

**JOINT FORCES STAFF COLLEGE
JOINT ADVANCED WARFIGHTING SCHOOL**

**ONE SIZE DOES NOT FIT ALL:
HOW ACQUISITION FAILS THE JOINT FORCE COMMANDER**

by

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A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning and Strategy. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

This paper is entirely my own work except where documented in footnotes.

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ABSTRACT

Financial and political forces have pulled DOD towards joint acquisition of multi-role fighters, and away from joint interdependence. This risky trend toward fewer, joint platforms has been exacerbated by the decision to end F-22 production at 187 aircraft and focus exclusively on fielding large numbers of the joint / multi-role F-35. With this plan, the DOD is accepting high risk to its future ability to achieve rapid air dominance. This risk is further heightened by the fact that the F-35 is early in its testing and has already fallen victim to some of the same trends in acquisition that plagued the F-22. If the F-35 program successfully delivers all 2,443 planned aircraft, it will ultimately account for 93% of the US fifth-generation fighter fleet and 78% of the total US tactical aviation fleet. This “one-size-fits-all” approach has insidiously led to a flawed aircraft acquisition strategy that allows unacceptable risk to combat effectiveness in an attempt to gain efficiency. This efficiency is very likely to prove elusive, and the approach may be counterproductive, if achieved at the expense of effective core-competency contributions to joint interdependence. The paper examines the risks and implications for Joint Force Commanders associated with the current DOD fighter recapitalization plan. Ultimately, the paper challenges the conventional wisdom that fewer, large, joint acquisition programs are preferable to a larger number of smaller Service-specific programs.

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GLOSSARY

Advanced Electronically Scanned Array (AESA) radar – currently the most advanced radars. Essential technology for building stealth fighters since they have no moving parts and feature low-probability-of-intercept (LPI) data transmission capabilities.

Air Superiority – That degree of dominance in the air battle of one force over another that permits the conduct of operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by opposing air forces.¹

Air Supremacy – That degree of air superiority wherein the opposing air force is incapable of effective interference.² (Sometimes referred to as Air Dominance)

Attack Aircraft – Aircraft designed primarily for air-to-ground operations. Attack aircraft usually have an “A” designation (e.g., A-10).³

“Born Joint” – Conceptualized and designed with joint architectures and acquisition strategies.⁴

Fifth-Generation Fighter Aircraft – Currently the most advanced fighter aircraft, incorporating the most modern technology, and considered generally more capable than earlier generation (e.g., fourth-generation and below) aircraft. While there is no official list of requirements, for an aircraft to be considered a fifth-generation fighter it is generally agreed it must be designed from the beginning for network-centric operations and to feature extremely low, all-aspect, signatures.⁵

Fighter Aircraft – Aircraft designed primarily for air-to-air combat, though they can

¹ U.S. Joint Chiefs of Staff, *Joint Publication 3-0, Doctrine for Joint Operations* (Washington DC: U.S. Joint Chiefs of Staff, 17 September 2006 incorporating change 1 dated 13 February 2008), GL-5.

² U.S. Department of the Air Force, *Air Force Doctrine Document 2-1.1, Counterair Operations* (Washington DC: U.S. Department of the Air Force, 01 October 2008), 42.

³ Ronald O’Rourke, *Tactical Aircraft Modernization: Issues for Congress* (Washington DC: Congressional Research Service RL33543, July 9, 2009), 2.

⁴ U.S. Joint Chiefs of Staff, *Joint Publication 1, Doctrine for the Armed Forces of the United States* (Washington DC: U.S. Joint Chiefs of Staff, 02 May 2007 incorporating change 1 dated 20 Mar 2009), I-2.

⁵ Ronald O’Rourke, *F-35 Joint Strike Fighter (JSF) Program: Background and Issues for Congress* (Washington DC: Congressional Research Service RL30563, September 16, 2009), 2.

have some air-to-ground capability as well. Fighter aircraft usually have an “F” designation (e.g., F-22).⁶

Joint – Connotes activities, operations, organizations, etc., in which elements of two or more Military Departments participate.⁷

Joint Acquisition Program – An acquisition program set up to acquire a single system design, or variants of a single design, for use by more than one of the military Services.⁸

Joint Interdependence – The purposeful reliance by one Service on the unique capabilities of another, to maximize the synergistic and reinforcing effects of the capabilities of both Services.⁹

Multi-Role Fighter – Aircraft designed to have substantial capability in both air-to-air and air-to-ground operations. These aircraft are also known as “strike” aircraft or dual role fighters and can have either an “F” designation (e.g., F-35) or an “F/A” designation (e.g., F/A-18E/F).¹⁰

Network-Centric Operations – Operations that seek to translate an information advantage into a competitive warfighting advantage through the robust networking of well-informed, geographically dispersed forces.¹¹

Stealth Aircraft – Also known as LO (low observable) aircraft, are designed to be less visible (ideally invisible) to radar, infrared and/or other detection methods.¹² According to Lockheed Martin, a world leader in the design and manufacture of stealth, “stealth is a powerful force multiplier, providing survivability and effectiveness within the parameters of a reduced force structure.”¹³ Stealth, in current fighter aircraft, refers primarily to radar avoidance. Shape and material

⁶ O’Rourke, *Tactical Aircraft Modernization*, 2.

⁷ U.S. Joint Chiefs of Staff, *Joint Publication 1*, GL-8.

⁸ David L. McNicol, *Joint Acquisition: Implications from Experience with Fixed-Wing Tactical Aircraft* (Institute for Defense Analysis, IDA Paper P-4049, September 2005), 1.

⁹ U.S. Joint Chiefs of Staff, *Joint Publication 1*, I-2.

¹⁰ O’Rourke, *Tactical Aircraft Modernization*, 2.

¹¹ U.S. Department of Defense, *The Implementation of Network-Centric Warfare* (Washington, DC: U.S. Department of Defense, 2005), 4.

¹² Bill Sweetman, *Stealth Aircraft* (Osceola, Washington: Motorbooks International, 1986), 14.

¹³ Lockheed Martin, “Stealth,” linked from *Lockheed Martin Home Page*, http://www.lockheedmartin.com/capabilities/air_power/stealth/index.html (accessed February 12, 2010).

are the primary techniques for reducing radar signature of aircraft.¹⁴ Airframe shape can redirect electromagnetic waves and radar absorbent material can reduce radar signals that reflect off the plane.¹⁵ These techniques are most effective when incorporated into the aircraft design from the beginning. Varying degrees of stealth can be achieved and, generally, the more stealthy the airframe the more expensive it is to produce and maintain.

Supercruise – The ability of an aircraft to cruise at supersonic (greater than the speed of sound) airspeeds without the use of afterburner. This ability greatly increases the effective operational range and makes a fighter more lethal and survivable.

Tactical Aircraft – Term used generically to refers to all types of fighters, and attack planes. These aircraft generally have a shorter combat radius than strategic aircraft such as bombers.¹⁶

Tactical Aircraft Recapitalization – A revision of the tactical aircraft force structure; for example, changes made in the long-term mix of types and numbers of tactical aircraft.

¹⁴ Ibid.

¹⁵ Ibid.

¹⁶ Ronald O'Rourke, *Tactical Aircraft Modernization*, 2.

CHAPTER 1 – INTRODUCTION

In 1983, then leading aerospace executive and former Department of Defense (DOD) executive Norman Augustine, observing trends in DOD procurement, facetiously predicted “[I]n the year 2054, the entire defense budget will purchase just one aircraft. This aircraft will have to be shared by the Air Force and Navy 3-1/2 days each per week except for leap year, when it will be made available to the Marines for the extra day.”¹ Today the DOD is taking an intermediate step toward fulfilling his prophecy with tactical aircraft recapitalization focusing on the purchase of just one platform. The Services’ apparent inability to create affordable procurement programs and the lack of a DOD-wide acquisition strategy are exacerbating the problem.² In 2009, a Government Accountability Office (GAO) study examining 96 major military acquisition programs found projected cost overruns of \$296 billion.³ These overruns, combined with the costs of two ongoing wars and with increased Federal spending on domestic priorities, have led to tough programmatic cuts. These decisions necessarily involve some level of risk to national security and, because of the nature of our civil-military system, are largely political.

