Eaker was confident that they would succeed using familiar tactics.[10] Even as the bombers exited the target area after completing their mission, enemy fighters swarmed B-17s unable to stay within the group formation. The Luftwaffe were typically afraid of flying into a group of B-17 bombers, as the high concentration of guns meant a formidable defense. However, there were reports of fighters directly challenging bombers, with the most of them employing the strategy of flying from the direction of the sun to mask their attacks. The American bombers returned to Britain around 1930 in the evening, finding that they had lost fifteen aircraft that day.[11]

The unusually warm weather and good conditions meant that the combined bomber offensive mission was highly concentrated around the intended targets. Wind, weather, and obscuration were not a factor as they usually were for that time of year. As a result of the Allied bombing, a devastating fire storm erupted in the city, creating a whirlwind updraft of super-heated air creating a 1,500-foot-high tornado of fire, casting smoke 19,000 feet into the burning sky.[12] The fire ripped through the city indiscriminately imposing its will upon the inhabitants and structures. Civilians seeking safety in bomb shelters and cellars were only destined for doom as the fire consumed the oxygen in the burning city above.[13]

The final large-scale mission conducted under Operation Gomorrah took place on the night of 2-3 August, when 740 aircraft launched from their base at High Wycombe for Hamburg, but bad weather prevented many of the bombers from reaching their target. Many of them diverted to bomb secondary targets instead. Thirty of the 740 bombers were shot down that day, but the massed bomber formations planned for attrition and still achieved their intended mission.

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[10] Musgrove, *Operation Gomorrah: The Hamburg Firestorm Raids,* 1.

[11] Chen, "Bombing of Hamburg, Dresden, and Other Cities."

[12] Edward M. Sion, *Through Blue Skies to Hell* (Drexel Hill: Casemate, 2007), 80.

[13] Musgrove, *Operation Gomorrah: The Hamburg Firestorm Raids,* 3.

In the ten-day operation, Hamburg was unreservedly destroyed. A personal correspondence from German Field Marshal Wilhelm Keitel to his wife dated 3 August 1943 captured the fear instilled in the German people after the bombardment of the city:

> Hamburg has been a catastrophe for us, and last night there was yet another heavy air raid on it. The same must be expected for Berlin as soon as the nights are long enough for the longer flying time involved. That is why I want you to leave Berlin as soon as possible in view of the enormous danger there now is of fires breaking out; fires are far more dangerous than high explosive [bombs]...I am afraid of vast conflagrations consuming whole districts, streams of burning oil flowing into the basements and shelters, phosphorus, and the like. It will be difficult to escape from the shelters then, and there is the danger of tremendous heat being generated. This will not be cowardice, but the sheer realization that in face of phenomena like these one is completely powerless; in the heart of the city you will be quite powerless.[14]

All said and done, nearly seven square miles of Hamburg lay in ruins, including the area that produced one third of the German U-boats in service. In one week of air raids nearly 3,000 aircraft dropped 12,000 tons of munitions. Operation Gomorrah consisted of eight days and seven nights of heavy air raids on Hamburg killing between 34,000 – 43,000 people, wounding 37,000 and displacing an estimated one million people.[15] Another 180,000 people lost their jobs, a ten percent reduction in the nation's work force, wounding Germany's war effort.

History of the Force

This operation from history underscores the incredible strategic impact of a fully resourced bomber force. Nearly 98,000 bombers were built just prior to, and during World War II.[16] Comparatively, the US Air Force (USAF) currently has only 157 bombers in the active inventory, a 509 percent decrease from the service's World War II dominant roster. This

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[14] David H. Lippman, "Allied Aerial Destruction of Hamburg During World War II," *World War II Magazine*, July 1998, accessed 5 August 2019, https://www.historynet.com/allied-aerial-destruction-of-hamburg-during-world-war-ii.htm.

[15] Rusian Budnik, "Firestorm Hell: Operation Gomorrah – 'Hiroshima' of Germany," *War History Online*, accessed 15 July 2019, https://www.warhistoryonline.com/instant-articles/operation-gomorrah.html.

[16] Editor's Official, "Airplanes of the Past," accessed 8 August 2019, https://www.airplanesofthepast.com/wwii-bomber-pro.

represents the smallest bomber fleet in the service's history, and could be threatening national security. So, what has changed about the character of war to drive such sharp reduction? How did the bomber force go from dominating the skies of Europe and the Pacific to an after-thought in strategic policy? This paper will examine the USAF bomber force through the lens of strategic competition to better understand the bomber force we have, versus the force we need. If the USAF prioritizes a return to strategic bombing as a hallmark joint function, it will underscore their efforts to build, repurpose, and manage a dominant strategic fleet capable of meeting Combatant Command (COCOM) objectives and fulfill expectations outlined in the 2018 National Defense Strategy (NDS).

To maximize effectiveness in a large-scale combat operation, the USAF must take steps today to ensure readiness for tomorrow. To do this they must, increase the overall size of the bomber force and appropriately man the squadrons to fly them - modernizing in the process, and re-examine global basing requirements to project this capability to deter, and if necessary, engage the enemies of the United States. Service leaders must continue to advocate for airpower's place in the joint fight. This promise to national security can only followed through with a properly managed and resourced fleet. A look back at the young independent air service after the Second World War provides context from the past of why we have the limited force of today.

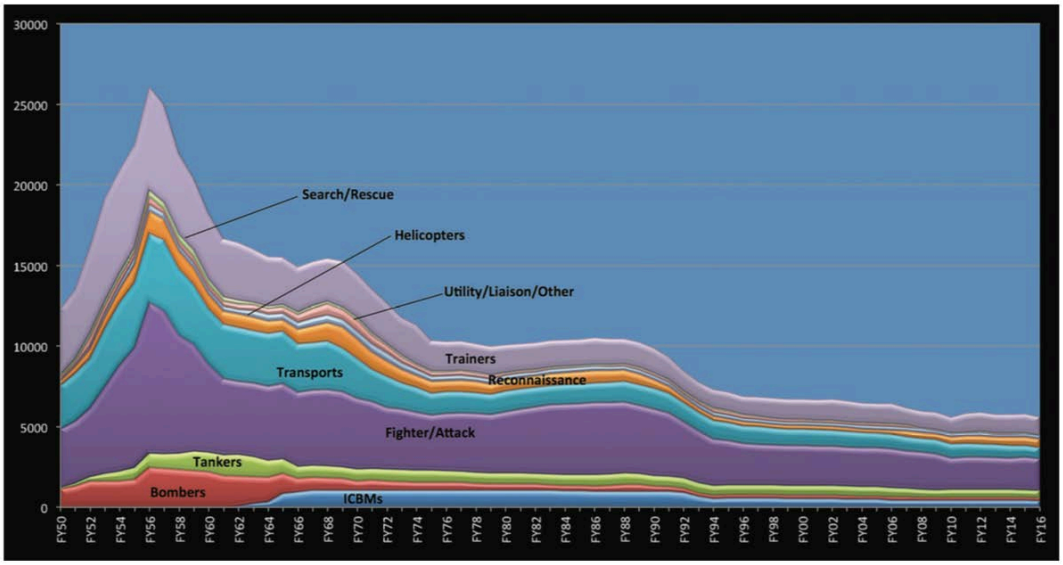

Figure 1. USAF Historical Aircraft Inventory by Type 1950-2016. Christopher J. Bowie and James C. Ruehrmund Jr., *Arsenal of Airpower: USAF Aircraft Inventory, 1950-2009* (Washington, DC: Mitchell Institute Press, November 2010), 3.

Figure 1 provides a glimpse of the Air Force's historical inventory represented by numbers of major types of systems from 1950 through 2016. The USAF experienced significant growth starting in 1950 as a result of National Security Council (NSC) 68. NSC 68 outlined US objectives and programs for national security under the Truman administration and beyond. The policy paper provided a blueprint for the militarization of the Cold War from 1950 to the collapse of the Soviet Union at the beginning of the 1990s.[17] The document, and its subsequent amplifications, advocated for a large expansion of the military budget, the development of the hydrogen bomb, and increased military aid to allies of the United States.[18]

The spike in aircraft numbers to a peak level of more than 26,000 aircraft was a direct result of NSC 68, as seen in the graph above.[19] The growth was the result of a unique set of

[17] Ernest R. May, *American Cold War Strategy: Interpreting NSC 68* (Bedford Books of St. Martin's Press, 1993), 17.

[18] Walter T. Hixson, "What Was the Cold War and How Did We Win It?" *Reviews in American History* 22, no 3, 1994, 507-511.

[19] Stephen L. McFarland, *A Concise History of the US Air Force* (Washington, DC: Government Printing Office, 1997), 51.

circumstances such as, 1) the threatening posture of the Soviet Union and the need to build up forces to fight in Korea, 2) a push from President Eisenhower to reduce overall military spending by relying on air and missile power provided by the USAF, 3) shifting roughly fifty percent of the military budget to the USAF, and 4) a masterful advocacy campaign in Congress on the value of air power in the new security environment.[20] Furthermore, NSC 162/2 approved by President Eisenhower in 1953 helped shape Cold War national security policy. This policy paper described the need to maintain, "a strong military posture, with emphasis on the capability of inflicting massive retaliatory damage by offensive striking power…considering nuclear weapons as available for use as other munitions."[21]

The context behind figure 1 represents a paradigm shift from the massive bomber operations of the World War battle space. During World War II, Secretary of War Henry L. Stimson and President Harry S. Truman initiated the US Strategic Bombing Survey (USSBS), to determine exactly how effective strategic bombing had been in the European and Pacific theaters.[22] The final study, consisting of over 330 separate reports and annexes, was astounding in its size and firm in its conclusions. The survey's results included detailed successes and failures of the strategic bombing campaign and offered areas for improvement for targeting and the principals of bombardment. Moreover, USAF leaders and writers of doctrine used the survey to innovate airpower using new technology and tactics against better targets.[23] As such, it has been used for decades as a primary source and a guiding text for air power and strategic bombing advocates.[24]

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[20] McFarland, *A Concise History of the US Air Force*, 51-58.

