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PRECIPICE OF PARITY:
FUTURE OF THE USAF FIGHTER FORCE STRUCTURE

BY

LIEUTENANT COLONEL MATTHEW R. VOLLKOMMER

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The undersigned certify that this thesis meets master's-level standards of research, argumentation, and expression.

DR. EVERETT C. DOLLMAN (Date)

DR. JAMES FORSYTH (Date)



DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.



ABOUT THE AUTHOR

Lieutenant Colonel Matthew R. Vollkommer earned his commission in 2000 through the Air Force Reserve Officer Training program. A Distinguished Graduate of Undergraduate Pilot Training, he has completed numerous flying tours and has held several positions at the squadron and wing level. Lt Col Vollkommer is a Senior Pilot with more than 1,600 hours in the F-22 and F-16, including more than 450 hours of combat time. During his career, he has flown combat missions in support of Operation Joint Forge, Operation Iraqi Freedom, and Operation Enduring Freedom. Lt Col Vollkommer holds a bachelor's degree in Environmental Sciences from the University of Delaware and a master's degree from Embry-Riddle University in Aeronautics. Upon graduation from the School of Advanced Air and Space Studies, he was assigned to 1st Fighter Wing, Langley AFB, Virginia.



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ABSTRACT

The United States has and *will* place a premium on the ability of the military to project power on a scale capable of conducting major combat operations in support of national security objectives. Now, and for the foreseeable future, the CAF fighter force's ability to support those objectives is threatened by both external and internal factors. The emergence of A2/AD capabilities over the past two-decades now provides the possibility, and soon the probability, of thwarting the United States ability to project power. These possibilities are even more pertinent as the United States has embarked on a strategic rebalance to the Asia-Pacific region, bringing the A2/AD capabilities of China to the forefront of CAF fighter force structure decision-making. As the United States continues to exit from over a decade defined by two wars, the need to recapitalize and modernize the CAF fighter force in order to operate effectively in A2/AD environments will meet the realities of budgetary uncertainty. As the effects of the Budget Control Act of 2011 and subsequent sequestration over the next 10 years persist, the Air Force is obliged to make difficult choices concerning its fighter fleet that will result in a smaller number of available aircraft than are present today. The situation is going to arise where the CAF will have a significant gap in total number of airplanes it *has* and the total number of airplanes it needs. The Air Force views a fifth-generation equipped fighter force as the necessary means to continuing support for American national security objectives due to the low probability of the legacy fourth-generation fighters to operate, or even survive, in a highly-contested environment. To continue to support this ability when faced by the highly contested A2/AD environment in the future, the CAF fighter force *must* receive its full planned complement of fifth-generation capability. Even if the USAF acquires *all* those projected aircraft, and as other nations continue to counter US capabilities, the CAF fighter force's survivability and ability to support national objectives will be subject to higher risk.

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Chapter 1

Introduction

Conformation of the ground is of the greatest assistance in battle. Therefore, to estimate the enemy situation and to calculate distances and the degree of difficulty of the terrain so as to control victory are virtues of the superior general. He who fights with full knowledge of these factors is certain to win; he who does not will surely be defeated.

—Sun Tzu

Air Power is like poker. A second-best hand is like none at all—it will cost dough and win you nothing.

—Gen George Kenney

The United States relies on freedom of access to the global commons for its continued national prosperity. Underwriting this freedom is the US military's unique capacity to project power on a global scale. In particular, the United States Air Force contribution stems from its capacity to integrate its core missions within US strategy and operations: specifically, to provide “*Global Vigilance, Global Reach, and Global Power*” [emphasis in the original], functions it has accomplished with unprecedented success.¹ Since the decisive application of US airpower displayed during Operation Desert Storm in 1991, the ability of the Air Force's Combat Air Force (CAF) fighter force to secure air superiority and precision strike capability has been unmatched by any adversary. Unfortunately, over the past two decades the CAF may have become a victim of its own success. The vital core missions it facilitates and executes are now simply assumed by planners and policy makers. Achievement of core missions is expected; it already exists or can be achieved with relative ease. But this *may* not be the case today, and most assuredly *will* not be if complacency is the norm and current trends continue. The world is changing and America's would-be opponents are adapting. The Air Force is facing

¹ US Department of the Air Force, *Global Vigilance, Global Reach, Global Power for America* (Washington, DC: US Department of the Air Force, 2013), 2. The five core missions of the Air Force are air and space superiority; intelligence, surveillance, and reconnaissance; rapid global mobility; global strike; and, command and control.

new threats that seek to degrade and/or deny the relative freedom of power projection and operation enjoyed for much of the past six decades.

Two of the most pressing threats are described in detail and assessed here. The first is the proliferation of advanced technological measures to prevent, or at least slow, US military power from deploying into a particular theater. These anti-access (A2) technologies are additionally intended to drive already deployed US forces further away from primary contested areas, complicating ongoing or planned operations within the theater. The primary means associated with A2 in this context is the proliferation of ballistic and cruise missiles around the world. The second technological threat is aimed at restricting the movement, specifically of airpower, within the theater. The area denial (AD) advances in both surface-to-air missiles (SAMs) and counter-air fighters represent a significant threat to US airpower, specifically the CAF aircraft that will operate within the contested environment.

Threats facing the CAF are complicated by issues internal to the United States. As the wars in Iraq and Afghanistan come to a close, all of the services now face significant fiscal uncertainty that convolutes the process of multi-year procurement strategies. For the CAF, difficulty lies in best making long-term decisions on force structure, recapitalization, and modernization based upon short-term fiscal realities.² As the fourth-generation fighter fleet continues to age and the fifth-generation recapitalization is delayed, other nations have steadily been bolstering their A2/AD capabilities specifically designed to challenge US airpower.

In the past two decades, China has risen to the stature of a global power. In 2012, the United States declared that its military would undergo a strategic rebalance to the Asia-Pacific region to best ensure national interests.³ The United States has maintained a military presence in the region for over a century, but the Chinese view this rebalancing as a direct response, an offensive move intent on containing their national prosperity, a move that reinforces their decision to achieve military sufficiency—if not superiority—

² Gen Michael Hostage, “Combat Air Forces in the 2020s” (presented at the Air Force Association Air and Space Conference, Washington, DC, September 18, 2013), 5.

³ US Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* (Washington, DC: Office of the Secretary of Defense, 2012), 2.

with the US.⁴ After witnessing the dismantling of Iraq's A2/AD structure, China began a comprehensive modernization and recapitalization effort that included both direct and indirect means based upon the ancient concept of *sashoujian*—assassin's mace.⁵ The layered defensive capability of China's A2/AD architecture initially sought to deter a superior adversary, but is growing in capacity to rival the most advanced air force in the world—the USAF.

This thesis comprises a critical look at the decisions being made concerning the projected CAF fighter force structure as it relates to the emergence of a high-contested A2/AD operational environment in the Asia-Pacific region. Specifically, is the projected fighter force capable of supporting national security objectives in an A2/AD environment? Although Air Forces leaders continue to pursue recapitalization to a fifth-generation CAF fighter force to remain relevant in the increasing contested A2/AD environments that will be present in a future conflict, the process is well behind original projections. During the period of recapitalization, with the continued reliance on legacy fourth-generation platforms, the CAF will be subject to significant risk during operations conducted against advanced A2/AD technologies. It is important to understand the context of how the CAF fighter force has reached this point and to postulate what the composition of the force and the threat may be in the future.

Chapter two provides a foundational understanding of the characteristics and threat systems involved in A2/AD strategies. A2/AD strategies and technologies are not new and have historical roots in the ballistic missile operations of Nazi Germany and the Japanese operations that sought to impede General MacArthur and General Kenney's island-hopping campaign during World War II. What is relatively new about A2/AD are the advances in technology that have created systems that are more capable, accurate, and lethal than those the CAF fighter force has previously faced.

⁴ Anthony H. Cordesman, Ashley Hess, and Nicholas S. Yarosh, *Chinese Military Modernization and Force Development: A Western Perspective* (Washington, DC: Rowman & Littlefield, 2013), 31.

⁵ Jason E. Bruzdinski, "Demystifying Shashoujian: China's 'Assassin's Mace' Concept," in *Civil-Military Change in China: Elites, Institutes, and Ideas after the 16th Party Congress*, ed. Andrew Scobell and Larry M. Wortzel (Carlisle Barracks, Pa: Strategic Studies Institute, US Army War College, 2004), 315.

Following the descriptions of A2/AD and their associated technologies, the CAF fighter force structure is detailed with particular emphasis on how fiscal constraints and the A2/AD threat are shaping the force. Just as the Soviet Union and the Cold War shaped the fighter force that dominated the skies over Iraq in 1991, the fighter force of the future is being shaped by the Asia-Pacific rebalance and threats expected there. But today, the fiscal environment is more tumultuous than was the case during the development and fielding of the fourth-generation fighter force.

Chapter three examines the conduct of the CAF fighter force during Operations Desert Shield and Desert Storm. The recapitalization of the fighter force that occurred during the Cold War was a result of the changes in Air Force leadership and fighter requirements that occurred after the Vietnam War. When faced with the advanced Soviet-produced A2 capabilities of the North Vietnamese, the CAF fighter force developed into one that valued aircraft with advances in speed, maneuverability, and lethality. The F-15C Eagle, F-15E Strike Eagle, and the F-16 Fighting Falcon were a direct result of the recapitalization efforts that proved their worth during the Gulf War. Additionally, the first stealth aircraft—F-117 Knight Hawk—demonstrated the value of operating with impunity amongst the most advanced A2 architectures fielded by the Iraqi military.

The Iraqi military possessed the third largest army in the world supported by an advanced Soviet-based A2/AD capability in both integrated air defense systems (IADS) and ballistic missiles. Initially outnumbered, as the US and coalition forces began to flow into the Middle East after the invasion of Kuwait by Iraq in 1991, the CAF fighter force possessed both a quantitative and qualitative superiority over the Iraqi military. Such superiority provided the means for the decisive use of airpower that vindicated the modernization and recapitalization efforts following the aftermath of Vietnam. Additionally, the perceived ease of execution of the CAF fighter force against the Soviet-equipped Iraqi military provided the impetus for countries including China and Russia to reevaluate their A2/AD capability in this modern way of warfare.

Chapter four brings the discussion to the present and looks at the US strategic decision to rebalance to the Asia-Pacific region and the reciprocal perspective of China. The United States views China's counter-intervention strategies supported by A2/AD

capabilities as significant impedance to regional security and the ability to deter and defeat aggression. Conversely, the legacy of “the century of humiliation” due to the intervention of Western powers continues to resonate in China’s modern-day political and military thought.⁶ Exacerbating the relationship are the continual demands for Chinese transparency in military modernization and strategic rationale by the United States, compounded with China’s territorial claims that create tensions with nations involved in bilateral security agreements with the United States. Most disconcerting for the CAF fighter force is China’s continued military modernization and recapitalization of their A2/AD capabilities that may prove to be too formidable if an unavoidable military conflict should occur.

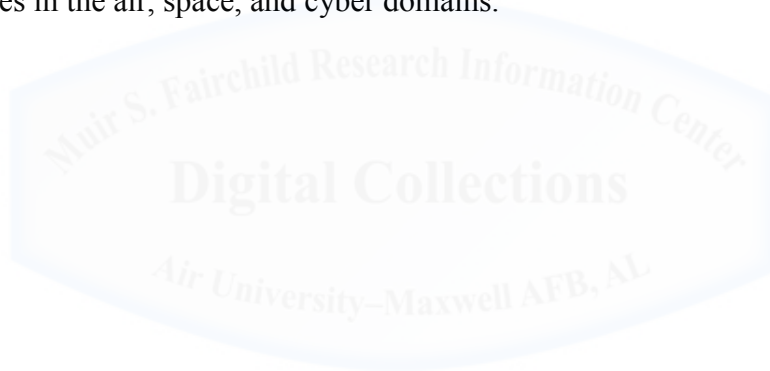
Chapter five posits a situation circa 2025 in which the United States and China are involved in armed conflict. The possible contexts of any preconditions leading to a Sino-American conflict are speculative, and this thesis does not attempt to provide a definitive scenario. Rather, an understanding of the relationship of the modern great power politics and the resource constraints that China faces in the future are only meant to illustrate a situation that *could* lead to a conflict, not what *will* lead to war. In this hypothetical scenario, the United States will face an adversary that is more closely matched to its own capabilities. China is presumed to continue modernizing its forces, and the results of decisions based upon fiscal constraints are projected to delay recapitalization to a fifth-generation dominant fighter force. In this context, the US is will have significantly degraded its ability to successfully support national security objectives.

It is important to reiterate that the intent of this thesis is not to suggest that a Sino-American conflict is inevitable. The intent is to provide decision-makers and strategists with an understanding of the how near-term decisions may affect the long-term capability of the CAF fighter force. The choice of China as the focus of study is a result of the strategic rebalance to the Asia Pacific and, as Gen Herbert Carlisle said, “The tactical problem [is] centered on the [People Republic of China] because they are the pacing threat, as it would be called. They are the most capable. But clearly, if you look at what Russia’s doing and what both the PRC and Russia are doing with respect to exporting

⁶ Xinbo Wu, “Agenda for a New Great Power Relationship,” *The Washington Quarterly* 37, no. 1 (Spring 2014): 68.

capability, these advanced capabilities will be ubiquitous throughout the world just because they go to the highest bidder.”⁷ If the United States does not continue to prepare and equip for operations against the most capable potential threat, then capability to project power globally in support of national interests against whatever threats emerge will be in serious jeopardy.

The information contained in this thesis has been completely obtained and derived from unclassified, open-source material. The decision to use unclassified sources was a deliberate one to maximize exposure of its conclusions to students, strategists, and decision makers. The United States possesses many capabilities that will support operations in the future and will continue to be influential in the overall outcome of a particular conflict. Although the focus is on the CAF fighter force, the issues raised—on emerging threats and fiscally-constrained recapitalization—are common to many capabilities in the air, space, and cyber domains.



⁷ Gen Herbert Carlisle, “Viewing the Asia Pacific Rebalance Through the Lens of PACAF’s Strategy” (presented at the Air Force Association Air and Space Conference, Washington, DC, September 18, 2013), 2.

Chapter 2

Anti-Access/Area Denial and Air Force Fighter Force Structure

In order to credibly deter potential adversaries and to prevent them from achieving their objectives, the United States must maintain its ability to project power in areas in which our access and freedom to operate are challenged.

—Hon. Leon Panetta

Fiscal constraints are driving the CAF to a smaller force, but it must be a more capable force with the ability to operate in, and eventually control, denied and degraded environments. This will only happen if we recapitalize our fighter fleet to the full complement of Lightning IIs.

—Gen Michael Hostage

The resounding success of US airpower—anchored by the efforts of the USAF combat air forces—in securing air dominance against the perceived advanced, Soviet-based, air defense network of Iraq served as a wakeup call to much of the world. As a result, potentially hostile states began to design and procure weapons and systems specifically to deny the effectiveness of US airpower projection around the globe. These weapons and systems continue to be an important factor in the strategic calculus of a state that is technologically incapable of engaging US airpower in a conventional force-on-force manner. By using A2/AD capabilities, an adversary may be capable of thwarting “US ability to project power and force on its own terms.”¹ Moreover, the CAF fighter force is likely to encounter contested strategic situations where base establishment near a potential foe and operations within the area of responsibility is increasingly difficult.²

The A2/AD concept has recently entered the strategic military lexicon, but the general idea is not a new one and has been dealt with by military strategists and leaders in the past. An early representation of A2/AD occurred in operations over Germany and

¹ Col Vincent Alcazar, “Crisis Management and the Anti-Access/Area Denial Problem,” *Strategic Studies Quarterly* 6, no. 4 (Winter 2102): 42.

² John Albert Shaud and Adam B. Lowther, “An Air Force Strategic Vision for 2020-2030,” *Strategic Studies Quarterly* 5, no. 1 (Spring 2011): 9.

Japan, against the Allies, during WWII. In Europe, Nazi Germany understood the latent power, in both men and material, the US represented in support of the Allies in the European theater. Its efforts to deny the build-up of that power had two primary emphases. First, the *Kriegsmarine* instituted an A2 campaign to isolate Great Britain from its great industrial ally. German U-boats sought out and destroyed supply ships in the Atlantic Ocean with the intent of exhausting the supporting efforts of the United States and starving the Allies of needed supplies.³ Second, the V-1 and V-2 missile attacks represented a paradigm change in the projection of A2/AD beyond the horizon. Largely viewed for their destructive capacity against the British population's resolve to support the war, the technologically advanced drone and missile programs severely stressed the Allies defenses. The V-1s were difficult to defend against, especially initially, and the V-2s were unstoppable once launched. Compounding matters, it was difficult for the Allies to determine their points of origin.⁴

Finally, Japanese air power contested Lt Gen George C. Kenney and the Fifth Air Force during Gen Douglas MacArthur's island-hopping campaign. Kenney understood the importance of air power in overcoming the A2/AD threat and placed gaining air control over the battle area as the first priority during campaigns.⁵ As sea and air forces tightened the noose around Japan's home islands, the desperate use of kamikaze attacks proved a serious asymmetric threat to America's combined operations. Kenney remained undaunted by the adversity his forces faced and continued his calls for the deployment of the means—fighters and bombers—to obtain the desired objectives of the campaign.

In the wars that followed, American Airpower proved dominant, and by the 1980s was all but assumed in its military operations. But times always change. As the US continues to exit from over a decade of grinding combat operations in its two most recent wars, the needs of recapitalization and modernization of the CAF fighter force will meet the realities of budgetary uncertainty. Gen Michael Hostage, commander of Air Combat Command, described the environment that will face the CAF.

³ Alcazar, "Crisis Management," 48.

⁴ Alcazar, "Crisis Management," 48.

⁵ Thomas E. Griffith, *MacArthur's Airman: General George C. Kenney and the War in the Southwest Pacific*, Modern War Studies (Lawrence, Kan: University Press of Kansas, 1998), 96.

Make no mistake; the role of the CAF over the coming decades will be critical, likely more critical than ever was before. We must always be ready to provide dominant combat airpower for America, despite our current fiscal constraints. In my judgment, the US national debt, and its associated budget repercussions, remain the most significant threat to our national security. More than two decades of sustained global engagement and combat operations have imposed tremendous stress on our service members and equipment. At the same time, the economic means we rely upon to underwrite our global security posture are becoming increasingly constrained and it seems will remain so for the foreseeable future. Therefore, the context in which past decisions were made has changed, and we are now being forced to make decisions impacting long-term force structure based upon short-term fiscal constraints.⁶

As has been the case in years following a conflict, decisions made today will have significant repercussions on the future of the CAF fighter force. Investiture in a CAF fighter force comprised solely of fifth-generation aircraft looks to hedge the bet that quality will be better than quantity, since the fiscal environment will limit the quantity available to the USAF.

This chapter provides a foundational understanding of the characteristics and threat systems involved in A2/AD strategies that most directly affect the ability of deployment, basing, and execution of USAF combat fighter forces during an operation. A discussion and investigation follows showing how the current fiscal environment and the A2/AD threat are shaping recapitalization and modernization of those forces.

Anti-Access

Air power advocate Giulio Douhet described the necessity for possessing the means of offensive aerial action in order to best provide for a nation's defense in his seminal work *The Command of the Air*. He aptly stated:

For a nation to be equipped with an air force intended for aerial combat alone is not only to jeopardize the home front, but also to preclude any possibility of offensive action against enemy objectives—a condition of profound aerial inferiority. The only real effective aerial defense cannot

⁶ Hostage, "CAF in the 2020s," 4–5.

but be indirect; for it consists in reducing the offensive potentiality of the opponent's air forces by destroying the source of aerial power at its point of origin. The surest and most effective way of achieving this end is to destroy the enemy air force at its bases, which are found on the surface. This principle which governs the situation: it is easier and more effective to destroy the enemy's aerial power by destroying his nest and eggs on the ground than to hunt is birds in the air.⁷

Douhet's vision of an aerial armada operating with impunity over the battle space would not come to fruition as the technological advances in aerial defense sought to counter the pace of the development of aerial warfare.⁸ Nevertheless, his ideas of preventing an opposing force from gaining access to the necessary airfields in order to operate resonate in the strategic calculus of an adversary trying to counter US air power.

In 2013, the Air-Sea Battle Office of the DOD released the *Air-Sea Battle: Service Collaboration to Address Anti-Access & Aerial Denial Challenges* to further codify the future nature of strategic environment in which operations will take place.⁹ Anti-Access is "an action intended to slow deployment of friendly force into a theater or cause forces to operate from distances farther from the locus of conflict of conflict than would otherwise prefer. A2 affects movement to a theater."¹⁰ Since the end of the Cold War, the USAF has touted its capability as a responsive force capable of bring air power anywhere in the world. The foundation of this responsiveness has been the vast basing and infrastructure accessible to the USAF in order to conduct operations. As A2 capabilities and systems continue to grow, those forward deployed sanctuaries will be in reach of an adversaries' efforts to thwart the deployment of forces or conduct of operations. In other words, even if basing and infrastructure was a low-risk concern in

⁷ Giulio Douhet, *The Command of the Air*, ed. Richard H Kohn and Dino Ferrari (Tuscaloosa, AL: University of Alabama Press, 2009), 53–54.

⁸ "Nothing man can do on the surface of the earth can interfere with a plane in flight." Douhet, *The Command of the Air*, 9.

⁹ The document produced by the Air-Sea Battle Office is an unclassified summary of the classified Air-Sea Battle Concept, version 9.0, dated May 12 and the Air-Sea Battle Master Implementation Plan (FY13), dated May 12.

¹⁰ Air-Sea Battle Office, "Air-Sea Battle," 2.

the past, future deployment and operations at those installations may now be at risk.¹¹

An additional complicating aspect of access will likely occur when the US is faced with the reality that foreign governments will be increasingly hesitant of allowing forces to deploy and operate when faced with the threat of attacks against them or from political pressures within their nation. For example, during Operation Enduring Freedom, Saudi Arabia denied the US the right to execute operations against al Qaeda and the Taliban even though the US had been operating there since Desert Storm in 1991. Similarly, during preparation for Operation Iraqi Freedom in 2003, US planners were counting on access to basing and infrastructure that the USAF had been operating from for twelve years. The Turkish government denied the request, preventing the US air power direct access to northern Iraq.¹² Future diplomacy between the US and foreign partners will need to address base access and infrastructure as “the USAF’s path remains that of betting that forward bases, which are falling increasingly within the reach of enemy ballistic missiles, cruise missiles, and other A2 capabilities, can nonetheless be utilized by its expeditionary air units.”¹³

Air base vulnerability was of concern during past operations and likely will be during future ones. During the Cold War, the threat of a Soviet attack on forward deployed forces was a near and constant threat. The Salty Demo exercise of 1985 demonstrated that chaos would ensue in USAF operations under a sustained aerial attack. The immediate reaction was enacting policy changes for base preparation, hardening, and execution of operations under an A2 threat.¹⁴ Recently, the *2010 Quadrennial Defense Review*, echoing the same concern evident following the Salty Demo exercise, asserted that forward deployed forces in an A2 environment will require bases and supporting

¹¹ Robert M. Gates, *Quadrennial Defense Review Report: February 2010* (Washington, DC: Government Printing Office, 2010), 31.

¹² Michael G. Vickers and Robert C. Martinage, *The Revolution in War: Thinking Smarter About Defense* (Washington, DC: Center for Strategic and Budgetary Assessment, 2004), 71–72.

¹³ Andrew F. Krepinevich, Barry Whatts, and Robert Work, *Meeting the Anti-Access and Area-Denial Challenge* (Washington, DC: Center for Strategic and Budgetary Assessment, 2003), 20.

¹⁴ Roger Cliff, *Entering the Dragon’s Lair: Chinese Antiaccess Strategies and Their Implications for the United States* (Santa Monica, CA: RAND, 2007), 9.

infrastructures that are more resilient to attack than were currently available.¹⁵

Further compounding the issues has been the current and future reliance on short-range platforms for executing operations in the A2/AD environment.¹⁶ As noted by Center for Strategic and Budgetary Assessments analysts in 2003:

The stated intention of USAF leaders to depend predominately on short-range platforms to cope with A2/AD threats for some three decades is borne out by the following observations. First, in March 1999 the Air Force, in response to congressional language directing the preparation of “a comprehensive plan for the future of the long-range bomber force” produced a white paper that deferred initial operational capability (IOC) for a follow-on to the B-2 until 2037. In the meantime, the vast majority of USAF investment in combat platforms—procurement plus RDT&E—is programmed to go to short-range platforms, mainly to the F/A-22 and the F-35 [Joint Strike Fighter].¹⁷

Unfortunately, proper base and infrastructure hardening has been difficult to determine due to uncertainty by policy makers.

In 2004, President George W. Bush initiated the Global Defense Posture Review to assess the US’s overseas posture and determine the best solution to position a more flexible and expeditionary force. The complex strategic environment—defined by state actors, non-state actors, and asymmetric A2/AD threats—prevented the administration from confidently forecasting the type and location of potential conflict. The result was a continuation of the expeditionary nature of the USAF in maintaining sufficient basing and facilities, foreign agreements, and security cooperation.¹⁸ Consequently, military facilities “are not defensive strongholds but rather launching pads and logistical hubs that support operations beyond their immediate vicinity.”¹⁹ The vulnerability becomes more dire when considering that emerging A2 technologies have significantly improved accuracy and lethality when compared to the Scud threat then-present during Desert

¹⁵ Gates, *QDR 2010*, 33.

¹⁶ Short-range for this analysis is considered a combat radius of 1000 km or less.

¹⁷ Krepinevich, Whatts, and Work, *Meeting the Challenge*, 20.

¹⁸ Stacie L. Pettyjohn, *U.S. Global Defense Posture, 1783/2011* (Santa Monica, CA: RAND, 2012), 87.

¹⁹ Pettyjohn, *U.S. Global Defense Posture*, 12.

Storm.²⁰

Two key categories of A2 capabilities that threaten USAF deployment and operations are surface and sub-surface ballistic missiles and land-attack cruise missiles.²¹ The first use of cruise and ballistic missile systems occurred during WWII with the attacks prosecuted by the V-1 and V-2, respectively, against England and Northern Europe. Though the delivery systems were inaccurate in application, the physical and psychological effects attending the thousands of casualties caused by those weapons made them of prime concern to the Allied commanders.²² For the past 30 years, several of the major conflicts involved the use of short and intermediate-range ballistic missiles.²³ The ballistic missile threat will only continue to rise as advances in technology produces weapons that have improved range, accuracy, reliability, and lethality are proliferated around the world with A2 strategies to deter outside aggression. According to the National Air and Space Intelligence Center (NASIC), “Over 20 countries have ballistic missile systems, and missiles likely will be a threat in future conflicts involving US forces.”²⁴

Theater ballistic missiles align into three categories as a function of the maximum effective range from launch to target: short-range ballistic missiles (SRBMs), medium-range ballistic missiles (MRBMs), and long-range ballistic missiles (LRBMs) [Figure 1].²⁵ SRBMs are the first category of primary concern in considering the A2 threat. SRBMs are the most widely produced and proliferated with over twenty countries

²⁰ Gates, *QDR 2010*, 31.

²¹ US Joint Chiefs of Staff, *Joint Operational Access Concept (JOAC)* (Washington, DC: US Joint Chiefs of Staff, 2012), 9; Christopher Bowie J., *The Anti-Access Threat and Theater Air Bases* (Washington, DC: Center for Strategic and Budgetary Assessment, 2002), 37 Of note: the use of special forces, terrorist organizations, long-range reconnaissance and surveillance systems, cyber attack, counter-space operations, and weapons of mass destruction also constitute A2 threats, but are beyond the scope of this discussion.

²² National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat* (Wright-Patterson Air Force Base, Ohio: National Air and Space Intelligence Center, 2013), 4–5.

²³ National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, 4.

²⁴ National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, 4.

²⁵ National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, 9 Intercontinental ballistic missiles comprise a separate category of ballistic missile and are all currently nuclear-only capable, therefore beyond the scope of this discussion.

producing the type. The most widely distributed is the Russian manufactured SS-1C Mod1, or Scud-B, that has an extended range over the Scud. The Scud was most famously introduced to the US's attention during the launches of Iraqi Scuds on Israel and Saudi Arabia during Desert Storm. SRBMs in development now will possess GPS navigation capabilities, maneuvering reentry vehicles (RVs), and other countermeasures to disrupt the effects of counter-advances in missile defense technologies.²⁶

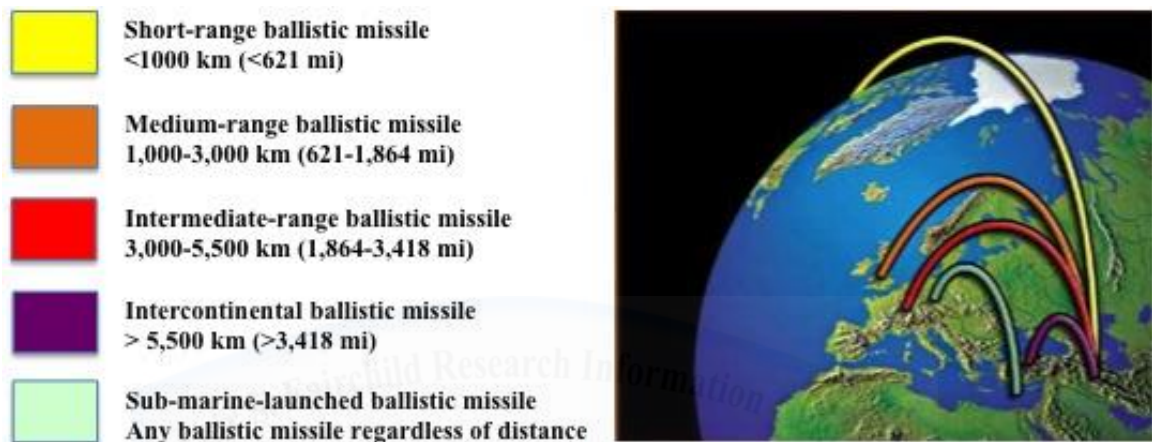


Figure 1: Ballistic Missile Ranges

Source: National Air and Space Intelligence Center, Ballistic and Cruise Missile Threat (Wright-Patterson Air Force Base, Ohio: National Air and Space Intelligence Center, 2013), 9.

MRBMs and IRBMs are the second and third category of ballistic missile that deepens a potential adversaries A2 capability. China, India, Saudi Arabia, Pakistan, and Iran all possess and continue to advance their strategic missile arsenals [Table 1].²⁷ In accordance with the Nuclear Forces Treaty enacted in 1988, neither the United States nor Russia possesses ballistic missile in the MRBM and IRBM category. China is undergoing a significant modernization program as an aspect of the nation's overall A2/AD strategy that includes both conventional and nuclear capable ballistic missiles. NASIC assesses that "China is also acquiring new conventionally armed CSS-5 MRBMs to conduct precision strikes to conduct precision strikes. These systems are like intended to hold at-risk or strike logistical nodes, regional military bases including airfields and

²⁶ National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, 10–11.