In the world of tactical aircraft recapitalization, financial and political forces have pulled DOD towards joint acquisition of multi-role fighters and away from Service-

¹ Norman R. Augustine, *Augustine’s Laws*, 6th ed. (Reston: American Institute of Aeronautics and Astronautics Inc., 1997), 107.

² Antony H. Cordesman, Arleigh A. Burke and Hans Ulrich Kaeser, *America’s Self-Destroying Airpower: Becoming Your Own Peer Threat* (Washington DC: Center for Strategic & International Studies, December 16, 2008), ii.

³ U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapons Programs* (Washington DC: Government Accountability Office, March 2009), 6.

specific acquisition of more specialized systems that support joint interdependence. The need to reduce costs and increase interoperability, while replacing large numbers of aging aircraft, ostensibly supports this trend. The Navy is shifting from four platforms (S-3, E/A-6/B, F-14, F/A-18A/C) to the multi-role Super Hornet (F/A-18E/F/G) and the joint / multi-role F-35C. The Marine Corps is planning to replace the AV-8B and the F/A-18A/C with the F-35B, and the Air Force plans to replace the A-10, F-16, and F-15E with the F-35A. Ultimately the F-35 is slated to replace five platforms in three Services.

The impact of this “consolidation” trend has been increased by the decision to end F-22 production at 187 aircraft. On the Defense Secretary’s recommendation, and on the threat of a Presidential veto, the full Senate voted 58 to 40 on July 21, 2009, to remove funding for future F-22 production from the 2010 Defense Bill.⁴ According to senior leaders in the Air Force, this decision leaves the United States with, at best, a high-risk F-22 force.⁵ The Secretary intends to offset the risk by not allowing the F-35 to suffer the same fate as the F-22, and thereby fielding large numbers of F-35s. Current plans call for 2,443 U.S. F-35s divided amongst the Air Force, Navy, and Marine Corps, and several hundred more with close allies such as Britain and Australia.⁶ With this plan, the DOD is accepting high risk to its future ability to achieve rapid air dominance by relying on less-

⁴ The Senate Armed Services Committee had previously added \$1.75 billion to the 2010 Defense bill for continued F-22 production, see Jeffrey R. Smith, “Senate Votes 58-40 to End Production of the F-22,” *The Washington Post*, July 22, 2009, <http://www.washingtonpost.com/wp-dyn/content/article/2009/07/21/AR2009072100135.html>, accessed (September 18, 2009).

⁵ Chief of Air Combat Command, General John Corley, stated 381 F-22s is the minimum for a low-risk force, see William Matthews, “Senate F-22 Foes Outnumbered But Still Fighting,” *Defense News*, July 14, 2009, <http://www.defensenews.com/story.php?i=4187281> (accessed October 17, 2009). Air Force Secretary Michael Donley and Chief of Staff General Norton Schwartz called 243 F-22s a moderate-risk force, see Michael Donley and Norton Schwartz, “Moving Beyond the F-22,” *The Washington Post*, April 13, 2009, A12.

⁶ Barry Watts, *The F-22 Program in Retrospect* (Washington DC: Center for Strategic and Budgetary Assessments, August 2009), 2.

capable air-to-air platforms of old fourth-generation fighters in the near term, and F-35s in the long term, to augment the smaller F-22 fleet.⁷ Furthermore, the fact that the F-35 is still an unknown quantity having just entered low-rate initial production and completing only 16 of 168 scheduled test flights in 2009 heightens this risk.⁸ The decision to bet heavily on the F-35 stands in sharp contrast to two recent DOD studies which concluded the F-35 program is two and a half years behind schedule and \$16.5 billion over budget.⁹ These numbers are disturbing given the expanded responsibilities of an F-35 Program that already has broad ambitions and considerable risk.

If the F-35 program could successfully deliver all 2,443 planned aircraft, it would ultimately account for 93% of the U.S. fifth-generation fighter fleet and perhaps 78% of the total U.S. tactical aviation force structure. This “one-size-fits-all” approach inherently accepts inordinate risk to combat effectiveness to gain questionable efficiency in procurement of a total number of fighter aircraft. The risk becomes clearer when one considers the unpredictability of future events in international affairs or warfare.¹⁰ As a nation, our ability to forecast our next military engagement or equipment requirement has been poor. Major events, such as the rapid collapse of the Soviet Union and the last nine years of nation building in Afghanistan and then Iraq were unanticipated and caused the U.S. to question and then change its defense posture.

⁷ Ibid, 1.

⁸ Michael Barkoviak, “Lockheed Martin F-35 Testing, Purchasing Will Slow in 2010,” *DailyTech*, January 25, 2010, <http://www.dailytech.com/Lockheed+Martin+F35+Testing+Purchasing+Will+Slow+in+2010/article17484.htm> (accessed 8 February 2010).

⁹ Tony Capaccio, “Gates Calls for Delay in Pentagon Purchases of Lockheed F-35s,” *Bloomberg.com*, January 7, 2010, <http://www.bloomberg.com/apps/news?pid=20601109&sid=aK6UwiltYSBU> (accessed 8 February 2010).

¹⁰ Watts, *The F-22 Program in Retrospect*, 3.

The recent history of the A-10 program exemplifies the impact of this unpredictability on force structure requirements. The A-10 was on its way to retirement before the start of the war in Afghanistan, but proved to be an ideal weapon for that low-technology conflict and is now planned to be in the inventory for years to come. If the future holds more unconventional conflicts, such as Iraq and Afghanistan, is the F-35 the right weapon to replace the A-10 for such a conflict? Similarly, our ability to forecast air-superiority requirements for the service life of the F-22 and F-35 is limited at best. If the future holds a large scale conventional conflict against a high-end, peer adversary, will the less-air-to-air-capable F-35 be able to make up for a lack of F-22s to provide rapid air dominance?

This paper examines the risks and implications for future Joint Force Commanders associated with the current DOD fighter recapitalization plan. In doing so, it considers whether heavy reliance on large joint acquisition programs, such as the F-35, is worth the risk it presents to the nation by putting all “eggs in one basket.” According to Joint Pub 1, “the nature of the challenges to the United States and its interests demand that the Armed Forces operate as a fully integrated joint team across the range of military operations.”¹¹ As an officer, being “joint” means first being good at what you do, and then being capable of and willing to work together with members of the other Services. The same is true for platforms. Being “joint” does not mean every Service must have the same capabilities and/or equipment. In fact, the challenges are best met when each is

¹¹ U.S. Joint Chiefs of Staff, *Joint Publication 1, Doctrine for the Armed Forces of the United States* (Washington DC: U.S. Joint Chiefs of Staff, 02 May 2007 incorporating change 1 dated 20 Mar 2009), I-2.

equipped with the most effective weapons to contribute their unique but complementary capabilities.¹²

Thesis Statement

The trend in tactical aircraft acquisition toward fewer platforms, and towards only multi-role / joint platforms is counter to the concept of joint interdependence, unacceptably increases strategic and tactical risk, and fails to deliver the efficiency that motivated the trend to begin with.

The scope of this paper is limited to tactical aircraft recapitalization, although the ideas expressed certainly apply outside this small section of our national defense. The Joint Cargo Aircraft, the V-22, and Joint Unmanned Aerial Vehicle (UAV) development programs follow similar patterns and beg similar questions. The examples used in the paper are for illustrative purposes and are not meant to be exhaustive.