[21] James S. Lay, Jr., *Report to the National Security Council by the Executive Secretary: NCS 162/2* (Washington, DC, 30 October 1953), 582, 593.

[22] US Strategic Bombing Survey, *Summary* (Washington DC: Government Printing Office, 1945).

[23] Ibid., 286.

[24] Gian P. Gentile, *How Effective is Strategic Bombing? Lessons Learned from World War II to Kosovo* (New York, NY: New York University Press, 2000).

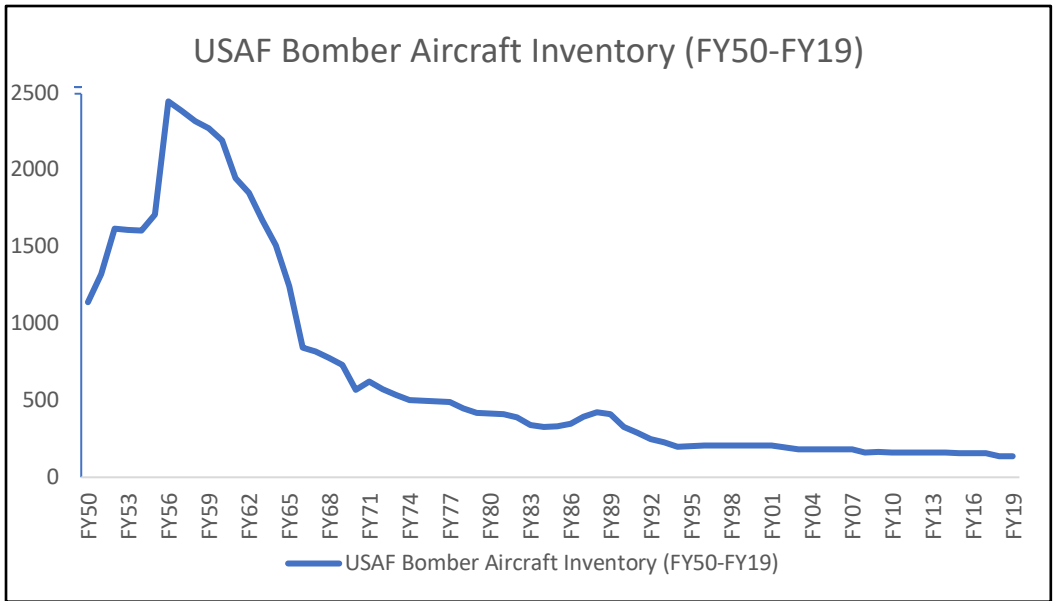

Figure 2. US Air Force Posture Over Seven Decades. Created by author.

When the Air Force became an independent service in 1947 they faced adopting a doctrine that would merit their existence and fulfill the USSBS's recommendations. Would the doctrine and early theory of strategic bombing carry through, or would the service need to evolve? The graph in figure 2 demonstrates the priority placed on the need for large quantities of bomber aircraft in the first twenty years of the service's existence. At the time, jet engine technology was emerging, and many of the legacy bombers of World War II were no longer survivable against modern threats. In fiscal year 1956 (FY56) the service peaked at 2,450 bombers (primarily B-36 and B-47 medium bombers) – the highest it would ever be as an independent service. Of course, this was nothing compared to the industrial ramp up to World War II, but at the time no existential threat existed that required massive conventional bomber formations. For the time being, aviation industry focused on building smaller, faster, and cheaper fighters to meet the threat faced in Korea that could also deliver nuclear weapons to deter the Soviets.[25]

[25] Christopher J. Bowie and James C. Ruehrmund Jr., *Arsenal of Airpower: USAF Aircraft Inventory, 1950-2009* (Washington, DC: Mitchell Institute Press, November 2010), 2.

As the conflict in Korea persisted with limited bomber operations, tension between the United States and the Soviet Union developed in the post-war world order. USAF leadership looked at building a modern force capable of enduring service. So much so that on April 15, 1952 amid the Korean conflict the Boeing B-52 took its first flight. A year later, on October 3, 1953 Assistant Secretary of the Air Force Roger Lewis revealed that Boeing would begin building the B-52 bomber at a cost of $3.6 million each.[26] The USAF ordered 252 aircraft knowing that the B-52 would represent the backbone of a modern strategic bombing force supporting both conventional and nuclear missions. President Dwight D. Eisenhower's "New Look" policy relied on long-range heavy bombers as a primary component of his massive retaliation doctrine to deter the Soviet Union.[27] Ultimately, 742 were built over the next eleven years to create the force required to meet national defense policy.[28]

After the large B-52 purchase, the United States modified its nuclear force posture from purely bombers to a multi-pronged triad. This incorporated intercontinental ballistic missiles (ICBM) and submarine-launched ballistic missiles (SLBM) into nuclear deterrence policy. The triad complicated Soviet targeting and enhanced American's ability to coherently retaliate and survive a first salvo attack.[29] Figure 3 illustrates the bomber draw down in context to ICBM and SLBM arrival into the triad inventory. The invention and subsequent proliferation of the atomic bomb drastically and permanently changed the bomber structure forever. No longer was the strategic bomber America's sole sword and shield. The principal of mass that dominated World War II was replace by one aircraft and one powerful nuclear weapon, not only a cost savings

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[26] Walter J. Boyne, *Beyond the Wild Blue: A History of the United States Air Force, 1947-2007* (New York: St. Martin's Press, 2007), 469.

[27] Michael R. Moeller, "US Bomber Force: Sized to Sustain an Asymmetric Advantage for America," (The Mitchell Institute for Aerospace Studies. Arlington, VA, 2015), 6.

[28] Marcelle Size Knaack, *Post-World War II Bombers* (Washington, DC: Office of Air Force History, 1988), 255.

[29] Moeller, "US Bomber Force: Sized to Sustain an Asymmetric Advantage for America," 6.

measure but a strategic shift in force structure. A comprehensive nuclear defense was put in place that relied on both air and naval assets. The new nuclear posture sharply influenced the decline in the numbers of bombers needed and acquired since the mid-1960s.

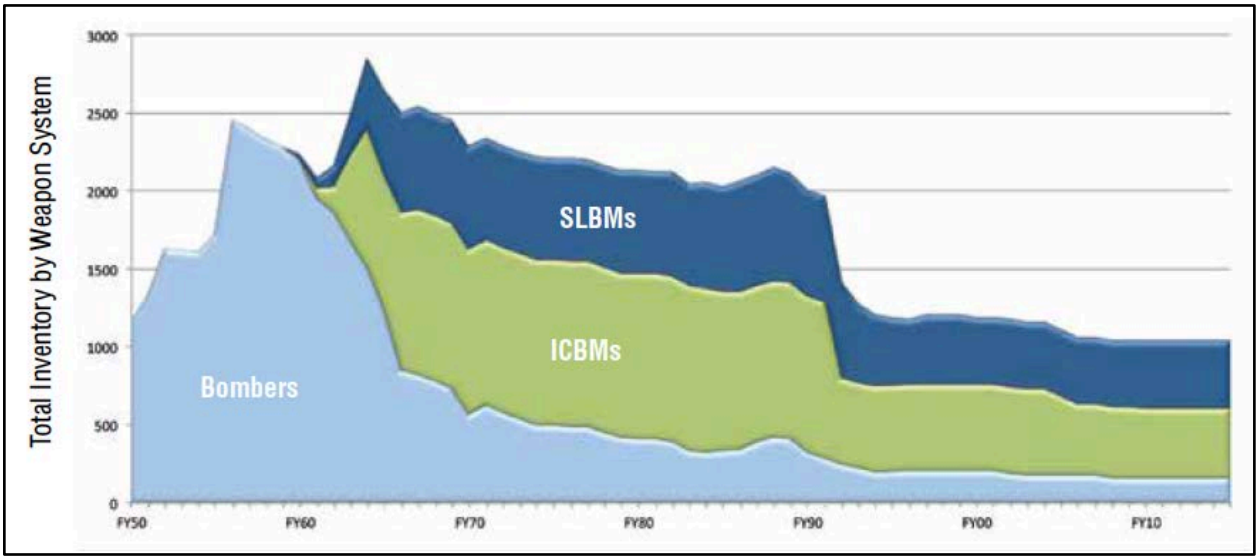

Figure 3. Bomber, ICBM, SLBM Total Inventory 1950-2016. Michael R. Moeller, "US Bomber Force: Sized to Sustain an Asymmetric Advantage for America," (The Mitchell Institute for Aerospace Studies, Arlington, VA, 2015), 7.

After the nuclear triad was established, analysis of bomber force size focused on nuclear target coverage exclusively, and maintained a relatively constant requirement for 250 bombers, yielding approximately 200 combat-coded jets.[30] The USAF planned to start a number of new bomber programs to both sustain, replace and/or augment the B-52 fleet. Improving air defense systems in the Soviet Union required new bombers to counter these threats, allowing access to all target sets. For example, the service planned to purchase 250 B-70 bombers, but growing concerns over the aircraft's survivability, developmental difficulties, and rising costs, led to the program's termination.[31]

[30] David A. Deptula and Douglas A. Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future" (Mitchell Institute Policy Paper Vol 19 Arlington, VA, March 2019), 38.

[31] Nick Kotz, *Wild Blue Yonder. Money, Politics, and the B-1 Bomber* (New York: Pantheon Books, 1988), 31.