²⁷ National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, 17.

ports and naval assets.”²⁸ Both North Korea and Iran have made significant investment into their respective MRBM and IRBM arsenals. Both nations are perusing weapons developments that include expanded inventories and varied payloads to include the incorporation of a nuclear warhead.²⁹

Table 1: MRBM and IRBM Characteristics

Missile Type	Deployment Mode	Range (km)	Number of Launchers ^a
<u>China</u>			
CSS-2	Transportable	3,000	5 to 50 (Limited mobility)
CSS-5 Mod 1	Road-Mobile	>1750	Fewer than 50
CSS-5 Mod 2	Road-Mobile	>1750	Fewer than 50
CSS-5 Conventional	Mobile	>1750	Fewer than 30
CSS-5 ASBM ^b	Mobile	>1500	Unknown
<u>North Korea</u>			
No Dong	Road-mobile	1,250	Fewer than 50
IRBM	Road-mobile	>3,000	Fewer than 50
<u>Iran</u>			
Shahab 3	Silo & road-mobile	2,000	Fewer than 50
Sejjil	Road-mobile	2,000	Unknown

Note: All ranges are approximate; this is not an all-inclusive list of nation’s inventories.
^aThe missile inventory may be larger than the number of launchers
^bAnti-Ship Ballistic Missile

Source: Adapted from National Air and Space Intelligence Center, Ballistic and Cruise Missile Threat (Wright-Patterson Air Force Base, Ohio: National Air and Space Intelligence Center, 2013), 17.

Cruise missiles provide another means of destructive power projection in a comprehensive A2 strategy. The intended missions and launch modes, not the maximum range, determine the categories of cruise missiles. The two broadest categories are anti-ship cruise missiles and land-attack cruise missiles (LACMs).³⁰ Compared to ballistic missiles, whose flight time is measured in minutes, cruise missiles may possess flight

²⁸ National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, 14.

²⁹ Steven A. Hildreth, *North Korean Ballistic Missile Threat to the United States*, CRS Report RS21473 (Washington, DC: Library of Congress, Research Service, February 24, 2009), 7; Steven A. Hildreth, *Iran’s Ballistic Missile and Space Launch Programs*, CRS Report R42849 (Washington, DC: Library of Congress, Research Service, December 6, 2012), 2.

³⁰ National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, 26.

times measured in hours with complex routing to avoid detection and engagement from aerial defenses.³¹ Cruise missiles are widely regarded as more accurate weapons than ballistic missile due in part to their longer flight profiles and GPS-guided navigation systems. Additionally, target identification technologies include terrain contour mapping, electro-optical image detection, and radar image detection.³²

According to NASIC, “The success of US Tomahawk cruise missiles has heightened interest in cruise missile acquisition in many countries . . . The cruise missile threat to US forces will continue to increase. At least nine foreign countries will be involved in LACM production during the next decade, and several of the LACM produces will make their missiles available for export.”³³ The threat from cruise and ballistic missiles is magnified in light of the technological advances that have dramatically increased their conventional destructive capacities to disrupt, degrade, and/or destroy the CAF fighter forces from operating.

In 1999, a RAND study highlighted the potential devastating effects on fighters attacked by various types of munitions carried by Chinese developed ballistic missiles with GPS-guidance and submunitions [Figure 2].³⁴ The study demonstrated that the destruction from a single attack of up to ninety-six aircraft, parked in standard spacing, out in the open, is a distinct possibility the US may face when conducting expeditionary operations in the future. Submunitions, in particular, show enhanced effectiveness when compared to the destructive power of unitary warheads against aircraft in the open. Both China and Russia produce and proliferate missiles that can contain submunition payloads, but several countries have the means to alter conventional missiles to carry submunitions should they choose to do so. As the authors of the study noted, “modifying these missiles to carry submunition warheads would enable [any nation] to attack truly enormous

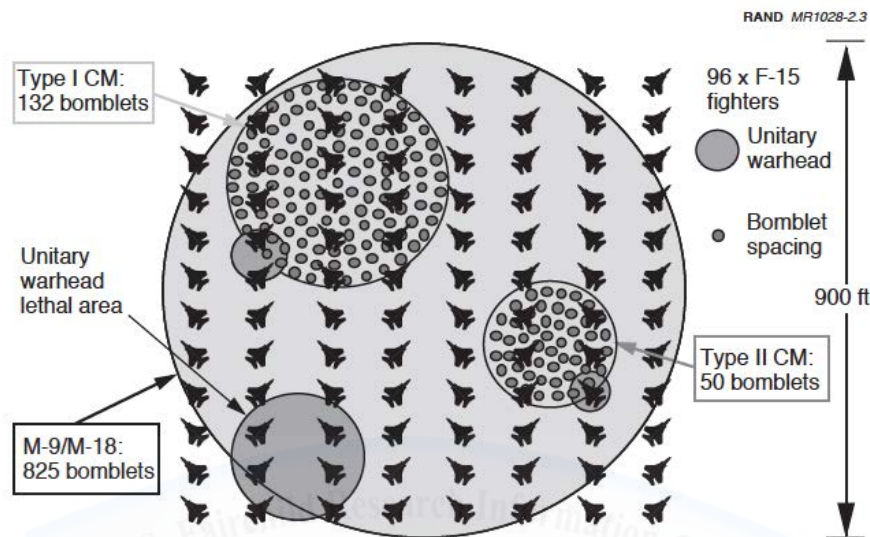
³¹ John Stillion and David T. Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks: Technology, Scenarios, and U.S. Air Force Responses* (Santa Monica, CA: RAND, 1999), 10. A cruise missile flying at 350 knots will require two hours and 51 minute flight to fly 1,000 nautical miles.

³² Carlo Kopp, “China’s Air Defence Missile Systems,” *Defence Today*, June 2008, 56–57.

³³ National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, 27.

³⁴ Stillion and Orletsky, *Airbase Vulnerability*, 13–14.

areas.”³⁵ Ballistic and cruise missiles will remain a mainstay for many nations’ A2 strategies based in part to the missile’s relatively low operating costs and penetration potential of aerial defense networks.



NOTE: Aircraft spacing reflects guidelines set out in U.S. Air Force, *Facility Requirements*, Air Force Handbook AFH 32-1084, September 1, 1996, Table 2.6, for F-15 aircraft parked at a 45-degree angle.

Figure 2: Comparison of Warhead Lethal Radii for a Typical Ballistic Missile and the Two Postulated Cruise-Missile Candidate UAVs

Source: John Stillion and David T. Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks: Technology, Scenarios, and U.S. Air Force Responses* (Santa Monica, CA: RAND, 1999), 13–14.

Area Denial

Car von Clausewitz in *On War* states, “the defensive form of warfare is intrinsically stronger than the offensive.”³⁶ A common misperception is that Clausewitz advocates a purely defensive strategy. In reality, the statement is taken out of the context and Clausewitz views the defensive as a means of initial preservation. When “one has used the defensive measures successfully, a more favorable balance of strength is usually created; thus, the natural course in the war is to begin defensively and end by

³⁵ Stillion and Orletsky, *Airbase Vulnerability*, 14.

³⁶ Carl von Clausewitz, *On War*, ed. Michael Howard and Peter Paret, Indexed Edition (Princeton, N.J.: Princeton University Press, 1984), 358.

attacking.”³⁷ Indeed, the defensive form, used exclusively, must eventually fail, for there is no additional cost imposed on the enemy if a counterstrike never materializes. Attacks will continue at the opponent’s leisure until the defender eventually succumbs. Thus the use of IADS, comprised of SAMs complemented by air intercept fighters, seeks to preserve national power and continue to contest an aggressor in a comprehensive AD strategy until an offensive can be mounted. It is not, however, sufficient or an end in itself.

The DOD Air-Sea Battle Office defined AD as “an action intended to impede friendly operations within an area where an adversary cannot or will not prevent access.”³⁸ As A2 seeks to prevent the successful movement *into* a theater, AD focuses on restricting movement *within* a theater. The USAF has enjoyed relative air superiority if not outright air dominance since 1945.³⁹ Since the impressive victory by the USAF over Iraq in 1991—what at the time was the most robust IADS outside of the Soviet Union—states have made significant investment into advanced air intercept fighters and surface to air missiles.⁴⁰ However, advances in AD technologies may potentially elevate the operational risk to USAF operations to an unacceptable level. The Soviet Union, and now Russia, has been at the forefront of design, development, and proliferation of AD technologies for the past 60 years.

The introduction of modern AD systems into the battlespace occurred over the skies of North Vietnam in the 1960s. The S-75 Dvina (SA-2 Guideline) was the only SAM available to the North Vietnamese, with approximately 50 batteries widely distributed across 150 prepared sites throughout the country by the mid-1960s.⁴¹ While a majority of fighter losses by the US were still due to older-technology anti-aircraft artillery, the missile threat grew significantly. From 1971 to 1973, SAMs accounted for

³⁷ Clausewitz, *On War*, 358.

³⁸ Air-Sea Battle Office, “Air-Sea Battle,” 2.

³⁹ Jan Van Tol et al., *AirSea Battle: A Point-of-Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessment, 2010), 26.

⁴⁰ Andrew F. Krepinevich, *Why AirSea Battle?* (Washington, DC: Center for Strategic and Budgetary Assessment, 2010), 23.

⁴¹ Carlo Kopp, *Surface to Air Missile Effectiveness in Past Conflicts*, Technical Report APA-TR-2010-1001 (Air Power Australia, April 2012), 3, <http://www.ausairpower.net/APA-SAM-Effectiveness> (accessed on 18 January 2014) Exact number of batteries and fixed sites varies.

31.5 percent of F-4s shot down and 17 B-52s. SAMs were of such concern during the Linebacker I/II campaigns, that a significant proportion of tactical sorties were directed at suppressing or destroying the SAM sites.⁴² The Arab-Israeli wars of the 1970s and early 1980s saw the introduction of the S-125 Niva (SA-3) and 2k12 ZRK Zub (SA-6 Gainful). Both missiles offered improved capabilities to include speed, maneuverability, and mobility as compared the strategic SA-2. Table 2 represents the basic characteristics of the so-called single-digit family of SAM systems. Following the relatively underwhelming performance of the Soviet-based IADS in North Vietnam and vulnerabilities discovered during the Arab-Israeli Wars, the Soviet Union sought “to develop a new generation of SAMS and radars, with more range, better jam resistance, and importantly much better mobility.”⁴³ The result was the development of what would be known as double-digit SAMs.

Table 2: Russian Single-Digit SAMs

Missile Type	Min Range (nm)	Max Range (nm)	Min Altitude (ft.)	Max Altitude (ft)	Speed (Mach)
SA-2 Guideline	3-4	15.5-43	170-10k	72-98k	1.9-2.6
SA-3 Goa	2	9	65	60k	>3
SA-5 Gammon	9	100-150	1,000-1,750	65-100k	>4
SA-6 Gainful	2-3	12-13.5	65-275	23-46k	1.75-2.0

Note: All values are approximate; variance is due to different versions of the system.

Source: Compiled from multiple sources from *Surface to Air Missile Systems and Integrated Air Defence Systems (Air Power Australia)*, <http://www.ausairpower.net/sams-iads.html#mozTocId220080> (accessed on 18 January 2014).

The double-digit SAM represents an evolution in AD technology combining high mobility, electronic protection, multiple target tracking and engagement, and increased range speed. According to airpower analysis Dr. Carlo Kopp, “By the mid to late 1990s, technical strategists across the Russian industry defined the agenda for the next

⁴² Kopp, *Effectiveness*, 5.

⁴³ Carlo Kopp, *Surviving the Modern Integrated Air Defence System*, Air Power Australia Analysis 2009-02 (Air Power Australia, February 3, 2009), 5–6, <http://www.ausairpower.net/APA-2009-02.html> (accessed 18 January 2014). US electronic jamming and anti-SAM significantly degraded North Vietnam SA-2 operations. The Arab-Israeli wars revealed low-altitude vulnerabilities of Soviet SAM systems.

generation of products.”⁴⁴ The S-300PMU (SA-10C Grumble) and 9K81/S-300V (SA-12 Gladiator/Giant) were the first of the new class of Russian SAMs to employ high power, mobile, long-range phased array radar systems with anti-jam capabilities in conjunction with an advanced intercept missile. The advent of the air-to-ground (AGM)-45 Shrike, and the latter AGM-88 High Speed Anti-Radiation Missile (HARM), Soviet engineers realized the importance of countering the anti-radiation missiles used to target SAM system radars.⁴⁵ This concern spurred the incorporation of low-probability of intercept techniques to the radar systems, the use of defensive counter measures, and emitting decoys to prevent or confuse anti-radiation missile engagements.⁴⁶ The mobility of the double-digit systems also allows for a five-minute “shoot and scoot” philosophy to further delay the accurate determination of a system’s location in efforts to suppress or destroy enemy air defense.⁴⁷

Russian air defense industries have further expanded the double-digit SAM inventory that provides greater protection and lethality. These systems are akin to what LtGen George J. Flynn (USMC) as the Joint Staff’s director of joint force development described as presenting “U.S. strategists with the most prolific barriers to effective theater entry and operation.”⁴⁸ The S-300PMU1 (SA-20A Gargoyle) and S-300PMU2 Favorit (SA-20B Gargoyle) possess capable maximum effective ranges near 200 km.⁴⁹ These systems are most comparable to the US NIM-104 Patriot missile and associated air defense system, but the Russian systems possess better radar defenses—specifically in countering jamming effects.⁵⁰ Additionally, the S-400 Triumf (SA-21 Growler) currently serving in air defense batteries around Moscow now boast a maximum effective range out to 400 km and include counter-low observable (LO) developments [Table 3].

⁴⁴ Carlo Kopp, “Evolving Technological Strategy in Advanced Air Defense Systems,” *Joint Forces Quarterly*, no. 57 (Quarter 2010): 87.

⁴⁵ Kopp, *Surviving IADS*, 5–6.

⁴⁶ Kopp, *Surviving IADS*, 8–10.

⁴⁷ Kopp, “Evolving Technological Strategy,” 88.

⁴⁸ Nathan Freier, “The Emerging Anti-Access/Area-Denial Challenge,” *CSIS.org*, May 17, 2012, <http://csis.org/publication/emerging-anti-accessarea-denial-challenge> (accessed 8 January 2014).

⁴⁹ Vickers and Martinage, *Revolution in Warfare*, 99.

⁵⁰ Carlo Kopp, “Proliferation of Advanced Air Defence Systems,” *Defence Today*, March 2010, 25.

China has benefitted from its armament procurements from Russia and has produced an intrinsic variant dubbed the HQ-9. The HQ-9 is an S-300PMU1 class weapon with comparable range and capability. The HQ-9 system, available for foreign sales since 2008, possesses the capability to detect, target, and engage anti-radiation missiles.⁵¹ This represents a significant capability to counter adversary SAM suppression and destruction efforts first developed by the US.

Table 3: Russian Double-Digit SAMs

Missile Type	Min Range (nm)	Max Range (nm)	Min Altitude (ft)	Max Altitude (ft)	Speed (Mach)
SA-10 Grumble	2.7	40.5	82	82.5k	>6.7
SA-12 Gladiator	3.3	40.5	82	82.5k	>5.0
SA-12 Giant	7	55	3k	100k	>6.0
SA-20A Gargoyle	3	81	32	90k	>7.0
SA-20B Gargoyle	2	108	32	90k	>7.0
SA-21 Growler	1	130-215	32	90-100k	6.0-7.0

Note: All values are approximate; variance is due to different versions of the system.

Source: Compiled from multiple sources from *Surface to Air Missile Systems and Integrated Air Defence Systems (Air Power Australia)*, <http://www.ausairpower.net/sams-iads.html#mozTocId220080> (accessed on 18 January 2014).

The development of these, and future systems, are also a result of the US investment in LO technologies as a means to increase survivability for the past 20 years. Analysts at the CSBA postulated these investments in 2003.

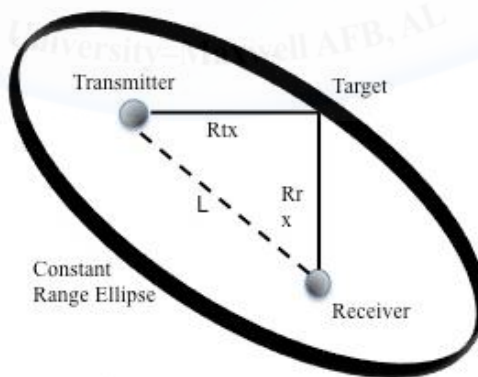
Of course, the very likelihood of this outcome will inevitably encourage serious adversaries to invest in asymmetric responses, starting with advanced air defenses such as the SA-10 or SA-20. Because these systems employ very powerful radars, they will probably prove difficult to take out even for platforms with the low observability of F/A 22—particularly in the absence of any electronic-warfare support. Low observability does not confer invisibility in any portion of the electromagnetic spectrum. In the case of radar, if a so-called stealthy platform gets close enough, burn-through will occur, which was most likely how an F-117 was downed by a Serbian SA-3 on the night of March 27, 1999, about 35 nm north of Belgrade.⁵²

⁵¹ Kopp, “Evolving Technological Strategy,” 89; Kopp, “Proliferation,” 25.

⁵² Krepinevich, Whatts, and Work, *Meeting the Challenge*, 23.

Russia and China are continually investing in AD development to counter the LO capabilities that the US presents as a threat to their national security. Aircraft shape and composition are the primary means of creating a LO aircraft. Typically, those characteristics optimize reduced reflectivity of the X and Ku bands of the electromagnetic spectrum used by radars for many AD systems. Developments in VHF-band radars are “based upon the much reduced effectiveness of shaping and materials designed to defeat the upper band radars.”⁵³ Additionally, with the VHF radar development, technological advances in connectivity and processing power are allowing the effective development of biostatic radar systems.

Biostatic radar systems are comprised of separate transmitting and receiving elements in order to correlate a target’s location. By using a separate receiver, any radar emission scatter resulting from the LO aircrafts shaping or materials can be detected and correlated. Key to the correlation is the use of constant range ellipses to determine the target’s range, pulse-Doppler shift to calculate velocity and vector, and the time distance of arrival of the target in relation to the known distance between the transmitter and the emitter [Figure 3].⁵⁴



Notes: R_{tx} = transmitter range to target, R_{rx} = receiver range to target
 L = distance between receiver and transmitter.
 Biostatic range expressed as $R_{tx} + R_{rx} - L$ remains constant at all points on the ellipse.

Figure 3: Biostatic Range

Source: Adapted from LtCol Arend G. Westra, “Radar versus Stealth: Passive Radar and the Future of U.S. Military Power,” *Joint Forces Quarterly* no. 55 (Quarter 2009): 139.

⁵³ Kopp, “Evolving Technological Strategy,” 90.

⁵⁴ LtCol Arend G. Westra, “Radar versus Stealth: Passive Radar and the Future of U.S. Military Power,” *Joint Forces Quarterly*, no. 55 (Quarter 2009): 139–40.

A multistate network incorporates multiple biostatic systems to further increase the accuracy of target location while minimizing the threat to each of the transmitters in the system by sharing the relative emission of electromagnetic energy.⁵⁵ Developments such as the ones described above “will reshape, over the coming decade, the character of air defense systems the United States will confront in future expeditionary operations.”⁵⁶

Budget and Force Structure

In January 2012, the Secretary of Defense Leon Panetta, in coordination with President Barak Obama, released *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* to outline the DOD’s strategic guidance for the future. Recognizing the threat that an adversary possessing A2/AD capabilities represents, US forces will need to be capable of projecting power anywhere in the globe despite those capabilities. Specifically, “states such as China and Iran will continue to pursue asymmetric means to counter our power projection capabilities . . . the U.S. military will invest as required to ensure its ability operate effectively in anti-access and are denial (A2/AD) environments” (emphasis in original).⁵⁷ While the strategic guidance called for investment, the DOD was facing the possibility of sequestration—automatic spending cuts—of \$487 billion dollars as a result of the Budget Control Act of 2011 and the possibility of \$500 billion more in additional cuts over a 10-year period.⁵⁸ Chief of Staff of the Air Force (CSAF) Gen Mark A. Welsh III described the difficulties the cuts would have when he stated, “Defense cuts totaling \$487 billion over 10 years will be hard but manageable though significant challenges remain.”⁵⁹

A significant challenge for the USAF is in determining the balance of

⁵⁵ Westra, “Radar versus Stealth,” 139.

⁵⁶ Kopp, “Evolving Technological Strategy,” 91.

⁵⁷ US Department of Defense, *Sustaining U.S. Global Leadership*, 4–5.

⁵⁸ Catherine Dale and Pat Towell, *Assessing the January 2012 Defense Strategic Guidance (DSG)*, CRS Report R42146 (Washington, DC: Library of Congress, Research Service, August 13, 2013), 1; Daniel Gaynor, “Fiscal Cliff 2013: Why U.S. National Security Will Be Damaged by Sequestration,” *PolicyMic*, November 27, 2012, <http://www.policymic.com/articles/19604/fiscal-cliff-2013-why-u-s-national-security-will-be-damaged-by-sequestration> (accessed 19 January 2012).

⁵⁹ US Department of the Air Force, *Air Force Priorities for a New Strategy with Constrained Budgets* (Washington, DC: Department of the Air Force, 2012), 5.

recapitalization and modernization that will occur in the CAF fighter force given the inconsistency in projecting expenditures due to the constrained fiscal environment. Three years earlier, *the Quadrennial Defense Review 2010* projected an increase in survivability when facing A2/AD threats with an increase in fifth-generation aircraft, but also highlighted the decision to end the production of the F-22 Raptor in favor of “activities with more pressing needs.”⁶⁰ The USAF remains committed to creating an all fifth-generation fighter force comprised of F-22s and F-35 Lightning IIs, as the nature of a highly contested A2/AD environment in the near future will expose the CAF’s fourth-generation fighter fleet to significant risk. The research and development by Russia and China into their own fifth-generation fighter forces further compounds the risk. Gen Welsh echoed the risk by stating that “a 4th generation aircraft meeting a 5th generation aircraft in combat will be more cost-efficient, [but] it will be dead before it ever knows it’s in the fight.”⁶¹ Unfortunately, the recent fiscal uncertainties and delays in F-35 production have made the determination of when the recapitalization of the CAF fighter force will occur difficult to ascertain.

The CAF’s fourth-generation fighter fleet is old and is only getting older. After the resounding success of Desert Storm and the end of the Cold War with the fall of the Soviet Union, two factors precipitated the state of the CAF’s fighter force of today: fighter inventory cuts and the allure of stealth. The overall cuts in fighter strength that occurred in the 1990s were also part of larger reduction in USAF end-strength in reaction to the end of the Cold War. Starting with the George H.W. Bush administration, subsequent administrations deemed the Cold War inventories of personnel and material excessive due to the lack of a global threat and an increased focus on unconventional threats.⁶² The lack of aircraft procurement that occurred during the 1990s anticipated divestiture of a large fourth-generation fighter force structure and the incorporation of more capable F-22s, and then the F-35 [Figure 4].

⁶⁰ Gates, *QDR 2010*, x–xi.

⁶¹ Quoted in Hostage, “CAF in the 2020s,” 17.

⁶² Rebecca Grant, “Losing Air Dominance” (Mitchell Institute Press, September 2008), 8–13.

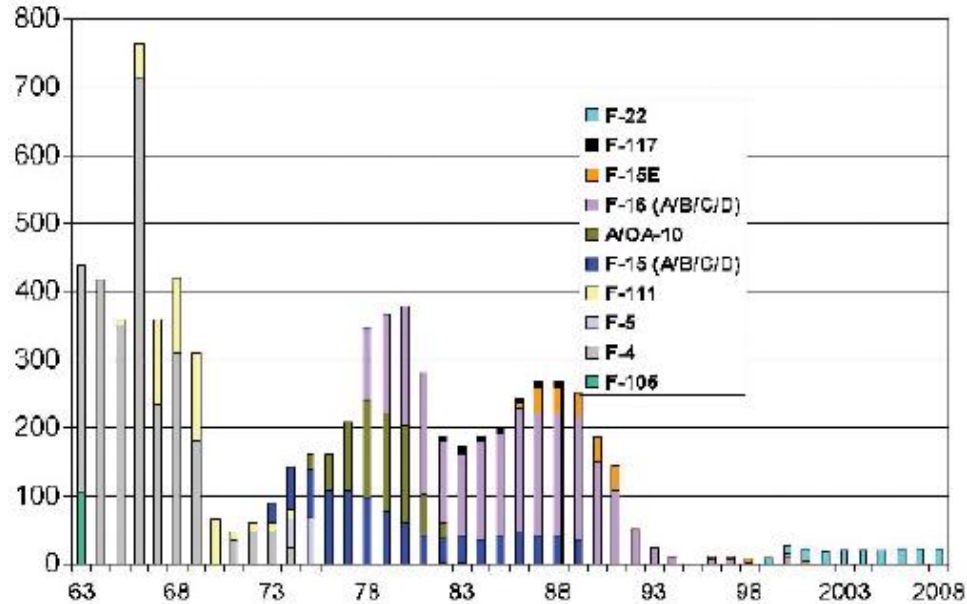


Figure 4: Major Fighter Aircraft Buys, 1963-2008

Source: Rebecca Grant, *“Losing Air Dominance”* (Mitchell Institute Press, September 2008), 12.

Procurement of new fighters fell to zero in 1995, and then was characterized by low-rate production into the 2000s as the fighter purchases of the 1990s were expected to remain viable until the F-22 and F-35 reached full-rate production. The urgency for fifth-generation fighters appeared to be waning, however. According to then-CSAF Gen Merrill McPeak, “there would be no point in acquiring ‘aluminum’ fighters” after success of stealth during Desert Storm.⁶³

Unfortunately, the truncated F-22 procurement has deepened the gap in the CAF fighter force structure requirement that mandates fourth-generation be kept long after their obsolescence. Presidential Budget Decision (PBD) 753 slashed the F-22 budget by \$10 billion dollars and formally set the final inventory to 183 aircraft.⁶⁴ Of those aircraft, only 100 to 140 are suitable for going to combat at any given time, “yet numerous war games and studies have confirmed a minimum requirement for 260 Raptors.”⁶⁵ The F-22 inventory is much lower and very different from the original procurement expectation of

⁶³ Quoted in Grant, “Losing Air Dominance,” 9.

⁶⁴ Grant, “Losing Air Dominance,” 13. Later legislation added four additional F-22s to compensate for earlier attrition establishing the final aircraft inventory today of 187.

⁶⁵ Robert P. Haffa Jr., “Full-Spectrum Air Power: Building the Air Force America Needs” (The Heritage Foundation, October 12, 2012), 15.

750 F-22s—originally planned as a one-for-one replacement for the F-15C. The regressive inventory has been the result of stepped reductions. The George H.W. Bush administration cut the F-22 program from 750 down to 680. The Clinton administration further cut the procurement three times from a final inventory of 442 to 339 to the PBD 753 inventory of 183. Airpower analyst Rebecca Grant cautioned in 2008 “if production halts at 183 aircraft . . . F-22s will begin to retire soon. The first jets may reach their planned service life hours in 2020, at the time when enemy fifth generation fighters could become abundant. Once the F-22 retirements commence, there is no going back to air dominance.”⁶⁶

A foreboding condition is that the average age of the fighter force is approaching 24 years old and many are being retired without a one-for-one replacement by F-35s [Figure 5].⁶⁷

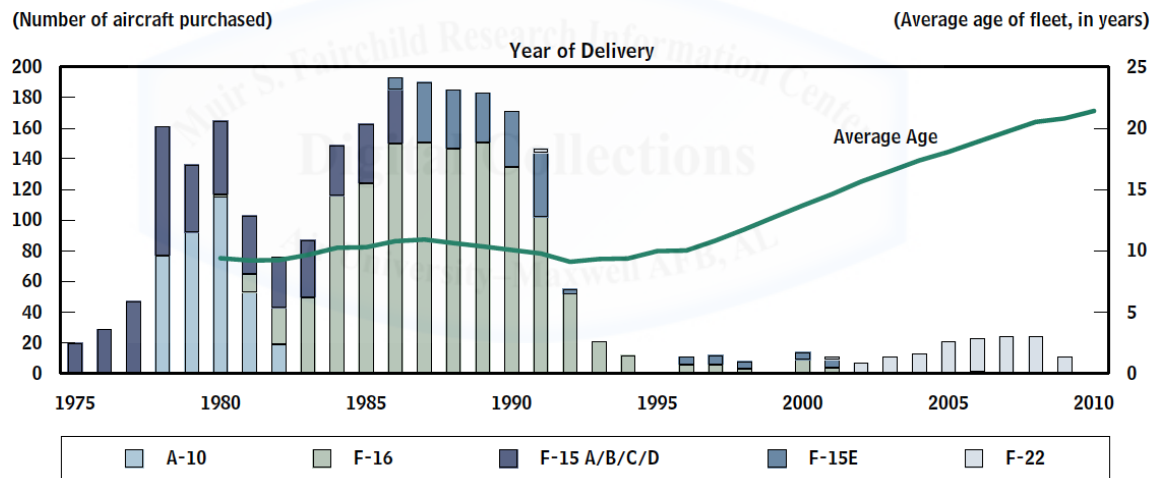


Figure 5: USAF Current Fighter Inventory, by Year of Delivery and Average Age

Source: US Congress. Congressional Budget Offices, *Alternatives for Modernizing U.S. Fighter Forces: May 2009* (Washington, DC: Government Printing Office, 2009), 9.

The Congressional Budget Office (CBO) conducted a study in 2009 highlighting the trends that will occur if procurement of new aircraft lags the retirement of older ones.

⁶⁶ Grant, “Losing Air Dominance,” 22.

⁶⁷ Gen Mark A. Welsh III, “The Strategic Choices and Management Group” (House Armed Services Committee, September 18, 2013), 6; Congressional Budget Offices, *Alternatives for Modernizing U.S. Fighter Forces: May 2009* (Washington, DC: Government Printing Office, 2009), 9.

The study demonstrated that without further procurement, even with extending structural design life by modernizing current fourth-generation inventories, the CAF fighter inventory would be *below* the USAF goal of 2,200 aircraft [Figure 6].⁶⁸

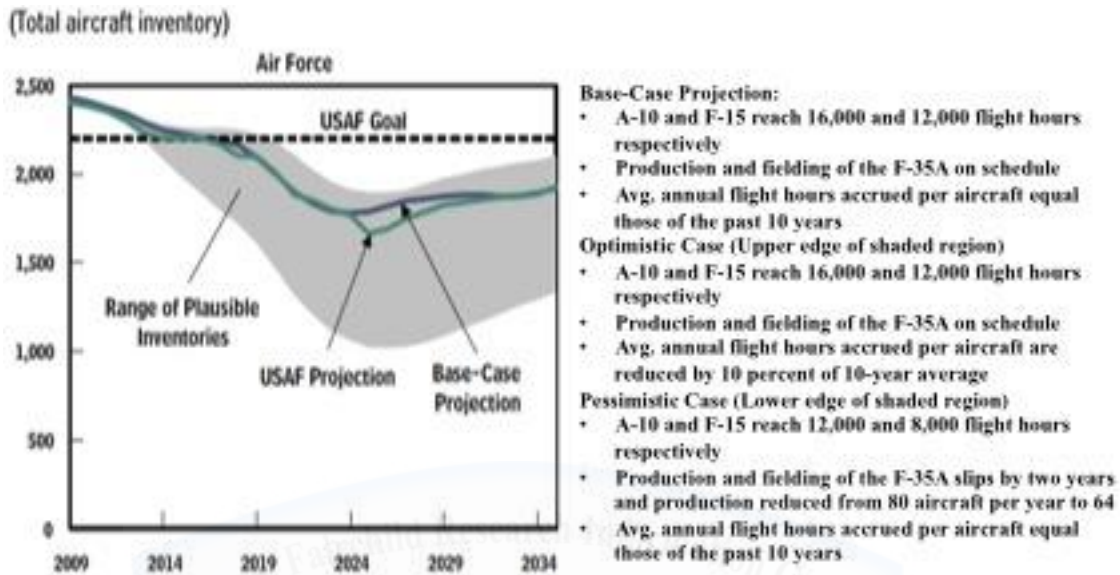


Figure 6: Potential Fighter Inventories under a Range of Projections

Source: Adapted from US Congress. Congressional Budget Offices, Alternatives for Modernizing U.S. Fighter Forces: May 2009 (Washington, DC: Government Printing Office, 2009), 10.