Regarding methodology, the paper begins by framing the discussion. Chapter II examines the trend and the current and proposed tactical fighter inventories. A quick capabilities overview is included to provide insight into the implication of the consolidation trend. Additionally, brief histories of the F/A-18E/F, F-22, and F-35 programs offer insights into the programmatic decisions that contributed to the large trend towards fewer and only multi-role / joint programs. With this framework set, Chapter III explores the concept of joint interdependence and the potential impact that large joint acquisition programs, such as the F-35, have on the concept. To this end, the paper also considers Service-specific roles and functions, as codified in law, as well as the evolution of “jointness” in the United States Armed Forces. This evolution is

¹² Ibid.

examined from the perspective of jointness in execution and acquisition, to include the motivation for joint acquisition programs.

Chapter IV considers strategy and risk, including the internal and external pressures that make up the strategic environment and lead to programmatic decisions. This section provides a look at potential risks and implications for future Joint Force Commanders (JFCs) associated with the potential capabilities gained and lost by transitioning to the proposed fleet of 187 F-22s, 506 FA-18E/Fs, and 2,443 F-35s. Finally, Chapter V offers conclusions and recommendations. The recommendations center on reversing the trend by prioritizing platform effectiveness and Service core-mission contributions to joint interdependence over the perceived cost savings of a common multi-role platform.

In 1780, George Washington wrote, “there is nothing likely to produce peace as to be well prepared to meet an enemy.”¹³ Even if DOD successfully procures the F-35 on schedule and at or under cost estimates, will the resulting force be well prepared to meet a future enemy? Ultimately, this paper challenges the conventional wisdom that fewer and larger joint acquisition programs are preferable to a larger number of smaller Service-specific programs.

¹³ George Washington, 1780, quoted in Peter T. Tsouras, *Warrior's Words* (London: Arms and Armour Press, 1993), 332.

CHAPTER 2 – FRAMING THE DISCUSSION

This chapter frames the discussion by exploring the downward trend in fixed-wing tactical aircraft acquisition and the relevant aircraft programs. It begins by establishing the scope of the trend and examining some of its causes and implications. Next, the chapter provides an overview of the current tactical aircraft inventory and the capabilities of the aircraft within that inventory which are slated to be replaced. Finally, it presents the recapitalization plan and narrows the discussion through a brief history of the three platforms that are to make up the entire tactical fleet (F/A-18E/F, F-22, and F-35). This final section offers insights into programmatic decisions that shaped the larger trend.

Being Informed by the Trend

The trend in tactical aviation acquisition has been towards fewer aircraft, fewer types of aircraft (platforms) and, more recently, only multi-role / joint platforms. This trend is not a new development and is not unique to tactical aircraft. As early as 1984, the USAF noted new tactical aircraft were becoming more difficult to procure.¹ In 1992, at the end of the Cold War, the combined USAF, Navy, and Marine Corps tactical fighter strength was 5,783 aircraft.² By the year 2000, it had dropped to 3,985 aircraft.³ Today, these three Services maintain a combined inventory of approximately 3,500 tactical

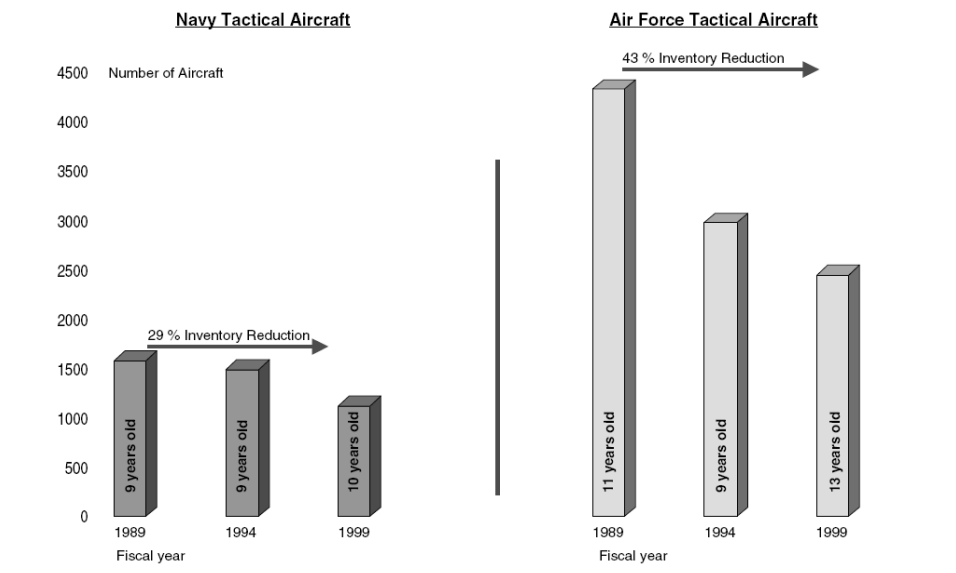
¹ U.S. Congressional Budget Office, *Tactical Combat Forces of the United States Air Force: Issues and Alternatives* (Washington DC: Congressional Budget Office, May 1984), 17.

² Antony H. Cordesman, Arleigh A. Burke and Hans Ulrich Kaeser, *America's Self-Destroying Airpower: Becoming Your Own Peer Threat* (Washington DC: Center for Strategic & International Studies, December 16, 2008), 3.

³ Ibid.

aircraft.⁴ Of those, the Air Force operates about 2,400 land-based aircraft, and the Navy and Marine Corps operate about 1,100 aircraft capable of ship-based operation.⁵ Figure 1 graphically depicts this downward trend in tactical aircraft inventories for the period from 1989 to 1999. The numbers presented here do not include Unmanned Aerial Systems

Figure 1. GAO Graph of Downward Trend in Tactical Aircraft Inventories



Source: General Accounting Office, *Tactical Aircraft* (Washington DC: Government Printing Office, 2001), 34.

(UAS). UAS have been used almost exclusively for Intelligence Surveillance Reconnaissance (ISR) missions, but have recently taken on a light attack role. UAS were not included in the trend analysis because of the recent nature of UAS tactical use and their current lack of air-to-air combat capability. However, future UAS development will likely accelerate the downward trend in manned tactical aircraft, especially in the area of manned strike fighters.

⁴ Ronald O'Rourke, *Tactical Aircraft Modernization: Issues for Congress* (Washington DC: Congressional Research Service RL33543, July 9, 2009), Table 1.

⁵ Ibid.

The number of different platforms has declined along with the overall number of aircraft. This aspect of the trend is intrinsically linked to the increase in multi-role / joint platforms. In 1984, the USAF operated six types of tactical aircraft (F-111, A-10, A-7, F-15, F-16, and F-4) and the Navy and Marines also operated six types (F-14, AV-8, F-4, A-7, A-6E, and S-3B). Many of these platforms were designed or suited for a single role such as air-superiority, interdiction, or Close Air Support (CAS) (F-15, A-10, F-111, A-7, A-6, and S-3B). Today's combined inventory includes six types of tactical aircraft (A-10, AV-8B, F/A-18, F-16, F-15, and F-22). Of these, the multi-role F/A-18 accounts for the majority of the Navy's 10 active-duty aircraft carrier air wings (CVWs), and the multi-role F-16 accounts for the majority of the USAF inventory.⁶ Current DOD plans call for the inventory to shrink to three types of tactical aircraft (F-22, F/A-18E/F, and F-35A/B/C). Of these three multi-role platforms, the F-35 will account for the vast majority of the total fleet.