Later, the requirement for the B-1 was based on the B-70, with a need for 240 supersonic bombers to replace aging B-52s. The high-speed bomber could ingress at low altitude and arrive at targets undetected. Unexpectedly, Soviet look-down shoot-down technology emerged closely thereafter, and the low altitude high-speed tactic became less survivable and less feasible. In response, President Jimmy Carter cancelled the B-1 and elected to invest in the new Advanced Tactical Bomber (ATB) program – the precursor program that lead to Northrop's development of the B-2 Spirit.[32] Subsequently, President Ronald Reagan decided to procure 100 B-1s as an interim bomber and ordered 132 new B-2 stealth bombers – for a total of 232 bombers.[33] Justification for the 232 bomber force was explained by then-Air Force Chief of Staff General Larry D. Welch in 1990 at his testimony to congress, "The original number of 132 was arrived at from the 230 total penetrating bombers required to give us the most efficient coverage of Soviet targets."[34]

The Bomber Force of Today – Strategic Undermatch

Today, the USAF is operating the smallest, oldest, and least ready aircraft force it has fielded in its history.[35] By comparison, in 1990 the Air Force fielded 290 bombers, today it has just 157 in the active inventory, a decrease of forty-six percent.[36] Meanwhile, the force is stressed from continuous combat operations in Allied Force, Enduring Freedom, Iraqi Freedom, Odyssey Dawn, Inherent Resolve and Freedom Sentinel, in addition to continuous bomber rotations to US

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[32] Michael E. Brown, *Flying Blind: The Politics of the US Strategic Bomber Program* (Ithaca: Cornell University Press, 1992), 303.

[33] Kotz, *Wild Blue Yonder. Money, Politics, and the B-1 Bomber*, 96.

[34] US Congress Senate Committee on Armed Services, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, Hearing part 7, 101st Congress, 2nd session (Washington DC: Government Printing Office, 1990), 8-17.

[35] David A. Deptula, "Interdependent Warfare: Combined Effects Power in the 21st Century" (Mitchell Institute Policy Paper Vol 10 Arlington, VA, March 2018), 16.

[36] Erin Duffin, "Total Aircraft Force of the U.S. Air Force for Fiscal Years 2018 to 2020, by type," Editors Official, 29 April 2019, accessed 30 July 2019, https://www.statista.com/statistics/239424/total-aircraft-force-of-the-us-air-force-by-type/.

Central Command (CENTCOM) and US Indo-Pacific Command (INDO-PACOM). An undersized and under resourced USAF translates to fewer national security options, and the assumption of significantly higher risk at the strategic, operational, and tactical levels of war.

The reason for the force reduction is clear and can be traced through history and policy. In the years after the Cold War, America sought a peace dividend. The numbers of aircraft designed for major combat operations (MCO) were cut to make budgetary room for other projects and priorities. For example, the B-2 program procurement resulted in just twenty-one of 132 originally approved, planned and ordered, and only 100 B-1s were procured out of a planned 150.[37] Likewise, the most capable fighter aircraft in history, the F-22 Raptor, was cut early and produced less than half of the 381 originally approved, planned, and ordered.[38]

That decision came down to an excessive focus on near-term priorities and budget efficiencies. The situation also highlights the shifting priorities of the Department of Defense (DoD) depending on who is leading the department. Throughout the 2000s, the need for the F-22 was debated because threats that could rival American air power seemed a distant concern. Furthermore, preparation for peer-to-peer competition was pushed aside for the nearsighted counter-terrorism fight. The hopes of achieving a highly modern, highly technical US military posture declined as the Global War on Terror dominated policy and budgetary decisions across the first decade of the twenty-first century. Secretary of Defense Robert Gates was responsible for these decisions during his tenure. He famously scolded his commanders saying, "I have noticed too much of a tendency towards what might be called 'next-war-itis,' the propensity of much of the defense establishment to be in favor of what might be needed in a future conflict."[39]

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[37] Brown, *Flying Blind: The Politics of the US Strategic Bomber Program*, 305.

[38] John Hamilton, *F-22 Raptor* (Minneapolis: ABDO Publishing, 2013), 55.

[39] Jed Babbin, *How Obama is Transforming America's Military from Superpower to Paper Tiger* (New York: Encounter Books, 2010), 213.

Secretary Gates' statement highlights his contempt for the department's preoccupation with the future. When he cancelled the F-22, Gates boasted that, "…by 2020, the United States is projected to have…nearly 1,100…advanced fifth generation F-35s and F-22s. China, by contrast, is projected to have no fifth-generation aircraft by 2020. And by 2025, the gap only widens."[40] He was badly mistaken. As of 2019, the Air Force has only 186 F-22s and 153 F-35s, 761 less than Gates promised.[41] Too few F-35s are being procured each year—forty-eight per-year for the Air Force—versus the over 100 per-year originally programmed.[42] In comparison, China is beating all of Secretary Gates' generous assumptions. The People's Republic of China has produced two 5th generation stealth fighters, the J-20 and J-31, and is also expected to field a stealth bomber with a range that will exceed five thousand miles within a year or two.[43]

Our adversaries have studied the American way of war. These belligerents have worked to match our strengths, while probing our weaknesses inherent to global operations. There is a reason why Russia, China, and many other European nations are motivated to develop stealth fighters to supplement their air forces. This is also why Chinese military leaders speak openly about challenging the US Navy with advanced anti-ship cruise missiles that could sink an aircraft carrier. A recent comment by a senior Chinese officer underscores their boldness on the matter stating, "we'll see how frightened America is" in the face of such action.[44]

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[40] David A. Deptula, "Building the Air Force We Need to Meet Chinese and Russian Threats" *Forbes*, 11 February 2019, accessed 2 August 2019, https://www.forbes.com/sites/davedeptula/2019/02/11/building-the-air-force-we-need/#4d13fa582b97.

[41] Ibid.

[42] Ibid.

[43] Deptula, "Building the Air Force We Need to Meet Chinese and Russian Threats."

[44] Jamie Seidel, "Sink Two Aircraft Carriers: Chinese Admiral's Chilling Recipe to Dominate the South China Sea," *News.com.au*, 2 January 2019, accessed 1 August 2019, https://www.news.com.au/technology/innovation/military/sink-two-aircraft-carriers-chinese-admirals-chilling-recipe-to-dominate-the-south-china-sea/news-story/aaa8c33d57da62e7d5e28e791aa26e0f.

Maintaining the status quo in the face of such pressure is not a viable or sustainable option. Remaining at current readiness and resource levels risks ceding the initiative to our adversary. Additionally, it complicates force projection and makes forces vulnerable to assault, suffering high rates of aircraft attrition, and increases the likelihood of a protracted war – and perhaps even defeat. Air power provides a unique asymmetric advantage for the United States and our allies through its ability to strike targets anywhere on the globe in a matter of hours. This advantage falls upon a capable and ready bomber force that is exceptionally positioned to confront any foe regardless of the tyranny of distance.

Likewise, a comparison to Russia's development in recent years is cause for concern. Although the United States spends more money on its air force than Russia, there is significant contrast between the two. For example, the fact that Russia has more bombers than the United States is rather interesting. One of the main reasons for this is that Russia has older bombers still in service that are cheap, instead of spending their money on new, costly projects to create a more modern, competitive force. Russia's primary bombers are still the Tupolev 95 fielded in 1956, Tupolev 160 fielded in 1981, and the Tupolev 22M fielded in 1972.[45] Even though many of them are upgraded to incorporate modern avionics, instruments, and sensors, the cost cannot be compared to both the development cost as well as the unit cost of some of the extreme US projects like the B-2. As an example, the unit cost of a Tupolev 160 is about $40 million while the Northrop Grumman B-2 is over $2 billion.[46]

While the Russian bomber force may be numerically larger, they suffer from a lack of modernization. This decreases their overall ability to integrate between platforms, communicate and survive in contested environments, and makes them susceptible to jamming and other forms of exploitation. Their force structure relies on the principle of mass to guarantee that the bomber

[45] Editors Official, "USAF and Russian Air Force – A Comparison," 30 July 2019, accessed 30 July 2019, https://migflug.com/jetflights/usaf-and-russian-air-force-a-comparison/.

[46] Ibid.

will get through to its target. The United States has taken an alternate approach, combining range, payload, and precision as the cornerstone of their force – sacrificing quantity for survivable quality.

When Secretary Gates left the DoD in 2011, it marked a change in strategic thinking. The new line of thinking culminated in the 2018 NDS, which refocuses national defense efforts back on strategic power competition. Specifically, the NDS claims that America is "emerging from a period of strategic atrophy," and in a return to "great power conflict."[47] Unsubtly so, this places Russia and China at the forefront of military strategy in an attempt to balance and contest the eco-political power yielded by our closest competitors. Although conflict is not a forgone conclusion, the US-Russia-China relationship appears to be stuck in a security dilemma, competing against each other in a growing game of cat and mouse.[48] Challenges are not limited to great power competition, but also include regional influencers like Iran, North Korea, and regions of the Middle-East and Africa.

To confront these challengers, the Commander-in Chief and the Chairman of the Joint Chiefs of Staff look to bring a whole of government approach to deter and deescalate, but also stand ready to defend national interests and seize the initiative. The USAF is unique in its inherent ability to project power on short notice with unmatched range, mass, lethality, and survivability. The air service can facilitate independent, theater-wide, full-spectrum operations. Due to global reach and global strike, missions can originate from the continental United States (CONUS) and engage the enemy anytime, anywhere. COCOMs understand this value and is a key reason why they place a high priority on USAF aircraft and personnel while forming their

[47] US Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge* (Washington, DC: Government Printing Office, 2018), 1.