The structural design life limits of the A-10 Thunderbolt II and the F-15A/B/C/D are 12,000 and 8,000 hours respectively; therefore, in each projection those aircraft would require structural modification during modernization. According to the CBO, “In addition to chronological age, about 80 percent of today’s Air Force fighters have expended more than 50 percent of their service life as measured by hours flown.”⁶⁹ Consequently, the CBO projects that the Air Force fighter retirement rate will increase from 10 to 20 in 2009 to a peak of approximately 180 aircraft per year in 2025. The shortfall of fighter aircraft would reach a peak of 400 aircraft—20 percent below the Air

⁶⁸ Congressional Budget Offices, *Alternatives for Modernizing*, 10. The CBO study’s findings closely mirror a similar study conducted by the USAF concerning fighter modernization programs under the George W. Bush administration’s 2009 Fiscal Year Defense Program.

⁶⁹ Congressional Budget Offices, *Alternatives for Modernizing*, 7.

Force's goal—in 2025.⁷⁰

The USAF is now pursuing modernization of some of the fourth-generation fighter force and recently lowered the total aircraft inventory requirement to meet national security objectives. The Service Life Extension Program (SLEP) and combat Avionics Programmed Extension Suites (CAPES) are Air Force initiatives to bridge the “capability gap” between fourth-generation and fifth-generation fighters.⁷¹ 300 F-16 Fighting Falcon's structural service life will be extended from 8,000 to 10,000 hours, resulting in additional six to eight years of service, and will include advances in avionics.⁷² USAF F-15C modernization is focusing on keeping 179 aircraft viable until 2035, well beyond when the last Eagle was intended to be retired. Additionally, the USAF will require the F-15E Strike Eagle and a projected fleet of 283 A-10s to remain in viable service in the CAF until 2035, even though “legacy fourth generation aircraft will only have a limited capability to operate in an anti-access and area denial environment.”⁷³ Now, in 2014, the USAF is pursuing the divestiture of the entire A-10 fleet due to its lack of capability to survive in the A2/AD threat and for fiscal savings in support of modernization and recapitalization of aircraft that can.⁷⁴ Overall, to support the efforts to determine the future viability of the overall fighter end strength is the reduction from 2,200 to 1,900 total aircraft. This reduction results in a total of primary mission aircraft—capable of executing contingency operations—of 1,100 aircraft and the acceptance of by Air Force leadership with the higher risk inherent with fewer aircraft.⁷⁵

A third condition negatively affecting the capability gap in the CAF fighter force structure is the procurement schedule of the F-35. The USAF plans to procure 1,763 F-

⁷⁰ Congressional Budget Offices, *Alternatives for Modernizing*, 7.

⁷¹ US Department of Defense, *Annual Aviation Inventory and Funding Plan: Fiscal Years (FY) 2013-2042* (Washington, DC: Government Printing Office, 2012), 11; Lt Gen Burton M. Field and Lt Gen Charles R. Davis, “Fiscal Year 2014 Department of Defense Combat Aviation Program” (House Armed Services Committee, April 17, 2013), 7.

⁷² US Department of Defense, *Inventory and Funding Plan FY13-42*, 11; Field and Davis, “Combat Aviation Program,” 7.

⁷³ Field and Davis, “Combat Aviation Program,” 8.

⁷⁴ US Department of the Air Force, *United States Air Force Fiscal Year 2015 Budget Overview* (Washington, DC: Department of the Air Force, 2014), 40, <http://www.saffm.hq.af.mil/shared/media/document/AFD-140304-039.pdf> (accessed 18 March 2014).

⁷⁵ Field and Davis, “Combat Aviation Program,” 5.

35s, to complement the 187 F-22s, over the next 25 years [Figure 7].⁷⁶

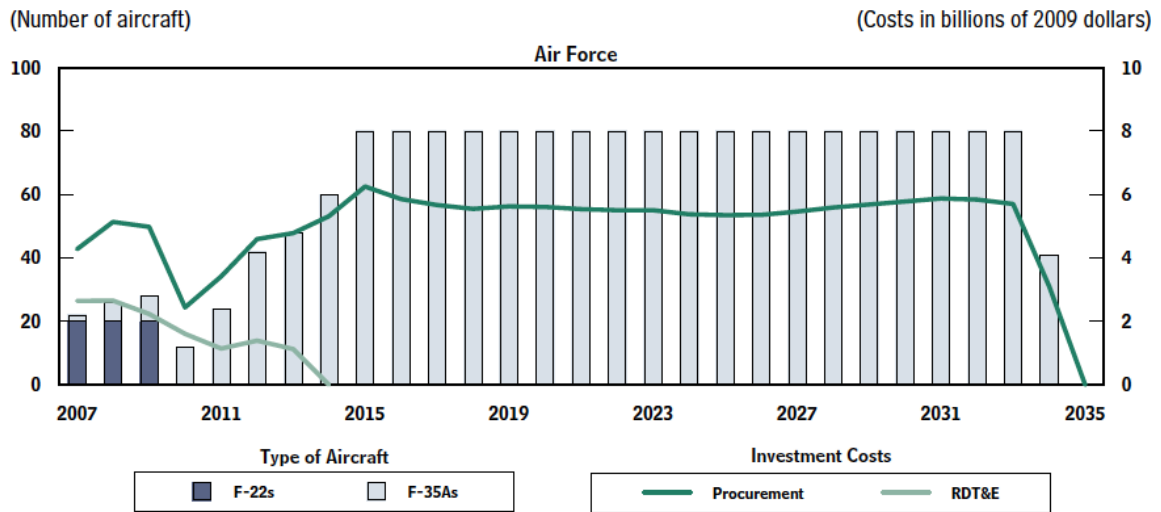


Figure 7: Fighter Aircraft Purchase and Associated Investment Cost

Source: US Congress. Congressional Budget Offices, *Alternatives for Modernizing U.S. Fighter Forces: May 2009* (Washington, DC: Government Printing Office, 2009), 4.

The first two non-research and development F-35s were ordered in 2007 with an expectation that the first combat-coded squadron would achieve Initial Operational Capability by 2013. During a recent report to the Congressional Defense Committees, the DOD per the National Defense Authorization Act (NDAA) for fiscal year (FY) 2013 identified the expecting IOC dates for the respective services that will operate the F-35. The USAF reported the first CAF F-35 squadron would become IOC by August 2016, fully three years later than original estimates in 2009.⁷⁷ Compounding the delay in F-35 IOC is the slip of full-rate production of 80 aircraft per year by 13 months in 2012 until November 2015 and again in 2013 an additional slip of 36 months to full-rate production by 2018.⁷⁸ Despite these delays, the USAF still plans on procuring 201 F-35s from FY14

⁷⁶ Congressional Budget Offices, *Alternatives for Modernizing*, 3–4. Of note: 187 F-22s and 1,763 F-35s result in an end-strength of 1,950 fighters.

⁷⁷ US Department of Defense, *F-35 Initial Operational Capability*, Report to Congressional Defense Committees, June 2013, 7.

⁷⁸ Jeremiah Gertler, *F-35 Joint Strike Fighter (JSF) Program*, CRS Report RL30563 (Washington, DC: Library of Congress, Research Service, February 16, 2012), 10; Congressional Budget Offices, *Long-Term Implications of the 2014 Future Years Defense Program* (Washington, DC: Government Printing Office, 2013), 5.

to FY18, but will continue to require modernization of legacy fourth-generation aircraft to prevent a deepening capability gap.⁷⁹

The USAF is fully invested in the procurement of the F-35 as the future backbone of the CAF fighter force. Gen Welsh, in testimony to the House Armed Services Committee in 2013, described the importance of the F-35 to the future of the USAF.

The F-35 is essential to any future conflict with a high-end foe. The very clear bottom line is that a fourth generation fighter cannot successfully compete with a fifth generation fighter in combat, nor can it survive and operate inside the advanced, integrated air defenses that some countries have today, and many more will have in the future. To defeat those networks, we need the capabilities the F-35 will bring. For the past two years, the program has remained steadily on track; now it needs stability . . . We cannot afford to mortgage the future of our Air Force and the defense of our Nation. Investment and modernization is not optional, and it is required to execute our core missions against a high-end threat in 2023.⁸⁰

Fifth-generation fighters possess significant capabilities, to include LO and advanced avionics, when compared to the legacy fourth-generation fighters. Most significantly is the fifth-generation fighter's ability to significantly reduce the enemy's capability of engaging American forces while enabling those forces' ability to engage theirs.⁸¹ Since 1991, the Air Force has reduced its fighter force through divestiture and attrition by 1,911 aircraft, to include 600 F-16s, 435 F-15s, and 205 A-10s.⁸² In addition, during that period the USAF divested completely in the A-7 Corsair II, F-4 Phantom, F-111 Aardvark, and the F-117 Nighthawk.⁸³ The CAF fighter force is the smallest it has been since post-WWII, with only 187 F-22s and 11 F-35s procured since the 1990s and facing an aging

⁷⁹ US Department of Defense, *Inventory and Funding Plan FY13-42*, 11.

⁸⁰ Welsh III, "The Strategic Choices and Management Group," 9.

⁸¹ Hostage, "CAF in the 2020s," 17.

⁸² Col (Ret) James Ruehrmund, Jr. and Christopher J. Bowie, *Arsenal of Airpower: USAF Aircraft Inventory 1950-2009* (Maxwell AFB, AL: Mitchell Institute Press, 2010), 23, 36-37; "2013 USAF Almanac," *Air Force Magazine* 96, no. 5 (May 2013): 45.

⁸³ Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 23, 36-37; "2013 USAF Almanac," 45.

fourth-generation fleet that will continue to be retired.⁸⁴ The acquisition of the F-35 is of such importance that Gen Hostage emphatically stated, “the programmed purchase of 1,763 F-35s is not a luxury; ***it is a national security imperative*** (emphasis in original).”⁸⁵

Conclusion

The emergence of A2/AD technologies proliferated around the world combined with the constrained domestic fiscal environment has defined the USAF’s CAF fighter force structure of the future. First, A2 advances in ballistic missile and cruise missiles will only increase, requiring rigorous and innovative strategic planning and procurement when considering the deployment of forces facing those threats whose range, accuracy, and destructive power continue to improve. Once in theater, while negating adversaries’ A2 capabilities, the CAF fighter force will be subject to the most significant technological advances in air defense: an IADS incorporating double-digit SAMs. The capabilities of these systems pose an extreme risk to legacy fourth-generation fighters, restricting their use to ranges that may be too far from the battle to be effective. Second, the fiscal environment of the future will remain volatile and susceptible to changing priorities that may affect force structure. To ensure the viability of the CAF fighter force, a delicate balance between recapitalization and modernization is ongoing with the realities of an aging fleet and an increasing need for the F-35 to remain competitive in and A2/AD environment.

⁸⁴ Welsh III, “The Strategic Choices and Management Group,” 5–6; “2013 USAF Almanac,” 32.

⁸⁵ Hostage, “CAF in the 2020s,” 18.

Chapter 3

The Application of Airpower in Iraq, 1991

Gulf lesson one is the value of air power . . . (it) was right on target from day one. The Gulf War taught us that we must retain combat superiority in the skies . . . Our air strikes were that the most effective, yet humane, in the history of warfare.

—President George H. W. Bush

The United States relies on the air force, and the air force has never been the decisive factor in the history of war.

—Saddam Hussein

Under the totalitarian rule of Saddam Hussein, Iraq became the dominant military power in Persian Gulf region following the eight-years long war with Iran from 1980-1988. His vision was of Iraq's preeminence in the Arab world, and as the premier leader began to demand the "withdrawal of US forces from the Gulf, claiming there no longer was any need for foreign presence in the region."¹ By the spring of 1990, Saddam Hussein fielded the third largest army and the sixth largest air force in the world, far surpassing the other militaries in the Gulf region.² The acquisition of such military strength, necessary to continue Iraq's war with Iran, came at a significant cost. Iraq's military investment resulted in financial indebtedness to many of the countries in the region, most notably the oil-rich Kingdom of Kuwait. Kuwait had loaned Iraq over \$40 billion during the course of the war and unlike many of the other Arab nations was demanding repayment of those loans.³ In the summer of 1990, Iraq and Kuwait attempted negotiations to settle financial obligations and territorial claims, but ultimately failed on 1 August 1990. The following day, Iraq invaded the sovereign nation of Kuwait

¹ US Department of Defense, *Conduct of the Persian Gulf War: Final Report to Congress* (Washington, DC: US Department of Defense, 1992), 4–5.

² James P. Coyne, *Airpower in the Gulf* (Arlington, VA: Aerospace Education Foundation, 1992), 14.

³ Coyne, *Airpower in the Gulf*, 15.

and in 24-hours Iraq's elite Republican Guard divisions were poised precariously on the border between Iraq and Saudi Arabia.⁴

Neither the Persian Gulf states nor the United States anticipated the Iraqi invasion. Both viewed the initial military buildup of Republican Guard divisions as a coercive measure by Saddam to bring about a favorable outcome in the negotiations with Kuwait.⁵ Though American military planning was primarily concerned with the possibility of war with the Soviet Union in Europe, contingency planning for regionalized conflicts—specifically involving Iraq—was in place by 1989. The general plan involved three phases; deter, defend, and execute a counteroffensive rolling back the aggressions of Iraq against Saudi Arabia.⁶ The initial draft operational plan for the defense of the Arabian Peninsula (OPLAN 1002-90) in the spring of 1990 would prove valuable in establishing a foundation of operations for what would later become Operations Desert Shield and Desert Storm.⁷

The specter of perceived failures during the Vietnam War was ever-present during the planning and execution of military operations and the discussions occurring in Congress about the US involvement in the Middle East. US Air Force historian Richard Hallion noted, “When critics of action in the Gulf spoke out over the fall and winter of 1990-1991 (particularly in Congress), they talked less in terms of the Gulf crisis itself and more in reference to Vietnam. Vietnam dominated the debate and was the yardstick by which the Gulf was measured. Would the military do better than . . . Vietnam? Would we become bogged down as in . . . Vietnam? Would the Gulf trigger massive antiwar protests as had . . . Vietnam? Would the Gulf war trigger casualties on the order of . . . Vietnam?”⁸ Even before the start of the 100-hour ground war, the fears of another Vietnam were quelled by the unmatched decisiveness of US and Coalition airpower, specifically shouldered by the efforts of the CAF fighter force.

⁴ Thomas A. Keaney and Eliot A. Cohen, *Revolution in Warfare? Air Power in the Persian Gulf* (Annapolis, MD: Naval Institute Press, 1995), 1.

⁵ Keaney and Cohen, *Revolution in Warfare?*, 1.

⁶ Alexander S. Cochran et al., “Part I: Planning,” in *Gulf War Air Power Survey: Volume I Planning and Command and Control* (Washington, DC: Office of the Secretary of the Air Force, 1993), 35.

⁷ Keaney and Cohen, *Revolution in Warfare?*, 2.

⁸ Richard Hallion, *Storm over Iraq: Air Power and the Gulf War*, Smithsonian History of Aviation Series (Washington, DC: Smithsonian Institution Press, 1992), 17.

This chapter comprises an examination of the conduct of the CAF fighter force against Iraq during Operations Desert Shield and Desert Storm to establish a baseline for analysis regarding potential future conflicts. First, the growth of the CAF fighter force during the Cold War enabled the decisive application of airpower in support of the national security objectives. Second, the Iraqi military's robust A2/AD capability proved influential in the conduct of operational planning and deployment considerations of US airpower. Finally, the means afforded to the US in the face of an Iraqi military wholly unprepared to counter the awesome power brought to bear by US airpower would prove decisive in the conduct of the war.

A New Generation of Fighters

On 8 August 1991, F-15C Eagles from the 71st Tactical Fighter Squadrons (TFS) completed an unprecedented 14-hour non-stop flight from their home station at Langley AFB to King Abdul Aziz Air Base (AB) in Saudi Arabia, a major event signifying the US commitment to security of the Arabian Peninsula.⁹ The F-15C, its sibling the F-15E Strike Eagle, F-16, and A-10 were all conceived in the light of the bitter lessons learned during the air campaigns of the Vietnam War. The devastating effect on the CAF fighter force caused by North Vietnamese aircraft and SAM A2 capabilities described previously served as the catalyst for modernization to increase lethality, maneuverability, and survivability. Leading the USAF were the fighter pilots who flew in the largely fighter and attack aircraft war and felt the brunt of the North Vietnamese A2 capabilities. According to Richard Hallion, "Those air force leaders whose formative experiences had been in the great European and Pacific bomber offensives of the Second World War were moving on, and soon to disappear entirely. In their place stepped a new leadership tempered in fighter cockpits in Korean and Southeast Asian skies."¹⁰

The New Guard leadership of fighter pilots saw the terrible price of conducting air operations against the more agile MiG-17s and MiG-21s. Over the course of the Vietnam War, the CAF fighter force only was able to amass a kill ratio of 2.41 MiGs per US fighter loss. In contrast, the kill ratio for the US fighters was 8 to 1 during World

⁹ Coyne, *Airpower in the Gulf*, 16–17; Hallion, *Storm over Iraq*, 136.

¹⁰ Richard Hallion P., "U.S. Air Power," in *Global Air Power*, ed. John Andreas Olsen, 1st ed (Washington, DC: Potomac Books, 2011), 102.

War II and 10 to 1 during the Korean War.¹¹ The Air Force implemented changes in tactics and training to help offset the MiGs performance advantages, but these were too late and too little to have significant impact during the war. Nonetheless, during the post-Vietnam era the Air Force committed itself to partially countering opposing technological enhancements with routine institutional tactics and training development at the Tactical Fighter Weapons Center at Nellis AFB, Nevada. Experienced pilots were vastly more effective in combat, and so the “Red Flag” exercise was created to expose aircrews to the intensities and dangers of war in a training environment to eliminate the “beginner syndrome” in air combat.¹² Still, the most important response to the low victory-to-loss rate experienced during Vietnam was the paradigm shift that occurred in fighter aircraft development.

The prevailing acquisition paradigm of fighter aircraft in the 1950s and 1960s was one of bigger, faster, heavier, more complex “aircraft with the intended purposes of nuclear weapons delivery and air defense against Soviet nuclear bombers.”¹³ The lessons, and losses suffered, by the less-maneuverable century-series and F-4 Phantom II fighters in Vietnam stimulated research and development into aircraft possessing high thrust-to-weight ratios, excellent maneuverability and visibility, and advanced avionics. Additional motivation for fighter advancement came during the unveiling of the Soviet’s “next generation” of aircraft at the 1967 Tushino Air show outside of Moscow.¹⁴ These aircraft included a prototype of the MiG-23 super-sonic bomber and the Mach 3+ MiG 25 high-altitude interceptor.¹⁵ The two-decades long fighter development stagnation in the US resulted in a fighter force that was becoming evenly matched and even susceptible to losing dominance in the air. An ambitious group, dubbed the “Fighter Mafia,” would lead fighter development during the late-1960s and early-1970s that would result in the F-15 and F-16.¹⁶

The “Fighter Mafia,” whose members included noted advocates Maj John Boyd

¹¹ Richard Hallion P., “A Troubling Past: Air Force Fighter Acquisition since 1945,” *Air & Space Power Journal* 4, no. 6 (Winter 1990): 7.

¹² Hallion, *Storm over Iraq*, 31–32.

¹³ Hallion, *Storm over Iraq*, 35.

¹⁴ Hallion, “A Troubling Past,” 7.

¹⁵ Hallion, *Storm over Iraq*, 37.

¹⁶ Hallion, *Storm over Iraq*, 38.

and Maj John M. “Mike” Loh, gained initial support from the work of Maj Gen Arthur C. Agan’s study promoting a force comprised of maneuverable, agile-fighters carrying both missiles and an internal gun (which was originally lacking in the F-4).¹⁷ Under the endorsement of then CSAF Gen John P. McConnell, the Fighter Mafia reshaped the original design requirements of the next generation F-X fighter program.¹⁸ Boyd and his colleagues summarily rejected the original F-X design calling for a 60,000+ pound, Mach 2.7 fighter that only possessed a thrust-to-weight ratio of 0.75. The group formulated the design, influenced by Boyd’s vision of what the F-X should be, of a true front-line fighter to surpass the capabilities of the F-4.¹⁹ The outcome of their work was the lighter, energy-efficient, advanced air-superiority fighter—the McDonnell Douglas F-15.²⁰ By October 1968 the F-15 design was selected in the F-X program and by April 1971 the aircraft had passed its critical flight review. Tactical Air Command received delivery of the first production F-15 in 1974 and achieved initial operational capability in September 1975, only seven years after program inception.²¹

Even prior to the first flight of the F-15, some members of the Fighter Mafia were concerned that the aircraft was “just another big fast sled, and were ardently championing instead a lighter, single-engine, even more agile, and less-than-Mach-2 air superiority fighter.”²² In February 1972, Boyd and Loh released a request for proposal to five of the leading aircraft manufactures for designs of a next-generation lightweight fighter (LWF). By April 1972, the Air Force awarded development contracts for the General Dynamics YF-16 and the Northrop YF-17 LWF prototypes.²³ After six months of intense comparative testing, the Air Force declared the YF-16 the winner on 13 January 1975. The first flight of a production model F-16A occurred during the winter of 1976, followed by the activation of the first Air Force squadron in January 1979, similarly only seven years after the initial call for proposals.²⁴ Of note, the YF-17 would live on in

¹⁷ Hallion, *Storm over Iraq*, 38.

¹⁸ Hallion, *Storm over Iraq*, 38.

¹⁹ Hallion, “A Troubling Past,” 8.

²⁰ Hallion, “A Troubling Past,” 8.

²¹ Hallion, “A Troubling Past,” 8; Hallion, *Storm over Iraq*, 40–41.

²² Hallion, *Storm over Iraq*, 41.

²³ Hallion, “A Troubling Past,” 9.

²⁴ Hallion, *Storm over Iraq*, 42–43.

service with the Navy and the Marine Corps in the form of the F/A-18 Hornet.

Air Force historian Richard Hallion describes what made these “fourth generation” aircraft so successful as compared to their predecessors, stating:

First and foremost, it was the climate of hard, pragmatic thought from which they sprang—thought rooted in the combat experience of Europe, the Pacific, MiG Alley, North Vietnam, and the Middle East—couple [*sic*] with insightful appreciation of how future warfare was likely to evolve and what contemporary and future technology could realistically offer. As for the airplanes themselves, they were successful because they offered a package of attributes rather than overemphasizing any one quality such as speed. The advantages that these aircraft possessed reflected the shrewd application of available technology. These advantages included extraordinary agility, superlative handling qualities, sophisticated user-friendly avionics, greatly improved reliability and maintainability, intensive incorporation of human-factor considerations, enhanced flight safety, and unprecedented weapons accuracy. In addition, they had the ability to be configured for both air-to-air and air-to-ground missions and to carry a variety of weapons. Finally, they had an innate ability to be adapted for a variety of other roles.²⁵

As the acquisition of the F-15 and F-16 was occurring, the Air Force was developing a new type of low-observable aircraft capable of operating with impunity amongst the A2 capabilities, presumed to be present in any future conflict. The effectiveness of advanced SAMs, shown during the Vietnam War and the 1973 Arab-Israeli conflict, hampering US efforts in achieving air dominance prioritized the research and design of the first stealth aircraft—the F-117.²⁶

The research and development of the application of low-observable technologies in the design of fighter aircraft began as early as the mid-1970s. The proliferation of advanced Soviet Union A2 capabilities to its client states led to US efforts to reduce the radar cross section (RCS) of aircraft to decrease detection and increase survivability against those Soviet systems.²⁷ In 1975, Lockheed Martin’s Skunk Works began the research and development of a low-observable (“stealth”) strike aircraft. By 1981,

²⁵ Hallion, “A Troubling Past,” 9–10.

²⁶ Grant, “Losing Air Dominance,” 7.

²⁷ Vickers and Martinage, *Revolution in Warfare*, 24.

Lockheed had produced the F-117 and conducted successful test flights under the cover of darkness due to the sensitive nature of the classified program. Continuing in its covert roots, the F-117 entered service in 1983 and the Air Force only officially acknowledged the aircraft's existence in 1988.²⁸ First seeing action in 1989 during Operation Just Cause in Panama, it was not until Operation Desert Storm where the world was witness to the F-117s awesome capabilities of stealth and precision engagement.²⁹

Budget and Force Structure

As was seen in the years following World War II, the years that followed Vietnam were characterized by a reduction in funding for all the services. The Air Force budget historically, since its inception, has risen and fallen with the fluctuations of the overall DOD budget [Figure 8].³⁰

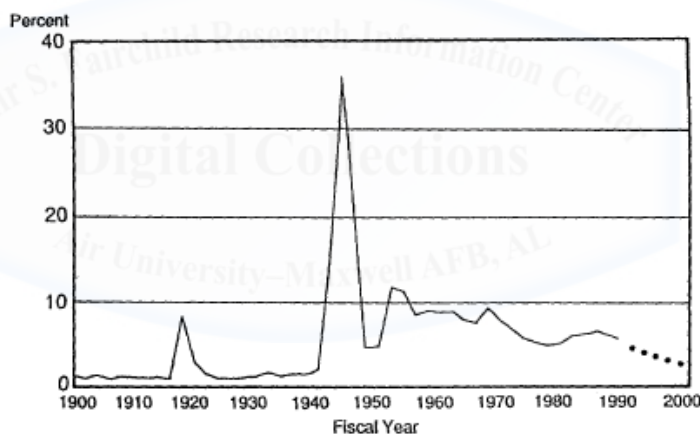


Figure 8: US Defense Spending as a Percentage of Gross National Product (GNP)

Source: Brig Gen Lawrence P. Farrell, Jr., "Balancing Budgetary and Force Constraints," in The Future of Air Power in the Aftermath of the Gulf War, ed. Robert L. Pfaltzgraff and Richard H. Shultz (Maxwell AFB, AL: Air University Press, 1992), 274.

The upward deviation in downward trend occurring between FY67 and FY69 was

²⁸ Vickers and Martinage, *Revolution in Warfare*, 25.

²⁹ Vickers and Martinage, *Revolution in Warfare*, 25; Keaney and Cohen, *Revolution in Warfare?*, 189–91.

³⁰ Brig Gen Lawrence P. Farrell, Jr., "Balancing Budgetary and Force Constraints," in *The Future of Air Power in the Aftermath of the Gulf War*, ed. Robert L. Pfaltzgraff and Richard H. Shultz (Maxwell AFB, AL: Air University Press, 1992), 274.

a result of increased spending during the Vietnam War but the downturn that followed led to the lowest levels of defense spending since before the Second World War. During the first half of the 1980s, President Ronald Reagan’s administration increased defense spending to correct the deficiencies of the “hollow force” that resulted from the “decade of neglect” during the 1970s.³¹

For Air Force planners, the vacillation in the service’s allocated budget proved difficult in efficiently executing recapitalization and modernization strategies [Figure 9].³² As of 2010, the overall DOD budget has invested “approximately \$9 trillion dollars in land-based and space power since 1950—an average of \$146 billion per year.”³³ Strategic investment in the US nuclear arsenal, to include bombers and tankers, exceeds the per year average during the 1950s and 1960s. The Air Force’s budgetary lean-years following the Vietnam War resulted in deficiencies in spare aircraft, training, and aircraft mission capable rates at all-time lowest levels.³⁴ With seemingly no other choice, by the second half of the 1970s, the Air Force began to modernize the CAF fighter force despite the strict fiscal environment.

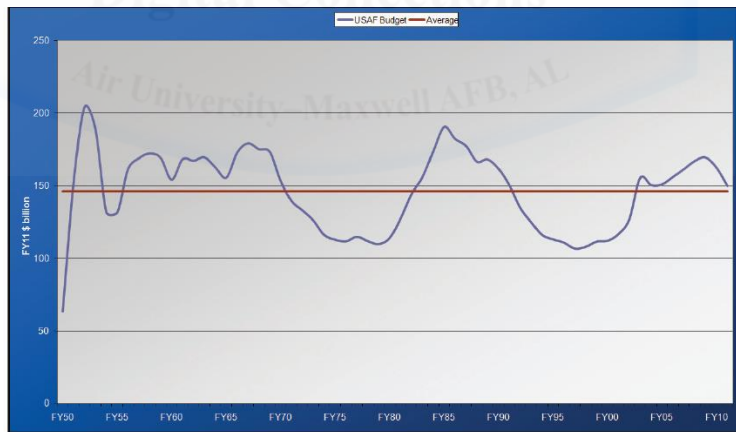


Figure 9: USAF Budget Oscillation over Time

Source: Col (Ret) James Ruehrmund, Jr. and Christopher J. Bowie, Arsenal of Airpower: USAF Aircraft Inventory 1950-2009 (Maxwell AFB, AL: Mitchell Institute Press, 2010), 6.

³¹ Farrell, Jr., “Balancing Budgetary and Force Constraints,” 264–66.

³² Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 6.

³³ Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 6.

³⁴ Farrell, Jr., “Balancing Budgetary and Force Constraints,” 266.

Beginning in 1974, the modernizing CAF fighter force would eventually possess 585 F-15s, 386 A-10s, and 156 F-16s.³⁵ Bolstering the CAF fighter force was the continued operation of 1,376 F-4s, 371 A-7s, 105 F-5s, and over 800 century-series aircraft. By the end of the “decade of neglect”, the CAF possessed a force comprised of 3,684 aircraft with over 70 percent of the fleet introduced into the Air Force inventory in the 1950s and 1960s.³⁶ Under the increased defense spending of the Reagan administration, the Air Force further modernized the CAF fighter force with increased purchases of F-15s, F-16s, A-10s, and F-117s [Figure 10].³⁷ Additionally, the Air Force increased the retirement of the Vietnam-era century series aircraft—the F-100, F-101, F-102, F-103, F-104, and F-105—that would be incapable of facing advanced A2 threats being proliferated around the world.

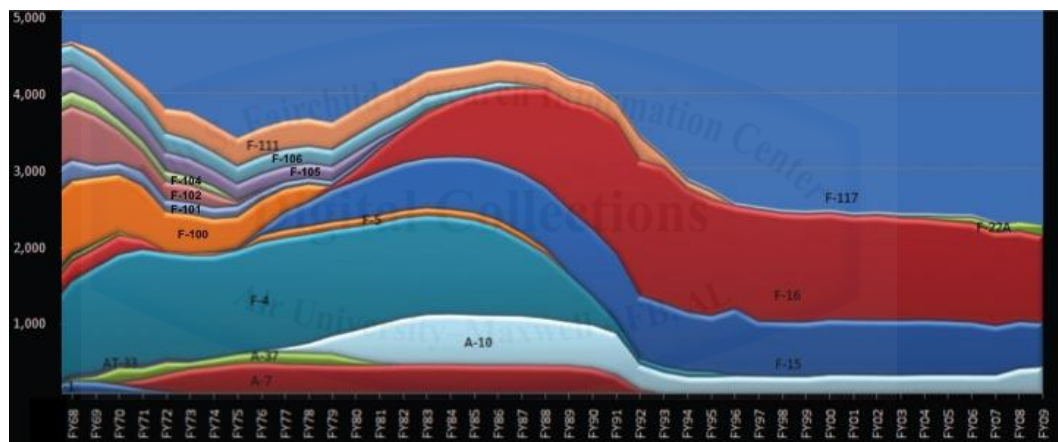


Figure 10: USAF Fighter Force Composition FY68-FY09

Source: Ruehrmund, Jr. and Bowie, Arsenal of Airpower, 8.