There are several reasons for this downward trend in tactical aircraft inventories. The most obvious is that, under current U.S. acquisition strategy, tactical aircraft are becoming more capable and more expensive to produce. A USAF acquisition study in 1983, for example, concluded the F-15 was 3.4 times more capable than its predecessor the F-100, and 14 times more expensive.⁷ Similarly, the F-22 is far more capable than

⁶ Ronald O'Rourke, *Navy F/A-18E/F and EA-18G Aircraft Procurement and Strike Fighter Shortfall: Background and Issues for Congress* (Washington DC: Congressional Research Service RL30624, October 21, 2009), 2.

⁷ U.S. Department of the Air Force, *Affordable Acquisition Approach* (Air Force Systems Command, February 9, 1983), 33.

the F-15, and at least 8 times more expensive.⁸ The Services also contribute to the downward trend by taking longer to complete their procurement plans, which in turn makes their programs vulnerable to changes in both performance requirements and political priorities.⁹ Small changes or changes early in development can generally be accommodated without adversely affecting cost or schedule. However, significant changes in design requirements, especially late in development, often adds considerable cost and delays to a program. While these reasons are significant, other factors also contribute to the trend.

Another major contributing factor to the downward trend in tactical aircraft acquisition is the lack of a coherent DOD-wide acquisition strategy.¹⁰ Historically, each Service has developed its own recapitalization plan in isolation from the others.¹¹ Because of this, the Services' plans tend to assume higher funding levels than they are likely to receive. When the Services are faced with the reality of reduced funding levels and programmatic cost overruns, they respond by slowing procurement to match the funds received and this, in turn, drives up per-unit costs.¹² This pattern highlights what others have noted as an, "intrinsic aspect of tactical aircraft procurement [which] makes it an attractive target for defense budget cutters, [that] it is possible to cut procurement by

⁸ The design requirement was for the F-22 to be 3 times more effective than the F-15C and it easily exceeded this requirement. The cost comparison is based on Program Average Unit Cost (PAUC) and uses data from U.S. Department of Defense Selected Acquisition Reports, <http://www.acq.osd.mil/ara/am/sar/1990-SEP-SARSUMTAB.pdf> (accessed 10 February 2010).

⁹ United States Air Force, *Affordable Acquisition Approach*, 18.

¹⁰ U.S. Government Accountability Office, *Tactical Aircraft: DOD Needs a Joint and Integrated Investment Strategy* (Washington DC: U.S. Government Accountability Office, April 2007), 20.

¹¹ Ibid.

¹² U.S. Congressional Budget Office, *Tactical Combat Forces of the United States Air Force*, 18.

slowing but not cancelling a program.”¹³ These slowdowns can yield large short-term savings and allow defense budget cutters to avoid the politically difficult step of ending a program outright.¹⁴ Unfortunately, this political expediency has long-term consequences for the Nation. In the end, the U.S. pays more for less in the form of higher per-unit costs and lower production totals. Together, these factors have driven the downward trend in tactical aircraft acquisition.

Current Tactical Aircraft Inventory

This section describes the current U.S. tactical aircraft inventory and the capabilities of the platforms slated to be replaced. The information presented in this section is useful to understanding the implications of the trend towards fewer joint / multi-role platforms. Table 1 shows the approximate breakdown of tactical aircraft in the inventory as of early 2009. Several of the aircraft in the current inventory are highly specialized while others are deliberately less so. The specialized aircraft include the A-10, F-15, and AV-8B. Current DOD recapitalization plans call for the joint / multi-role F-35 to replace all or part of the mission of these specialized platforms. One must pay particular attention to each of these specialized platforms to understand the capabilities lost in transitioning to less-specialized, multi-role platforms.

The A-10 “Thunderbolt II” is a USAF ground attack aircraft designed during the Cold War as a Close Air Support (CAS) platform. A-10 pilots are experts in providing CAS in joint / coalition environments. The A-10’s low subsonic employment speeds and

¹³ Ibid.

¹⁴ Ibid.

Table 1. Approximate U.S. Tactical Aircraft Inventory in Early 2009

Service and aircraft type	Inventory
Air Force	
F-22 fighter	135
F-15A/C fighter	470
F-15E strike fighter	220
F-16 strike fighter	1,200
A-10 attack plane	350
Subtotal Air Force	2,375
Navy and Marine Corps	
F/A-18E/F strike fighter (Navy)	380
F/A-18A/B/C/D strike fighter (Navy & Marine Corps)	620
AV-8B VSTOL attack plane (Marine Corps)	125
Subtotal Navy and Marine Corps	1,125
TOTAL all services	3,500

Source: Ronald O'Rourke, *Tactical Aircraft Modernization: Issues for Congress* (Washington DC: Congressional Research Service RL33543, July 9, 2009), Table 1.

long flight-endurance are ideally suited to its mission.¹⁵ Its primary weapon is a 30mm cannon, capable of firing 3900 rounds per minute, but it can also employ a wide variety of air-to-ground weapons.¹⁶ It is the only tactical aircraft in the U.S. inventory armored against gunfire from the ground.¹⁷ The robust A-10 design has two engines and redundant systems to absorb battle damage, and it is capable of short takeoffs and landings on unimproved surfaces. The A-10 has proven to be an ideal aircraft for CAS in

¹⁵ U.S. Department of the Air Force, "A-10 Thunderbolt II," linked from *U.S. Air Force Home Page*, <http://www.af.mil/information/factsheets/factsheet.asp?fsID=70> (accessed February 13, 2010).

¹⁶ Ibid.

¹⁷ U.S. Congressional Budget Office, *Alternatives for Modernizing U.S. Fighter Forces* (Washington D.C.: Congressional Budget Office, May 2009) 25.

the low-technology threat environment encountered in the current wars in Iraq and Afghanistan. Since 2001, the A-10 has received multiple upgrades to expand the types of weapons it can deliver and to improve its data-link and communication equipment.¹⁸ Though the A-10 has exceeded its design service life, major structural repair programs are underway to extend the life of the A-10 inventory.¹⁹

In comparison, the F-35A is far less suited to the A-10's mission. The F-35 is not armored, has a smaller gun with limited ammunition, has less flight endurance, is not capable of operating from unimproved locations, and employs at higher speeds than the A-10. Although many of these features that make the F-35 less suited to the CAS mission do make it more capable in other mission areas, they also greatly increase the cost of the platform. The F-35 is a stealth fighter with an advanced sensor suite, and is far more survivable than the A-10 against an air threat or Surface to Air Missile (SAM) threat. In comparison, the A-10 has no radar, very limited air-to-air capability, and is vulnerable to SAM attack.²⁰ While the F-35 will be capable of performing the A-10's mission it will be less efficient and effective at that mission set. Likewise, F-35 pilots will have a broader set of missions in which to maintain proficiency and will likely be less expert at providing CAS.

The F-15 "Eagle" is a highly successful USAF fourth-generation fighter that was produced in two versions. The F-15A/C is a twin-engine, single-seat, air-superiority

¹⁸ U.S. Department of the Air Force, "A-10 Thunderbolt II," linked from *U.S. Air Force Home Page*, <http://www.af.mil/information/factsheets/factsheet.asp?fsID=70> (accessed February 13, 2010).

¹⁹ Russell Wicke, "New wings to secure A-10 longevity," May 9, 2008, <http://www.af.mil/news/story.asp?id=123098096> (accessed February 13, 2010).