[48] Jack Snyder, "One World, Rival Theories," *Foreign Policy*, no. 145 (November/December 2004), 9.

strategy.[49] As one Air Force analyst recently detailed, "in the last five years Air Force Global Strike Command (AFGSC) has gone from supporting one enduring COCOM requirement to an average of twelve annually, a 1,100-percent increase."[50]

Despite growing joint military operations within the same time, the number of bomber aircraft has steadily decreased. Now, the bomber fleet composed of twenty B-2 stealth bombers, sixty-two B-1 swept wing supersonic bombers, and seventy-five highly aged B-52 represent a low-density high-demand (LDHD) asset and must be carefully managed. In addition, geographic COCOM requests, taskings, and strategies stretch the force thin. Moreover, the B-2 and B-52 force is beholden to its functional COCOM – US Strategic Command (STRATCOM) – for its no fail nuclear mission. This tension between deployment abroad and deployment in garrison emphasizes the paradox between the force we have, and the force we need. The management of the bomber force is guarded by numerous agencies including, AFGSC, 8th AF, USSTRATCOM, 5th Bomb Wing (BW), 2nd BW and the 509th BW to name a few; each seeking to use the limited bombers to shape phase zero operations through shows of force, deployments, joint interoperability exercise, and deterrence missions. These organizations dilute the effectiveness of each platform by asking them to do too much with too little, and the true losers are the COCOMs who are on the front lines of strategy and geo-political issues.

[49] Deptula and Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future," 26.

[50] John A. Tirpak, "USAF to Retire B-1, B-2 in Early 2030s as B-21 Comes On-Line," *Air Force Magazine*, February 2018.

The Force We Have Versus the Force We Need

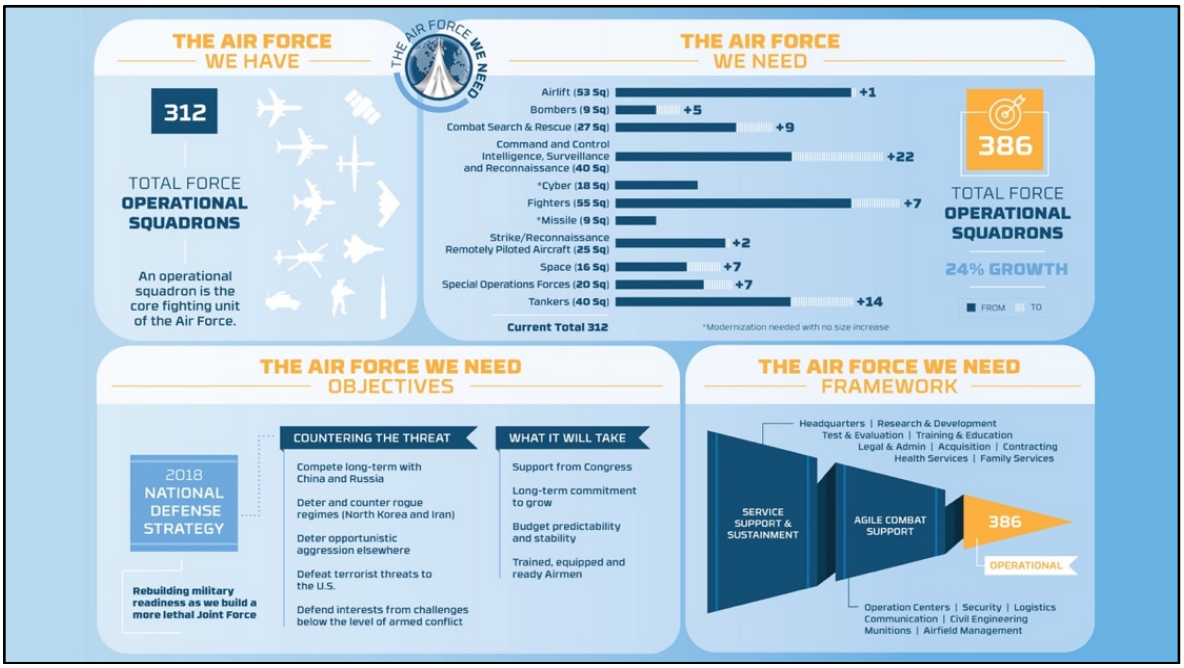

Figure 4. The Force We Need. Secretary of the Air Force Public Affairs, "Air Force Outlines Future of Bomber Force," 12 February 2018, accessed 5 August 2019, https://www.af.mil/News/Article-Display/Article/1438634/air-force-outlines-future-of-bomber.

In typical fashion, the air service is rising to meet the challenges they face. Specifically, the leadership team of Secretary of the Air Force Dr. Heather Wilson, and Chief of Staff of the Air Force General Dave Goldfein are taking these issues head on. In a rousing speech at the 2018 Air Force Association Convention, Wilson laid out the foundational plan to grow the service to meet the demands of peer-completion. The bottom-line, she told the crowd, was that the service was too small for what the nation expects of its air service – which includes air, cyber, and space missions. "To confront an innovating adversary, we must grow the force from 312 operational squadrons to 386 by 2025, a twenty-five percent increase in overall strength" (see figure 4).[51]

Wilson's assertion is simple. If senior leaders expect the USAF to implement the NDS, then give them the resources they need. Of the seventy-four new operational squadrons, five are

[51] Secretary of the Air Force Public Affairs, "Air Force Outlines Future of Bomber Force," 12 February 2018, accessed 5 August 2019, https://www.af.mil/News/Article-Display/Article/1438634/air-force-outlines-future-of-bomber-force/.

projected to be bomb squadrons – the largest percent increase of any category or aircraft. The USAF must grow in order to present multiple dilemmas to our adversaries, and that begins with a larger bomber force. Her pulse on the operational problem remains firm, and notes that aerial refueling will be mobility's biggest shortfall. This highlights the need for fourteen new tanker squadrons – highlighted by the new KC-46 tanker - which are needed to supply global reach to a growing strike force. A growing force provides a much-needed reprieve to the stressed LDHD assets bearing the weight of the current operations tempo. The USAF must continue to highlight the gap that exists between the force we have and the force we need to meet the security requirements outlined in the NDS.

Understanding the Need

The USAF brings to bear long-range strike via a 1,000 ICBM force, and the aforementioned bomber fleet.[52] As this paper focuses on the future of the bomber force, only the latter will be explored exclusively. Long-range global strike is a core mission for the air service.[53] Historically and doctrinally obligated to this mission, the USAF provides global power for the nation and its allies. At America's disposal is an aging fleet of conventional and nuclear capable heavy bombers, the B-1, B-2, B-52. Each of these aircraft are capable of employing across incredible distances to include unrefueled ranges of: 7,500 miles, 6,000 miles, and 8,800 miles, respectively.[54] Achieving this sort of combat effect with alternative systems would drive far higher mission expense, risk, and vulnerability. In relative terms, bombers can literally cover every target on the globe from bases well outside the enemy's reach, minimizing the anti-access defense prepared by our adversaries.

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[52] Martin Van Creveld, *The Age of Airpower* (New York: Public Affairs, 2011), 219.

[53] Curtis E. LeMay Center for Doctrine Development and Education, *Volume 1, Basic Doctrine* (Maxwell Air Force Base: LeMay Center for Doctrine, 2015), 5.

[54] Deptula and Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future," 14.

Range can only be exploited by maximizing a highly lethal and accurate combat payload. A direct comparison between aircraft makes this point clear. A single B-1 can carry twenty-four 2,000lb Joint Direct Attack Munitions (JDAMs), while an F/A-18 can only carry two 2,000lb JDAMs.[55] To achieve the striking power of a single bomber, the commander would need to authorize the use of twelve limited-range fighters, significantly increasing risk and support components required. Furthermore, a single B-1 can deliver ninety-six 250lb small diameter bombs, while the same payload would require twelve F/A-18s. Lastly, the B-1 costs $66,036 per flying hour, whereas those twelve fighters would collectively cost $292,800, 443 percent more than a single bomber.[56] From a payload, cost, and risk perspective it is clear that bombers present the commander with the best option available while maximizing combat effectiveness.

From a survivability perspective, stealth bombers like the B-2, and in the future the B-21, afford the United States an option to create effects in highly contested and defended airspace. The B-21 will be the Air Force's next generation long-range stealth strike bomber built by Northrop Grumman. Few details about the program have been released to ensure its development remains highly classified. Northrop remains tight-lipped about the aircraft's attributes, but we know the Air Force's requirements are for a long-range, stealthy, bombing platform capable of penetrating modern advanced threats.[57]

As more advanced surface-to-air missile systems and integrated air defense systems are acquired and modernized, access to targets becomes more difficult.[58] The effectiveness of older bombers decreases against these modern threats, however, their survivability remains possible by

[55] Deptula and Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future," 8.

[56] Ibid.

[57] Congressional Research Service, *Air Force B-21 Raider Long-Range Strike Bomber*, Congressional Research Service Report for Congress (Washington, DC: Library of Congress, 12 October 2018), 3.

[58] Martin Van Creveld, *The Age of Airpower*, 196.

the use standoff weapons to achieve results from safe ranges. The adversary faces the same concerns. However, the future threats identified by the NDS will require a massive amount of firepower to defeat.[59] Some estimates indicate that a conflict with Russia could present as many as 250,000 aim points.[60] That sort of requirement will demand a bomber's payload, but standoff munitions are cost prohibitive and represent a scarce resource. This discussion quickly turns to the survivability, range, access and payload capabilities of the B-2. But, at only twenty in the active inventory and at various stages of readiness, the rapid acquisition of the B-21 cannot be stressed enough.

Structuring the Force to Support the Fight

The question thus evolves from how many squadrons *do we need*, to how many aircraft *should we have* in the inventory to fill each squadron and fulfill air power's commitment to the NDS? To answer this, we need to examine the Air Expeditionary Force (AEF) management model. The AEF is a management tool used to deploy assets and people within a rotating bucket of resources.[61] Each AEF is a mini-Air Force containing sufficient numbers and types of aircraft and personnel to conduct core missions when called upon by the COCOM.[62] The AEF structure remains sound, but recent budgetary pressures and force structure divestments have heavily slashed the service's ability to provide the necessary forces to fill the AEFs.[63] By 2010, the force became so small that they were forced to abandoned the AEF model to meet ground force demands for close air support and intelligence surveillance and reconnaissance requirements. This

[59] US Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge* (Washington, DC: Government Printing Office, 2018), 3.