The vacillation in defense spending would occur again during the second half of the 1980s, as shown by Figure 9, thereby prompting a reaction by the Air Force. The response was the delaying of long-range research and development in favor of continuing modernization while the budget remained above the historical average.³⁸ The CAF

³⁵ Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 33–35.

³⁶ Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 33–35.

³⁷ Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 8.

³⁸ Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 6; Farrell, Jr., “Balancing Budgetary and Force Constraints,” 268.

fighter force structure was able to reach a stable force posture by the early 1990s and “was able to maintain that level by living off the fruits of the Reagan buildup.”³⁹ In fact, the CAF was able to exceed procurement projections originally made during the pessimistic fiscal environment of the 1970s [Table 4].⁴⁰

Table 4: Procurement Quantities: Plans Versus Reality, Selected Programs

Program	Procurement Quantities	
	Total Planned in FY76	Actual Through FY92
F-15 ^a	729	1083
F-16	650 ^b	1985 ^c
A-10	733 ^d	707

^aIncludes F-15 A/B/C/D/E models

^bConsidered subject to revision upward during the life of the airframe

^cLimited procurement after FY92

^dGoal revised upward to 825 FY81; reduced to 687 FY82

Source: Adapted from Kevin N. Lewis, Planning Future U.S. Fighter Forces (Santa Monica, CA: RAND, 1993), 43.

The investment that began with the first acquisition of the F-15A in 1974 was fully repaid with the performance of the CAF fighter force during Operation Desert Storm, demonstrating clearly “the importance of air power [sic] in modern conflict.”⁴¹ The force, incorporating the most modern aircraft in the world and upgraded aircraft battle-tested in Vietnam, provided the US with a flexible, responsive, and lethal capability needed to underwrite national security. On the eve of US involvement in the Middle East, the CAF fighter force was comprised of 4,134 aircraft, including: 335 A-7s; 572 A-10s; 390 F-4s; 890 F-15s; 1,613 F-16s; 286 F-111s; and, 48 F-117s.⁴² Planners preparing to bring US airpower to bear on the Iraqi military in 1990 were able to draw upon a fighter force more than 200 percent larger than the CAF fighter force in service today.⁴³

³⁹ Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 6.

⁴⁰ Kevin N. Lewis, *Planning Future U.S. Fighter Forces* (Santa Monica, CA: RAND, 1993), 43.

⁴¹ Farrell, Jr., “Balancing Budgetary and Force Constraints,” 274.

⁴² Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 36–37.

⁴³ “2013 USAF Almanac,” 45. Current CAF fighter force is comprised of 2,025 aircraft.

Road to War

The collapse of the Soviet Union created a tumultuous change in the national security environment for the United States. The National Security Strategy (NSS) of 1990 attempted to account for the reality of the changes occurring in Eastern Europe, but was cautious in response to the change at the time of the report's publication in March of that year.⁴⁴ But foreshadowing of the need for US involvement in the Middle East was clear in the 1990 NSS as “the Middle East is a vivid example, however, of a region in which, even as East-West tensions diminish, American strategic concerns remain. Threats to our interests—including the security of Israel and moderate Arab states as well as the free flow of oil—come from a variety of sources . . . The necessity to defend our interests will continue.”⁴⁵ As US political and military institutions were continuing to evaluate the changing nature of the strategic environment, Saddam Hussein had set a vision of securing regional hegemony amongst the Arab states.

Beginning in the 1970s and into the 1980s, Saddam Hussein attained a substantial military capability from the purchase of arms from the Soviet Union and France. These purchases, using the profits from oil sales, emboldened his self-perceived position as a competent military leader who only attained the rank of general because of an honorary degree from Iraq's military college.⁴⁶ In 1980, Saddam invaded Iran which resulted in an eight-year war of attrition, where Iraq's deficient capability to employ or counter airpower was highlighted as a strategic failure. Undaunted, Saddam began to rebuild the Iraq military immediately following the Iraq-Iran War to support his vision of uniting “the Arabs by first conquering some Arab states and then persuading the others to join him in a Pan-Arab Union.”⁴⁷ During the summer of 1990, Saddam elevated his commitment to his vision, going from bellicose rhetoric against Kuwait and the United Arab Emirates of “complicity with the United States to cheat on oil production quotas” to

⁴⁴ Don M. Snider, *The National Security Strategy: Documenting Strategic Vision* (Carlisle, Pa: Strategic Studies Institute, U.S. Army War College, March 15, 1995), 7–8.

⁴⁵ George H.W. Bush, *1990 National Security Strategy* (Washington, DC: The White House, 1990), 13.

⁴⁶ Coyne, *Airpower in the Gulf*, 13.

⁴⁷ Coyne, *Airpower in the Gulf*, 14.

action in the early morning invasion on 2 August 1990.⁴⁸

On 5 August 1991, 72 hours before US F-15Cs would land in Saudi Arabia in defense of the Arabian Peninsula, President Bush outlined “the US national policy objectives: Immediate, complete, and unconditional withdrawal of all Iraqi forces from Kuwait; Restoration of Kuwait’s legitimate government; Security and stability of Saudi Arabia and the Persian Gulf; and Safety and protection of the lives of American citizens abroad.”⁴⁹ Of immediate concern was the precarious positioning of the Iraqi military on the border with Saudi Arabia. Those forces, without warning, could possibly seize valuable oil fields and ports placing 20 percent of the world’s oil reserves at risk.⁵⁰ As swiftly as the Bush administration was able to put together an international coalition, US airpower quickly deployed to the region to establish the first line of defense in what would become Operation Desert Shield.

Auspiciously, during the fall of 1989, the DOD began to look at the scenario of Kuwait and Saudi Arabia from a “nation from the north.”⁵¹ During the 1980s, political and military planners saw the Soviet Union as the dominant threat to US security interests in the Persian Gulf region. By the end of the decade, planning at Central Command (CENTCOM), under the direction of the Chairman of the Joint Chiefs of Staff in the fall of 1989, transitioned toward a regional threat in the Middle East. CENTCOM tested and re-evaluated its plan during the spring and summer of 1990 during Exercise Internal Look, due to concerns over Saddam Hussein’s intentions in the region.⁵² “The exercise validated tactical concepts, logistics plans, and force requirements. The lessons learned served as a basis for subsequent deployments and operations during Operation Desert Shield.”⁵³ The air campaign against Iraq during Desert Shield would come from the efforts of Col John Warden and his Checkmate planning group at the Pentagon and the simultaneous efforts being completed by Lt Gen Charles Horner’s Central Command Air

⁴⁸ US Department of Defense, *Conduct of the Persian Gulf War*, 5; Coyne, *Airpower in the Gulf*, 16.

⁴⁹ US Department of Defense, *Conduct of the Persian Gulf War*, 19.

⁵⁰ US Department of Defense, *Conduct of the Persian Gulf War*, 19; Hallion, *Storm over Iraq*, 135.

⁵¹ Coyne, *Airpower in the Gulf*, 16.

⁵² US Department of Defense, *Conduct of the Persian Gulf War*, 33.

⁵³ US Department of Defense, *Conduct of the Persian Gulf War*, 33.

Forces (CENTAF) staff.⁵⁴ As in any planning process, one of the first tasks was to understand the character and composition of the enemy.

Iraqi Threat to Air Operations

US air planners faced an adversary that possessed one of the largest armies in the world, but more importantly an air defense force organized, trained, and equipped by Soviet material and doctrine. Above all other countries, Iraq's "air operations drew heavily upon Soviet-style integrated air defense management, with a controlled network of SAMs, antiaircraft artillery, and fighters."⁵⁵ In addition to the threat of Iraq's formidable A2 capability, Saddam Hussein's surface-to-surface missile (SSM) arsenal could place theater deployment and regional operations at risk.

The Iraqis had the basic variant of the Soviet-made Scud missile, plus two indigenous variants, by the summer of 1990. The Al-Hussein (Al-Husyan) had a maximum effective range of 600 km and the Al-Hijarah's maximum effective range was 750 km.⁵⁶ Each of these single-stage, single-warhead SSMs could be configured with conventional explosives or unitary and binary nerve agents.⁵⁷ These modified Scud missiles were also capable of both fixed and mobile-deployed launch operations from standard and Iraqi-built transporter-erector launchers.⁵⁸ By February of 1990, US intelligence sources located the construction of missile launcher complexes in the desert of western Iraq.⁵⁹ Assuming the use of the Al-Hussein missile, analysts determined that the 600 km flight profile of the SSM would put the key Israeli cities of Jerusalem, Tel Aviv, and Haifa at risk [Figure 11].⁶⁰ Additionally, from launch areas in southern Iraq, the Al-Hussein missile was in range of key installations and cities in northeastern Saudi

⁵⁴ John Andreas Olsen, *John Warden and the Renaissance of American Air Power*, 1st ed (Washington, DC: Potomac Books, 2007), 181–82; Tom Clancy, *Every Man a Tiger* (New York: Putnam, 1999), 265–77.

⁵⁵ Hallion, *Storm over Iraq*, 128.

⁵⁶ US Department of Defense, *Conduct of the Persian Gulf War*, 13.

⁵⁷ US Department of Defense, *Conduct of the Persian Gulf War*, 14.

⁵⁸ US Department of Defense, *Conduct of the Persian Gulf War*, 13.

⁵⁹ US Department of Defense, *Conduct of the Persian Gulf War*, 14–15.

⁶⁰ US Department of Defense, "Information Paper: Iraq's Scud Ballistic Missiles" (Department of Defense, July 25, 2000),

<http://www.iraqwatch.org/government/US/Pentagon/dodscud.htm> (accessed 11 February 2014).

Arabia. Ominously, Saddam Hussein demonstrated his willingness to use SSMs and chemical agents during the Iran-Iraq War. The Iraqis fired over 200 Al-Hussein missiles over a three-month period during the “War of the Cities” between Baghdad and Tehran in 1988.⁶¹



Figure 11: Al-Hussein Surface-to-Surface Area of Influence 1990-1991

Source: US Department of Defense, “Information Paper: Iraq’s Scud Ballistic Missiles” (Department of Defense, July 25, 2000), <http://www.iraqwatch.org/government/US/Pentagon/dodscud.htm>

The weapons proved to be of greater psychological effect against the civilian population than as discrete military-value weapons due to the approximately 3,000 meter circular error of probability (CEP) of the modified Scud missiles. Despite the missiles’ relative inaccuracy and small payload, they were a formidable threat. Planners estimated that Iraq possessed over 600 SSMs—a number that would be closer to 1,000—and that “they were more of a terrorist weapon against cities than a serious threat to military forces.”⁶² The concern from the President down to the US air planners was that every effort “should be made to ‘preclude’ missile strikes against Israel, Saudi Arabia, and

⁶¹ US Department of Defense, *Conduct of the Persian Gulf War*, 13.

⁶² Cochran et al., “GWAPS Vol. I: Part I Planning,” 167.

other countries in the region, as well as attacks on coalition military forces.”⁶³ A primary concern of missile attacks against Israel, specifically, was due to the concern of an Israeli retaliation dissolving the cohesiveness of the coalition that included Arab nations in the region.⁶⁴ Complementing Iraq’s AD ballistic missile capability was a numerically robust A2 threat comprised of fighter aircraft supporting a modern IADS.

The Iraqi Air Force (IAF) projected a significant threat on paper, but US intelligence agencies and planners knew the numbers were not reflective of their true character. The IAF possessed over 700 fighter, attack, reconnaissance, and bomber aircraft that could provide air defense or conduct limited offensive air operations [Table 5].⁶⁵

Table 5: Iraq Aircraft Inventory 1990-1991 with A2 Capability

Category	Type	Number ^a
Attack	J-6 Farmer	30
	MiG-23 Flogger	95
	Mirage F1	90
	Su-7 Fitter-A	30
	Su-20/22 Fitter	70
	Su-25 Frogfoot	60
	Su-24 Fencer	25
Fighters	J-7 Fishbed	40
	MiG-21 Fishbed	150
	MiG-25 Foxbat	32
	MiG-29 Fulcrum	30
Bombers	Tu-22 Binder	16
	Tu-16 Badger	4

^aVariations remain among the unclassified estimates of Iraq’s major weapons systems at the start of the Gulf War.

Source: Adapted from Tim Ripley, “Desert Storm: The Air War-20 Years On,” *Air Forces Monthly*, April 2011, 54

Of these major platforms, 323 could conduct all-weather fighter operations while 140 fighters were limited to daytime, visual flight rules (VFR) only.⁶⁶ The IAF’s failure to

⁶³ Cochran et al., “GWAPS Vol. I: Part I Planning,” 165.

⁶⁴ Cochran et al., “GWAPS Vol. I: Part I Planning,” 119.

⁶⁵ Coyne, *Airpower in the Gulf*, 19–20; Tim Ripley, “Desert Storm: The Air War-20 Years On,” *Air Forces Monthly*, April 2011, 54.

⁶⁶ Cochran et al., “GWAPS Vol. I: Part I Planning,” 207.

play a decisive role during the eight-year war with Iran did not limit Saddam Hussein's significant acquisition of more advanced French F-1s and MiG-29s. Iraq suffered significant losses in pilots and aircraft during the previous war, and was now placing great responsibility of "significantly more complex equipment" in the hands of inexperienced pilots.⁶⁷

IAF's performance during the Iran-Iraq war showed that "fewer than half of these aircraft were either third generation (comparable to the US F-4) or fourth, and were flown by pilots of marginal quality."⁶⁸ Compared to the quality of training and equipment of US CAF fighters, the IAF was significantly outmatched. The IAF Soviet-based centralized control of fighters further limited the potential full use of the aircraft's capabilities. In the Iran-Iraq War's air-to-air arena, IAF pilots were more concerned for the preservation of their forces than over the destruction of the Iranian fighters. US intelligence analysts noted that when Iranian fighters would lock on with the radars, this action "generally would cause Iraqi pilots conducting offensive counter air missions to abort their missions."⁶⁹ In a paper prepared for Chairman, Joint Chiefs of Staff Gen Colin Powell by the Defense Intelligence Agency, the IAF was characterized as "unable to defend its airspace from a coalition attack and would be either neutralized quickly in the air or would choose to withhold its aircraft from action in hardened shelters."⁷⁰ The greatest challenge for planners was the threat of the Iraqi IADS using Soviet-made SAMs.

Iraq's *Kari* (Iraq spelled backwards in French) air defense network was "formidable, combining the best features of several systems."⁷¹ Iraq followed the Soviet model that included redundant layers and communication networks with early warning, acquisition, and tracking radars designed to direct fighter, SAM, and anti-aircraft artillery

⁶⁷ Barry D. Watts, "Part I: Operations," in *Gulf War Air Power Survey: Volume II Operations and Effects and Effectiveness* (Washington, DC: US Government Printing Office, 1993), 75.

⁶⁸ US Department of Defense, *Conduct of the Persian Gulf War*, 11.

⁶⁹ US Department of Defense, *Conduct of the Persian Gulf War*, 11.

⁷⁰ Cochran et al., "GWAPS Vol. I: Part I Planning," 206.

⁷¹ US Department of Defense, *Conduct of the Persian Gulf War*, 12; Barry D. Watts and Thomas A. Keaney, "Part II: Effects and Effectiveness," in *Gulf War Air Power Survey: Volume II Operations and Effects and Effectiveness* (Washington, DC: US Government Printing Office, 1993), 130.

(AAA) engagements.⁷² According to Hallion, the capital city of Baghdad alone possessed “seven times the density of defenses as Hanoi had during Linebacker II and defenses denser than the most heavily defended Eastern European target at the height of the Cold War.”⁷³ In the wake of the Israeli raid on the Osirak nuclear reactor in 1981, Saddam upgraded the Kari system and fortified air defenses of the industrial and strategic centers around Baghdad and other locations around Iraq.⁷⁴ A national Air Defense Operations Center (ADOC), located in Baghdad, controlled the entire Kari system. The ADOC established priorities for air defense engagements and directed the operations of the five geographically aligned sector operations centers (SOCs) [Figure 12].⁷⁵ The modernized computer-based system linked and integrated the Soviet and Western radars and weapon systems, providing redundancy to the Iraqi command and control system.⁷⁶

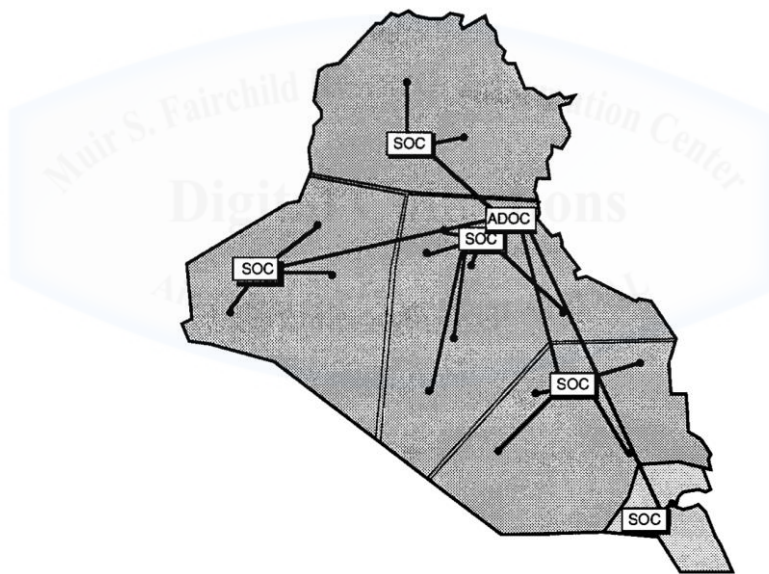


Figure 12: Iraqi IADS Command and Control

Source: James A. Winnefeld, *A League of Airmen: U.S. Air Power in the Gulf War*, Project Air Force (Santa Monica, CA: Rand, 1994), 297.

⁷² Coyne, *Airpower in the Gulf*, 20.

⁷³ Hallion, *Storm over Iraq*, 169; US Department of Defense, *Conduct of the Persian Gulf War*, 12.

⁷⁴ US Department of Defense, *Conduct of the Persian Gulf War*, 12.

⁷⁵ James A. Winnefeld, Preston Niblack, and Dana J. Johnson, *A League of Airmen: U.S. Air Power in the Gulf War*, Project Air Force (Santa Monica, CA: RAND, 1994), 297.

⁷⁶ US Department of Defense, *Conduct of the Persian Gulf War*, 12.

The Iraqi forces possessed an impressive quantity of AAA pieces and SAMs. The Iraqi Kari system had at its disposal approximately 7,000 AAA pieces; 9,000 infra-guided missiles; and 7,000 radar-guided missiles.⁷⁷ AAA protected specific locations, even deployed onto the roofs of many building in and around Baghdad. Types of AAA ranged from 14.5-mm, 23-mm, 37-mm, 57-mm, and the self-propelled ZSU-23-4 and ZSU-57-2 creating the backbone of the IADS low-altitude defense structure.⁷⁸ Additionally, the Iraqi compliment of infrared missiles supported the AAA defense of the low altitude environment. These included the SA-7 Grail, SA-8 Gecko, SA-9 Gaskin, SA-13 Gopher, SA-14 Gremlins, and SA-16 Gimlet missiles systems. Finally, strategic SAMs of the SA-2, SA-4, SA-6, and Roland SAM systems were responsible for defense against medium- and high-altitude enemy operations.⁷⁹ While numerous, the Iraqi IADS strategic SAMs were capable of limited coverage in dense pockets around strategic, high-value areas [Figure 13].⁸⁰

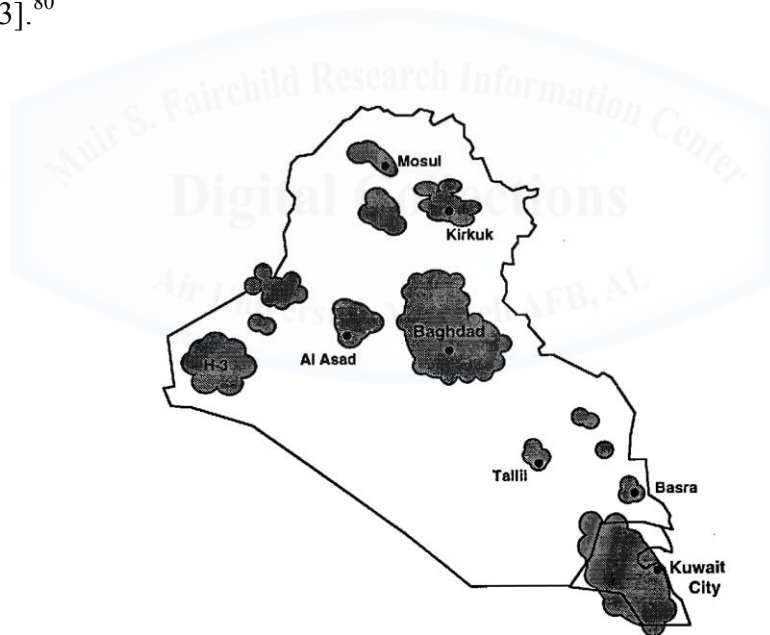


Figure 13: Iraq Radar-Guided SAM Coverage Prior to Desert Storm

Source: Watts and Keaney, "GWAPS Vol. II: Part II Effects," 134.

US planners understood the importance of the Iraqi IADS to Saddam's strategic defense

⁷⁷ Winnefeld, Niblack, and Johnson, *A League of Airmen*, 118.

⁷⁸ US Department of Defense, *Conduct of the Persian Gulf War*, 12.

⁷⁹ US Department of Defense, *Conduct of the Persian Gulf War*, 12.

⁸⁰ Watts and Keaney, "GWAPS Vol. II: Part II Effects," 134.

against outside aggression. The defense of Iraq during the Iran-Iraq war relied heavily on the IADS, and again military leaders in Baghdad would rely primarily on the ground-based air defenses, and not their fighters who demonstrated limited capability (or willingness) to engage the enemy.⁸¹ Though Saddam was confident in the IADS capability to defeat US air operations, the Kari system could not deal with the aerial armada that soon would saturate and defeat it. The systems design was for dealing with small-sized raids from Israel in the East or Iran in the West, thereby creating exploitable gaps in coverage for operations from the North or South that US fighters took full advantage of during Desert Storm.⁸²

US CAF Fighter Response

Due to the precarious disposition of Iraqi forces in Kuwait poised to cross over the border into Saudi Arabia, President Bush and the Joint Chiefs of Staff knew that air power was the only force capable of dealing with the immediate threat early in the crisis.⁸³ The 24 F-15s landing on 8 August 1991 in support of the defense of the Arabian Peninsula represented just the beginning of what would become the largest mobilization of US air power since World War II.⁸⁴ By the end of the first week after initial deployment, there were 112 CAF fighters conducting defensive combat air patrols and preparing for the arrival of follow-on forces to build the presence in the Gulf region [Table 6].⁸⁵ In total before the start of the Desert Storm on 17 January 1991 the CAF fighter force alone exceeded the IAFs all-weather and VFR-only fighter capability. Critically, US fighter forces benefited from the previous efforts by CENTCOM and CENTAF in securing basing rights, specifically in Saudi Arabia, and the storage over more than “\$1 billion worth of fuel, ammunition, and equipment in Oman.”⁸⁶

⁸¹ Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 130.

⁸² Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 134.

⁸³ Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 73.

⁸⁴ Clancy, *Every Man a Tiger*, 303.

⁸⁵ Keaney and Cohen, *Revolution in Warfare?*, 238–39.

⁸⁶ Coyne, *Airpower in the Gulf*, 15; Winnefeld, Niblack, and Johnson, *A League of Airmen*, 47–48.

Table 6: CENTAF Fighter Aircraft Strength (Selected Dates)

Date	A-10	F-4G	F-15	F-15E	F-16	F-111	EF-111	F-117	Total
8-Aug-90	0	0	24	0	0	0	0	0	24
15-Aug-90	0	0	46	22	44	0	0	0	112
4-Sep-90	96	24	72	24	120	32	10	18	396
25-Dec-90	102	36	96	28	120	64	18	36	500
1-Jan-91	120	48	96	46	168	64	18	36	596
17-Jan-91	144	48	96	48	208	64	18	36	662
24-Feb-91	146	49	96	48	215	66	20	36	676

Source: Adapted from Keaney and Eliot A. Cohen, Revolution in Warfare?, 238–39.

Beside the Iraqi forces that the fighters were going to face, operations had to deal with another significant challenge in the region—the size of the operational environment. Saudi Arabia, Iraq, and the surrounding countries of interest encompassed a landmass roughly half the size of the United States that would cover an area from the Dakotas in the North to Florida in the South. Laterally, the region would stretch from the Carolinas to Colorado [Figure 14].⁸⁷

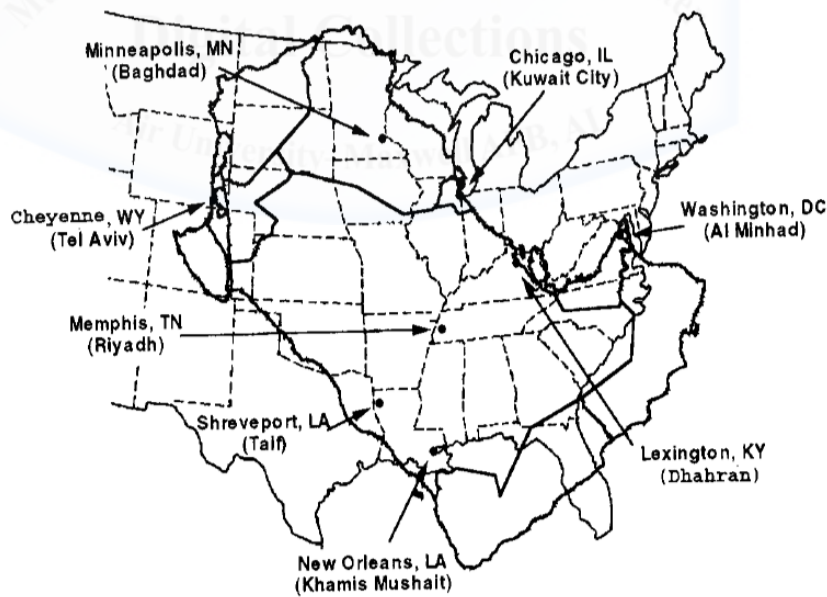


Figure 14: Relative Distances of the Area of Operations

Source: Thomas A. Keaney and Eliot A. Cohen, Revolution in Warfare? Air Power in the Persian Gulf (Annapolis, MD: Naval Institute Press, 1995), 142.

⁸⁷ Keaney and Cohen, *Revolution in Warfare?*, 142; Winnefeld, Niblack, and Johnson, *A League of Airmen*, 294.

As a result, F-117s operating from the southeast corner of Saudi Arabia traveled a distance of over 665 nm to reach the southern border of Iraq, while F-111s and their electronic-jamming sibling the EF-111 were 525 nm from the border at Al Taif [Figure 15]⁸⁸. F-16s operating from the United Arab Emirates faced a 528 nm flight. Other assets were located closer to the Iraqi border, such as the F-15s at Tabuk, Al Karj, and Dharan, and air operations usually involved force packaging of multiple assets to provide air superiority, suppression of enemy air defense, and surface attack capabilities.⁸⁹ This required the forces to marshal near the north center of Saudi Arabia to receive fuel from aerial tankers, and then push forward in mass to bring air power to bear upon the Iraqi military.⁹⁰ This tactic extended travel distances and times that crews would be airborne, but provided the best means to decisively bring all enabling forces deployed to best assure mission success.

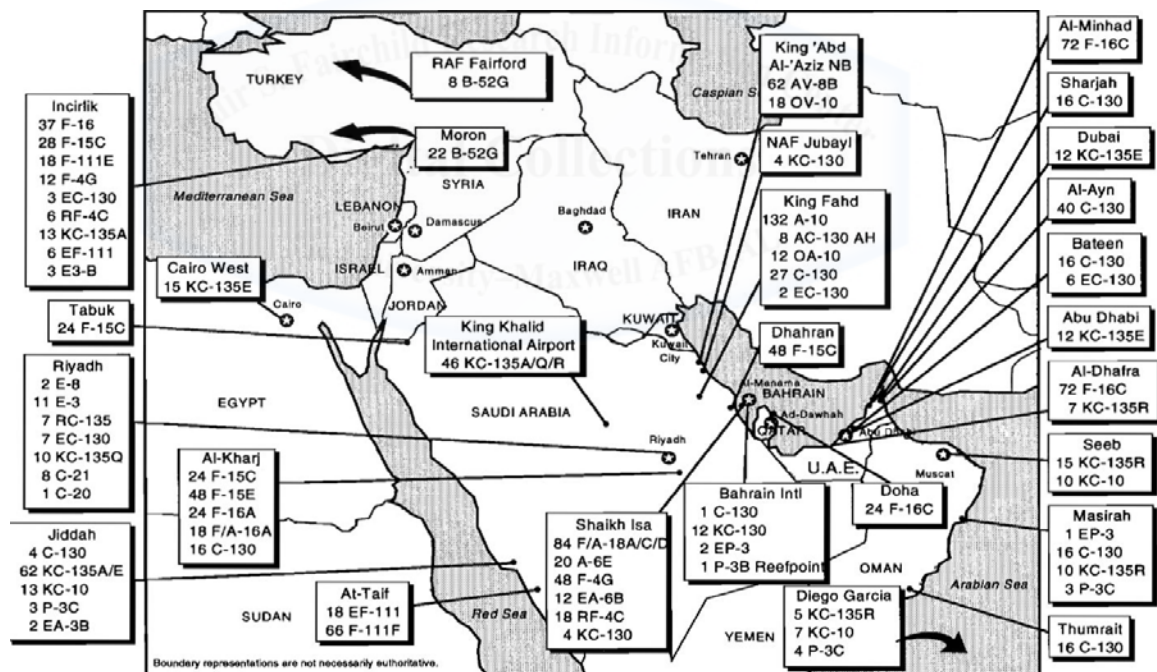


Figure 15: Locations of US Aircraft in CENTCOM AOR, 24 February 1991

Source: Winnefeld, Niblack, and Johnson, A League of Airmen, 294.

⁸⁸ Watts, "GWAPS Vol. II: Part I Operations," 88.

⁸⁹ Watts, "GWAPS Vol. II: Part I Operations," 98.

⁹⁰ Watts, "GWAPS Vol. II: Part I Operations," 98–101; Keaney and Cohen, *Revolution in Warfare?*, 142–43.

As forces continued to flow in during the fall and winter of 1990, there was concern that Saddam would react by invading Saudi Arabia or attacking US deploying forces.⁹¹ He did not. US leader's concern over this scenario during the build-up of air and land forces, termed the "window of vulnerability," was quelled by two factors.⁹² First, forces benefitted from "the passivity of an opponent, who had, at least in theory, the capability to make the deployment a harrowing and costly military ordeal, rather than the exhausting and chaotic but nonetheless peaceful operation it was."⁹³ The use both conventional and chemical Scud missiles against Iran was well known and a serious concern for deploying forces by both the political and military leadership.⁹⁴ Second, the deployment of forces to bases that presented distance challenges also provided relative safety from aerial attack. The US forces in the northern half of the Arabian Peninsula within the range of Iraqi Scuds, a preponderance of the US air power would be outside the threat posed by possible SSM, SAM, or aircraft attack.⁹⁵ During the five-month buildup before Desert Storm, Saddam's passivity provided time for the CAF fighters and the coalition to practice inter-operability and collect intelligence about the Iraqi order of battle.⁹⁶ On the eve of the war, the coalition fighter strength had grown to over 1,800 aircraft, which the CAF's 662 fighters representing 36 percent of the total force.⁹⁷

The force amassed in the Persian Gulf was impressive by any standard, but represented only a portion of the CAF fighter force structure at the time. The US possessed a significant strategic reserve capable of conducting another operation in a different region in the world.⁹⁸ The CAF possessed 109.4 fighter squadron equivalents (FSEs) available worldwide during desert storm. An FSE constitutes a squadron possessing 24 primary mission assigned inventory (PMAI) aircraft capable of executing wartime operations and were not in a state of maintenance, attrition, or other status. The US sent 32.8 FSEs to the Gulf, representing the range of fighter capabilities from air

⁹¹ US Department of Defense, *Conduct of the Persian Gulf War*, 37.