²⁰ U.S. Department of the Air Force, "A-10 Thunderbolt II," linked from *U.S. Air Force Home Page*, <http://www.af.mil/information/factsheets/factsheet.asp?fsID=70> (accessed February 13, 2010).

fighter, armed with a 20mm cannon and typically eight air-to-air missiles. F-15A/C pilots are the foremost air-to-air combat experts. The F-15A/C fleet is approaching the end of its designed service life. In 2007, the USAF had to ground the entire F-15 fleet for over a month following an incident where an aircraft disintegrated in flight due to fatigue and wear from 27 years of service.²¹ The F-15E “Strike Eagle” is a newer, multi-role version of the original Eagle. The F-15E is a two-seat fighter and the crew includes a pilot and a Weapons System Operator (WSO). The F-15E has excellent combat range and payload capacity and is ideal for deep-interdiction missions. The F-15E typically carries a mixed load of air-to-ground weapons and a limited number of air-to-air weapons for self defense. The F-15E community maintains proficiency in a wide variety of missions.

The aging fleet of F-15s was intended to be relieved by the F-22; however, due to cuts in the F-22 program, current recapitalization plans call for F-35As to augment the small “silver-bullet” force of 187 F-22s. In comparison to both the F-15A/C and F-22 the F-35A is not optimized for air-to-air combat, and while its stealth and advanced avionics should give it an advantage over the F-15A/C, its weapons carriage is limited in its stealth configuration and it is less survivable against high-end air and surface threats than the F-22. Additionally, the F-35A has less payload and range capacity than the F-15E. F-22 program cuts and delays in the F-35 program have caused the Air Force to consider plans to maintain a fleet of 177 upgraded F-15Cs through 2025. Under this plan, the United States would rely on 40-45 year old F-15Cs for some portion of its air superiority responsibility for national defense.

²¹ Sydney J. Freedburg, Jr., “Aging Aircraft,” *National Journal* (14 March 2008): cover story.

Versions of the F-35 will also replace the F-16, F/A-18A/B/C/D, and the AV-8B. The F-35A/B/C are planned to be far more capable than these older aircraft, and there should be no capabilities lost in these transitions. The F-16 “Fighting Falcon” is a relatively inexpensive, light-weight, single-engine, single-seat, fourth-generation multi-role fighter operated by the USAF and many allies around the world. The F/A-18A/B/C/D “Hornet” is operated by the Navy and Marine Corps. It is a fourth-generation multi-role fighter capable of aircraft carrier operations. The AV-8B “Harrier” is a subsonic Short TakeOff Vertical Landing (STOVL) light attack aircraft operated by the U.S. Marine Corps. The Harrier is the only aircraft currently in the inventory that can operate from U.S. amphibious ships. As will be discussed later, the fifth-generation capabilities of the F-35A/B/C will be duplicated across the Navy, Air Force, and Marine Corps. While the F-35 is designed to be far more capable than these older aircraft, it will also be far more expensive, and the program has already experienced considerable delays and cost increases due to problems with the F-35B development.

Proposed Tactical Aircraft Inventory

From this fundamental understanding of the older platforms, the paper will now consider those platforms slated to replace them. Table 2 shows the proposed U.S. tactical aircraft inventory under the current DOD recapitalization plan. Table 2 represents the inventory at a date in the future when all 2,443 F-35s have been delivered to the Services. The next section describes the F/A-18E/F, F-22, and F-35 programs and highlights aspects of the programs that contributed to the overall trend in fighter acquisition.

F/A-18E/F “Super Hornet”

The F/A-18E/F Super Hornet is a larger version of the earlier F/A-18A/B/C/D Hornet, with greater flight range and payload capacity, as well as an AESA radar and

Table 2. Proposed U.S. Tactical Aircraft Inventory

Service and aircraft type	Inventory
Air Force	
F-22 fighter	185
F-35A strike fighter	1763
Subtotal Air Force	1,948
Navy and Marine Corps	
F/A-18E/F strike fighter (Navy)	506
F-35B/C strike fighter (Navy and Marine Corps)	680
Subtotal Navy and Marine Corps	1,186
TOTAL all services	3,134

Source: Congressional Budget Office, *Alternatives for Modernizing U.S. Fighter Forces*, May 2009, Table 3-1. This CBO table uses 187 for the number of F-22s; however, two have been lost in accidents as of January 2010.

limited stealth attributes. The F/A-18E/F is generally considered a fourth-generation strike-fighter, although some supporters argue it is a “fourth-plus” or “4.5” generation strike fighter because it incorporates “some fifth-generation technology.”²² The Navy opted to procure Super Hornets after a failed attempt to procure their own stealthy strike fighter (the A-12 program) and opting not to pursue a carrier version of the Advanced Tactical Fighter (F-22).

The Super Hornet program exhibits some aspects of the overall trend in tactical aviation acquisition, but not all. To begin with, the Navy countered the trend by setting modest capability requirements and basing the design on an existing airframe. By doing so they were able to avoid large Research and Development (R&D) costs and quickly

²² O’Rourke, *Navy F/A-18E/F and EA-18G Aircraft Procurement*, 2.

execute the procurement. Additionally, export sales helped keep production costs lower.²³ Procurement began in FY1997 and through FY2009 the Navy had procured 449 of a planned total of 506 F/A-18E/Fs.²⁴ The most recent forecast for total acquisition cost of the Super Hornet program is approximately \$52 billion.²⁵

In other respects, however, the program does conform to the broader trend. The Super Hornet is a multi-role fighter and the Navy greatly increased its reliance on this single platform by procuring a newer version of the same jet.²⁶ Additionally, the Navy's plan competed with the F-22 and F-35 programs for overall acquisition funding, and per-unit cost fluctuated greatly with annual production rates and Multi-Year Procurement (MYP) deals. For example, in FY2008 the Navy procured 37 F/A-18E/Fs at an average procurement cost of \$74.9 million.²⁷ In FY2009 the procurement rate dropped to 23 aircraft and unit price increased to \$81.0 million.²⁸ In FY2010 the Navy budgeted about \$1.0 billion for the procurement of nine F/A-18E/Fs at an average per unit cost of \$117.2 million.²⁹ This 56% increase in cost in just two years reflects the fact that the F/A-

²³ Erik Hildebrandt, "Boeing's Super Hornet Cleared for International Sales," *Defense Daily*, August 7, 2001, <http://www.defensedaily.com/articles/dd/2001/dd0807013.html> (accessed December 17, 2009).

²⁴ U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapons Programs* (Washington DC: Government Accountability Office, March 2009), 9.

²⁵ Ibid.

²⁶ O'Rourke, *Navy F/A-18E/F and EA-18G Aircraft Procurement*, 1.

²⁷ Ibid, 2.

²⁸ Ibid.

²⁹ U.S. Department of the Navy, *Fiscal Year (FY) 2010 Budget Estimates, Justification of Estimates, May 2009, Aircraft Procurement, Navy, Volume I, Budget Activities 1-4*, Budget Item Justification Sheet P-40, 014500.

18E/Fs procured in FY2008 and FY2009 were procured in higher annual quantities, and under a MYP arrangement.

F-22 “Raptor”

The F-22 “Raptor” is the world’s most capable air-to-air combat aircraft and is operated exclusively by the USAF. The F-22 is currently the only stealth fighter in the U.S. inventory and the world’s first and only operational fifth-generation fighter.

Although originally conceived to be exclusively an air superiority fighter, the current design includes some air-to-ground capability. The F-22 possesses a unique combination of all-aspect stealth, supercruise, thrust-vectoring, and advanced sensors. These attributes are tied together by an integrated avionics suite that fuses on-board and off-board information to give the pilot unprecedented Situational Awareness (SA). Beginning in FY1999 the Air Force procured its complete inventory of 187 F-22s, including the final 24 in FY2009.³⁰ The USAF originally planned to buy as many as 750 F-22s in combination with about 1700 F-35As as part of its high-low mix of more-capable air-superiority fighters and more-affordable dual-role aircraft.³¹ The F-22 was intended to completely replace the aging F-15C fleet and is key to the USAF fulfilling its Title 10 responsibilities for the next twenty plus years.³²

The history of the F-22 acquisition process exhibits all the factors that contributed to the broader trend in tactical aircraft procurement. The program goals were ambitious both in terms of capability requirements and planned procurement totals. The design

³⁰ Jeremiah Gertler, *Air Force F-22 Fighter Program: Background and Issues for Congress* (Washington DC: Congressional Research Service RL31673, December 22, 2009), 1.