[60] Moeller, "US Bomber Force: Sized to Sustain an Asymmetric Advantage for America," 13.

[61] Looney, William R. "Expeditionary Force: Taking the Air Force into the Twenty-First Century," *Air and Space Power Journal* (Winter 1996), 6.

[62] See appendix 2

[63] Deptula and Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future," 17.

shift harshly strained equipment, aircraft, and personnel. It was, perhaps, a partial impetus for the 2,000+ pilot shortage that devastated USAF pilot manning in the years since Operation Enduring Freedom and Operation Iraqi Freedom began.[64]

With proper inventories of people and equipment, the USAF could and should resume a viable AEF structure. To justify this construct and build the necessary force, the USAF should point to their enduring obligation to support the national strategy. Leaders can use the AEF as a force management tool that connects the objectives of the NDS directly to the force structure necessary to achieve those objectives. The AEF construct used as a force-sizing model provides the USAF a logical, relevant, and justifiable mechanism for the American people and Congress to grasp the tie between the demands of national security and defense strategy and the quantity and types of aircraft needed to execute them. The return to great power competition, along with growing regional threats, revitalized the importance of the force sizing concept.[65]

To swell the AEFs back to sustainable levels, the force must grow. To illustrate an example of how the AEF can work as a force-shaping mechanism, look at the bomber force through the AEF lens. With respect to the current 2018 NDS, there is a base-line, long-term requirement for one squadron of twelve combat coded B-21s per AEF.[66] The result is a requirement for 120 combat coded B-21s, or ten operational squadrons with twelve B-21s each. As a rule of thumb, twenty-five percent of combat aircraft are needed to support training and operations, and another twenty percent are normally planned for attrition and reserve. Thus, a total number of 180 B-21s (120 combat coded, thirty for training, thirty for attrition and reserve) are required to support the ten AEF structure. Additionally, the USAF needs six non-penetrating

[64] Stephen J. Bressett, "Bleeding Talent: A Qualitative Study of Pilot Retention in the B-2 Community" (Doctoral Thesis, Creighton University, Omaha, NE, 9 October 2018), 13.

[65] Deptula and Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future," 18.

[66] Ibid.

long-range strike aircraft to supplement each AEF for a standoff mission, or for when a permissive environment is created. Given the same formula used above, the service should seek ninety legacy bombers (sixty combat coded, fifteen for training, fifteen for attrition and reserve).[67] When all said and done, the USAF needs a bomber force of 250 penetrating and legacy aircraft across fifteen operational squadrons.

Lastly, although Secretary Wilson's call for the "force we need" is premised on growth, it should be considered that her comments are based on the current environment and do not include surplus capacity to compete against a peer, or to simultaneously engage in two major-theater wars. All available resources must be dedicated to building the force that real-world challenges necessitate. America has a moral imperative to create the most capable force possible to give its pilots the greatest chance at coming home safely.

In other times of war, industrial mobilization proved be a critical capability in surging wartime capacity. However, modern aircraft are not so easily acquired. None of the current bombers are in production, and their manufacturing molds have been long since destroyed. Rare earth elements, critical components, and raw materials often come from other nations that would likely limit our wartime supply. Legacy aircraft, fighter, bomber, and mobility alike, could benefit from surging wartime industry to meet combat demands and replace attrited forces. However, low-observable platforms like F-22, F-35, B-2, B-21, and RQ-170 would not be capable of wartime industrial replacement. This presents a critical mandate on service leadership to build, maintain, and support the force they plan to fight with today, for tomorrow.

The current bomber force is remarkably stressed in a constant cycle of global and domestic exercises, combat missions, and deterrence maneuvers. Combatant commanders around the world want a bomber's presence to deter potential enemies, and if necessary to provide on demand global strike. The management of the bomber force is guarded by numerous agencies

[67] Deptula and Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future," 18.

including AFGSC, 8th AF, USSTRATCOM, 7th BW, 2nd BW and the 509th BW to name a few. The tension between these organizations creates pressure on the LDHD bomber force. For example, EUCOM desires four Bomber Task Force (BTF) missions a year in the European theater, but so does INDO-PACOM. Additionally, USSTRATCOM, the primary COCOM for the strategic bomber force, also yearly requires both conventional and nuclear exercises and deterrence missions. So, who gets what, and when? Whose objectives are accomplished when a squadron deploys to Fairford, United Kingdom? Are they controlled by USSTRATCOM or EUCOM? The answer is complicated.

Air Force Global Strike Command is responsible for organizing, training, and equipping the bombers who are organized under a Numbered Air Force (NAF), the historic 8th AF. The NAF oversees daily operations of the five bomber wings in Missouri, Louisiana, Texas, South Dakota, and North Dakota. The wings are responsible for the execution of the training and combat missions tasked from the NAF or higher. So, if EUCOM wants a squadron of B-52s to spend three-weeks in the area of responsibility (AOR) it requires a series of organizational deconflictions. EUCOM wants specific objectives to be accomplished in those three weeks, but if USSTRATCOM and 8th AF are going to agree to the deployment, they also need to have training and strategic objectives met. The limited bomber force is also consummately beholden to the nuclear mission. For a Cold War style engagement, as might be expected in a peer-to-peer fight, USSTRATCOM will withhold twenty-five percent of its bomber and tanker fleet from external availability.[68] This could be the Achilles heel for the heavy bomber force who would likely be needed for night-one conventional missions.

At the same time, INDO-PACOM's continuous bomber presence (CBP) on Guam remains steadfast. The CBP is a visible show of the USAF's commitment to Pacific security.[69]

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[68] Alan J. Vick, Paul Dreyer, and John Meyers, *Is the USAF Flying Force Large Enough? Addressing Capacity Demands in Four Alternative Futures* (Santa Monica: RAND, 2018), 18.

[69] Amy McCullough, "Bombers on Guam," *Air Force Magazine* 98, no. 8 (August 2015), 20.

The vital Pacific island has been home to American bombers since World War II. During Vietnam B-52s stationed on Guam executed missions to Vietnam and back. Since then, a nearly continuous deployment of B-1s, B-2s, and B-52s have remained in rotation. The pivot to the Pacific theater is amplified by a rising China and an increasingly belligerent North Korea, there is no reason to think the USAF would bring these aircraft back to CONUS anytime soon. So, with a squadron on Guam and a squadron in England, the limited bomber force is stretched thin to fulfill monthly training requirements, inspections, exercises, and any other taskers either conventional or nuclear. Furthermore, the grounding of the B-1 fleet in 2019 left only the very limited B-2 fleet and the remaining B-52 fleet to do the rest of the work. This example highlights the need for the bomber force to grow just to fill COCOM requirements in a static status quo environment. To do this, the USAF could employ three potential fixes; build, repurpose, and manage.

How Do We Get There?

Build

The DoD recently purchased a new long-range bomber, the B-21 Raider, and plans to acquire at least 100 of them. The program is off to a good start, and the first flight is expected to be late in 2021.[70] B-21s will initially replace the B-1 and B-2, and could possibly replace the B-52 in the future. B-21 development was highly classified until the summer of 2015, when the Air Force revealed initial details of the aircraft and the program. Although technical details and other proprietary data remains out of public view, many details of the budget, acquisition strategy, procurement quantities, and other aspects of the B-21 program are now in the public arena. The FY2019 budget request included $2.31 billion for further research and development of the new aircraft. As passed, the FY2019 defense appropriations bill will fund the program at $2.28 billion.[71] The budget is likely to swell as the program matures and testing milestones are met.

[70] Valeria Insinna, "Coming in 2021: The B-21 Raider's First Flight," *Defense News,* 25 July 2019, accessed 1 August 2019, https://www.defensenews.com/air/2019/07/25/coming-in-2021-the-b-21-raiders-first-flight/.

[71] Congressional Research Service, *Air Force B-21 Raider Long-Range Strike Bomber,* 63.

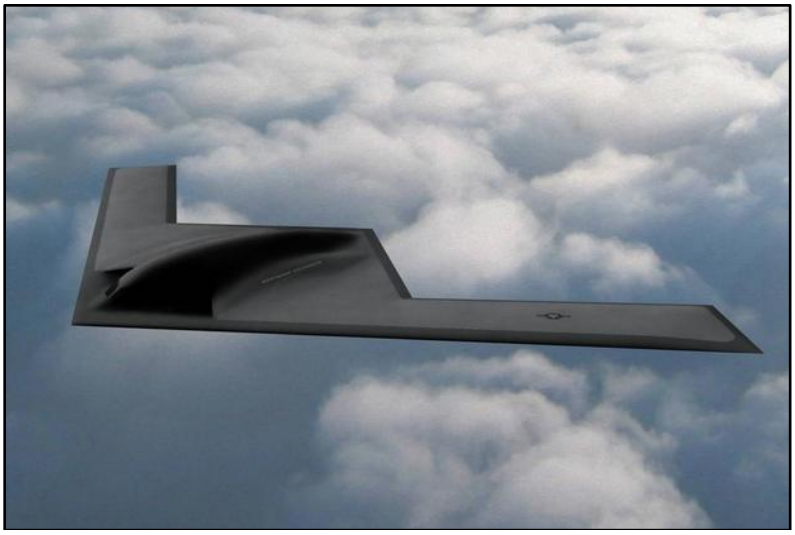

Figure 5. Artist concept of the B-21 Long Range Strike Bomber. Mark Barrett and Mace Carpenter, *Survivability in the Digital Age: The Imperative for Stealth* (Washington, DC: Mitchell Institute Press, July 2017), 34.