⁹² US Department of Defense, *Conduct of the Persian Gulf War*, 37.

⁹³ Keaney and Cohen, *Revolution in Warfare?*, 151.

⁹⁴ Keaney and Cohen, *Revolution in Warfare?*, 4.

⁹⁵ Keaney and Cohen, *Revolution in Warfare?*, 151.

⁹⁶ Hallion, *Storm over Iraq*, 156; Coyne, *Airpower in the Gulf*, 25.

⁹⁷ Hallion, *Storm over Iraq*, 158; Keaney and Cohen, *Revolution in Warfare?*, 142–43.

⁹⁸ Project Air Force (U.S.), *Project Air Force Assessment of Operation Desert Shield: The Buildup of Combat Power* (Santa Monica, CA: RAND, 1994), 56.

superiority to tactical reconnaissance.⁹⁹ Therefore, the US deployed only 30 percent of the total CAF fighter force structure available worldwide in support of Operations Desert Shield and Storm. Still, some capabilities were stretched thin within the deployed fighter forces. At the time, the F-4G represented the only USAF asset capable of executing the SEAD mission. Similarly, the aging F-111 fleet and the newly fielded F-15E and F-117 were present in relatively small numbers in the service's long-range strike mission. The SEAD and long-range strike missions' high demand during Desert Storm required 66 and 67 percent, respectively, of the total capability available in the force.¹⁰⁰ Despite the grueling demands placed upon it, on 17 January 1991, the Iraqi military saw the overwhelming power in both numbers and quality the CAF had brought to bear in its unprecedented deployment.

The Result

The plan was set. According to Lieutenant General Horner, now as the Joint Forces Air Component Commander (JFACC), "Our fundamental strategy was simple. Blind them and beat the tar out of them as they groped about. We were going to stomp the Iraqi Air Force into submission. Not fair, not pretty, not poetic. Our goal was to be as vicious and unrelenting as possible. To do otherwise would just prolong the suffering and death."¹⁰¹ The dismantling of the Kari system was job number one. The US planners' knowledge of the IADS allowed them to prepare and unleash the application of air power necessary to overwhelm it. A confident Brig Gen Buster C. Glosson, Chief of Air Plans and commanded the fighter forces during the war, stated, "We knew so much about the Iraq air defense system, we could have built it ourselves."¹⁰² Planners and commanders were confident in the plan set in motion early on 17 January that losses would be on the low side of approximately 100 friendly aircraft.¹⁰³ Lt Gen Horner believed, hoped, the number would be lower, but he admitted, "There had been a number of estimates, ranging from a hundred to three hundred-plus. I checked with my guts, then

⁹⁹ Lewis, *Planning Future U.S. Fighter Forces*, 54.

¹⁰⁰ Lewis, *Planning Future U.S. Fighter Forces*, 54; Project Air Force (U.S.), *Assessment of Desert Storm*, 59.

¹⁰¹ Clancy, *Every Man a Tiger*, 357.

¹⁰² Rebecca Grant, "Desert Storm," *Air Force Magazine* 94, no. 1 (January 2011): 42.

¹⁰³ Keaney and Cohen, *Revolution in Warfare?*, 44.

wrote '42' on a piece of paper, folded it, and passed it to Buster. My number turned out to be a good guess. But I had meant 42 USAF only, so I can't take much credit for accuracy. Actual losses were USAF 14, [US Navy] 6, [US Marine Corps] 7, [Royal Saudi Air Force] 2, [Royal Air Force] 7, Italy 1, and Kuwait 1, for a total of 38."¹⁰⁴ Lt Gen Horner's estimate was for losses during the first night, the final number of 38 losses was for the entire 37-day air campaign.

The CAF fighter force that flew over Iraq the first night represented every type of fighter capability in the USAF. F-117s flew deep into Iraq into the heart of the IADS to attack key command and control, weapons of mass destruction, and communications sites to blind and cripple the Iraqi military's ability to wage war.¹⁰⁵ F-16s, with F-4G Wild Weasels and EF-111s, attacked SAM and AAA positions enabling F-15Es and F-111s to strike airfields and Scud sites to reduce Iraq's A2/AD capability and protect coalition partners and nations in the region.¹⁰⁶ "Saddam's most critical assets, his command, control, communications, and intelligence (C3I), integrated air defenses, and power generation capacity, were inoperable. The coalition knocked out his microwave towers, telephone exchanges, relay stations, cables, and transmission lines early."¹⁰⁷ The IAF fighters proved ineffective against US fighters, specifically the F-15C that shot down a total of 8 aircraft on the first night: 2 MiG-21s, 3 F-1s, and 3 of the IAFs most advanced fighter, the MiG-29.¹⁰⁸ In total, CAF fighters flew 530 aircraft in operations against Iraq in that first night.¹⁰⁹

The IAF was never a real factor in the fighting. During the first week, the IAF amassed 35 sorties per day but had also lost 14 aircraft to coalition air superiority fighters.¹¹⁰ After the initial losses of IAF fighters, Saddam sheltered some of his aircraft in hardened bunkers and some were sent to Iran for sanctuary, as he believed the US could only sustain operations for a couple of days.¹¹¹ Part of the concept of the initial air-

¹⁰⁴ Clancy, *Every Man a Tiger*, 339.

¹⁰⁵ Coyne, *Airpower in the Gulf*, 49.

¹⁰⁶ Coyne, *Airpower in the Gulf*, 50.

¹⁰⁷ Coyne, *Airpower in the Gulf*, 50.

¹⁰⁸ Watts and Keaney, "GWAPS Vol. II: Part II Effects," 120.

¹⁰⁹ Coyne, *Airpower in the Gulf*, 50.

¹¹⁰ US Department of Defense, *Conduct of the Persian Gulf War*, 160.

¹¹¹ Hallion, *Storm over Iraq*, 193.

to-air plan “was to convince Iraqi pilots—especially more capable ones—their chances of surviving the very next sortie” was not high; and in this the CAF was very successful.¹¹² When IAF fighters did fly, they would routinely stay greater than 40 to 50 miles away from oncoming strike packages.¹¹³ As there were limited engagements in the air, the US focused efforts on the destruction of aircraft on the ground, in the open or in hardened shelters. By the end of the war, airstrikes destroyed over 200 aircraft with 375 of Iraq’s 594 aircraft shelters destroyed on the ground.¹¹⁴

The operations conducted during the first night of Desert Storm fragmented the IADS operations negating the Iraqi air defense forces ability to integrate operations. The destruction of the hardened SOCs within the first couple of days enabled US and coalition forces to operate with virtual impunity at medium and high altitudes.¹¹⁵ Of the 38 total losses (and 10 aircraft damaged) of US and Coalition aircraft during the conflict only 16 percent was a result of radar-guided SAMS.¹¹⁶ The largest cause, 71 percent, of loss or damage was due to viable IR SAMs and AAA engaging aircraft at low-altitude.¹¹⁷ F-16 and A-10 operations were most susceptible due to their employment of unguided ordinance that increased in accuracy when dropped at lower altitudes. Due to the losses in low altitude, Brig Gen Glosson directed CAF fighters to shift to medium altitudes for operations and weapons release.¹¹⁸

At the end of the war, the Coalition loss rate was 4.7 times lower than experienced over North Vietnam from January to December 1967 and 14 times lower than during Linebacker II.¹¹⁹ Supporting the survivability of CAF fighter forces was the a combination of attacking SAM sites with high speed anti-radiation missiles (HARMs) from F-4Gs, EF-111 jamming aircraft, and the electronic counter measure (ECM) pods carried by the fighters themselves.¹²⁰ The use of electronic warfare blinded Iraqi missile

¹¹² Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 127–28.

¹¹³ Hallion, *Storm over Iraq*, 194.

¹¹⁴ Coyne, *Airpower in the Gulf*, 54; US Department of Defense, *Conduct of the Persian Gulf War*, 154.

¹¹⁵ US Department of Defense, *Conduct of the Persian Gulf War*, 154.

¹¹⁶ Keaney and Cohen, *Revolution in Warfare?*, 52.

¹¹⁷ Keaney and Cohen, *Revolution in Warfare?*, 52.

¹¹⁸ Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 143.

¹¹⁹ Keaney and Cohen, *Revolution in Warfare?*, 52–53.

¹²⁰ Hallion, *Storm over Iraq*, 172.

operators, while the HARMs would punish them for turning on their target tracking radars. Without the jamming pods, and fear invoked by the HARMs, analysts estimated that “fully 50 percent of all strike aircraft would not have returned.”¹²¹ The decisiveness by which the Coalition dismantled Iraq’s AD capability and secured air superiority enabled the concerted effort to negate Iraq’s SSMs.

Iraq’s SSM arsenal posed a significant strategic and operational challenge for air planners as those missiles could dramatically affect the conduct and outcome of the war.¹²² Air planners focused the initial counter-SSM effort on the production, assembly, storage, and fixed launch sites, accounting for 43 of the initial 476 identified CENTAF targets before the start of the air campaign.¹²³ In October 1990, Saddam threatened “in the event of war, I’ll attack Saudi Arabia and Israel with long-range missiles . . . And I’ll burn Israel.”¹²⁴ Saddam made good on his threat and launched the first SSMs at Israel and Saudi Arabia on 17 and 18 January 1991, respectively.¹²⁵ The damage done by these attacks was minimal due to the SSMs inaccuracy, but the political call for action from both the Israeli’s and Saudi’s was immediate.¹²⁶ Of primary concern was an Israeli response that would have been militarily insignificant against Iraq, but could fracture the Coalition that contained several Arab partners.¹²⁷

The US took action to restrain the Israeli desires for retaliation and keep the coalition together against the common foe of Iraq. First, Patriot anti-ballistic missile systems arrived in Israel to protect Tel Aviv just 17 hours after the first Iraqi SSMs fell.¹²⁸ Lieutenant General Horner thought the efforts in the Arabian Peninsula and especially in Israeli were critical to the overall operation. He stated, “Though many will claim that the Patriots failed to stop the Scuds, the question about their success is really beside the point. The Scuds themselves failed to bring relief from terror to the people in

¹²¹ Hallion, *Storm over Iraq*, 172.

¹²² Hallion, *Storm over Iraq*, 178.

¹²³ US Department of Defense, *Conduct of the Persian Gulf War*, 166; Cochran et al., “GWAPS Vol. I: Part I Planning,” 146.

¹²⁴ Quoted in Clancy, *Every Man a Tiger*, 379.

¹²⁵ Clancy, *Every Man a Tiger*, 379–80.

¹²⁶ Coyne, *Airpower in the Gulf*, 55; Clancy, *Every Man a Tiger*, 380.

¹²⁷ Cochran et al., “GWAPS Vol. I: Part I Planning,” 119, 168; Clancy, *Every Man a Tiger*, 381; Coyne, *Airpower in the Gulf*, 55.

¹²⁸ Hallion, *Storm over Iraq*, 180.

Israel, the Patriots succeeded magnificently.”¹²⁹ Second, the USAF would embark on what became the “Great Scud Hunt.”¹³⁰ F-15Es and F-16s searched the Iraqi desert during the night—when 80 percent of all SSM launches took place—and A-10s searched during the day.¹³¹ During the course of Desert Storm, there were over 1,460 strikes against Iraqi SSM capabilities. Additionally, another 1,000 “Scud patrol” sorties continued to search for Scuds or dropped on other targets, as directed by the JFACC.¹³²

In total, Saddam Hussein’s forces launched 88 SSMs: 42 fired at Israel, 43 at Saudi Arabia, and three fired at Bahrain.¹³³ The highest activity of Iraqi SSM launches occurred during the first week of Desert Storm. Iraq launched 33 SSMs the first week achieving a daily average of 4.7 launches per day; it launched the remaining 55 SSMs during the last 36 days at a rate of only 1.7 SSMs.¹³⁴ Determining the direct correlation between the anti-SSM efforts and the reduction of SSM launches proved difficult to ascertain. Fighter sensor limitations at the time made it difficult to effectively determine and accurately report battle damage assessment on SSM attrition. According to the Gulf War Air Power Survey team, “Certainly Scud-hunting operations by Coalition aircraft . . . harried and harassed the launch operations . . . So beyond the disruption induced by the level of effort put into the hunt for mobile Scud launchers, Coalition air power does not appear to have been very effective against this target category.”¹³⁵

Conclusion

US and Coalition aircraft proved a dominant factor in the war against Iraq. The CAF fighter force was the backbone of the overall effort providing over 55 percent of all sorties involving offensive counter air, defensive counter air, interdiction, close air support, and combat air patrol.¹³⁶ In comparison to the 38,170 “shooter” sorties flown by CAF fighters, the IAF was only able to amass approximately 430 sorties in defense of

¹²⁹ Quoted in Clancy, *Every Man a Tiger*, 381.

¹³⁰ Coyne, *Airpower in the Gulf*, 56.

¹³¹ Clancy, *Every Man a Tiger*, 381; Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 335.

¹³² Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 331–32.

¹³³ Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 337.

¹³⁴ Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 337–38.

¹³⁵ Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 340.

¹³⁶ Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 107.

their country.¹³⁷ The impressive achievement had roots in the modernization decisions and fiscal environment determined by the Cold War strategic setting. Before Desert Storm, the 10 years of modernization provided “the nation with the responsive and flexible capabilities that were needed to underwrite US national security.”¹³⁸ Operations Desert Shield and Desert Storm became a repudiation of critics who downplayed the role of air power and ushered in a revolution in the application of air power in the modern era.¹³⁹ The echoes of these sentiments of retribution and uncontested dominance in the air have continue and seldom been challenged in the recent conflicts where US air power has been applied.

Air superiority has become almost an expectant rather than a variable in the strategic military thought, but what will the future hold? After Desert Storm, Secretary of the Air Force Donald B. Rice cautioned, “We won't fight the same war in 20 years. Other militaries are working now on the ability to defend against the tactics and weapons of Desert Storm. We need to forge ahead too.”¹⁴⁰ Since Desert Storm, the CAF fighter force has always had the advantage in quantity and quality. What will the situation be when these attributes are closer to parity in an operational environment vastly larger and contested specifically to counter our previous advantages? The next chapter will examine that situation.

¹³⁷ Watts and Keaney, “GWAPS Vol. II: Part II Effects,” 107.

¹³⁸ Farrell, Jr., “Balancing Budgetary and Force Constraints,” 274–75.

¹³⁹ Coyne, *Airpower in the Gulf*, 113; Hallion, “U.S. Air Power,” 110.

¹⁴⁰ Donald B. Rice, “Air Power in the New Security Environment,” in *The Future of Air Power in the Aftermath of the Gulf War*, ed. Robert L. Pfaltzgraff and Richard H. Shultz (Maxwell AFB, AL: Air University Press, 1992), 13.

Chapter 4

The Asia-Pacific Pivot and Potential Consequences

Only a fool would take us on again, but some fools are still out there—terrorists, drug lords, guys like Saddam who would choke the world's economic lifeline or use weapons of mass destruction.

—Hon. Donald B. Rice (1992)

Will we ever fight China? It doesn't really matter. Hopefully not. We pray that we don't. But we'll probably fight their stuff.

—Lt Gen Herbert Carlisle (2011)

In January 2012, the Department of Defense released *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* that outlined the department's future strategic guidance. A key—and most noticeable—tenet of the strategy was “*rebalance toward the Asia-Pacific region*” (emphasis in original) necessitating a significant change in the US Military's posture for global security.¹ The “pivot” of military strategy from West to East would seek to ensure not only the maintenance of peace and stability, but also the continued prosperity of American economic interests.²

Since the turn of the twenty-first century, the Asia-Pacific region has become the largest source of imports and second-largest source of exports for the United States.³ The region possesses both the fastest growing economic market and the largest population

¹ US Department of Defense, *Sustaining U.S. Global Leadership*, 2.

² US Department of Defense, *Sustaining U.S. Global Leadership*, 2; The term “pivot” in reference with the United States' revitalized interests in the Asia-Pacific is most attributed to Secretary of State Hillary Clinton as she stated, “as the war in Iraq winds down and America begins to withdraw its forces from Afghanistan, the United States stands at a pivot point.” See Hillary Clinton, “America's Pacific Century,” *Foreign Press*, October 11, 2011, http://www.foreignpolicy.com/articles/2011/10/11/americas_pacific_century (accessed 9 December 2013).

³ Mark E. Manyin, *Pivot to the Pacific? The Obama Administration's “Rebalancing” Toward Asia*, CRS Report R42448 (Washington, DC: Library of Congress, Research Service, March 28, 2012), 6.

increase over the last two decades, creating tremendous potential economic opportunities on the one hand, but grave and troublesome security concerns on the other.⁴ To foster economic growth *and* more stable regional security, the United States strives for closer military ties with China. Central to this effort is the promotion of increased transparency on the part of China in order to build mutual confidence and preemptively deescalate any tensions between the two nations should they arise. Conversely, China views the pivot by the United States intensions as merely another instance of Western intervention into the regional affairs of the Asia-Pacific. Moreover, China perceives transparency as not as a confidence-building measure, but as an effort by the US to probe and take advantage of China's weaknesses. The precarious nature of the Sino-United States relationship is directly attributed to China's rapid rise in political and economic influence bolstered by their past and future military modernization efforts. In classical realist terms, the rising power of China threatens the existing power position of the United States.⁵

China's decision to embark on an unprecedented military modernization effort began shortly after Desert Storm. The swift destruction of the Iraqi military by US airpower that was "mostly equipped with Soviet and Chinese weaponry, offered Chinese observers sobering proof of high-technology weaponry's ability to deliver highly accurate, lethal firepower and thereby bring about a rapid decision on the battlefield."⁶ Chinese modernization does not seek to match the US capability-for-capability, rather evokes the use of *shashoujian*—"assassin's mace"—to build capability and method to combat a superior foe.⁷ *Shashoujian* today represent the capabilities and methods capable of deterring a superior adversary or employed to surprise and cripple an

⁴ Manyin, *Pivot to the Pacific?*, 6.

⁵ This classic conundrum of hegemonic change was first identified by Thucydides in his *History of the Peloponnesian War*: "What made war inevitable was the growth of Athenian power and the fear which this caused in Sparta." Thucydides, *History of the Peloponnesian War*, trans. Rex Warner, Rev. ed, The Penguin Classics (Baltimore, MD: Penguin Books, 1972), 49; Additionally, hegemonic change is fully described in Robert Gilpin, *War and Change in World Politics* (Cambridge; New York: Cambridge University Press, 1981).

⁶ Cliff, *Entering the Dragon's Lair*, 22; Roger Cliff et al., *Shaking the Heavens and Splitting the Earth: Chinese Air Force Employment Concepts in the 21st Century* (Santa Monica, CA: RAND, 2011), 36.

⁷ Bruzdinski, "Shashoujian," 312, 333.

adversary at the onset of conflict.⁸ The doctrine that accompanied the development of technical *shashoujian* became one of counter-intervention to minimize the influence of external-actors deemed counter to China's interests. "It is difficult to avoid the conclusion that—as the military dimension of this—China has embarked on a course intended to establish itself as, at a minimum, the dominant military power in East Asia and the Western Pacific."⁹ The combination of the technological and doctrinal modernization has resulted in the A2/AD environment the US will contend with during its pivot to the Asia-Pacific.

The following comprises an examination of the character of the interaction between the United States and China that will define the future strategic environment in the Asia-Pacific region. First, the strategic pivot by the United States brings the Sino-American relationship to potentially new, heightened tensions considering the differing desires of both nations. Second, the continuing evolution in national security policy, doctrine, and military modernization enables China to contest America's expanded external influence in the region, challenging its position as the dominant regional power.

The US Perspective

The pivot to the Asia-Pacific region is not an entirely new endeavor. Rather, it represents a sharpened focus on the best means to assure the continuing national interests and security of the United States. In fact, America has been an influential actor in the region for greater than a century; at least since Commodore Perry opened Japanese markets to US business in 1853.¹⁰ American presence in China was highlighted by its support of resistance to Japan prior to its entry into World War II through the venerable "Flying Tigers."¹¹ Specifically, since the end of World War II, the United States has championed economic access, openness of global commons, and international order to

⁸ Krepinevich, *Why ASB?*, 14.

⁹ Lt Col (Ret) Thomas R. McCabe, *China's Air and Space Revolutions*, Mitchell Paper 10 (Maxwell AFB, AL: Mitchell Institute Press, April 2013), 3.

¹⁰ George Feifer, *Breaking Open Japan: Commodore Perry, Lord Abe, and American Imperialism in 1853* (New York: Smithsonian Books/Collins, 2006).

¹¹ Daniel Ford, *Flying Tigers Claire Chennault and His American Volunteers, 1941-1942* (New York: Smithsonian Books/Collins, 2007).

foster prosperity and security in the region.¹² Currently, the United States', "economic, security, and people-to-people ties with the region are strong and continue to grow."¹³ They are challenged, however, and America's ability to maintain and expand its interests in the region now require the DOD to maintain and develop capabilities to ensure continued access throughout the region.

China's emergence as a dominant power in the Asia-Pacific region directly affects the ability of the United States to promote its interests in the region. Previous national and defense strategic guidance called for the continuation of engagement and cooperation with China. For instance, after the Gulf War, the *National Security Strategy* stated, "Consultations and contact with China will be central features of our policy, lest we intensify the isolation that shields repression. Change is inevitable in China, and our links with China must endure."¹⁴ Similarly, the 2006 *Quadrennial Defense Review* (QDR) stressed the importance of engagement and cooperation, while underplaying the implications of China's rising military in shifting the balance of power in the region.¹⁵ These strategic policies do not contradict the current defensive shift to the Asia-Pacific region, nor were they misguided or purposefully shortsighted; they were understandable products of the US strategic environments of the time. In 1991, the United States witnessed both the end of the Cold War and collapse of Soviet Communism. The unpredictable nature of the Soviet demise compelled the United States to maintain focus on the regional security of the European mainland.¹⁶ Similarly, in 2006, the US strategic focus was not on the Asia-Pacific region, but on the continued military operations occurring in Iraq and Afghanistan. By 2010, however, the implications of China's increasing A2 capabilities began to retrieve specific attention in US strategic documents and guidance.

¹² Charles T. Hagel, *Quadrennial Defense Review 2014* (Washington, DC: Government Printing Office, 2014), 4.

¹³ Hagel, *QDR 2014*, 4.

¹⁴ George H.W. Bush, *1991 National Security Strategy* (Washington, DC: The White House, 1991), 11.

¹⁵ Mark Gunzinger and Jim Thomas, "The 2010 Quadrennial Defense Review: An Initial Assessment" (Center for Strategic and Budgetary Assessment, February 1, 2010), 4, <http://www.csbaonline.org/wp-content/uploads/2010/02/2010.02.01-The-2010-Quadrennial-Defense-Review.pdf> (accessed 8 January 2014).

¹⁶ Bush, *1991 NSS*, 6–7.

China's counter-intervention strategies supported by A2/AD capabilities represent a significant challenge to the ability to deter and defeat aggression by the United States. The 2010 QDR cautioned, "States with the means to do so are acquiring a wide range of sophisticated weapons and supporting capabilities that, in combination, can support anti-access strategies aimed at impeding the deployment of U.S. forces to the theater and blunting the operations of those forces that do deploy forward."¹⁷ Specifically referenced in the QDR were the increasing capabilities of North Korea and Iran, and the comprehensive military modernization program of China.¹⁸ The modernization programs have produced systems with greater range and accuracy than those faced by coalition forces during the Gulf War. This will limit the relative sanctuary from enemy action afforded those forces forward deployed in conflicts since the end of the Cold War. By 2012, these challenges have become of such a concern that the DOD is adapting its investments in future technologies to ensure the ability to operate in projected A2/AD environments.¹⁹ The DOD's most recent statements and publications heighten the importance of preparing to meet the challenges in the Asia-Pacific region defined by China's A2/AD capabilities.

Secretary of Defense Charles Hagel and the DOD have underscored the need for added vigilance toward the rise of China's power. In a speech made in 2013, Hagel asserted, "America's enduring commitment to peace and security in the Asia-Pacific region depends on sustaining the ability to deter aggression and operate effectively across all domains."²⁰ To accomplish this task, Hagel included the need for increased presence in the region of the United States' most advanced technologies—specifically the F-22 and F-35.²¹ The most recent QDR echoes Hagel's message maintaining an Air Force with "global power projection capabilities crucial for this updated defense strategy. We will modernize next-generation Air Force combat equipment . . . particularly against advancing modern air defense systems."²² These capabilities are critical for supporting two of the nation's core interests: security of the United States, its allies, and partners;

¹⁷ Gates, *QDR 2010*, 31.

¹⁸ Gates, *QDR 2010*, 31.

¹⁹ US Department of Defense, *Sustaining U.S. Global Leadership*, 5–6.

²⁰ Quoted in Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 9.

²¹ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 9.

²² Hagel, *QDR 2014*, ix.

and sustaining an open international economic system that promotes opportunity and prosperity.²³ These core interests similarly guided the United States' decision to expel Iraqi forces from Kuwait and secure Persian Gulf security.²⁴ Unlike the situation leading up to Desert Storm, the United States faces a potential adversary that continues to subvert attempts to understand its intentions.

Complicating the strategic environment in the Asia-Pacific region is China's continued lack of transparency, and America's unwillingness to understand the Chinese point of view. Chinese military strategist Sun Tzu poignantly understood the value of a transparent adversary when he stated, "Determine the enemy's plans and you will know which strategy will be successful and which will not."²⁵ Chinese strategists foresee that competition between the United States and China has the potential to increase, especially considering the US strategic pivot to the region.²⁶ Therefore, China strives to maintain a level of opacity in the modernization of its military and the intentions of those forces. Deng Xiaoping, echoing Sun Tzu, valued opacity in a strategy for a weaker force versus a stronger force. Deng asserted, "[China] is moving forward, but our enemies are not asleep either. Therefore, by that time, if we have to fight we will still be the weak trying to defeat the strong."²⁷ China's ability to subvert an adversary's understanding of China's strategy, and potential weakness, the uncertainty created reduces the likelihood of successful planning by an adversary. For the Chinese, increased transparency is the route to its demise. Unfortunately, from an American or Western perspective, the lack of transparency increases unease regarding the intentions of the Chinese, prompting a vicious cycle or classic security dilemma in which both sides maximize their defenses to prepare for the worst that, in turn, reinforces the perception that the increased security is needed.

The United States advocates continued efforts of engagement and cooperation with China to ensure the economic and military security of the Asia-Pacific region. Since

²³ Hagel, *QDR 2014*, 11.

²⁴ US Department of Defense, *Conduct of the Persian Gulf War*, 19; Bush, *1990 NSS*, 1–2.

²⁵ Sun Tzu, *The Illustrated Art Of War*, trans. Samuel B. Griffith (New York: Oxford University Press, 2005), 152.

²⁶ Wu, "Agenda for a New Great Power Relationship," 65.

²⁷ Quoted in Bruzdinski, "Shashoujian," 333.

the historic renewed dialogue between the two countries in 1972, the DOD continues to build relations with the People's Liberation Army (PLA) in a variety of mission sets from humanitarian assistance to counter-piracy efforts.²⁸ But according to General Welsh and General Carlisle the relationship is historically tumultuous: "Our relationship with China . . . has had its ups and downs over the past four decades. In recent years, growing distrust and increasing misperception have made the need to improve lines of communication between our two governments and militaries all the more urgent."²⁹ As a measure to remove such distrust and misperception, the United States seeks to strengthen military-to-military relations encourage transparency on the role and capability of the PLA to achieve strategic objectives.³⁰ And yet, perhaps for reasons outlined above, the more the US tries to build confidence through mutual transparency, the more China appears to obfuscate its plans and capabilities. Adding to these difficulties, continued efforts by the United States to increase Chinese transparency face challenges and contestation stemming from the inculcated view of Western and Japanese subjugation held dear in China.

The legacy of "the century of humiliation" still bitterly resonates in modern-day Chinese political and military thought.³¹ Since the formation of the People's Republic of China (PRC) in 1949, the government has advocated, outwardly, the importance of national sovereignty rights and non-interference in the domestic affairs of nations.³² Now with the pivot, China's perspective is one of the United States embarking on an offensively-based policy as a means of containing China's rise as a region and world power.³³ The American policy of containment throughout the Cold War sought to limit

²⁸ Hagel, *QDR 2014*, 17.

²⁹ Gen Mark A. Welsh III and Gen Hawk Carlisle, "Strengthening Understanding and Engagement with China's Air Force," *Air & Space Power Journal* 28, no. 1 (February 2014): 4.

³⁰ Office of the Secretary of Defense, "Military and Security Developments Involving the People's Republic of China 2013" (Department of Defense, Fall 2013), 61–62.

³¹ Wu, "Agenda for a New Great Power Relationship," 68. The "century of humiliation" stems from the intervention and imperialism by the West and Japan during a period encompassing the end of the Opium War in 1840 to the rise of People's Republic of China in 1949.

³² Wu, "Agenda for a New Great Power Relationship," 68.

³³ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 24.

Soviet expansionism and its success left the United States as the world's sole hegemon.³⁴ A 2013 Chinese defense white paper alludes to a coming US policy of containment, similar to Cold War policy:

There are signs of increasing hegemonism, power politics and neo-interventionism. Local turmoils [sic] occur frequently. Hot-spot issues keep cropping up. Traditional and non-traditional security challenges interweave and interact. Competition is intensifying in the international military field. International security issues are growing noticeably more abrupt, interrelated and comprehensive. The Asia-Pacific region has become an increasingly significant stage for world economic development and strategic interaction between major powers. The US is adjusting its Asia-Pacific security strategy, and the regional landscape is undergoing profound changes Some country has strengthened its Asia-Pacific military alliances, expanded its military presence in the region, and frequently makes the situation there tenser. On the issues concerning China's territorial sovereignty and maritime rights and interests, some neighboring countries are taking actions that complicate or exacerbate the situation.³⁵

In recent years China has begun to outwardly demonstrate expanding roles for the PLA in supporting national security and counter-interventionism.

China's sovereignty and territorial integrity are "core interests" according to senior Chinese officials, routinely calling upon PLA forces to secure those interests.³⁶ Since 1949, the PRC has laid sovereign claim to an expansive area of the South China Sea—known as the nine-dash line [Figure 16].³⁷

³⁴ Bush, *1990 NSS*, 2; For a more in depth discussion about the evolution of the strategy of containment from 1947 on, see John Lewis Gaddis, *The Long Peace: Inquiries into the History of the Cold War* (New York: Oxford University Press, 1989).

³⁵ Information Office of State Council, "The Diversified Employment of China's Armed Forces" (The People's Republic of China, April 2013), 2–3, http://news.xinhuanet.com/english/china/2013-04/16/c_132312681.htm (accessed 18 March 2014).

³⁶ Office of the Secretary of Defense, "China 2013," 3.