³¹ Ibid, 2.

³² Ibid.

requirements of a stealthy highly agile fighter incorporating state of the art sensor and avionics technology represented considerable technical risk. To address this risk, large amounts of money (~\$24.3 billion) were invested in an extended R&D phase, based on planned procurement totals of close to 1350 aircraft.³³ However, planned production totals changed rapidly when the Navy, which had originally planned to buy over 600 carrier versions of the ATF, dropped out of the program.³⁴ Shortly thereafter, in 1990, then defense secretary Dick Cheney delayed the start of F-22 production two years and cut the peak production rate from 72 to 48 planes per year.³⁵ By February 1991, these program changes plus inflation and adjustments in labor rate and material costs had increased the projected program cost for a 750 aircraft program from \$79.5 billion to \$103.7 billion.³⁶

These ambitious capability goals and reductions in total procurement and annual production rates extended program completion and exposed the program to changing requirements and priorities. It took almost two decades from the beginning of the Demonstration/Validation phase in 1986 before the Air Force declared Initial Operational Capability (IOC) in December 2005.³⁷ This long development period meant that some

³³ U.S. Department of the Air Force, SAF/FMB, "Committee Staff Procurement Backup Book: FY 2010 Budget Estimates, Research, Development, Test and Evaluation (RDT&E), Descriptive Summaries," Vol. 3, May 2009, 150.

³⁴ Barry Watts, *The F-22 Program in Retrospect* (Washington DC: Center for Strategic and Budgetary Assessments, August 2009), 4.

³⁵ Office of Assistant Secretary of Defense (Public Affairs), "Cheney Cuts Major Pentagon Aircraft Buys," news release, April 26, 1990, 4.

³⁶ U.S. Government Accountability Office, *Aircraft Development: Reasons for Recent Cost Growth in the Advanced Tactical Fighter Program GAO/NSIAD-91-138* (Washington DC: Government Accountability Office, February 1991), 1.

³⁷ Gertler, *Air Force F-22 Fighter Program*, 1.

design elements, such as computers, software, and sensors required modernization even while the plane was still in production.³⁸ Additionally, changes in the international security environment drove further programmatic change. A recent retrospective on the F-22 program noted, “[t]he F-22 had the misfortune of entering full-scale engineering development in 1991, the same year as the first Persian Gulf War (Operation Desert Storm) and the collapse of the Soviet Union.”³⁹ Ironically, the overwhelming success of F-15s at providing air superiority had an adverse effect on political support for a future air superiority fighter. This political climate caused the Air Force to recast the aircraft as a multi-role fighter and to scramble to add some air-to-ground capability to the design. In September 2002, the Air Force temporarily re-designated the aircraft the F/A-22, to emphasize this new air-to-ground capability.⁴⁰ These changes in design requirements late in development greatly increased cost and caused further delays in the program. During this period, the production rate was further reduced to 20 planes per year.

These reductions in annual procurement rates had a devastating effect on flyaway unit cost and total aircraft procurement numbers. In 1988, the ATF program office established a flyaway unit cost goal of \$35 million per plane in FY 1985 dollars, or roughly \$60 million in FY 2009 dollars based.⁴¹ These numbers were based on annual procurement rates of 72 planes per year. By May 2009, the average flyaway unit cost for 175 production F-22s had grown to \$158.8 million per plane at a production rate of 20

³⁸ Ibid, 3.

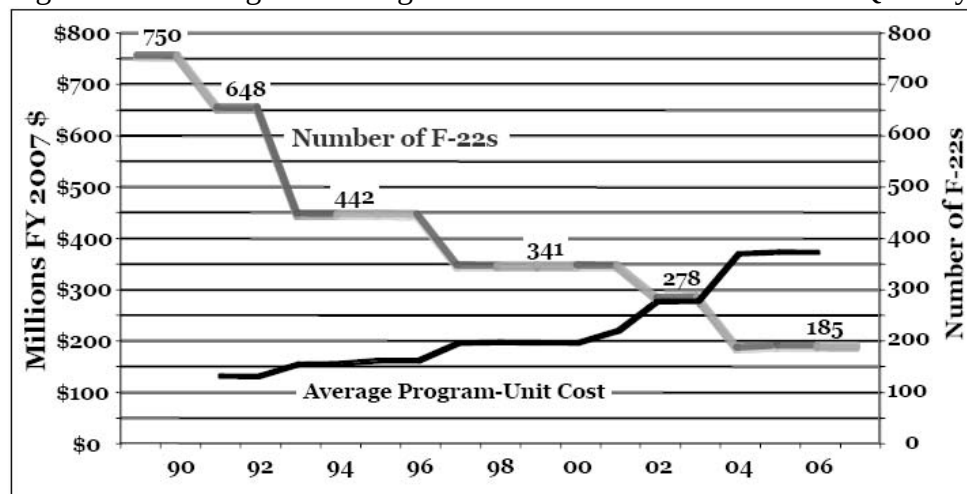
³⁹ Watts, *The F-22 Program in Retrospect*, 4.

⁴⁰ In December 2005, it was changed back to F-22. Gertler, *Air Force F-22 Fighter Program*, 1.

⁴¹ Watts, *The F-22 Program in Retrospect*, 3.

planes per year.⁴² These higher flyaway unit costs drove further decreases in total planned procurement. As the total planned buy decreased, the large R&D investment had to be allocated to fewer aircraft. At the end of 2007, the DOD estimated the total acquisition cost of a 183-aircraft F-22 program at about \$64.5 billion dollars, about \$30.4 billion of which was R&D costs.⁴³ Of the \$30.4 billion spent on R&D a large portion of that amount was spent adding a last minute air-to-ground capability to the design. Huge reductions in production totals resulted in a Program Acquisition Unit Cost (PAUC) of \$350.8 million, about 50% of which is R&D cost.⁴⁴ Figure 2 graphically depicts this inverse relationship between PAUC and total procurement quantity.

Figure 2. F-22 Program Average Unit Cost vs. Total Procurement Quantity



Source: Steve Kosiak and Barry Watts, "US Fighter Modernization Plans: Near-Term Choices," (Washington, DC: Center for Strategic Budgetary Assessments, 2007), Figure 2.

⁴² U.S. Department of the Air Force, SAF/FMB, "Committee Staff Procurement Backup Book: Fiscal Year (FY) 2010 Budget Estimates, Aircraft Procurement, Air Force," Vol. 1, May 2009, P-40 No. 3, 1.

⁴³ The number cited for total planned F-22 procurement depends on the date of the source. The most commonly cited figure is 183 though some documents show totals like 184 or 181. The most recent and accurate number is 187 which includes: 179 production aircraft; 6 Production Representative Test Vehicle (PRTV) II aircraft; and 2 Engineering and Manufacturing Development (EMD) aircraft funded with R&D money, Gertler, *Air Force F-22 Fighter Program*, 6.

⁴⁴ PAUC is the program's total acquisition cost divided by the total number of aircraft acquired (including non-production aircraft), Gertler, *Air Force F-22 Fighter Program*, 9.

Ultimately, the large investment in R&D produced what nobody disputes is the most capable air superiority fighter in the world. In fact, the F-22 is so capable that the U.S. government has banned exporting the F-22, even to its closest allies.⁴⁵ Improvements in the production line paid dividends, and the last 60 F-22s purchased were the most capable and least expensive to date.⁴⁶ Unfortunately, a failure to distinguish sunk costs from opportunity costs caused some politicians to see PAUC as a reason to cancel further production and prevented the American people from receiving a reasonable return on their R&D investment.