When the Air Force initially released information about the program, they announced that it hoped to buy 80 to 100 B-21s.[72] That number was subsequently resolved to a request for 100 in the FY2017 budget submission and subsequent testimony by the Air Force Vice Chief of Staff, General Steve Wilson. Wilson continued by emphasizing that, "We require a fleet size that will ensure sustained dominance well into this century and intend to procure a minimum of 100 B-21s. Procuring at least 100 B-21s will also reduce lifecycle ownership costs. Further, we are continuing to study the right size of the total future bomber force."[73]

At that time, the USAF established 100 aircraft, "as the floor—not the ceiling" for the B-21 fleet size, Wilson added.[74] A spokesman added that, "Air Force Global Strike Command requires a minimum of 100 B-21 Raider aircraft, with a mix of legacy bombers, to meet future

[72] Congressional Research Service, *Air Force Next-Generation Bomber: Background and Issues for Congress*, Congressional Research Service Report for Congress (Washington, DC: Library of Congress, 22 December 2009), 4.

[73] US Air Force, *Statement of General Stephen W. Wilson, Vice Chief of Staff of the Air Force to the Committee on Armed Services, United States House of Representatives regarding Military Assessment of Nuclear Deterrence Requirements*, 8 March 2017.

[74] Ibid.

COCOM requirements."[75] It is evident by this statement that leaders are aware of the need to swell the bomber force with a focus on achieving COCOM objectives. But, we have seen this story play out before. The initial plans for B-2 called for 132 aircraft.[76] Ultimately, only twenty-one B-2s were built, significantly raising the per unit price. The B-2 was never intended to replace existing bombers, but to add survivability to the bomber force. Arguably, that role as an augmentation rather than a replacement made it easier to reduce the number bought, since adding any quantity of B-2s would leave the bomber force more capable than before. By contrast, the Air Force plans to retire its B-2s and B-1s by 2040.[77] Following those retirements, with the full planned buy of 100 B-21s, the bomber fleet would grow in number from 157 to 176.

Subsequently, Secretary Wilson's announcement of increasing the bomber fleet by five squadrons would likely necessitate 75 additional bombers, with only the B-21 then in production. In deciding whether and how quickly to acquire B-21s, legislators may wish to consider the tradeoff between the cost and effectiveness of a new bomber against extending the service lives of existing B-52s, B-1s, and B-2s. This may be a challenging comparison, particularly as the B-52s are scheduled to remain in service for eighty years, an unprecedented and remarkable service life for a combat aircraft. Quite apart from the B-52's suitability to operate in evolving air defense environments, the challenges of maintaining and operating an eighty-year-old aircraft in regular service are unknown. That said, many of the B-52's systems are upgraded and have been replaced over the years, so the time since manufacture may not represent the actual maturity of the aircraft.

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[75] John A. Tirpak, "It's Official: Minimum of 100 B-21s," *Air Force*, 16 March 2017, accessed 25 July 2019, http://www.airforcemag.com/DRArchive/Pages/2017/March%202017/March%2015%202017/It%E2%80%99s-Official-Minimum-of-100-B-21s.aspx.

[76] Brown, *Flying Blind: The Politics of the US Strategic Bomber Program*, 301.

[77] Oriana Pawlyk, "To Make Way for Future Bomber, AF Plans to Retire B-1, B-2 in 2030s," 12 February 2018, accessed 30 July 2019, https://www.military.com/daily-news/2018/02/12/make-way-b-21-air-force-plans-retire-b-1-b-2-2030s.html.

Repurpose

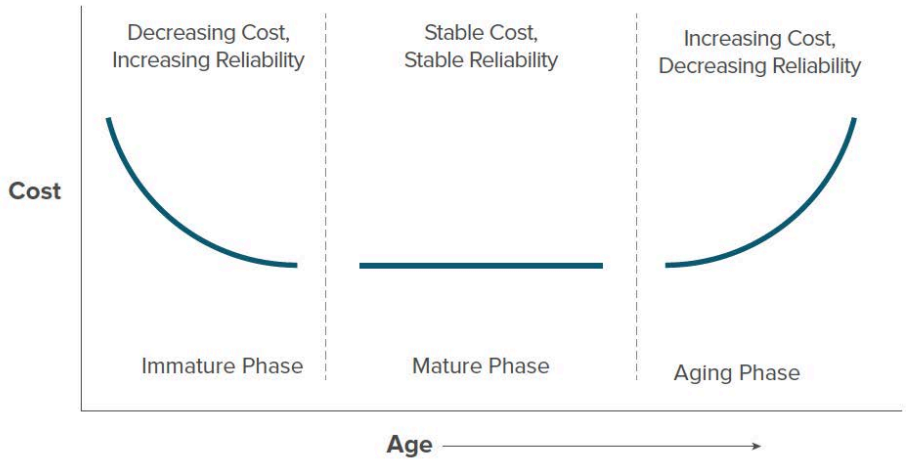

Figure 6. Maintenance Lifecycle Graph. Congressional Budget Office, *Operating Costs of Aging Air Force Aircraft*, Congress of the United States (Washington, DC: Library of Congress, September 2018), 4.

B-1 and B-52 aircraft have reached the aging phase of their lifecycle (see figure 6). The B-1, more so, has seen an early entrance into this phase due to lifelong engineering, mechanical, and structural issues.[78] In fact, the B-1 was grounded for nearly a month amid questions and concerns regarding the aircraft's egress system, plummeting readiness rates down to single digits.[79] The Congressional Budgetary Office determined that the B-1's operating cost per flying hour grew at an annual rate of three percent, much higher than expected for an aircraft so young.[80] The dismal readiness rates of the sixty-two B-1s further increases stress on the LDHD bomber force. The rising cost of the B-1 in combination with its declining readiness rate is a primary

[78] Tara Copp, "Air Force Reveals Risk, Bravery Behind B-1 Emergency Landing and Blown Hatch," *Air Force Times,* 19 June 2018, accessed 20 August 2019, https://www.airforcetimes.com/news/your-air-force/2018/06/19/air-force-reveals-risks-bravery-behind-b-1-emergency-landing-and-blown-hatch/.

[79] Stephen Losey, "B-1 Lancer Readiness is in the Toilet, Here's Why," *Air Force Times*, 4 June 2019, accessed 30 July 2019, https://www.airforcetimes.com/news/your-air-force/2019/06/04/b-1-lancer-readiness-is-in-the-toilet-heres-why/.

[80] Congressional Budget Office, *Operating Costs of Aging Air Force Aircraft.* Congress of the United States (Washington, DC: Library of Congress, September 2018), 4.

justification for it being the first to be replaced by the B-21.[81]

Spending more on aircraft maintenance may be reasonable and appropriate. Researchers have argued that the Air Force underinvested in spare parts during the 1990s.[82] Also, some costs—such as those for military and civilian compensation—have been growing faster than inflation because of pay raises and increased health care costs. Spending more on those categories may be necessary just to maintain the same level of performance among aircraft.[83] However, there could be another option to raise readiness rates while also growing the overall size of the bomber force – overall alleviating stress on the LDHD system.

In the desert of Tucson, Arizona sits the 309th Aerospace Maintenance and Regeneration Group (AMRG) – affectionately referred to as "the boneyard." The site is a USAF aircraft and missile maintenance facility that hosts nearly 4,000 mothballed aircraft. The Arizona dessert makes for an excellent low humidity, hard-soiled surface for long-term storage. There are four categories of storage at the boneyard. Long-term storage means aircraft are kept intact for future use. The parts reclamation category allows organizations to pull spare parts from retired aircraft and return them to active duty. Aircraft in the flying hold category are kept intact for shorter stays than long-term. Finally, the excess of DoD needs category allows aircraft to be sold off, whole or in parts.

Currently, the boneyard is home to eighteen B-1s and one hundred and seven B-52s.[84] The AMRG is not just a tourist attraction, but a functional restoration facility. To this end, recently the second ever B-52 was returned to active flying status from the boneyard.[85] The

[81] Secretary of the Air Force Public Affairs, "Air Force Outlines Future of Bomber Force."

[82] Congressional Budget Office, *Operating Costs of Aging Air Force Aircraft,* 8.

[83] Congressional Budget Office, *Costs of Military Pay and Benefits in the Defense Budget*, Congress of the United States (Washington, DC: Library of Congress, November 2012), 18.

[84] Editors Official, "AMARC Experience," accessed 8 August 2019, https://www.amarcexperience.com/ui/index.

[85] Kyle Mizokami, "The Air Force Resurrects Another B-52 From the Boneyard," 15 May 2019, accessed 29 October 2019, https://www.popularmechanics.com/military/aviation/boneyard/.

necessity came after a B-52 caught fire on Guam in 2018, and the requirement to boost the B-52 total number back to seventy-six. This demonstrated ability to return a bomber to active service highlights a re-purposing capability inherent to the Air Force at a limited cost to the taxpayer. These aircraft are bought and paid for, exist in durable long-term storage, and are awaiting minor maintenance to become lethal war machines again. This option should not be cast aside when planning for large-scale, future attrition warfare. Additionally, Tucson provides a great mass of legacy aircraft, but in the desert of Nevada there exists another complementary option.

F-117s currently in storage at a facility in Tonopah, Nevada could also be resurrected and brought back into service. Although these jets are no longer in the active inventory, numerous sightings of the black jets have been reported over the skies of the South West.[86] Speculation aside, the aircraft are in flyable condition and could be returned to the active duty. The exact number in storage is unclear, although fifty-nine jets were originally produced for service.[87] Carrying two weapons each does not bring great quantities of mass to the fight, but it does provide additional highly survivable aircraft back into the inventory and provide flexibility to the air tasking order process. Integrated as part of the bomber force, the F-117 could be effective in opening the door to other low observable platforms and providing access into advanced IAD networks.[88]

Manage

The organizational hodge-podge to command and control the bomber force is complicated and places stress on the LDHD system. The USAF should reorganize the bomber fleet and assign bombers directly to geographic combatant commanders. There are a number of

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[86] Tyler Rogoway, "New Video of F-117s Flying Out of Tonopah Emerges Despite Their Fates Being Sealed," 29 July 2018, accessed 19 August 2019, https://www.thedrive.com/the-war-zone/22487/new-video-of-f-117s-flying-out-of-tonopah-emerges-despite-their-fates-being-sealed.