³⁷ Office of the Secretary of Defense, "China 2013," 3; Craig Hill, "China's Nine-Dash Line in South China Sea," *China Daily Mail*, May 25, 2012, <http://chinadailymail.com/2012/05/25/chinas-nine-dashed-line-in-south-china-sea/> (accessed 31 March 2014) The name of the line comes from the official Chinese maps



Figure 16: Nine-Dash Line and Disputed Regions in South China Sea

Source: Craig Hill, “China’s Nine-Dash Line in South China Sea,” *China Daily Mail*, May 25, 2012, <http://chinadailymail.com/2012/05/25/chinas-nine-dashed-line-in-south-china-sea/> (accessed 31 March 2014).

China’s territorial claims to the areas encompassed by the nine-dash line remained uncontested for the better part of two decades; more rhetoric than action. Most nations with competing claims have routinely questioned the validity of the territorial assertions, and to date China has not produced an accepted legal-basis for the nine-dash line.³⁸ Regardless of legal claim, the Chinese government included the area of the nine-dash line to the map of China that adorns the nation’s official passport.³⁹ But now Chinese actions are following its rhetoric. Of note, Chinese maritime enforcement vessels have engaged in a protracted standoff with the Philippine Navy when Chinese fishing activities were occurring in internationally recognized Philippine economic exclusion zones.⁴⁰ Similar territorial disputes are also occurring in the East China Sea leading to both PLA Navy (PLAN) and PLA Air Force (PLAAF) involvement.

Worrisome to everyone’s interests in the region, territorial claims of the waters

that show the demarcation of the area. The line outlining the area is a single nine-dash line.

³⁸ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 65.

³⁹ Office of the Secretary of Defense, “China 2013,” 4.

⁴⁰ Office of the Secretary of Defense, “China 2013,” 3–4.

and islands of the East China Sea are bringing China and Japan into direct confrontation. Japan holds that the definition of territorial claims should be based upon an equidistant line from each nation's coast, while China's claims are defined by the extension of the continental shelf.⁴¹ The contested area happens to be lush in natural gas and oil reserves.⁴² A specific example of territorial Sino-Japanese contestation is the dispute over Diaoyu/Senkaku Islands in the southern part of the East China Sea.⁴³ On 23 November 2013 the Chinese government announced the "establishment of the East China Sea Air Defense Intercept Zone (ADIZ)" in accordance with its national laws and without any other further explanation.⁴⁴ The ADIZ encompasses the entire contested area in the East China Sea overlapping defense zones of both Taiwan and Japan.⁴⁵ The new ADIZ prompted an immediate response from Secretary of State John Kerry in condemning the unilateral actions as "an attempt to change the status quo" that only increases tensions in the region.⁴⁶ To date, the East China Sea ADIZ remains and speculation mounts concerning a similar action by China in the South China Sea.⁴⁷ Political scientist John Mearshiemer sees the strategic situation largely defined by China. He stated, "The US is still far more powerful than China, so China is making efforts not to make waves. But when China becomes more powerful, it will take greater risks, the US and China's neighbors will be more scared about China, and they will push back more forcefully in

⁴¹ Office of the Secretary of Defense, "China 2013," 21.

⁴² Office of the Secretary of Defense, "China 2013," 21.

⁴³ Wu, "Agenda for a New Great Power Relationship," 70 Diaoyu is the Chinese name for the islands, while Senkaku is the Japanese name.

⁴⁴ Ministry of National Defense, "Statement by the Government of the People's Republic of China on Establishing the East China Sea Air Defense Identification Zone" (The People's Republic of China, November 23, 2013), http://eng.mod.gov.cn/Press/2013-11/23/content_4476180.htm (accessed 1 December 2013).

⁴⁵ Wendell Minnick, Sung-Ki Jung, and Paul Kallender-Umezu, "More Chinese Air ID Zones Predicted," *Defense News*, December 1, 2013, <http://www.defensenews.com/article/20131201/DEFREG03/312010004> (accessed 1 December 2013).

⁴⁶ John F. Kerry, *Statement on the East China Sea Air Defense Identification Zone* (Washington, DC: Office of the Secretary of State, November 23, 2013), <http://www.state.gov/secretary/remarks/2013/11/218013.htm> (accessed 1 December 2013).

⁴⁷ Wendell Gertz, "Inside the Ring: U.S., China in War of Words over South China Sea Air Zone," *The Washington Times*, February 12, 2014, <http://www.washingtontimes.com/news/2014/feb/12/inside-the-ring-obama-pushback-against-china-is-pr/?page=all> (accessed 15 February 2014).

those situations.”⁴⁸ As the future strategic environment has China taking greater risks, the United States should fully attempt to understand not only the capabilities of the Chinese military but also its strategic mindset.

The Chinese Perspective

Since the early 1990s, China continues an ambitious long-term military modernization program to develop measures to deter or counter third-party intervention, and to fight and win short-duration, high technology regional conflicts.⁴⁹ China awakened to the realization that its forces were vastly inferior to the new Western standard typified by the performance of the United States, specifically US airpower, during the Gulf War.⁵⁰ Once confident of the ability to protect the interior of the country, China saw the preconceived benefits of time and space eroding in light of the penetrating, precision attacks committed against the centers of Iraqi power with decisive result. Chinese leadership now understood “that ‘a weaker force relying solely on the defensive would place itself in the position of having to receive blows,’ and that only by ‘taking active offensive operations’ could the weaker force now seize the initiative.”⁵¹ Many of China’s military strategists support and advocate seizing the initiative, especially against a superior force, by arguing that the Iraqi military would have had a better chance of defeating the coalition force if it had preemptively attacked rather than allowing the adversary to deploy and prepare for war.⁵² Chinese Lt Gen Li Jijun typifies the Chinese

⁴⁸ John J. Mearsheimer, “Can China, US Avoid Tragedy of Great Power Politics?,” *Global Times*, May 27, 2012, 2, <http://www.globaltimes.cn/NEWS/tabid/99/ID/711459/Can-China-US-avoid-tragedy-of-great-power-politics.aspx> (accessed 18 October 2013).

⁴⁹ Office of the Secretary of Defense, “China 2013,” i, 32; David Shlapak, “Equipping the PLAAF: The Long March to Modernity,” in *The Chinese Air Force Evolving Concepts, Roles, and Capabilities*, ed. Richard Hallion, Roger Cliff, and Phillip C Saunders (Washington, DC: National Defense University Press for the Center for the Study of Chinese Military Affairs, Institute for National Strategic Studies, 2012), 191.

⁵⁰ Zhang Xiaoming, “The PLAAF’s Evolving Influence within the PLA and Upon National Policy,” in *The Chinese Air Force Evolving Concepts, Roles, and Capabilities*, ed. Richard Hallion, Roger Cliff, and Phillip C Saunders (Washington, DC: National Defense University Press for the Center for the Study of Chinese Military Affairs, Institute for National Strategic Studies, 2012), 78.

⁵¹ Quoted in Xiaoming, “Equipping the PLAAF,” 78.

⁵² Cliff, *Entering the Dragon’s Lair*, 32.

observation of US air power as a “big step forward in both military theory and practice.”⁵³ For the past two decades China has been pursuing its own big step forward while remaining true to its cultural past.

Chinese international relations and domestic strategies are deeply rooted in the traditions and teachings forged over several millennia, which are now applied to the present context of the world. China’s aversion to expansionist and offensive-oriented strategic thinking, for example, is influenced by the teachings of Confucian philosophy.⁵⁴ This philosophy underpins the writings of Sun Tzu that still resonate in China’s military at all levels of warfare.⁵⁵ The Chinese are also students of history, theirs and others, in shaping their strategic development. As previously noted, the century of humiliation plays a lasting role in counter-interventional thought and regional security decision-making. After the Gulf War, and the revolution in military affairs the war represented to Chinese strategists, the government recognized the need for change.⁵⁶ The PRC “adopted a new military strategy, placing an emphasis on fighting and winning a future regional war under high-technology conditions along China’s periphery. The central military leadership made the proper readjustment to the air force’s strategic missions, requiring it to maintain strong capabilities not only for defensive operations, but also for offensive ones.”⁵⁷ China thus began a long-term significant investment as a result of the strategic change in military thinking.

Over the past two decades China’s annual budgetary expenditures for defense and military modernization are second only to those of the United States. China continues to support a nominal trend of average double-digit increases in annual defense spending since 1989.⁵⁸ According to the DOD, “Analysis of data from 2003 through 2012

⁵³ Cliff, *Entering the Dragon’s Lair*, 26.

⁵⁴ COL Mick Ryan, *India-China in 2030: A Net Assessment of the Competition Between Two Rising Powers* (Australia: Australian Defence College, 2012), 8.

⁵⁵ Ryan, *India-China 2030*, 8.

⁵⁶ Liang Qiao and Xiangsui Wang, *Unrestricted Warfare* (Beijing: PLA Literature and Arts Publishing House, 1999), 10; Cliff et al., *Shaking the Heavens*, 35.

⁵⁷ Xiaoming, “Equipping the PLA AF,” 78.

⁵⁸ Andrew S. Erickson and Adam P. Liff, Lifting the Shroud on China’s Defense Spending, interview by Nathaniel Austin, transcript, May 16, 2013, 1, http://www.nbr.org/downloads/pdfs/PSA/Erickson-Liff_interview_05162013.pdf (accessed 1 April 2014).

indicates China's officially disclosed military budget grew at an average of 9.7 percent per year in inflation-adjusted terms over the period."⁵⁹ In March 2013, China announced a 10.7 percent increase in its annual defense budget that equates to around \$114 billion—still several hundred billion dollars short of US defense spending but, given China's managed economy, is not directly comparable in terms of capabilities.⁶⁰ Unlike Saddam Hussein's borrowing to support military modernization, leading to enormous indebtedness, China's military expenditures are supported by a robust economy that has maintained double digit increases. China's economy now ranks as the second largest in the world, increasing from 11th in 1991 and fourth in the past decade.⁶¹ Therefore, barring a dramatic downturn in the Chinese economy or changes in economic decisions, rapidly increasing defense spending in China appears to be supportable for the foreseeable future.⁶² The problem of transparency transcends beyond strategic intention to the realm of economic opacity.

Official Chinese proclamations of annual defense expenditures are further shrouded by doubt and lack of transparency. The issue arises in how China outlines defense spending in its official documentation and press releases. In the published military budget, China "omits several major categories of expenditure, such as procurement of foreign weapons and equipment."⁶³ Additionally, several key functions and procurements are omitted from the defense budget. Analysts suggest expenditures for the "[People's Armed Police], local militia, over-seas weapons procurement, defense industry subsidies, defense-related defense industry group revenues in excess of the official subtotal for defense spending on equipment, Chinese arms exports, R&D, and defense nuclear and missile capabilities."⁶⁴ Therefore, what comprises the sum total of China's annual defense spending is routinely estimated to be two to three times higher

⁵⁹ Office of the Secretary of Defense, "China 2013," 45.

⁶⁰ Erickson and Liff, *Lifting the Shroud on China's Defense Spending*, 1; Office of the Secretary of Defense, "China 2013," 45.

⁶¹ "GDP Ranking," *The World Bank*, 2013, <http://data.worldbank.org/data-catalog/GDP-ranking-table> (accessed 10 January 2014).

⁶² Erickson and Liff, *Lifting the Shroud on China's Defense Spending*, 2.

⁶³ Office of the Secretary of Defense, "China 2013," 45.

⁶⁴ Charles Wolf Jr. et al., *China and India, 2025: A Comparative Assessment* (Santa Monica, CA: RAND, 2011), 100.

than the reported amount.⁶⁵ While China remains economically opaque, slight transparency is occurring through the introduction of new doctrine and materiel demonstrating a revised military strategy.

According to Sun Tzu, “Invincibility lies in the defense; the possibility of victory in the attack.” In today’s military parlance Sun Tzu’s dictum most aptly associates with the concept of conducting offensive operations within an overall strategic defensive mindset. In recent Chinese operational literature, strategic thinking has moved away from the concept of pre-emptively striking a more powerful enemy in an attempt to end the conflict quickly to one of balancing, with offensive strikes only as necessary or as a deterrent.⁶⁶ NASIC asserts that this change “demonstrates, at least to a degree, a growing confidence within the PLA that they can more-readily withstand U.S. involvement (i.e., achieve their main campaign objectives) than in years past.”⁶⁷ This view, however, does not negate the possibility of a pre-emptive measure to prevent a situation similar to the build-up seen prior to the Gulf War. Chinese strategists emphasize the use of surprise to achieve victory by striking unexpectedly in time and place.⁶⁸ Military strategists attest that preemption may reverse a losing proposition: “for the weaker party, waiting for the enemy to deliver the first blow will have disastrous consequences and may even put it in a passive situation from which it will never be able to get out.”⁶⁹ The view of a new environment defined by high-intensity, high technology war provides the impetus for a resurgence of *shashoujian*—assassin’s mace—in Chinese military strategy.

The PLA does not use the term A2/AD to describe its strategy for regional security; rather it employs the term *shashoujian*.⁷⁰ The terms are not directly analogous

⁶⁵ Wolf Jr. et al., *China and India, 2025*, 79.

⁶⁶ Lee Fuell, “Broad Trends in Chinese Air Force and Missile Modernization” (presented at the Presentation to the U.S.-China Economic and Security Review Commission, Washington, DC, January 30, 2014), 3–4, <http://www.airforcemag.com/testimony/Documents/2014/January%202014/013014fuell.pdf> (accessed 31 January 2014).

⁶⁷ Fuell, “Broad Trends,” 4.

⁶⁸ Cliff, *Entering the Dragon’s Lair*, 29.

⁶⁹ Cliff, *Entering the Dragon’s Lair*, 29.

⁷⁰ Krepinevich, *Why ASB?*, 14. *Shashoujian* were ancient hand maces that could be concealed in the wide sleeves characteristic of Chinese dress at the time. The *shashoujian* could be employed with little or no warning to break swords and crush

as the latter (*shashoujian*) can be “weapons systems and equipment” and/or a “certain type of combat method,” while the former (A2/AD) refers to a strategy or method supported by the systems and equipment.⁷¹ Today, *shashoujian* are those weapons and methods that seek to *deter* a superior adversary, such as the United States, or those able to cripple at the onset of hostilities capitalized with the use of surprise and deception.⁷² The PLA related the use of airpower by the United States in the Gulf War as the use of several types of *shashoujian* against Iraq. The United States utilized “at least five *shashoujian* on the battlefield” to cripple the adversary: the F-117A; B-1B Lancer; B-52 Stratofortress using air-launched cruise missiles from outside of air defenses; Tomahawk cruise missiles, and the B-2A Spirit.”⁷³ Chinese military strategy and preparations hold the concept of the *shashoujian* in the highest regard as a transformative means to ensure means to secure national interest in the face of a superior aggressor.⁷⁴ According to Andrew Krepinevich, “Assuming China is developing and fielding the capabilities to conduct the types of preemptive kinetic and non-kinetic blows envisaged in its military’s ‘Assassin’s Mace’ concept, it would gain both strategic and operational initiative from the outset.”⁷⁵ As *shashoujian* has provided the method, over the past two decades, airpower has risen as the means.

The PLAAF and the Second Artillery Force are raising to prominence the role of airpower in strategy and modern warfare. The Second Artillery Force, established in the 1990s, possesses China’s nuclear and conventional ballistic missile force. In conjunction with the PLAAF, these forces are the means by which China exercises its perceived role in regional security and counter-intervention of third-party actors. Specifically, in the Asia-Pacific Region, the PLA strategically postures its forces based upon a two-island chain delineation [Figure 17].⁷⁶

human skulls, even those protected by helmets. They obviously would be an attractive weapon for someone attempting the assassination of an important figure.

⁷¹ Bruzdinski, “Shashoujian,” 315.

⁷² Krepinevich, *Why ASB?*, 14.

⁷³ Bruzdinski, “Shashoujian,” 316–17. The PLA specifically mentioned the B-2 though the aircraft was still in testing at the time of Desert Storm.

⁷⁴ Bruzdinski, “Shashoujian,” 349–50.

⁷⁵ Krepinevich, *Why ASB?*, 29.

⁷⁶ Van Tol et al., *AirSea Battle*, 13.



Figure 17: The First and Second Island Chains.

Source: Jan Van Tol et al., AirSea Battle: A Point-of-Departure Operational Concept (Washington, DC: Center for Strategic and Budgetary Assessment, 2010), 13.

The First Island Chain includes the South China Sea and runs through the north Philippines, Taiwan, and then up to the Japanese main islands. Historically, China’s strategy for airpower operations was limited in scope, with power projection out to only the First Island Chain.⁷⁷ Since the 1990s, the Chinese government has added engaging a threat to its national interests out to the Second Island Chain—including US bases on Guam and the Japanese main islands.⁷⁸ Once again, Chinese military strategists began this effort with the investigation of independent air campaigns based upon the lessons garnered from the Gulf War.⁷⁹ This assessment resulted in transforming the PLAAF from primarily a subservient, supporting force to one that has risen to a place of equality

⁷⁷ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 66.

⁷⁸ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 66.

⁷⁹ Roger Cliff, “The Development of the PLAAF’s Doctrine,” in *The Chinese Air Force Evolving Concepts, Roles, and Capabilities*, ed. Richard Hallion, Roger Cliff, and Phillip C Saunders (Washington, DC: National Defense University Press for the Center for the Study of Chinese Military Affairs, Institute for National Strategic Studies, 2012).

amongst the other services.⁸⁰ The PLAAF is now given a third core mission to acquire the capability and create the doctrine of conducting operations out to the Second Island Chain.⁸¹ Despite the PLAAF's aspirations, Chinese officials will likely continue to rely on the capabilities of the Second Artillery Force for "coercion strategic strike missions, and suppression for enemy air defenses for some time to come."⁸² Most importantly China has, and will continue to modernize is A2/AD capabilities driven by perceived threats to national interests. The result of the modernization will continue to extend China's reach, thereby increasing the threat to those forces deploying to and operating in the in the Asia-Pacific

China's most predominant and prevalent AD resides with the Second Artillery Force's ballistic missiles and its expanding inventory of cruise missiles. According to the DOD, "Current and projected missile systems will allow the PLA to strike regional air bases, logistical facilities, and other ground-based infrastructure. Chinese military analysts have concluded that logistics and power projection are potential vulnerabilities in modern warfare, given the requirements for precision in coordinating transportation, communications, and logistics networks."⁸³ A general concept prevails based upon the threat posed by an adversary's forces to the Second Island Chain. Over the past two decades, the PLA's modernization of both ballistic and cruise missile inventories is intended to provide for better capability out to the Second Island Chain [Table 7].⁸⁴

⁸⁰ Cliff, "PLAAF's Doctrine," 153.

⁸¹ Richard Halloran, "A Revolution for China's Air Force," *Air Force Magazine* 95, no. 2 (February 2012): 47.

⁸² Mark A. Stokes, "China's Quest for Joint Aerospace Power: Concepts and Future Aspirations," in *The Chinese Air Force Evolving Concepts, Roles, and Capabilities*, ed. Richard Hallion, Roger Cliff, and Phillip C Saunders (Washington, DC: National Defense University Press for the Center for the Study of Chinese Military Affairs, Institute for National Strategic Studies, 2012), 58.

⁸³ Office of the Secretary of Defense, "China 2013," 33.

⁸⁴ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 225.

Table 7: The Second Artillery Force Historical Inventory Levels.

Type	1990	1995	2000	2005	2010	2013
DF-3/A (CSS-2 Mod)[IRBM]	60	>60	>30	2	2	2
DF-21/A (CSS-5 Mod 1/2) [MRBM]	0	10	>50	33	80	80
DF-21C (CSS-5 Mod 3) [MRBM]	0	0	0	0	36	36
DF-21D (CSS-5 Mod 4) [ASBM]	0	0	0	0	0	6
DF-15/M9 (CSS-6) [SRBM]	Some	Some	20	Some	96	144
DF-11/A/M-11A (CSS-7 Mod 2) [SRBM]	Some	Some	40	Some	108	108
DH-10/CJ-10 [LACM]	0	0	0	0	54	54

Source: Adapted from Anthony H. Cordesman, Ashley Hess, and Nicholas S. Yarosh, Chinese Military Modernization and Force Development: A Western Perspective (Washington, DC: Rowman & Littlefield, 2013), 225.

Evident from Table 7, China is developing, producing, and fielding a significant MRBM, SRBM, and LACM conventionally armed force to project power into the Asia-Pacific region. For instance, the DF-21D is a upgraded variant of the DF-21 MRBM that gives the PLA the possibility of engaging large ships, including aircraft carriers, with a maneuverable warhead at ranges greater than 1,500 km.⁸⁵ China has divested its older SRBM, similar to those used by Iraq during the Gulf War, and invested in newer DF-11 and D-15 SRBMs that possess improvements in both range, and most importantly, accuracy.⁸⁶ These improvements have a cumulative effect of increasing the effectiveness of the Second Artillery Force to prosecute an attack on a target at a greater distance, or standoff, and reduce the number of missiles needed to engage the target to achieve the desired effects. The PLA has also has increased the mobility and survivability of its ballistic missile inventories. According to Lee Fuell, “China’s emerging missile strategy will be marked by increased shooter survivability, enhanced operational flexibility, and significantly greater reach and precision.”⁸⁷ The Gulf War showed the difficulty of finding mobile ballistic missile launchers when coalition airpower executed over 1,500 sorties against Iraq’s missile capability resulting in zero confirmed destroyed mobile launchers.⁸⁸ Ballistic missile are not the only arrow in the AD quiver, however, China

⁸⁵ Office of the Secretary of Defense, “China 2013,” 5–6.

⁸⁶ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 234.

⁸⁷ Fuell, “Broad Trends,” 8.

⁸⁸ Thomas G. Mahnken, *The Cruise Missile Challenge* (Washington, DC: Center for Strategic and Budgetary Assessment, 2005), 46.

also possess a robust cruise missile capability.

Any scenario that would involve the Chinese military in the Asia-Pacific region would need to account for the threat from land-attack cruise missiles (LACMs), anti-ship cruise missiles (ASCMs), and air-launched cruise missiles (ALCMs). The DH-10 LACM reportedly possesses an effective range of over 1,500 km and the ability to fly circuitous routes to complicate air defense planning and execution.⁸⁹ The PLA has numerous ASCMs, including YJ-62 (C-602) and YJ-82/YJ-83 (C-802/803) capable of striking targets out to 280 km and 120/250 km respectively.⁹⁰ Many of the Chinese systems possess a dual, or multi-use, character regarding the means of launching the cruise missile. For instance the YJ-80 series of cruise missiles is capable of being employed from land, sea surface, and air via fighter or bomber aircraft. The threat posed by the employment of cruise missiles by those platforms, the PLA also has the capability to employ LACMs and ASCMs from submarines.⁹¹ Submarine employment not only increases the survivability of the cruise missiles, but also effectively increases the weapon's range, as the launch point can be further away from any static launch position. Modernization has not been the sole province of AD capabilities; rather, during the same period China's A2 capabilities have followed suit.

The PLAAF fighter force is a more operationally ready and capable force than any time in its history, and with modernization will remain a preeminent force in the future. As late as 1995 almost 80 percent of the PLAAF's fighter force was comprised of 1950s-era MiG-17 and MiG-19 fighters produced by the Soviet Union.⁹² The PLAAF first started flying the MiG-19 in 1962, when the CAF was flying more F-100 Super Sabers than any other airframe.⁹³ As RAND analysis David Shlapak points out, "While the F-100 was an excellent airplane in its own right, it is hard to imagine the US Air Force in 1995 being built around it, as the PLAAF was built around the MiG-19/J-6."⁹⁴

⁸⁹ Mahnken, *Cruise Missile Challenge*, 38.

⁹⁰ Carlo Kopp and Martin Andrew, *PLA Cruise Missiles*, Technical Report (Air Power Australia, March 2012), <http://www.ausairpower.net/APA-PLA-Cruise-Missiles.html> (accessed 1 April 2014).

⁹¹ Mahnken, *Cruise Missile Challenge*, 38–39; Kopp and Andrew, *PLA Cruise Missiles*.

⁹² Shlapak, "Equipping the PLAAF," 191.

⁹³ Shlapak, "Equipping the PLAAF," 192.

⁹⁴ Shlapak, "Equipping the PLAAF," 192.

Table 8 shows the composition of the PLAAF fighter force from 1990 until 2010.⁹⁵

Table 8: Select PLAAF Fighter Force Inventory Levels, 1990 to 2013

Type	1990	1995	2000	2005	2010	2013
J-5/MiG-17	40	40	...	...	...	...
J-6/MiG-19	3,000	3,000	1,500	722	n.d.	n.d.
J-7/MiG-21	500	500	700	756	552	380
J-8	50	100	250	245	312	n.d.
Su-27/J-11A	...	26	65	116	134	>150
J-10	...	...	...	62	120	200
Su-30	...	...	...	73	146	>150
Q-5	500	400	300	408	120	110
JH-7	...	...	...	39	72	70

n.d.: No Data Available

Source: Adapted from David Shlapak, "Equipping the PLAAF: The Long March to Modernity," in The Chinese Air Force Evolving Concepts, Roles, and Capabilities, ed. Richard Hallion, Roger Cliff, and Phillip C Saunders (Washington, DC: National Defense University Press for the Center for the Study of Chinese Military Affairs, Institute for National Strategic Studies, 2012), 192; Adam Baddeley, "The AMR Regional Air Force Directory 2013," Asian Military Review 21, no. 1 (February 2013): 28.

China's desire for force modernization occurred as the impoverished Soviet Union was imploding. After its collapse in 1991, China purchased the Soviet's state of the art front line fighter, the Su-27, forging a relationship with the two nations in arms sales totaling \$20 to \$30 billion over the next 15 years.⁹⁶ Starting in 1995 the PLAAF began removing approximately 3,000 antiquated fighter-interceptors from its inventory.⁹⁷ The result was a more aggregate mix between aircraft that are designated for specifically air-to-air and aircraft that conduct intercept and surface attack missions. The PLAAF's fighter modernization follows the USAF previous vision, before its current advocacy for an eventual all fifth-generation fleet, of a balanced high-technology/low-technology mixed CAF fighter force. The high/low mix blends the capabilities of a lower number of

⁹⁵ Shlapak, "Equipping the PLAAF," 192; Adam Baddeley, "The AMR Regional Air Force Directory 2013," *Asian Military Review* 21, no. 1 (February 2013): 28.

⁹⁶ McCabe, *China's Revolutions*, 4; Halloran, "A Revolution for China's Air Force," 47. The arms sales between China and the Soviet Union, later Russia, encompassed a wider range of military weapon systems, including: fighter and bomber aircraft, destroyers, submarines, tanks, missiles, and command and control systems.

⁹⁷ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 202.

high-technology aircraft with that of the larger quantities of low-technology fighter aircraft. The PLAAF continues to operate and upgrade the less-advanced J-7 and J-8 platforms as a balance between the procurement of fourth-generation equivalent J-10 and J-11 platforms that will continue to increase in number and enter operational service over the next 5 to 10 years.⁹⁸ Though the PLAAF is not attempting to match the United States in a system-by-systems based modernization approach, the capabilities of China’s fourth-generation fighters are comparable to the US standard.⁹⁹

The PLAAF’s fourth-generation fighter force possesses modern avionics, electronic countermeasures, and weapons employment capabilities similarly seen in the CAF. The Russian-built Su-27 and the indigenously-produced licensed copy, the J-11, are analogous to the F-15C, with the Su-30 bearing a similarity to the F-15E. For a single-engine airframe, the Chinese J-10 possesses similar characteristics to the widely proliferated F-16. Though not identical, the Chinese and US fighters “clearly seem to fill parallel slots in their respective force structures” [Table 9].¹⁰⁰

Table 9: USAF vs. PLAAF Fourth-Generation Fighters

Type	Initial Operational Capability	Maximum Takeoff Weight (kg)	Range (km)	Armament
F-15C	1979	30,845	>2,500	Up to 8 air-to-air missiles Up to 10 air-to-air missiles
Su-27/J-11	~1997	33,500	4,900	11,113 kg
F-15E	1989	35,741	2,540	8,000 kg
Su-30	2001	34,500	3,000	4,200 kg
F-16C	1984	21,772	1,550	4,500 kg
J-10	~2006	18,500	~1,100	

Source: Shlapak, “Equipping the PLAAF,” 203.

The PLAAF modernization effort started in the early 1990s has produced a fighter force that is vastly improved in overall performance and close, or in some cases exceeding, the Western model. Chinese modernization has produced a more capable force even as the total force has shrunk in overall size from 5,000 aircraft in 1990 to a combat-capable

⁹⁸ Xiaoming, “Equipping the PLAAF,” 80.

⁹⁹ Fuell, “Broad Trends,” 2.

¹⁰⁰ Shlapak, “Equipping the PLAAF,” 203.

force of 1,903 aircraft in 2012.¹⁰¹ Modernization of the PLAAF fighter force comprises the bulk of the combat-capable force, totaling 1,385 aircraft blended across a high/low mix of capabilities.¹⁰² During the same period, as the USAF reduced the CAF fighter force by 50 percent to 2,025 aircraft, the total USAF inventory shrunk from 9,907 to 5,551 aircraft from 1990 to 2012.¹⁰³ Comparatively viewing the total fighters forces held by each service, the Chinese have effectively reduced the fighter gap that was present two decades ago. The fighter force of the PLAAF is not the only means by which China would exercise an A2 strategy. The other is its formidable IADS network.

The PLA's understanding for the need of early warning (EW) led to modernization that allows the detection for potential threats over-the horizon (OTH). China operates a high-frequency skywave-exploiting OTH radar system that emits a low frequency signal (3-30 MHz) that bounces off the ionosphere. Target illumination occurs from the top-down, and then the signal again bounces off the ionosphere on the return to the OTH system. The skywave method extends detection ranges from this system out from 620 to 2,480 miles. Additionally, the system is able to detect stealth aircraft, cruise missiles, and maritime surface targets.¹⁰⁴ Long range EW of the OTH system provides the ability for a layered engagement of a threat with the use of ballistic missiles at range (DF-21D) followed by situational awareness of the striking force prior to entering fighter and SAM engagement zones.

The PLAAF controls one of the largest forces of SAM systems in the world. The PRC's first SAM system was the S-75 (SA-2 Guideline), purchased from the Soviet Union in 1959.¹⁰⁵ Soon after the system became operational, the PLA shot down a Taiwanese RB-57D reconnaissance plane on 7 October 1959; a full seven months prior to the Soviet shoot down of Francis Gary Powers' U-2.¹⁰⁶ During the period of the Sino-

¹⁰¹ Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 196.

¹⁰² Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 196–97.

¹⁰³ “2013 USAF Almanac,” 46; Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 23.

¹⁰⁴ Stokes, “Quest for Joint Aerospace Power,” 57.

¹⁰⁵ Cheng Hsi-hua, “The Employment of Airpower in the Taiwan Strait,” in *The Chinese Air Force Evolving Concepts, Roles, and Capabilities*, ed. Richard Hallion, Roger Cliff, and Phillip C Saunders (Washington, DC: National Defense University Press for the Center for the Study of Chinese Military Affairs, Institute for National Strategic Studies, 2012), 328.

¹⁰⁶ Cheng Hsi-hua, “Airpower in the Taiwan Strait,” 328.

Soviet split from 1960-1989, the PRC reversed-engineered and mass-produced the SA-2 system under the indigenous designation of the HQ-2A as the foundation of the mainstay of the IADS system.¹⁰⁷ As relations resumed, and as China assessed the aftermath of Desert Storm, the PLA began upgrading the aging HQ-2A systems and procured the more advanced SAM systems.