F-35A/B/C “Lightning II”

The F-35 Joint Strike Fighter (JSF) was conceived as a “relatively affordable” fifth-generation strike fighter combining the operational requirements of the Air Force, Navy, and Marine Corps into one platform that could be procured in three highly common versions.⁴⁷ The program’s design requirements call for 70% to 90% commonality among the three versions, with differences including the unit cost, manner of takeoff and landing, fuel capacity, and payload, among others.⁴⁸ 2,443 F-35s are slated to replace 350 A-10s, 1,200 F-16s, 220 F-15Es, 620 F/A-18A/B/C/Ds, and 125

⁴⁵ *Department of Defense Appropriation Act of 1998*, HR 2266, 105th Cong., 1st sess., *Congressional Record* H7656-7710. Representative David Obey sponsored amendment 295 to the 1998 DOD Appropriation Act on 7/29/1997. The amendment prohibited the sale of F-22 aircraft to any foreign government. The wording of this Obey amendment has been included in every DOD Appropriation Act since 1998 <http://thomas.loc.gov/cgi-bin/bdquery/D?d105:23:/temp/~bdgKYN::> (accessed 10 February 2010).

⁴⁶ PR Newswire, “Lockheed Martin Awarded Additional \$5 Billion in Multiyear Contract to Build 60 F-22 Raptors,” PR Newswire Online, <http://www.prnewswire.com/news-releases/lockheed-martin-awarded-additional-5-billion-in-multiyear-contract-to-build-60-f-22-raptors-52790072.html>, (accessed 8 February 2010).

⁴⁷ Jeremiah Gertler, *F-35 Joint Strike Fighter (JSF) Program: Background and Issues for Congress* (Washington D.C.: Congressional Research Service RL30563, December 7, 2009), 2.

⁴⁸ *Ibid.*

AV-8Bs; design features include, small physical size, single seat and single engine design, all-aspect stealth, internal weapons carriage, supersonic dash capability, advanced sensors (including an AESA radar and Electro Optical Targeting System) and integrated avionics. According to the USAF:

The F-35 program will...deploy a family of highly capable, affordable, fifth generation strike fighter aircraft...with optimum commonality to minimize life cycle costs. The F-35 was designed...to be our premier surface-to-air missile killer and is uniquely equipped for this mission with cutting edge processing power, synthetic aperture radar integration techniques, and advanced target recognition.⁴⁹

The Navy and Marine Corps testified that:

The commonality designed into the joint F-35 program will minimize acquisition and operating costs of Navy and Marine Corps tactical aircraft, and allow enhanced interoperability with our sister Service, the United States Air Force, and the eight partner nations participating in the development of this aircraft.⁵⁰

The statements from all three Services stress the cost saving and interoperability benefits of a common platform.

The three versions of the JSF were designed to meet the Services' specific requirements within the commonality constraints of the joint program. The F-35A is a Conventional TakeOff and Landing (CTOL) version of the aircraft being designed for the USAF.⁵¹ F-35As are to be more maneuverable (capable of 9gs), have an internal 25mm

⁴⁹ U.S. Congress, House, Armed Services Committee, Subcommittee on Air and Land Forces, *Hearings on Air Force Programs*, 111th Cong., 1st sess., May 20, 2009, 10.

⁵⁰ U.S. Congress, House, Armed Services Committee, Subcommittee on Seapower and Expeditionary Warfare, *Hearings on the Department of the Navy's Aviation Procurement Program*, 111th Cong., 1st sess., May 19, 2009, 1.

gun, and greater payload and range capacity than the F-35B version.⁵² F-35As are to replace Air Force F-16 and F-15E fighters, and A-10 attack aircraft. The F-35B is a STOVL version of the aircraft being designed for the Marine Corps and United Kingdom.⁵³ The F-35B version of the aircraft gives up considerable capability in terms of payload and range to accommodate the STOVL capability within the program commonality constraints. F-35Bs are to replace Marine Corps AV-8Bs and F/A-18A/B/C/Ds. The F-35B is central to achieving a long-term Marine Corps goal of fielding an all-VSTOL organic fixed-wing aviation capability.⁵⁴ The F-35C is a carrier-suitable CTOL version of the aircraft. The Navy version has larger and folding wings, carries more internal fuel, and has a heavier frame and landing gear to accommodate carrier operations.⁵⁵ Neither the F-35B nor the F-35C has an internal gun and both are 7.5g capable platforms.⁵⁶

The F-35 program represents the culmination of the consolidation trend in tactical aircraft acquisition. The program is DOD's largest weapon procurement program and its largest international cooperative program.⁵⁷ Current DOD plans call for acquiring a total

⁵¹ Lockheed Martin Web Page, <http://www.lockheedmartin.com/products/f35/index.html> (accessed February 10, 2010).

⁵² Ibid.

⁵³ Ibid.

⁵⁴ Gertler, *F-35 Joint Strike Fighter (JSF) Program*, 4.

⁵⁵ Lockheed Martin Web Page, <http://www.lockheedmartin.com/products/f35/index.html> (accessed February 10, 2010).

⁵⁶ Ibid.

⁵⁷ Gertler, *F-35 Joint Strike Fighter (JSF) Program*, 10.

of 2,443 JSFs for the Air Force, Marine Corps, and Navy, at an estimated total acquisition cost of about \$246 billion in constant FY2009 dollars (of which \$47.1 billion are research and development costs).⁵⁸ Allied participation was planned from the beginning to defray cost and risk and to establish a precedent for export sales of the aircraft.⁵⁹ Eight allied countries—the United Kingdom (UK), Canada, Denmark, The Netherlands, Norway, Italy, Turkey, and Australia—are participating in the F-35 program.⁶⁰ F-35 procurement began in FY2007 and the F-35A, F-35B, and F-35C were scheduled to achieve IOC in March 2013, March 2012, and September 2014 respectively.⁶¹ However, recent development problems have resulted in at least a one year delay from those projected IOC dates.⁶²

For the F-35 program to successfully deliver all 2,443 aircraft it will have to defy the acquisition trend; unfortunately, a review of the program to date is not encouraging. The JSF program began in 1995 and Lockheed Martin was awarded the development contract in October 2001.⁶³ Then Secretary of Defense William Cohen stated in 2000 that the JSF's joint approach "avoids the three parallel development programs for service-

⁵⁸ Ibid, 15.

⁵⁹ Ibid, 10.

⁶⁰ Michael Sirak, "F-35 Nations on Track to Sign New MOU, Says JSF Program Office," *Defense Daily*, November 20, 2006.

⁶¹ Andrew Tilghman, "Joint Strike Fighter Timeline Moved Up," *NavyTimes.com*, September 18, 2009; Dan Taylor, "Navy Officially Changes IOC For JSF Carrier Variant From 2015 to 2014," *Inside the Navy*, September 21, 2009.

⁶² Marcus Weisgerber and Jason Sherman, "Appropriations Bill Funds Development Of Second F-35 Engine," *Inside the Air Force Online*, 18 December 2009, http://insidedefense.com/secure/display.asp?docnum=AIRFORCE-20-50-11&f=defense_2002.ask. (accessed February 9, 2010).