[87] Mark A. Lorell, *Bomber R&D Since 1945: The Role of Experience* (Santa Monica: RAND, 1996), 54.

[88] Ibid.

sizable gains to be made by this reorganization such as, additional presence in the AOR, faster response times to emerging threats, reducing demand on mobility assets to get bombers into theater, increase allied interoperability, and expose aircrew to new realistic environments. This option is the fastest and most realistic of the three solutions. Because reorganizing the force seeks to use the limited resources in a more efficient way and directly provides combat power to the COCOM, it also strengthens the Air Force's commitment to the NDS. This is the substance of strategy, ensuring the ends are achieved using limited means and creative ways.

First, presence matters when it comes to deterrence.[89] Aircraft physically prowling the skies in the geographic region bring assurance to our allies and deterrence to our foes. In current fashion, bomber task force missions typically last three weeks. Is the assurance and deterrence narrative as strong if the task force packs up and leave? Potentially, this could bring into question America's resolve for the issues at hand. It is extremely difficult to assess if deterrence is actually working. However, constant presence provides a persistent aesthetic reminder that the United States is close, capable, and willing.

Second, stationing a bomber squadron on Fairford, United Kingdom and on Andersen Air Force Base on Guam, would greatly decreases the response times to emerging threats by decreasing the geographic proximity to common threats. Having a quick reaction force composed of bombers will pack a heavy punch. Moving assets closer to the AOR will significantly reduce the tanker and mobility assets required to lift the bombers across great distances. For example, in 2017 two B-2s executed a thirty-four hour combat mission from Missouri to Libya and back. The mission, resulting in seventy-eight ISIS fighters killed in action, required fifteen tankers to support the global strike.[90] Tankers are a critical asset in any projection of air power, and will be

[89] Alexander L. George, and Richard Smoke, *Deterrence in American Foreign Policy: Theory and Practice* (New York: Columbia University Press, 1974), 312.

[90] Dario Leone, "Here's How US Air Force Tankers Made Possible B-2 Night Strikes Against Daesh Training Camps in Libya," 22 January 2017, accessed 20 August 2019, https://theaviationgeekclub.com/heres-u-s-air-force-tankers-made-possible-b-2-night-strikes-daesh-training-camps-libya/.

in critical demand for other missions in the AOR.

Third, training aircrews in the actual environment they will go to war in will pay huge dividends. Flying around Europe or the Pacific is greatly different than flying around the American national airspace system. Europe abides by different rules and regulations governing airspace and air traffic, and the Pacific uses high frequency communications due to limited line of sight radios. These can be confusing enough in peacetime, let alone in war. NATO interoperability training is priceless for all participants, and will help solidify solidarity and build trusting relationships. Large exercises could be regularly planned and incorporate NATO strike packages – improving the way we lead, fight and communicate.

Finally, external factors cannot be overlooked. Changing weather patterns, geographic features, and national overflight restrictions all complicate operations. An aircraft sitting on the ramp in Guam is subject to heat, humidity, torrential downpours and a litany of other environmental factors that Minot, North Dakota does not have. Keeping jets in these environments permanently conditions the aircraft to that climate and helps maintenance personnel prepare for reoccurring issues before it's time for war. Acclimatizing men and equipment to the battlefield is part of sound training practices. Crews can get real-world exposure to dynamic conditions and train to them directly, instead of experiencing them in a simulator.

Conclusion

The most important reason to study and analyze the elements of the coercive successes and failures of strategic bombing is to inform future policy and policy makers. As such, a clear line can be drawn between strategic bombing and a political aim. Clausewitz's theory on war contends that war is an act of violence to compel our opponent to fulfill our will.[91] Therefore, compellence, coercion, and strategic bombing belong in the same lexicon. Air power is becoming

[91] Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976), 595.

increasingly important to American grand strategy. For example, the pivot to the Pacific squarely places the USAF in the middle of a range dilemma. The tyranny of distance represented there makes air power the only flexible, rapid, and low-risk option for commanders. Conversely, Europe offers another perspective, and is analogous to a knife fight in a phone booth – distance is the enemy. Air service planners must solve force projection, protection, and logistics issues while executing defensive and offensive joint functions simultaneously. Air power cannot do this alone. Coercion rarely works by raising costs and risks to civilians alone, a whole of government approach is needed to thrust multiple complex dilemmas upon our adversaries' systems.[92]

While a modern joint force will be essential to all conflicts, the Air Force offers the fastest, longest range, leading edge force available to the President and Joint Chiefs. Conventional air power offers exceptional flexibility across the spectrum of conflict as an instrument of national resolve and assurance. The Air Force can deter, deliver a tailored response, provide presence, or a show of force, or strike hard when required - over great distances - within hours. These power projection capabilities will become even more vital for protecting US national security interests in the future.

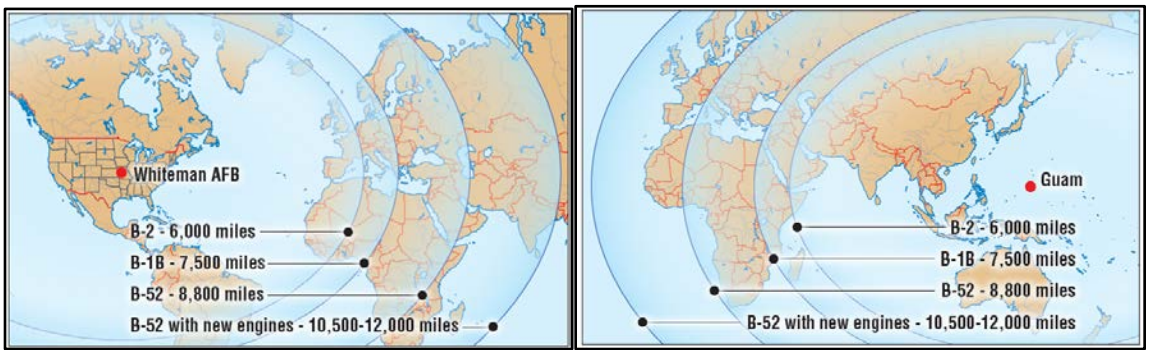

Figure 7. Bomber Range Projection. David A. Deptula and Douglas A. Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future" (Mitchell Institute Policy Paper. Vol 19. Arlington, VA. March 2019), 7.

Long range bombers armed with conventional weapons can rapidly reach any location on

[92] Robert A. Pape, *Bombing to Win: Air Power and Coercion in War* (Ithaca: Cornell University Press. 1996), 314.

the globe (see figure 7). This concept was demonstrated in 1983's BRIGHT STAR exercise when B-52s launched from bases in the United States and delivered conventional ordnance on a bombing range in Egypt, then returned nonstop to their stateside bases.[93] Bombers can bring to bear massive payloads with high levels of precision and with a low risk of loss and for a lower cost. For example, six B-2s, operating from Whiteman Air Force Base in Missouri with the support of six tankers, could conduct an operation like the 1986 Libya raid, which utilized two carrier battle groups, an Air Force F-111 squadron, and numerous supporting assets. Only a few highly survivable stealth aircraft would be placed at risk. The 1986 operation involved 119 aircraft and twenty war ships. Long-range bombers could execute such operations without reliance on forward bases or overflight rights.[94]

In order to support the national defense strategy, the United States must continue to stress and advocate for a high-quality modern force. Quality people are critical to high quality forces, and each service will have to sort through their retention difficulties.[95] Second to people, the USAF must further develop assets and technologies that create a force multiplying effect to gain direct advantages over our adversaries. Aerospace research and development strengthens our military muscle and also fortifies our economic element of national power. The United States has become an aerospace nation and leads the world in cutting edge aerospace technology in both military and commercial sectors.[96] These advances have widened the capabilities gap between our force and that of our enemy's.

However, today's force structure is a legacy of the Cold War when a large

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[93] Richard Beene, "US and Egyptian Forces Today Begin 'Bright Star 83'," 10 August 1983, accessed 20 August 2019, https://www.upi.com/Archives/1983/08/10/US-and-Egyptian-forces-today-began-Bright-Star-83/6714429336000/.

[94] US Air Force, *US Air Force White Paper on Long Range Bombers* (Washington, DC: Library of Congress, 1999), 3.

[95] Bressett, "Bleeding Talent: A Qualitative Study of Pilot Retention in the B-2 Community," 18.

[96] US Air Force, *US Air Force White Paper on Long Range Bombers* (Washington, DC: Library of Congress, 1999), 3.

intercontinental bomber force was part of the nuclear triad to deter, and if necessary, defeat the former Soviet Union. While part of the bomber force continues to support this mission, the environment demands increased emphasis on the conventional mission. The eighteen years of war since September 11, 2001 tested our resolve, placed thousands of hours on our aircraft and equipment, and exhausted our fighting force. Today's sizing of forces was built on the philosophy that the United States should maintain sufficient military power to be able to win two nearly simultaneous, major theater wars.[97]

Ultimately, the USAF has a smaller force today than ever before. But, this force also represents the most modern and efficient force they have ever fought with. Stealth technology reduces the support requirements needed to penetrate integrated enemy air defenses, increasing the combat power of the force. Growing capabilities of enemy air defenses have forced military planners to increase the numbers of jamming, fighter escort, refueling, and defense suppression aircraft. This underscores the B-2 example above wherein, though expensive, they are considerably more cost effective than the 119 aircraft package and placed fewer crews at risk. Precision guided munitions greatly increased the accuracy and mass of the existing combat aircraft, and air to air refueling enables global strike from secure bases in the continental United States. However, this may not be enough if asked to strategically face off against a peer opponent and the force must swell.

Senior leaders in the Air Force should actively advocate for a larger force structure across all platforms, but specifically a larger bomber fleet. They can accomplish this by pursuing stated goals of expanding the total number of active operational squadrons to 386, including a swell of bomber squadrons from nine to fourteen.[98] However, this is only a small first step. The increase in active squadrons does not increase lethality unless the number of aircraft assigned to those

[97] US Air Force, *US Air Force White Paper on Long Range Bombers* (Washington, DC: Library of Congress, 1999), 3.