China possesses a variety of indigenous and Russian-produced SAM systems that provide for a layering of defensive capability [Table 10].¹⁰⁸

Table 10: PLAAF SAM Systems

Designation	Guidance	Range (km)	Notes
HQ-2	Command	35	Similar to S-75/SA-2
HQ-7	Command	12	Similar to French Crotale
HQ-9	Track via missile	90/200 ^a	Merges S-300 / Patriot Technology
HQ-12/FT-2000	Inertial navigation system / passive radar	100 to 120	Targets airborne warning command and control, electronic warfare aircraft
S-300PMU	Radar homing	90	5V5RUD missile
S-300PMU1	Track via missile	150	48N6E missile
S-300PMU2	Track via missile	200	48N6E2 missile

Source: Adapted from Shlapak, "Equipping the PLAAF," 201-02.

Of particular interest in the composition of the PLAAF's AD capabilities is the HQ-12 anti-radiation SAM that appears to be specifically designed to attack Airborne Warning and Control System (AWACS) type aircraft and airborne jamming platforms.¹⁰⁹ The development of the system can easily be attributed to the effectiveness of the AWACS and airborne jamming platforms that, respectively, controlled the air armada during Desert Storm and degraded the Iraqi IADS ability to effectively seek to counter US and coalition airpower. Though the HQ-12 poses a formidable threat to the control and jamming aircraft, the preponderance of threat to air operations will be from the varied types and numerous quantities of the PLAAF's other "double-digit" systems.

The S-300 series, and China's reverse-engineered variant the HQ-9, are

¹⁰⁷ Cheng Hsi-hua, "Airpower in the Taiwan Strait," 328.

¹⁰⁸ Shlapak, "Equipping the PLAAF," 201-02.

¹⁰⁹ Shlapak, "Equipping the PLAAF," 201.

considered some of the world's most effective all-altitude systems. According to the DOD:

China's ground-based air defense A2/AD capabilities will likely be focused on countering long-range airborne strike platforms with increasing numbers of advanced, long-range SAMs. China's current air and air defense A2/AD components include a combination of advanced long-range SAMs – its indigenous HQ-9 and Russian SA-10 and SA-20 PMU1/PMU2, which have the advertised capability to protect against both aircraft and low-flying cruise missiles. China continues to pursue the acquisition of the Russian extremely long-range S-400 SAM system (400 km), and is also expected to continue research and development to extend the range of the domestic HQ-9 SAM to beyond 200 km.¹¹⁰

A typical S-300 regiment possesses 16 to 24 transporter-erector launchers, organized into four to six batteries. In this configuration, one regiment could fire 64 to 96 missiles, prior to reloading, in the protection of a given area.¹¹¹ The S-300 is most closely akin the Patriot missile system that performed so admirably during the Gulf War, but with one significant difference: the S-300 series are mobile while their American counterpart is a fixed system. Mobility provides these systems the means to “shoot and scoot” to negate or degrade US suppression of enemy air defense efforts.¹¹² Additionally, the PLA have also incorporated these advanced systems into its naval fleet, thereby adding to the mobility of the these advanced systems and increasing the threat to air operations further from the mainland of China.¹¹³ Of significance to CAF fighter operations, “These advanced SAMs could constrain the operation of even high-performance fighter aircraft; nonstealthy, so-called legacy jets—the F-15, F-16, and F/A-18—would be greatly at risk

¹¹⁰ Office of the Secretary of Defense, “China 2013,” 35.

¹¹¹ Cheng Hsi-hua, “Airpower in the Taiwan Strait,” 329.

¹¹² Kopp, “China's Air Defence,” 23.

¹¹³ “Ship-mounted SAM defenses include medium- and high-altitude systems, such as the SA-N-7 (naval version of the SA-11) on the Hangzhou-class (Sovremenny) and Guangzhou-class (Luyang I/Type 052B) destroyers, and the SA-N-6 (naval version of the S-300PMU/SA-20) on the Luzhou class, and the SA-N-6's indigenous equivalent, the HHQ-9, on the Luyang II class, as well as low- and very low-altitude systems, such as the HQ-61 and HQ-7 (Crotale) systems found on a wider variety of classes.” Cliff et al., *Shaking the Heavens*, 25–26.

if called upon to fly within the S-300/400's envelope.”¹¹⁴

Conclusion

The publication of *Sustain US Global Leadership: Priorities for a 21st Century Defense* in 2012 signified a strategic rebalance to the Asia-Pacific region. For the United States, the region represents a vital aspect of the nation's national interests with both economic and security concerns. The pivot also influences the DOD's investment in “force structure, capabilities, posture, operational concepts, and engagement in the region.”¹¹⁵ The United States recognizes the need for cooperation with China, the major regional actor in the region, as the means to encourage transparency on both parties' capabilities and intentions as the US shifts strategic and military focus to the region. Nonetheless, the American pivot and Chinese military modernization complicates the forging of an open bilateral relationship.

From China's perspective, the pivot represents an offensively based policy of containment by the United States echoing twentieth-century anti-Communist containment of the Soviet Union. After witnessing the outcome of the Gulf War, particularly the effectiveness of US airpower in bringing decisive action upon the Iraqi military, China embarked on an expansive modernization program of the PLA. Over the past 23 years, the PLA has advanced its airpower in order “to defend against perceived threats to national sovereignty and territorial rights.”¹¹⁶ The resurgence of the *shashoujian* concept in Chinese literature demonstrates that the PRC is not trying to match the US system-by-system. Instead, China is investing in methods of both direct and indirect action to target vulnerabilities while engaging opposing strengths in a layered defense strategy to prevent and inhibit operations in the region. The DOD calls this layering strategy A2/AD.

The PLA is developing a modern and capable force that poses a significant A2/AD threat to US interests in the Asia-Pacific region. China's modernization and production of ballistic and cruise missiles places any forces out to the Second Island

¹¹⁴ Shlapak, “Equipping the PLAAF,” 206.

¹¹⁵ Office of the Undersecretary of Defense, *United States Department of Defense Fiscal Year 2014 Budget Request: Overview* (Washington, DC: U.S. Department of Defense, 2013), 2–6.

¹¹⁶ Stokes, “Quest for Joint Aerospace Power,” 33.

Chain at risk during initial deployment and operations. The PLAAF now possesses, and continues to develop or acquire, one of the most advanced IADS in the world, with the capability of engaging targets out to 200 km from mobile or naval launch platforms. Adding to the PLAAF's A2 capability is the fighter force, which has progressed from an equivalent US century-series aircraft in the early 1990s to a force that is comparable to US fighters today. Bolstered by an increasing economy, China's A2/AD modernization "has been done on an economy a third to half of the [United States]—shades of the USSR!"¹¹⁷

Some of postulated that in just over a decade from now, in 2025, China would remain the second or overtake the United States as the world's leading economic power.¹¹⁸ Additionally, as US power diminishes and as China's military power creates the potential for conflict may occur as a result of varied reasons, such as the final manifestation of a growing security dilemma or both nations being drawn in to conflict due to third-party intervention.¹¹⁹ Regardless of the hypothetical scenario that may lead to military conflict, great power politics have the potential to create "the most dangerous scenario the United States may face . . . is one in which China becomes a potential hegemon in Northeast Asia."¹²⁰ Arguably, China has surpassed regional hegemony and is now on the rise to becoming a global hegemon.

¹¹⁷ McCabe, *China's Revolutions*, 12.

¹¹⁸ National Intelligence Council, *Global Trends 2025: A Transformed World*. (Washington, DC: National Intelligence Council, 2008), 29, http://www.dni.gov/nic/PDF_2025/2025_Global_Trends_Final_Report.pdf.

¹¹⁹ National Intelligence Council, *Global Trends 2025*, xi, 29; John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York: Norton, 2001), 35–36; Office of the Secretary of Defense, "China 2013," 32.

¹²⁰ Mearsheimer, "Can China, US Avoid Tragedy of Great Power Politics?," 401.

Chapter 5

Sino-American Conflict 2025: A Scenario

What is of supreme importance in war is to attack the enemy's strategy; next best is to disrupt his alliances; the next best is his army; the worst policy is to attack cities.

—Sun Tzu

You really have to have to launch out of Andersen someday and go, "Okay, where am I going next?" And nine hours later, when you get somewhere you go, "Man, it's a long ways out here".

—Gen Herbert Carlisle

The United States, since the end of World War II, has maintained a position as the world's dominant power. Power of this level is referred to as hegemony—the ability to effectively influence the international order as regards relations between states but not the power to establish complete control. Hegemony is not necessarily desirable, as it requires the hegemon, in this case the United States, to act as a stabilizing presence, underwriting international order both economically and militarily. “Over the next 20 years, the United States will find holding such a dominant position difficult.”¹ China, fueled by over three decades of prosperity, is an emerging superpower rivaling the US's standing as the world's leading financial actor. China's prosperity has provided the means for modernization of its military that is now considered one of the most formidable in the world—second only to the United States. In their view, the leaders of the PRC see the development of a modern military as a necessity to achieve the status of a great power.² RAND analysts' 2011 predictions, based upon China's military modernization efforts, were that “these changes are likely to accelerate in the future, so that, within another decade, the capabilities of China's air force could begin to approach those of the

¹ John Albert Shaud, *Air Force Strategy Study 2020-2030* (Maxwell AFB, AL: Air University Press, 2011), 95.

² Office of the Secretary of Defense, “China 2013,” 15.

US Air Force (USAF) today.”³

By 2025, the United States may remain the world’s foremost actor in the international order, but other nations will closely match its economic and military power.⁴ Specifically in the Asia-Pacific region, the National Intelligence Council cautions, “An absence of regional cooperation in Asia could help spur competition among China, India, and Japan over resources such as energy.”⁵ In a resource competitive environment, China’s continued military modernization and lack of transparency has the potential to heighten the growing security dilemma evident today. The modernization of the CAF to a fifth-generation fighter force will still be ongoing in 2025, but the overall structure will be different due to continued vacillations in force structure management and domestic fiscal instability. Conversely, China’s high/low modernization efforts will continue to field advanced ballistic missiles, IADS, and fourth- and fifth-generation aircraft. Though the overall military capability will likely still favor the United States, it is vital that military planners consider how these potential changes will affect the relationship with China in the future.

This chapter comprises an assessment of a hypothetical situation, based upon current projections of military capability, wherein the CAF fighter force must conduct operations in the Asia-Pacific region challenged by China’s A2/AD capabilities. This type of speculative gaming is routine in military planning, and does not constitute certainty or intent. It is a standard and necessary assessment tool for proper contingency planning. First, a plausible scenario initiating a potential Sino-American conflict provides the strategic context. Second, the fiscally-influenced CAF fighter force structure and China’s continued modernization shape the respective militaries of 2025. Under these conditions, and unlike Desert Storm, the size of the area of responsibility (AOR) in the Asia-Pacific region—compounded by the range of Chinese A2/AD systems—will stress the ability of the CAF fighter force to support national security objectives.

³ Cliff et al., *Shaking the Heavens*, 2.

⁴ National Intelligence Council, *Global Trends 2025*, 29.

⁵ National Intelligence Council, *Global Trends 2025*, xi.

Context of a Sino-American Conflict

Political scientist Kenneth Waltz poignantly states, “In the great-power politics of bipolar worlds, who is a danger to whom is never in doubt.”⁶ For the near future, the United States and China will be the dominant actors determining the strategic environment of the Asia-Pacific region. Unlike most historical situations of systemic bipolarity, which, according to Waltz, tend to stability in part due to a resultant decline in military and economic interdependence, relying instead on the reliability and precision of internal balancing of capabilities,⁷ the Sino-American relationship appears to be increasingly interdependent. Since the post-Mao economic reforms by Deng Xiaoping and subsequent PRC leadership, the United States and China have become each other’s main import and export partners.⁸ In addition, they share several of the same intra- and inter-regional trading partners, to include Japan, South Korea, Taiwan, and Germany.⁹ The globalized interdependent nature of the current international economic system can lead one to argue that counter to hegemonic transition theory predictions, the United States and China are *not* destined for conflict.¹⁰ However, as Waltz asserts, international interdependence can lead to national vulnerabilities.¹¹

China is rich with natural resources, but to continue to fuel its economic development it will still be dependent on the import of domestically scarce resources—specifically oil and natural gas.¹² China has demonstrated the desire to reduce these particular energy vulnerabilities with its territorial claims in both the East and South China Sea. While China claims historical precedence for the Diaoyu/Senkaku Islands and islands encompassed within the nine-dash line, there remains a strong possibility these overtures are more important as part of a larger strategy to secure nationally controlled energy resources than for cultural solidarity.¹³ China’s continued efforts to

⁶ Kenneth N Waltz, *Theory of International Politics* (Long Grove, Ill.: Waveland Press, 2010), 170.

⁷ Waltz, *Theory of International Politics*, 168.

⁸ Shaud, *Air Force Strategy Study 2020-2030*, 97.

⁹ Shaud, *Air Force Strategy Study 2020-2030*, 97.

¹⁰ Shaud, *Air Force Strategy Study 2020-2030*, 103.

¹¹ Waltz, *Theory of International Politics*, 143–46.

¹² Shaud, *Air Force Strategy Study 2020-2030*, 97.

¹³ Wu, “Agenda for a New Great Power Relationship,” 70; Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 65.

improve its geopolitical position in the Asia-Pacific region, just as the United States arguably has with its strategic pivot to the region, could lead to significant disputes that can ultimately lead to armed conflict.¹⁴ Political scientist Robert Gilpin simply states, “It is perceived certainty of gain that most frequently causes nations to go to war” and not uncertainty or miscalculation.¹⁵

Regardless of the situation that leads to conflict, both the United States and China continue to posture and develop their respective forces in relation to the other. Former Secretary of Defense Donald Rumsfeld commented, “As you know, you go to war with the Army you have. They're not the Army you might want or wish to have at a later time.”¹⁶ The greater context of his statement was a response to why the DOD had not foreseen, or quickly responded to, the need for up armoring the High Mobility Multipurpose Wheeled Vehicle (HMMWV) to protect against Improvised Explosive Devices (IEDs). A decade later, the USAF is attempting to foresee the future threat environment and have the CAF fighter force that USAF *wants* to have to be successful. Unfortunately, domestic decision-making and the modernization efforts by China are making the process difficult and precarious.

The CAF Fighter Force of 2025

Due to fiscal and political constraints, the USAF will manage risk by maintaining legacy fourth-generation platforms in the CAF fighter force inventory to support national security objectives. The halted procurement of the F-22 in 2009 to just 183 of these aircraft resulted in a shortfall of air superiority that, according to former CSAF Gen T. Michael Moseley, significantly alters capabilities, strategy, and planning: “When you have 183, you have a different reality. Your strategy may be the same . . . but you don’t have the overall capacity to deploy and generate forces with 183 total versus 381 . . . So

¹⁴ “Both bipolar and multipolar structures contain elements of instability, and the efforts by one or more states to improve their relative positions can trigger an uncontrollable train of events that can lead to international conflict and war.” Gilpin, *War and Change in World Politics*, 93; Wu, “Agenda for a New Great Power Relationship,” 70–71.

¹⁵ Gilpin, *War and Change in World Politics*, 92.

¹⁶ William Kristol, “The Defense Secretary We Have,” *Washington Post*, December 15, 2004, <http://www.washingtonpost.com/wp-dyn/articles/A132-2004Dec14.html> (accessed 9 April 2014).

there is a difference between 381 and 183 that is not just a numeric math problem; it's a real operational delta."¹⁷ The Air Force is bridging the delta by divesting 51 aircraft and modernizing the remaining 179 to remain viable through 2035, per the FY15 budget request.¹⁸ Additionally, the FY 15 request will look to divest the entire A-10 fleet—283 aircraft—to support the modernization and recapitalization efforts.¹⁹ The divestiture of 334 aircraft results in a fighter force below the previous year's identified minimum requirement of 1,900 total aircraft.²⁰ Lt Gen Charles Davis acknowledges, "Fiscal pressure drove these tough choices—balancing today's need against tomorrow's—and accepting near-term risk today to be ready and viable tomorrow."²¹ The CAF of tomorrow will build its foundation on a modernized and recapitalized fifth-generation fighter force—but a much smaller and later-deployed one than originally envisioned.

The F-22 and F-35 are the only US fighters capable of operating in the highly contested environments that an advanced A2/AD threat will pose now and in the future. As adversary technologies seek to counter the capabilities of the CAF's fifth-generation fleet, the F-22 will require modernization to remain viable.²² Gen Hostage bluntly states,

¹⁷ Gen T. Michael Moseley, Air Force Gen T. Michael Moseley Transcript, Part One, interview by Timothy Clark, transcript, October 31, 2007, <http://www.govexec.com/federal-news/2007/10/air-force-gen-t-michael-moseley-transcript-part-one/25643/> (accessed 12 November 2013). Later legislation added four additional F-22s to compensate for earlier attrition establishing the final aircraft inventory today of 187.

¹⁸ Lt Gen Charles R. Davis, "Fiscal Year 2015 Department of Defense Tactical Aircraft Programs" (House Armed Services Committee, April 8, 2014), 9–10. The 179 F-15 C/D plan is four more than the plan briefed by Lieutenant General Field and Lieutenant General Davis for FY14.

¹⁹ "The A-10C does not possess the necessary survivability to remain viable in contested environments. Additionally, fiscal constraints required the Air Force to prioritize multi-role legacy over single mission platforms." US Department of the Air Force, *USAF FY15 Budget Overview*, 40; Davis, "Tactical Aircraft Programs," 8.

²⁰ Field and Davis, "Combat Aviation Program," 5; Davis, "Tactical Aircraft Programs," 7.

²¹ Davis, "Tactical Aircraft Programs," 7.

²² Davis, "Tactical Aircraft Programs," 11; Gen Michael Hostage, Air Combat Command's Challenge: Buy new or modernize older aircraft, interview by Aaron Mehta, transcript, February 2, 2014, <http://www.airforcetimes.com/article/20140202/NEWS04/302020005/Air-Combat-Command-s-challenge-Buy-new-modernize-older-aircraft> (accessed 22 February 2014).

“If I do not keep that F-22 fleet viable, the F-35 fleet frankly will be irrelevant.”²³ He cites the F-35’s limited capability as an air superiority platform, compounded by the “pitifully tiny” number of F-22s. The reality of the quantitative deficiency in the F-22 fleet spurs the advocating of the full purchase of 1,763 F-35s for the CAF to meet the challenges posed by operating within an A2/AD environment. The limited purchase of the F-22 and the delayed delivery of the F-35 have led to the many stopgap measures for the CAF’s aging fourth-generation fleet. Unfortunately, the total numbers of fighters in the CAF is going to get worse before it gets any better.

In the 2014 *Quadrennial Defense Review* (QDR), the DOD outlined the main elements of the planned US force structure by FY 2019. For the CAF, the Air Force will reduce force structure from 55 to 48 fighter squadrons with 971 “combat coded” or PMAI aircraft.²⁴ The Total Active Inventory (TAI) is projected at 1622 aircraft.²⁵ These aircraft projections are 129 and 278, respectively, less than the 1,100 PMAI and 1,900 TAI higher risk force structure accepted by Air Force leadership identified in Chapter 2.

Two potential force structures for 2025 are projected. In each case, F-22, F-15C, and F-15E fleets remain constant, as additional procurement of those types of aircraft will not occur. In addition, F-35 deliveries to the CAF will reach an 80 aircraft per year maximum by 2021, from procurement authorizations initiated in FY19, although this will occur seven years later than initial projections.²⁶ For the first case, the PMAI of 971 aircraft set by the 2014 QDR remains constant across the force structure [Table 11].²⁷ To maintain a constant PMAI the CAF will reduce F-16s at a reciprocal rate as the F-35s

²³ Hostage, Air Combat Command’s Challenge: Buy new or modernize older aircraft.

²⁴ Hagel, *QDR 2014*, 40; Davis, “Tactical Aircraft Programs,” 4. A force structure of 48 fighter squadrons in FY 2019 represents a reduction of 27 fighter squadrons since 2001.

²⁵ TAI is the aircraft assigned to operating forces for mission, training, test, or maintenance functions excluding maintenance training. PMAI are aircraft assigned for the performance of the mission. To calculate TAI, multiply PMAI by a factor of 1.67 to account for aircraft in other than mission status.

²⁶ Congressional Budget Offices, *Long-Term Implications*, 38; US General Accounting Office, *F-35 Joint Strike Fighter: Current Outlook Is Improved, but Long-Term Affordability Is a Major Concern*, Report to Congressional Committees (Washington, DC: US General Accounting Office, March 2013), 5.

²⁷ Hagel, *QDR 2014*, 40; US Department of Defense, *Department of Defense Fiscal Year (FY) 2014 President’s Budget Submission: Aircraft Procurement Air Force*, vol. 1, Justification Book (Washington, DC: US Department of Defense, 2013), 1–19.

begin to enter the service. As a result, over the period the composition of the total force that is fourth-generation will decrease by 400 aircraft, equating to almost a 25 percent reduction of legacy aircraft.

Table 11: Projected CAF Fighter Force 2020 to 2025—Constant PMAI^a

Date	F-35A ^b	F-22A	F-15C/D	F-15E	F-16C/D ^c	TAI	PMAI	PMAI (% fourth-gen)
2019	225	187	179	219	812	1622	971	74.6
2020	285	187	179	219	752	1622	971	70.9
2021	365	187	179	219	672	1622	971	66.0
2022	445	187	179	219	592	1622	971	61.0
2023	525	187	179	219	512	1622	971	56.1
2024	605	187	179	219	432	1622	971	51.2
2025	685	187	179	219	352	1622	971	46.2

^aNumbers subject to rounding error.

^bF-35A deliveries for the Air Force reach 80 aircraft per year by 2021 from procurement authorizations for FY19.

^cF-16C/D reduction based upon one-for-one replacement with F-35A to maintain a constant PMAI of 971 aircraft.

Source: Derived from Charles T. Hagel, Quadrennial Defense Review 2014 (Washington, DC: Government Printing Office, 2014), 40; US Department of Defense, Department of Defense Fiscal Year (FY) 2014 President’s Budget Submission: Aircraft Procurement Air Force, vol. 1, Justification Book (Washington, DC: US Department of Defense, 2013), 1–19.

The second case assumes an increase (*back*) to the previously identified threshold of 1,100 PMAI. In each year, for a gradual increase of PMAI, the CAF would retain 36 F-16s per year over the one-for-one F-35 replacement construct [Table 12].²⁸ In this particular case the total force will increase by 129 PMAI aircraft over the 971 baseline, equating to an increase of greater than 13 percent of PMAI in the previous case. On the other hand, the overall reduction of fourth-aircraft generation is 166 aircraft less than in the first case, while the composition of the fighter force constituted by legacy aircraft is 6.4 percent higher by 2025.

²⁸ Davis, “Tactical Aircraft Programs,” 6; US Department of Defense, *FY14 Aircraft Justification Book*, Justification Book Volume 1 of 2:1–19.

Table 12: Projected PMAI CAF Fighter Force 2020 to 2025—Increased PMAI

Date	F-35A ^b	F-22A	F-15C/D	F-15E	F-16C/D ^c	TAI	PMAI	PMAI (% fourth-gen)
2019	225	187	179	219	812	1622	971	74.6
2020	285	187	179	219	788	1658	993	71.5
2021	365	187	179	219	744	1694	1014	67.4
2022	445	187	179	219	700	1730	1036	63.5
2023	525	187	179	219	656	1766	1057	59.7
2024	605	187	179	219	612	1802	1079	56.0
2025	685	187	179	219	568	1838	1100	52.6

^aNumbers subject to rounding error.

^bF-35A deliveries for the Air Force reach 80 aircraft per year by 2021 from procurement authorizations for FY19.

^cCAF retains 36 F-16C/Ds above one-for-one replacement with F-35As to achieve a total PMAI of 1100 by 2025.

Source: Derived from Davis, "Tactical Aircraft Programs," 6; US Department of Defense, FY14 Aircraft Justification Book, Justification Book Volume 1 of 2:1–19.

Once can view the implications of both cases positively or negatively to the CAF's ability to effectively meet the requirements of national security objectives. The first case has the advantage of providing the combatant commander in 2025 a CAF fighter force with a majority of fifth-generation aircraft. While this may sound appealing, the declaration of majority fifth-generation fleet is also deceiving. As Table 11 shows, the resultant increase in the percentage of fifth-generation aircraft is due to limiting PMAI thereby resulting in less combat capability, regardless of generational type. Alternatively, the second case presents a quantitative increase in capability based solely on overall increase in PMAI. The quantitative increase comes at a significant price, in maintenance and upgrades, as the overall fighter force is comprised of 216 more fourth-generation aircraft. Further complicating the issue is the identification of only 300 F-16s for the Service Life Extension Program, bringing into question the availability of 568 F-16s by 2025 in the second case.²⁹

Both cases are attempts to minimize the down-side of a depleting force structure, but the second is unapproved and, frankly, unlikely given current budget trends and

²⁹ Davis, "Tactical Aircraft Programs," 8; US Department of the Air Force, *USAF FY15 Budget Overview*, 41.

historical delays in recapitalization. Therefore, only the first case structure will be assessed in evaluating the capability of the CAF fighter force to conduct operations in a future Sino-American conflict. In contrast, it is important to assess the composition of the PLAAF in 2025, to include the first application of Chinese stealth and counter-stealth technologies.

The PLAAF in 2025

US Air Force leaders have consistently called for a fifth-generation fighter force to successfully achieve US national security objectives in the contested environments expected in the future.³⁰ China has taken notice. The PLAAF perceives stealth as providing an advantage to offensive operations that negates the ability of defensive operations.³¹ The initiation of hostilities by the United States, Chinese planners predict, would follow a historical pattern of conducting air and missile strike from forward bases as follow-on forces mobilize to the region.³² The PLA, with modernized ballistic missiles and cruise missiles, plans to counter US strategy by attacking where it is most vulnerable, its dependence on forward base access, to negate or degrade US operations.³³

By 2025, the Second Artillery Force may possess the ability to conduct conventional global precision strike through the vision of modernization China is instituting today. Even if the PLA falls short of this goal, the efforts made will only further its ability to hold any regional military installation in peril. Adding to the threat of advanced ballistic missiles is the continued production of thousands of DH-10 cruise missiles and development of the HN-2000. The HN-2000 is a next-generation cruise missile that combines precision strike, stealth, supersonic terminal speed, and an expected range of 4,000 km.³⁴ Airpower analyst John Stillion highlights the devastating capability of these A2 systems in a scenario involving the deployment of US aircraft to Kadena AB,

³⁰ Welsh III, "The Strategic Choices and Management Group," 9; Hostage, "CAF in the 2020s," 2; Moseley, Air Force Gen T. Michael Moseley Transcript, Part One.

³¹ Office of the Secretary of Defense, "China 2013," 66.

³² Krepinevich, *Why ASB?*, 16.

³³ Cliff, *Entering the Dragon's Lair*, 49.

³⁴ Ian Easton, *The Assassin Under the Radar: China's DH-10 Cruise Missile Program* (Arlington, VA: Project 2049 Institute, 2009), 5.

Japan.³⁵ Postulating the effects of a missile attack, he states, “Loses would be substantial. According to our calculation, only 82 of 268 aircraft deployed to Kadena AB—31 percent—would be available for post-attack operations.”³⁶ Kadena AB currently possesses only 15 fighter-sized hardened aircraft shelters, with no known plans to increase that number.³⁷ The CAF fighter force not only will have to contend with China’s advancing A2 capability, in 2025 US fighters will have to contest with an adversary also possessing fifth-generation fighters.

In 2009, former SECDEF Robert Gates asserted the PLAAF would not be in possession of a stealth aircraft before 2020.³⁸ The same year the deputy commander of PLAAF announced that the first Chinese stealth fighters were soon to undergo flight tests and would be in service in “eight or 10 years.”³⁹ Two years later, as Secretary Gates was visiting Beijing, the J-20 prototype conducted its maiden test flight.⁴⁰ This underestimation seems reminiscent of the similar view of the Soviet Union’s ability to produce a viable nuclear weapon, which occurred in 1949—5 to 20 years earlier than predicted.⁴¹ The PLAAF sees stealth technology as a necessary core capability to enable its transformation from a territorial defense force to one of regional power projection.⁴² The J-20, larger and heavier than the F-22, and the F-35 analog J-31, will both possess advanced avionics, multi-role capability, and low observability.⁴³ Currently the DOD

³⁵ For more about airbase vulnerability see Stillion and Orletsky, *Airbase Vulnerability*.

³⁶ John Stillion, “Fighting Under Missile Attack,” *Air Force Magazine* 92, no. 8 (August 2008): 35.

³⁷ Stillion, “Fighting Under Missile Attack,” 35.

³⁸ Jeremy Page, “A Chinese Stealth Challenge?,” *The Wall Street Journal*, January 5, 2011, <http://online.wsj.com/news/articles/SB10001424052748703808704576061674166905408> (accessed 18 November 2013).

³⁹ Page, “Stealth Challenge?”

⁴⁰ Page, “Stealth Challenge?”

⁴¹ Phillip S. Meilinger, *Bomber: The Formation and Early Years of Strategic Air Command* (Maxwell Air Force Base, AL: Air University Press, Air Force Research Institute, 2012), 157–59.

⁴² Office of the Secretary of Defense, “China 2013,” 66.

⁴³ Office of the Secretary of Defense, “China 2013,” 35; Cordesman, Hess, and Yarosh, *Chinese Military Modernization*, 208–09. Many official Chinese reports also identify the second stealth fighter as the J-21.

predicts these PLAAF stealth fighters will not be in service before 2018.⁴⁴ By 2025, however, analysts have postulated that the PLAAF will possess 96 of the fifth-generation fighters.⁴⁵ Unlike the United States, China continues its production of fourth-generation fighters for domestic use and international sales.

China's fourth-generation fighters are exceeding the capabilities of their United States counterparts. The PLAAF's Su-30 variant exceeds the capabilities of the F-15C in several critical areas to include electronic attack, range, and maneuverability.⁴⁶ The Su-30, Su-27/J-11, and PLAAF's stealth platforms, by 2020, may carry both the ramjet-powered R-77M and R-172 air-to-air missiles with maximum ranges of 160 and 400 km, respectively.⁴⁷ The range of these missiles significantly extends the PLAAF's AD reach, especially for the targeting of US surveillance and command-and-control aircraft. As China acquires additional fourth- and fifth-generation aircraft over the next decade, analysts predict that the PLAAF fighter force will have a TAI of 1,425 aircraft.⁴⁸ Applying the similar methodology presented above, the PLAAF would possess 854 PMAI of which 90 percent of those aircraft are fourth-generation platforms, but such categorization may be of reduced validity as China continues to modernize those platforms.⁴⁹ As stealth represents core offensive capability, the development of counter-stealth defensive systems has been ongoing since the F-117s' success in Desert Storm.

The commonly held misconception is that stealth connotes invisibility. Stealth technologies provide low observability (reduced detection range) based upon design optimization for particular wavelengths of the electromagnetic spectrum. The result is the aircraft's shaping and material composition that are "optimized to defeat some radar

⁴⁴ Office of the Secretary of Defense, "China 2013," 35.

⁴⁵ GlobalSecurity.org, "PLAAF Equipment," n.d., <http://www.globalsecurity.org/military/world/china/plaaf-equip.htm> (accessed 7 April 2014).

⁴⁶ Lt Gen David A. Deptula, "Right Sizing the F-22 Force" (PowerPoint, Washington, DC, February 5, 2008), 5.

⁴⁷ Cliff et al., *Shaking the Heavens*, 219.

⁴⁸ GlobalSecurity.org, "PLAAF Equipment."