[98] Secretary of the Air Force Public Affairs, "Air Force Outlines Future of Bomber Force."

squadrons is sufficient enough to meet the demands of the NDS. A peer-to-peer fight with Russia or China will need to incorporate something air planners have neglected in the current fight – attrition. Aircraft will be shot down, historical readiness rates due to maintenance will be a constant, and without the possibility of an industrial surge to create high-end survivable platforms within the war's timeline a true dilemma exists. Underscoring independent research justifying the increase in aircraft, a Mitchell Institute study concluded that the service requires 250 bombers and fifteen squadrons.[99] This should be the foundational argument by which the service focuses a preponderance of their efforts.

Figure 8. Recommendation for the Force We Need. Created by author.

The air service could find reprieve in the declining bomber force by using a multifaceted and creative approach to the force structure. First, they must build the 100 B-21 originally ordered, and immediately advocate for an addition 100 aircraft. Alone, this would bring the

[99] Deptula and Birkey, "The Force We Need: Key Factors for Shaping the Air Force for the Future," 18.

service slowly up to 200 total aircraft. To manage this cost, the service would have to prioritize other projects and missions. The call for an independent Space Force to be established by 2020 would presumably change the budgetary division across the DoD.[100] The USAF will lose the space mission, thus creating room to re-focus on air power dominance and their strategic bombing roots.

Secondly, the service could alleviate its limited platform availability by repurposing aircraft in storage at the boneyard and in Tonopah. This is the fastest option, and utilizes parts and aircraft that already exist and have already been paid for. Altogether 184 aircraft are available for repurposing.[101] Bringing a small percentage of these jets back to serve could greatly reduce the operational and maintenance pressure of the existing fleet. More aircraft available allows commanders to participate in more taskings without the fear of having to manage flying hour requirements past mission necessity. The twenty-five percent of aircraft beholden to USSTRATCOM nuclear alert would not strangle the conventional mission during two simultaneous major-theater wars.

Finally, the USAF must adopt a better management structure for the low-density high demand assets of the bomber force. The service should delay the retirement of legacy platforms like the B-1 and B-52 and station them permanently in Europe and the Pacific. This has powerful implications. First, it provides presence in geographic areas that require regular deterrence. A bomber's intimidating presence draws attention from the adversary, changes their decision making calculous, and rearranges their willingness to be aggressive without reprisal. Service leaders can pullback from the CBP on Guam and instead permanently station a squadron there or in Hawaii. This increases presence while also solving the confusing organizational rules created

[100] Hope H. Seck, "Pence: Space Force Will Be Independent Service by 2020, Include Elite Operators," 9 August 2018, accessed 18 August 2019, https://www.military.com/daily-news/2018/08/09/pence-space-force-will-be-independent-service-2020-include-elite-operators.html.

[101] Editors Official, "AMARC Experience."

by a towering bureaucracy. Of course, all bombers must be able to be recalled by USSTRATCOM for a nuclear mission or exercise. This could easily be planned as part of the operations tempo for a squadron, and alleviate the careful balancing of task force missions, deployments, bomber presence, and nuclear exercises. Bringing the aircraft closer to the fight reduces the mobility assets required to get the bombers to the target, and back. Survivable bases outside of threats ranges currently exist. Re-basing and subsequently re-assigning bombers directly to the COCOM commander provides them with a strategic asset for use at their discretion. This facilitates staff planners with the weapons they need to achieve the commander's objectives.

We owe a lot to the legacy of America's bomber pilots. To the daring brave young men who took to the skies over Europe and the Pacific - we are forever indebted. They are the heart and soul of our modern-day Air Force, they are our past and represent our future. In a world that is amidst strategic competition, the USAF must renew its commitment to strategic bombing. In a peer-to-peer fight there will be losses, and our brothers and sisters will not come home. We must prepare now, for our fight tomorrow as they did in the interwar years. As the Air Corps gained traction throughout the war, more crews and more aircraft became available for service. Lt Wooldridge survived his required twenty-five sorties over Europe in his B-17, thanks to a well-equipped, well-resourced, and well-trained Air Force that had everything to lose.

> Mission No. 25
> 13 December 1943
> 0615
> Well exactly one year ago today I was awarded my wings. This was my last mission. Sure have been waiting a long time for this one; yet never really believing that I would make it. Our losses have been enormous and very few have made the grade. My squadron has been completely wiped out four times with the exception of myself in the eight months that I have been here. I am the first and only pilot in the squadron to make it…When we landed at the base I was rolled in some ice cold mud and then the CO handed me a piece of paper and said, "if you sign this you will leave for the States in the morning." Of course, I signed it. Amen.[102]

[102] Wooldridge, *Diary of Kermit Wooldridge,* 15.

Appendix 1

THE BATTLE OF HAMBURG – CODENAME: OPERATION GOMORRAH

27 May 1943
Operations Order No. 173.

INFORMATION

1. The importance of Hamburg, the second largest city in Germany with a population of 1.5 million, is well known and needs no further emphasis. The total destruction of this city would achieve immeasurable results in reducing the industrial capacity of the enemy's war machine. This, together with the effect on the German morale, which would be felt throughout the country, would play a very important part in shortening and in winning the war.
2. The "Battle of Hamburg" cannot be won in a single night. It is estimated that at least 10,000 tons of bombs will have to be dropped to complete the process of elimination. To achieve the maximum effect of air bombardment this city should be subjected to sustained attack

Forces to be Employed

3. Bomber Command forces will consist of all available heavies in operational squadrons until sufficient hours of darkness enable the medium bombers to take part. It is hoped that the night attacks will be preceded and/or followed by heavy daylight attacks by the United States VIII Bomber Command.

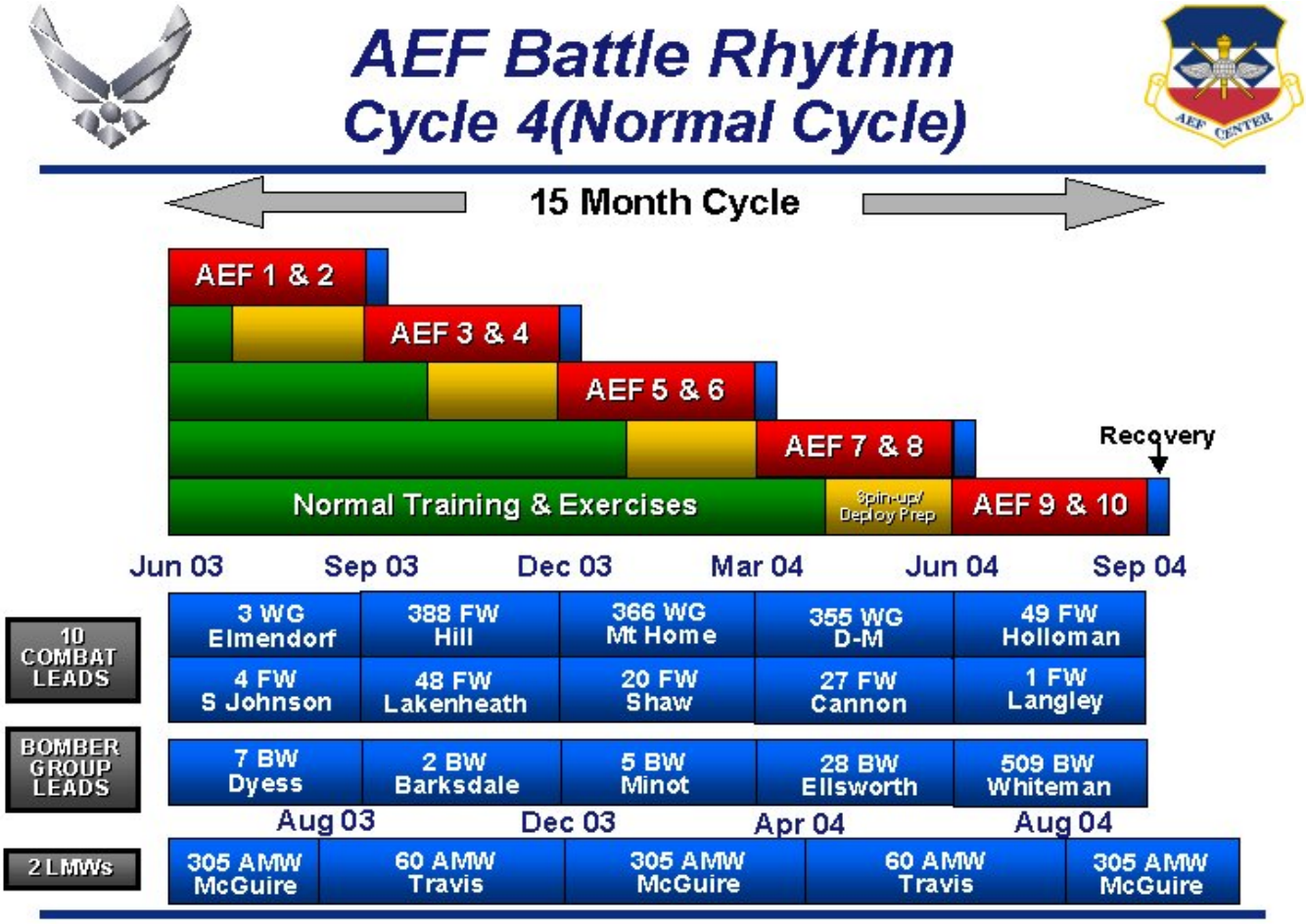
INTENTIONS

4. To destroy Hamburg.[103]

[103] Musgrove, *Operation Gomorrah: The Hamburg Firestorm Raids*, vii.

Appendix 2

Air Expeditionary Force Example Battle Rhythm



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