⁴⁹ The predicted fourth-generation component of the PLAAF is 1329 TAI resulting in a PMAI value of 796.

types or categories, and not defeat others.”⁵⁰ Most stealth designs optimize defeat of the centimeter-long wavelengths commonly used by engagement radars of both ground and airborne systems for missile guidance.⁵¹ Counter-stealth radar systems seek to exploit the inherent design vulnerabilities to other electromagnetic bands, particularly the VHF-band where materials and shaping become less effective in negating detection.⁵² These systems, incorporated into highly mobile IADS, have been in production and modernized since 2000.⁵³ According to Dr. Carlo Kopp, “Counter-stealth sensors will render US legacy aircraft unusable, as they will easily overcome any applied radar absorbent materials.”⁵⁴ He additionally affirms that the F-35 will be limited to “unusable” in situations facing counter-stealth systems.⁵⁵ Kopp bases this argument on the F-35s reliance on stealth for survivability due to its lower airspeed, maneuverability, and operational altitudes when compared to the F-22.⁵⁶

Further compounding the severity of this scenario would be the introduction of the 400 km capable S-400 “Triumpf” missile into the PLAAF inventory by 2025.⁵⁷ The system is capable of targeting aircraft, cruise missiles, SRBMs, and MRBMs.⁵⁸ The S-400 is further capable of engaging precision-guided munitions and high-speed antiradiation missiles (HARMs), depending on the particular missile load of the battery.⁵⁹ The system combines the capabilities of a longer-range S-300 with the equivalent intercept capability of the PAC-3 missile present in Patriot Missile batteries, all contained

⁵⁰ Carlo Kopp and Peter Goon, “The Collapse of American Air Power: The Proliferation of Counter-Stealth Systems” (PowerPoint, Australia, May 2009), 7, <http://www.ausairpower.net/PDF-A/APA-CVLO-Brief-May-2009-AE.pdf> (accessed 10 January 2012).

⁵¹ Kopp and Goon, “Counter-Stealth Systems,” 10.

⁵² Kopp, “Evolving Technological Strategy,” 90.

⁵³ Kopp and Goon, “Counter-Stealth Systems,” 19.

⁵⁴ Kopp and Goon, “Counter-Stealth Systems,” 32.

⁵⁵ Kopp and Goon, “Counter-Stealth Systems,” 32.

⁵⁶ Kopp, “Evolving Technological Strategy,” 92–93.

⁵⁷ Office of the Secretary of Defense, “China 2013,” 67. The DOD assess that the PLAAF would not possess the S-400/SA-21 until at least 2017.

⁵⁸ Office of the Secretary of Defense, “China 2013,” 67.

⁵⁹ Carlo Kopp, *Almaz-Antey 40N6/S-400 Triumpf Self Propelled Air Defense System/SA-21*, Technical Report APA-TR-2009-0503 (Air Power Australia, April 2012), <http://www.ausairpower.net/APA-S-400-Triumpf.html> (accessed on 18 January 2014) The S-400 is capable of carrying a combination of short-range missiles for point defense with long-range missiles for intercept operations on the same TEL.

within a mobile platform to increase the survivability of the system.⁶⁰ The S-400, similar to the S-300/HQ-9, is capable of integrating VHF band acquisition radars to support counter-stealth engagements.⁶¹ If the unfortunate circumstance occurs where the United States and China enter into an armed conflict, the CAF fighter force should expect to see an adversary with one of the most capable A2/AD systems in the world.

Engaging the Dragon

The ability of the CAF fighter force to project power in support of national security objectives must deal with particular challenges in the Asia-Pacific region. Not only will the capabilities of China's military to conduct an A2/AD strategy need to be overcome, but the CAF must first surmount the grand scale of the geophysical characteristics present in the AOR [Figure 18].⁶² To provide some scale to the vastness of the Western Pacific, consider that the distance from Andersen AFB, Guam to the Taiwan Straits is analogous to the distance from the northernmost point of Maine to the southernmost island in the Florida Keys. When referencing the relationship of the distances in the AOR during Desert Storm (Figure 14), the furthest most airfield from which CAF fighter operations were occurring required the F-117s deployed there to transit 665 nm prior to reaching the border of Iraq.⁶³ Operations that were to occur over Baghdad then had an additional 265 nm to traverse.⁶⁴ The cumulative distance an F-117 would travel on a given mission, to strike the target and safely return to the original base of departure, is *only* 30 nm more than a one-way journey from Guam to the Taiwan Straits. Although Andersen AFB is currently the furthest Pacific base from the Taiwan Straits, the eight other Pacific Air Forces bases also face the challenges that distance creates.

⁶⁰ Kopp, *S-400 Triumph*.

⁶¹ Kopp, *S-400 Triumph*.

⁶² Thomas P. Ehrhard and Robert O. Work, *The Case for a Carrier-Based Unmanned Combat Air System* (Washington, DC: Center for Strategic and Budgetary Assessment, 2008), 5.

⁶³ Watts, "GWAPS Vol. II: Part I Operations," 98.

⁶⁴ Watts, "GWAPS Vol. II: Part I Operations," 108.

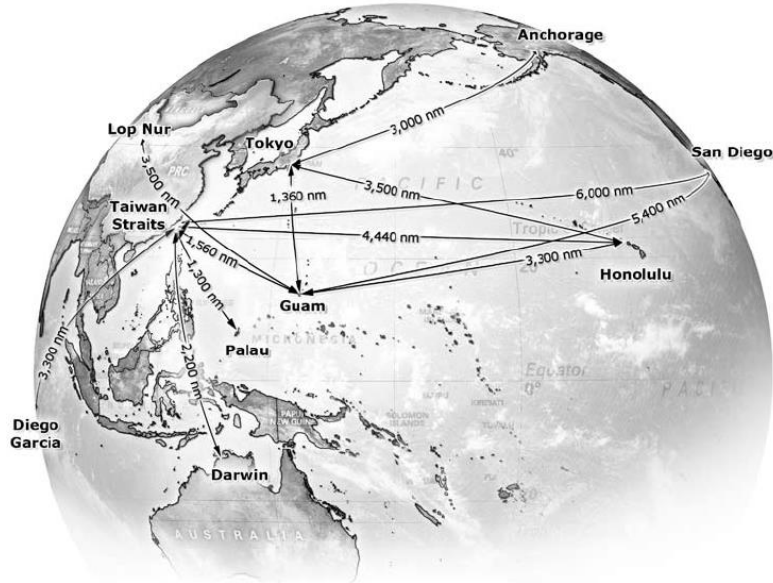


Figure 18: Distances in the Pacific

Source: Thomas P. Ehrhard and Robert O. Work, The Case for a Carrier-Based Unmanned Combat Air System (Washington, DC: Center for Strategic and Budgetary Assessment, 2008), 5.

Eight of the nine Pacific Air Forces Bases have a greater operational distance than the 10 airfields used by CAF fighter forces during Desert Storm.⁶⁵ Considering again the distance to the Taiwan Straits, Kadena AB located on the island of Okinawa is the closest US airfield with a range of approximately 450 nm.⁶⁶ During the Desert Storm, just four out of the 10 airfields used for CAF fighter operations were greater than the distance from Kadena AB to the Taiwan Straits.⁶⁷ One would have to travel to the Republic of South Korea to reach the second closest airfield to the Taiwan Straits. Kunsan AB is located approximately 775 miles away, which is greater than any airfield used by the CAF during Desert Storm.⁶⁸ The distances aircrew would have to face in the Western Pacific additionally lead to the issues of time required to transit the AOR and the

⁶⁵ PACAF airbases include Andersen AFB, Guam; Kadena AB, Japan; Misawa AB, Japan; Yokota AB, Japan; Kunsan AB, South Korea; Osan AB, South Korea; Hickam AFB, HI; Elmendorf AFB, AK; Eielson AFB, AK. Watts, "GWAPS Vol. II: Part I Operations," 6.

⁶⁶ Author derived distance using Google Earth mapping software.

⁶⁷ Watts, "GWAPS Vol. II: Part I Operations," 10. Ta'if AB, Kharmis Mushayt AB, Al Dahfra AB, and Al Minhad AB were greater than 450 miles from Iraq.

⁶⁸ Watts, "GWAPS Vol. II: Part I Operations," 10. Author derived distance using Google Earth mapping software.

possibility for increased aircrew fatigue.

Flight surgeons during Desert Storm cited aircrew fatigue as a pervasive problem during the war. For the aircrew, “life . . . during the air campaign involved little beyond sleep and the flight schedule.”⁶⁹ It became a standard routine for fighter pilots to fly every day with expected sortie durations of five to 10 hours.⁷⁰ CAF fighter operations in the Pacific region should expect sortie durations towards the upper end of the previous spectrum, and possibly—even routinely—exceeding 10 hours. For instance, a fighter taking off from Kadena AB would take approximately 55 minutes to fly to the Taiwan Straits.⁷¹ If the aircraft conducts a two-hour defensive counter air (DCA) sortie and returns, the total sortie duration would about four hours long. What if the same aircraft had the same DCA mission but was required to depart from Andersen AFB? Assuming similar conditions as the previous example, a sortie departing from Guam would increase four hours to eight hours and 30 minutes. Therefore, the situation arises where if both jets departed at the same time from Kadena AB and Andersen AFB, the aircraft from Kadena would be on-station for a second mission while the aircraft is still en-route back to Guam from its first mission.

The situation described above, while basic, provides insight to the difficulties associated with coordinating time and distance and the need for right sizing the deployed CAF fighter force to successfully conduct operations. On the eve of 17 January 1991, operations were about to transition from Desert Shield to Desert Storm. USAF fighters constituted 662 of the over 1,800 coalition aircraft.⁷² In 2025, a similar effort by the CAF fighter force would constitute a deployment of 68.2 percent of the available 971 PMAI in the CAF. Conversely, the fighter force that supported Desert Storm was only 26.7 percent of the available PMAI available.⁷³ If 68.2 percent of the CAF fighter force were to deploy in 2025, then only 309 PMAI would be available to respond to a second

⁶⁹ Keaney and Cohen, *Revolution in Warfare?*, 150.

⁷⁰ Keaney and Cohen, *Revolution in Warfare?*, 150.

⁷¹ This example assumes flying a direct line routing from Kadena AB to the Taiwan Straits at an average speed of .8 Mach, and 25,000 feet. Time required for aerial refueling operations included in the transit time calculation.

⁷² Hallion, *Storm over Iraq*, 158; Keaney and Cohen, *Revolution in Warfare?*, 142–43.

⁷³ Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 36–37. CAF fighter force TAI in 1991 was 4,134 aircraft. $4,135 \times (1/1.67) = 2,475$ PMAI aircraft.

contingency, homeland defense, or for use as a strategic reserve. The potential for elevated risk is always present when a small strategic reserve limits strategic military options. Another issue arises when not all of the aircraft deployed would be available to conduct combat operations.

Mission capable (MC) rate is a metric that represents the available force—in percentage—able to execute the tasked mission. The average MC rate for the CAF fighter force was 90.8 percent during Desert Storm, which was 4.9 percent higher than the pre-war peacetime MC rate [Table 13].⁷⁴ As of measure of comparison, Table 13 also shows the Operation Iraqi Freedom (OIF) MC rate covering the conduct of major combat operations from 19 March to 18 April 2003. Applying the average MC rate from the three periods above reduces the expected available force capable of executing the mission from 662 to 573 PMAI.⁷⁵

Table 13: MC Rates

	A-10	F-4G	F-15C	F-15E	F-16	F-111	EF-111	F-117	Average
Pre-Desert Storm	92.7	n.d.	85.0	87.9	90.2	78.0	n.d.	81.8	85.9
Desert Storm	95.7	87.0	94.0	95.9	95.2	85.0	87.5	85.8	90.8
OIF	85.0	...	82.6	84.1	^a	...	...	89.3	82.8
Total Average:									86.5

^aOIF F-16 variants MC rates: F-16+ 73.9; F-16CG 84.0; F-16CJ 80.4

Source: Derived from US Department of the Air Force, Air Force Performance in Desert Storm (Washington, DC: Government Printing Office, 1991), 3–5; Lt Gen T. Michael Moseley, Operation IRAQI FREEDOM: By the Numbers (US Central Air Forces, April 30, 2003), 10.

Unfortunately, an additional 15 percent of this force would have to fulfill the requirement for spare aircraft to replace primary aircraft that become non-mission capable. Therefore, the spare requirement reduces the available PMAI on an average day from 573 to 487 aircraft to conduct combat operations. The total force that one can never expect to get off the ground on a given day is thus 86 of the 662. That is equivalent to three and half

⁷⁴ US Department of the Air Force, *Air Force Performance in Desert Storm* (Washington, DC: Government Printing Office, 1991), 3–5; Lt Gen T. Michael Moseley, *Operation IRAQI FREEDOM: By the Numbers* (US Central Air Forces, April 30, 2003), 10.

⁷⁵ The total average MC rate of 86.5 is close to the historical attritional planning factor of 15 percent.

squadrons of aircraft that one *can expect* to never get off the ground.⁷⁶

What would the case be if all 971 PMAI were to deploy to support the operation in 2025? Though this situation is highly unlikely, it is unfortunately not much better off than the preceding case. Table 14 represents a varied number of cases that provide various levels of reserve, parity, and supremacy in numbers in comparison with the PLAAF fighter force. The CAF fighter force deployed in support in of Desert Storm had a numerical superiority of only 10 aircraft when compared to the Iraqi Air Force’s fighter force inventory shown in Table 5. To reach a similar level of numerical superiority against the PLAAF in 2025, the USAF would have to deploy greater than 87.6 percent of the available PMAI fighter force, leaving only five FSEs available for homeland defense, response for other contingency operations, or as strategic reserve. In order to achieve a ten-fold increase in numerical superiority, projected in the Table above, the CAF’s entire fighter force would need to be deployed and still would fall three PMAI short of obtaining a 100 aircraft advantage.

Table 14: Different Examples of Total Deployed PMAI CAF Fighter Forces^a

	Desert Storm Equivalent	Ten FSE Reserve	Parity	Five FSE Reserve	Zero FSE Reserve	PLAAF ^b
Deployed	662	731	839	851	971	854
Percent of CAF						
Deployed (Percent)	68.2	75.3	86.4	87.6	100	...
Reserve	309	240	132	120	0	0
MC	573	632	726	736	840	726
Spares	86	95	109	110	126	109
Total Available	487	537	617	626	714	617
Difference with PLAAF	-130	-80	0	9	97	...

^aNumbers subject to rounding error.

^bPLAAF MC rate assumed 85 percent PMAI with 15 percent requirement for spares.

Source: Author’s Original Work

Looking at the total numbers of aircraft deployed does not provide for a full understanding of the precarious situation the CAF fighter force may be in 2025. Equally important is to consider the internal composition of the types of fighters deployed,

⁷⁶ One fighter squadron equivalent (FSE) is comprised of 24 PMAI (Reference Chapter 2).

especially considering the highly contested nature of the A2/AD environment those forces would have to operate in. To explore the possible composition of a the deployed CAF fighter force in 2025, the percentages from Desert Storm, based on aircraft and mission type, will shape the example deployment. Upon reviewing Table 6, and dividing the force into three basic mission categories, the following percentages show a detailed view of the Desert Storm deployment: Air superiority 14.5 percent, surface attack 75.5 percent, and suppression of enemy air defense (SEAD) 10.0 percent.⁷⁷ These percentages are applied to the hypothetical deployment of a Desert Storm-sized fighter force (662 PMAI) and a force that achieves the same level of numerical superiority possessed by the CAF fighter force over the Iraqi Air Force (851) in Table 15.

Table 15: Deployed PMAI Based On Desert Storm Percentages^{a,b,c}

	F-15C	F-15E	F-16 ^e	F-22	F-35
TAI	179	219	352	187	685
PMAI ^d	107	131	211	112	410
662 Deployed	0	90	66	96	410
Total PMAI (percent)	0.0	68.7	31.2	85.7	100
851 Deployed	11	131	187	112	410
Total PMAI (percent)	10.3	100	88.6	100	100

^aNumbers subject to rounding error.

^bAssumes 971 PMAI constant force structure (See Table 10)

^cAssumes maximum utilization of fifth-generation assets and weapons carriage capability (I.E. F-15E over F-16)

^dTAI = PMAI * 1.67

^eF-16s deployed fulfills SEAD requirement plus excess required to fulfill surface attack requirement.

^fSEAD requirements: 662 deployed requires 66 SEAD capable aircraft; 851 deployed requires 85 SEAD capable aircraft.

Source: Author's Original Work

In both cases above, the contested nature of the A2/AD capability of the PLA requires the maximization of the fifth-generation CAF fighter force. Is this assumption unfounded? Air Force leaders argue differently. CSAF General Welsh argues, “The very

⁷⁷ The F-15C comprises the air superiority category; the A-10, F-15E, F-16, F-111, and F-117 comprise the surface attack category; and, the F-4G and EF-111 comprise the SEAD category.

clear bottom line is that a fourth generation fighter cannot successfully compete with a fifth generation fighter in combat, nor can it survive and operate inside the advanced, integrated air defenses that some countries have today, and many more will have in the future.”⁷⁸ The two examples above highlight the issues of the F-35’s delayed production, and if calls for cancelling the program are successful, the percentage of the force in 2025 that may be potentially usable is woefully insufficient. If such a CAF fighter force were to deploy to the Asia-Pacific to operate against the A2/AD capability of the PLA, then for 662 PMAI deployed 23.6 percent is comprised of fourth-generation fighters. For the example requiring 851 PMAI to deploy, the percentage of fourth-generation fighters decreases to 38.7 percent, however, those percentages represent 156 and 329 aircraft, respectively, that cannot “survive or operate” in the expected operational environment.

To maximize survivability, operational capability, and still preserve a reserve force in the United States, the 851 PMAI deployment results in the availability of 552 fifth-generation aircraft. Taking into account the 15 percent spare requirement, the CAF fighter force would have 444 aircraft available to take to the skies to face a superior force of PLAAF fighters numbering approximately 617 aircraft supported by an advanced IADS possessing sophisticated counter-stealth technology.⁷⁹ This scenario represents numerical superiority of 1.4:1 aircraft advantage for the PLAAF that could seriously contest CAF fighter force operations, leading the USAF dangerously close to the precipice of parity. General Hostage’s statement on 2 February 2014 concerning the importance of particular recapitalization programs echoes the severity of the situation that would result from *not* getting the projected CAF fighter force on the ability to achieve national security objectives in a highly contested A2/AD environment.

I am going to fight to the death to protect the F-35 because I truly believe the only way we will make it through the next decade is with a sufficient fleet of F-35s. If you gave me all the money, I needed to refurbish the F-15 and the F-16 fleets, they would still become tactically obsolete by the middle of the next decade. Our adversaries are building fleets that will overmatch our legacy fleet, no matter what I do, by the middle of the next decade. I have to provide an Air Force that in the middle of the next

⁷⁸ Welsh III, “The Strategic Choices and Management Group,” 9.

⁷⁹ 617 PLAAF aircraft also assumes of 15 percent spare status of the total assumed 854 PMAI available in 2025.

decade has sufficient fifth-generation capability that whatever residual fourth-generation capability I still have is viable and tactically useful. I am willing to trade the refurbishment of the fourth-gen [sic] to ensure that I continue to get that fifth-gen capability. I am fighting to the end, to the death, to keep the F-35 program on track. For me, that means not a single airplane cut from the program, because every time our allies and our partners see the United States Air Force back away, they get weak in the knees.⁸⁰

Conclusion

Since the Spanish-American War of 1898, the United States has and *will* place a premium on the ability of the military to project power on a scale capable of conducting major combat operations.⁸¹ To continue to support this ability when faced by the highly contested A2/AD environment in the future, the CAF fighter force *must* receive its full planned complement of fifth-generation capability. Even if the USAF acquires *all* those projected aircraft, and as other nations continue to counter US capabilities, the CAF fighter force's survivability and ability to support national objectives will be subject to higher risk.

As a Pacific power, the United States is reliant on access to its scare instillations and bilateral agreements to provide the forward presence to remain relevant in the region. China recognizes this reliance as a vulnerability to exploit, and through military modernization and recapitalization of its ballistic missile force can and will continue to place US forces at peril in defense of China's national interests.⁸² Further supporting Chinese military power is the continued modernization and production of the PLAAF fourth-generation fighter force. This force is a formidable defensive capability and is arguably on par with its Western counterparts. In the future, the first Chinese fifth-generation fighters will support the PLAAF fourth-generation force as China pursues an offensive capability to extend beyond territorial defense by 2025.⁸³ As the PLAAF fighter force's offensive capabilities evolve, one of the world's most advanced IADs will

⁸⁰ Hostage, Air Combat Command's Challenge: Buy new or modernize older aircraft.

⁸¹ Krepinevich, *Why ASB?*, 6.

⁸² Cliff, *Entering the Dragon's Lair*, 46.

⁸³ Stokes, "Quest for Joint Aerospace Power," 34; Office of the Secretary of Defense, "China 2013," 66.

continue to support the defense of the nation.

The developments made by China since 1991 have focused on the means to defeat the US ways of war, through direct and indirect means, in a fashion advocated by Sun Tsu in the quote that started this chapter. First, to attack the US strategy, China will seek to push the CAF fighter force far away from its shores by developing the capability to strategically attack during the deployment and build up phases of operation. Second, the threat of attack will place a great burden upon the nations allied with the US, as their sovereign territory would become a target for ballistic and cruise missile attacks. Finally, in directly countering US forces, modernization of the PLAAF fighters and IADs will continue to provide a formidable threat to CAF fighter operations in the Asia-Pacific region.



Chapter 6

Conclusions

We are prepared at any time to cope with all kind of threats and challenges . . . The Chinese military can assemble as soon as summoned, fight any battle, and win.

—Gen Chang Wanquan
Minister of National Defense

The air superiority that America has enjoyed over 60 years is not by accident, and gaining and maintaining it isn't easy. It requires trained, proficient, ready airmen and a credible, capable fleet of technologically superior aircraft.

—Gen Mark A. Welsh III

The ability of the future CAF fighter force to protect and secure US national security objectives is threatened by both external and internal factors. After Desert Storm, and in the wars that followed, American airpower has proven dominant over any adversary. A most unfortunate and unintended consequence that resulted from these resounding successes has led to a commonly held assumption that US airpower will always be available; unmatched in any conflict. The dismantling of the Soviet-equipped IADS that opposed US and coalition airpower led many nations—particularly Russia and China—to modernize and recapitalize their capabilities to directly counter the new US way of warfare. The emergence of A2/AD capabilities over the past two-decades now provides the possibility, and soon the probability, of thwarting the United States ability to project power. The CAF fighter force, reliant on forward bases, will encounter contested strategic situations where basing and operations are increasingly difficult.¹

As the United States continues to exit from over a decade of grinding combat operations in its two most recent wars, the need to recapitalize and

¹ Shaud and Adam B. Lowther, “Strategic Vision,” 9.

modernize the CAF fighter force in order to operate effectively in A2/AD environments will meet the realities of budgetary uncertainty. The Air Force views a fifth-generation equipped fighter force as the necessary means to continuing support for American national security objectives due to the low probability of the legacy fourth-generation fighters to operate, or even survive, in a highly-contested environment. Compounding these problems, the fourth-generation fighter force has an average aircraft age of over 24 years, older than many of the pilots who fly them. While modernization may increase the service life of an aircraft it does not sufficiently provide the means to increase its survivability. Nonetheless, many of these fourth-generation fighters will remain in service well into 2035.

Since 1991, the Air Force has reduced its CAF fighter force through divestiture and attrition by 1,911 aircraft, to include 600 F-16s, 435 F-15s, and 205 A-10s.² As the effects of the Budget Control Act of 2011 and subsequent sequestration over the next 10 years persist, the Air Force is obliged to make difficult choices concerning its fighter fleet that will result in a smaller number of available aircraft than are present today. The situation is going to arise where the CAF will have a significant gap in total number of airplanes it *has* and the total number of airplanes it *needs*. This gap will occur as older aircraft are retired prior to being replaced, F-22 procurement is truncated below operational requirements, and the delays continue in recapitalization with the F-35. Therefore, the Air Force is required to keep F-15Cs, F-15Es, and F-16s to minimize—not close—the fighter gap even though “a fourth generation fighter cannot successfully compete with a fifth generation fighter in combat, nor can it survive and operate inside the advanced, integrated air defenses that some countries have today, and many more will have in the future.”³

China’s efforts over the past two decades in modernizing and recapitalizing its PLAAF and 2nd Artillery Corps A2/AD capabilities typify a potential threat in the present and the future. China has emerged as the dominant

² Ruehrmund, Jr. and Bowie, *Arsenal of Airpower*, 23, 36–37; “2013 USAF Almanac,” 32.

³ Welsh III, “The Strategic Choices and Management Group,” 9.

military and economic power in the Asia-Pacific region, directly challenging the ability of the United States to exercise its security options there. The Sino-American relationship is now more tumultuous as the United States conducts a strategic rebalance to the region and China opposes the pivot as an offensive-minded means of interventionism on the part of the West. As the United States tries to balance future strategic needs with a military drawdown in an uncertain fiscal environment, the Chinese over the past decade have modernized and recapitalized with A2/AD systems that extend their influence with greater accuracy and lethality. Since Desert Storm, China views the modern way of war as defined by high-intensity and high technology weaponry, and in so doing has provided the impetus for the resurgence of *shashoujian*—assassin’s mace—in their military strategy.

Shashoujian are those weapons and methods that seek to deter a superior adversary or that provide the capacity to cripple an opponent at the onset of hostilities with the use of surprise and deception.⁴ PLA military strategy does refer to *shashoujian* specifically as A2/AD, but focuses on both direct and indirect means of quickly and decisively obtaining military objectives. The most prevalent means are advances in China’s ballistic and cruise missiles, IADS, and fighter forces. The 2nd Artillery Corps’ arsenal of missiles continues to grow in number and capability that could place every CAF fighter operating location under direct attack. Additionally, the second and third layers of defense constituting the IADS and advanced fourth-generation fighters would prove daunting to any operations within their range. By 2025, China’s A2/AD capabilities will only be more formidable as continued efforts will result in SAMS with greater range, fourth-generation fighters that are on par or exceed the capabilities of those in the West, and fielding of the PLAAF’s fifth-generation fighters.

The CAF fighter force will also be different in 2025 than it is today, but will continue to be reliant on legacy fourth-generation platforms. The Air Force intends to maintain 179 F-15Cs, all 219 F-15Es, and extend the life of 300 F-16s.

⁴ Krepinevich, *Why ASB?*, 14.

These fourth-generation fighters, some of which may be close to 40 years old by 2025, will support 187 F-22s and the fleet of F-35s. At current projections, which includes finally reaching full-rate production for the Air Force in 2021, the CAF fighter force will possess 561 F-35s. The 2014 QDR stated that the CAF will be comprised of 48 fighter squadrons and 971 PMAI aircraft by FY19.⁵ Assuming the CAF maintains of 971 PMAI by 2025, the entire fighter force will be comprised of 1,622 fighters. As of 2012, the CAF fighter force constituted 2,025 total aircraft with 1,213 PMAI available for tasking. These numbers are effectively further reduced, due to calculations accounting for MC rate and aircraft spare requirements, from 971 to 714 PMAI, of which 46 percent are fourth-generation fighters.

Based upon current projections, the PLAAF will not only possess a robust inventory of ballistic missiles and potentially the 400 km capable S-400 Triumph, but also a fighter-force of 1,425 aircraft with 854 designated as PMAI.⁶ Assuming similar attrition and spare requirements as the CAF, the PLAAF would be effectively reduced to 617 PMAI. If a Sino-American conflict were to occur in 2025, due to the A2/AD environment it may be necessary for every fifth-generation fighter in a PMAI status to be tasked. In this particular case, a total of 522 fifth-generation fighters would be able to deploy. 552 PMAI is reduced to 444 aircraft to take to the skies in time of conflict when taking into account MC rate and spare requirement for operations. This scenario will result in a numerical superiority of the PLAAF over the CAF's fifth-generation fighter force of 1.4 to one. In comparison to the situation during Desert Storm, the CAF had the numerical advantage over Iraq's all-weather capable fighters of over two to one.

The successes of the past must not blindly guide the future. As General Welsh noted in the quote at the beginning of this chapter, the United States has been fortunate to possess the capabilities for the past 60 years to virtually guarantee air superiority in any conflict anywhere in the world. This did not happen by chance, but was guided by decision-making that understood the changing character of the environments that the CAF fighter force may have to operate within. This process was not without its

⁵ Hagel, *QDR 2014*, 40.

⁶ Calculation is derived using the formula $TAI = PMAI * 1.67$

complications, but overall the Air Force has remained unmatched since the end of World War II. This is now changing. The proliferation of advanced A2/AD technologies is the new reality, and force structure decisions made based on past success and preferred ways of doing things are risky at best.

The CAF fighter force is old and only getting older. The Air Force *must* receive the projected fighter force to be able to stay above the level of parity when challenged in a highly contested environment. Quantity *does* have a quality all its own, but the quantity must be of the correct type. If the Air Force does not receive the appropriate force to face the future threat, strategic options that have been previously enjoyed by the United States may no longer be available. Considering the potential future supremacy of an enhanced A2/AD strategy and the US Air Force continually relying on legacy aircraft, it may not even be possible.

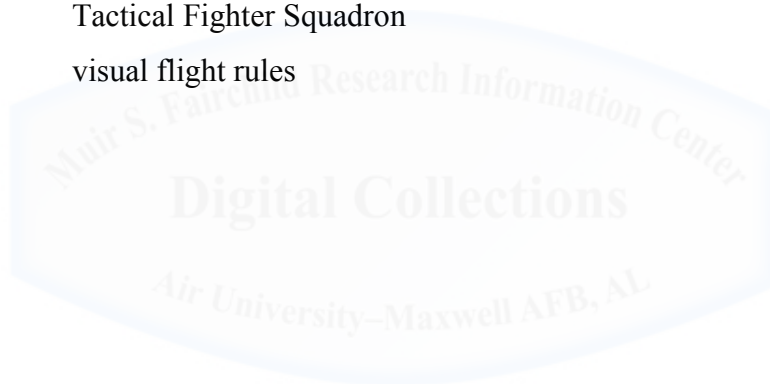


APPENDIX

ACRONYM LIST

A2	anti-access
AAA	antiaircraft artillery
AB	Air Base
AD	area denial
ADOC	Air Defense Operations Center
AGM	air-to-ground missile
ASCM	anti-ship cruise missile
CAF	Combat Air Force
CAPEX	Combat Avionics Programmed Extension Suites
CBO	Congressional Budget Office
CENTAF	Central Command Air Forces
CENTCOM	Central Command
CEP	circular error of probability
CSAF	Chief of Staff of the Air Force
FSE	fighter squadron equivalent
FY	fiscal year
GNP	Gross National Product
HARM	high-speed antiradiation missile
IADS	Integrated Air Defense System
IAF	Iraqi Air Force
IOC	initial operational capability
JOAC	Joint Operational Access Concept
LACM	land-attack cruise missile
LO	low-observable
LRBM	long-range ballistic missile
LWF	lightweight fighter
MRBM	medium-range ballistic missile

NASIC	National Air and Space Intelligence Center
NDAAs	National Defense Authorization Act
NSS	National Security Strategy
OPLAN	operation plan
PBD	Presidential Budget Decision
RCS	radar cross section
RV	reentry vehicle
SAM	surface-to-air missile
SLEP	Service Life Extension Program
SOC	Sector Operations Center
SRBM	short-range ballistic missile
SSM	surface-to-surface missile
TFS	Tactical Fighter Squadron
VFR	visual flight rules



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