⁶³ The JSF program combined the Air Force and Navy's Joint Advanced Strike Technology (JAST) program with a Defense Advanced Research Projects Agency (DARPA) initiative to develop an Advanced STOVL aircraft, Gertler, *F-35 Joint Strike Fighter (JSF) Program*, 4.

unique aircraft that would have otherwise been necessary, saving at least \$15 billion.”⁶⁴

Since contract award however, the estimated program costs for the JSF have increased dramatically. A recent Congressional Research Service (CRS) report noted:

Since 2002, the total estimated acquisition cost of the F-35 program has increased by roughly \$100 billion due, primarily, to a one-year extension in the program’s early development phase, a corresponding one-year delay in the start of procurement (from FY2006 to FY2007), revised annual quantity profiles, and revised labor and overhead rates.⁶⁵

According to that same report much of this increased cost and schedule slippage was incurred in the development of just one of the versions, the F-35B.⁶⁶ In other words, pooling requirements into one large joint program to potentially save \$15 billion has thus far resulted in \$100 billion in cost overruns and a year delay for all participants because of problems with the STOVL version. These cost overruns directly affected PAUC and APUC which, between October 2001 and December 2007, grew by about 38%.⁶⁷ The F-35 program, as of December 31, 2007, had a PAUC of about \$100.1 million in constant FY2009 dollars, and an APUC of about \$81.2 million in constant FY2009 dollars.⁶⁸ Most recently, the FY2010 budget funded the procurement of 30 F-35s at an average cost of \$227 million per aircraft. Further cost increases or schedule slips are likely to undermine partner participation and/or annual production rates.

⁶⁴ William S. Cohen, Secretary of Defense, letter to U.S. Rep. Jerry Lewis, 22 June 2000. The text of letter made available by *Inside the Air Force* on June 23, 2000.

⁶⁵ Gertler, *F-35 Joint Strike Fighter (JSF) Program*, 17.

⁶⁶ *Ibid.*

⁶⁷ *Ibid.*, 18.

⁶⁸ *Ibid.*

Chapter Summary

This chapter framed the discussion by exploring the downward trend in tactical aviation acquisition and the current and proposed tactical aircraft inventories. Since 1992, the number of tactical aircraft has decreased 40% and the number of platforms has decreased 50%. Current DOD recapitalization plans call for the number of platforms to be cut in half again to three platforms, all of which will be multi-role. Perhaps more significantly, one joint platform (the F-35) is to account for the vast majority of the tactical aircraft fleet (93% of the fifth-generation fleet and 78% of the total fleet). The key contributing factors to this trend are the lack of a coherent acquisition strategy above the Service level, more ambitious capability goals, and longer procurement times. These factors led to higher costs, lower procurement totals, and the search for efficiency through a focus on less-specialized multi-role / joint platforms. These factors and their interaction were highlighted during the review of the Super Hornet, F-22, and F-35 programs.

The chapter also described the current and proposed tactical aircraft inventories, and the capabilities of the aircraft that the DOD plans to replace with its fewer multi-role / joint programs. Particular attention was paid to specialized platforms to provide a better understanding of the capabilities lost in transitioning from more-specialized to less-specialized aircraft. The DOD is trying to save money by designing a single platform that is cheap and versatile enough to do many missions. The problem is that to be affordable and do many missions means the platform will not do them all well; generally, the more capable a platform the more it costs. While there is no denying that one can design a single vehicle to deliver the mail and drag race, the real question is whether you

can design it to do both missions well and still save money. A more likely outcome is an expensive hybrid that delivers mail inefficiently and cannot win a drag race. The U.S. requirement for low-cost, low-tech, close-air-support aircraft, and high-cost, high-tech air-superiority fighters are universal and such dedicated platforms will always respectively perform their primary missions more effectively and efficiently than a hybrid that does both missions. The next chapter examines the impact of the larger trend on the joint team's stated goal of joint interdependence.

CHAPTER 3 – JOINT INTERDEPENDENCE

We're the only country that I know of in the world that has four Air Forces, a Navy with an Air Force and an Army, an Army with a Navy and an Air Force and an Air Force that doesn't have any boats yet, they haven't been around long enough.

Senator Barry Goldwater¹

Joint interdependence is the key to gaining true efficiency and effectiveness in the DOD, and in a military establishment where “even the Navy’s army has an air force,” there is certainly room for improvement in this area.² Attaining true interdependence requires the Services to divest their organic-duplicate capabilities and rely on each other to competently perform their core competencies when called upon.³ While Joint Force Commanders (JFCs) have sometimes employed joint interdependent forces (usually out of tactical necessity), the Services have never embraced the concept. Since their creation, the Services have been unwilling to plan to rely on one another and have instead produced functional redundancy and duplication. This chapter begins with a look at the origins of the Services, to include their Service-specific roles and functions as codified in law. It then examines the evolution of “jointness” including the motivation for joint acquisition programs. This history is important to understand how acquiring the same platform in three Services has become the centerpiece of U.S. tactical aircraft recapitalization. This historical look at joint interdependence or lack thereof, provides

¹ Paul Mann, “Senate Group Urges Pentagon Reorganization,” *Aviation Week and Space Technology*, 21 October 1985, 29.

² William R. Ward, “Joint Cargo Aircraft: Whose Role, Whose Mission?” (research report, Air War College, 2007), 25.

³ Lawrence Wilkerson, “What Exactly Is Jointness?,” *Joint Forces Quarterly* (Summer 1997): 66.

insight into the effect that large joint acquisition programs, such as the F-35, will have on this concept in the future.

Congressionally Mandated Roles and Missions

The goals of the United States military are to protect the United States against external attacks and aggression, prevent conflict and surprise attack, and prevail against adversaries.⁴ To achieve these goals, each Service is given specific roles and functions codified in law. One must examine these roles and functions to understand the current lack of joint interdependence in the DOD.

The roles of the Services are the broad and enduring purposes for which they were established and are captured in U.S. Code Title 10. The language used for each Service differs significantly in its impact on the Service's commitment to joint interdependence. The role of the Air Force is centered on air and space operations and clearly calls for the Air Force to rely on the other Services. Although the Army's role is land centered, the law contains wording concerning organic capabilities that allows for redundant and overlapping capabilities with other Services. The language concerning the Navy is even more detrimental to the practice of joint interdependence. While focused on employment on and from the sea, it does not encourage the Department of the Navy to rely on any other Service. In fact, it specifically calls for the creation of a separate U.S. fighting force with its own sea, land, and air arms.⁵

The specific language of U.S. Code Title 10 regarding Service roles is worthy of note. According to law, the role of the Air Force is to "conduct prompt and sustained

⁴ U.S. Joint Chiefs of Staff, *National Military Strategy* (Washington, DC: U.S Joint Chiefs of Staff, 2004), viii.

⁵ Title 10, U.S. Code, Subtitle C, Part I, Chapter 507, §5062 (a).

offensive and defensive combat operations in the air and space.”⁶ The Air Force includes aviation and space forces, not otherwise assigned. The role of the Army is to “conduct prompt and sustained combat operations on land.”⁷ The Army includes land combat and service forces and any organic aviation, space forces, and water transport assigned. The role of the Navy is to “conduct prompt and sustained combat incident to operations at sea, including operations of sea-based aircraft and land-based naval air components and to conduct such land, air, and space operations as may be essential to the prosecution of a naval campaign.”⁸ The Navy includes, in general, naval combat and service forces and such aviation as may be organic therein. The Marine Corps is part of the Navy and its role is to “provide Fleet Marine Forces of combined arms, together with supporting air components, for service with the fleet in the seizure or defense of advanced naval bases and for the conduct of such land operations as may be essential to the prosecution of a naval campaign.”⁹ Title 10 states these Marine functions do not contemplate the creation of a second land army; however, the law says the Marine Corps will include, “not less than three combat divisions and three air wings and such other land combat, aviation, and other services as may be organic therein.”¹⁰ It is clear from U.S. Code Title 10 that joint interdependence stops at the “ancient military divide between sea and land.”¹¹ Other

⁶ Title 10, U.S. Code, Subtitle D, Part I, Chapter 807, §8062 (c).

⁷ Title 10, U.S. Code, Subtitle B, Part I, Chapter 307, §3062 (b).

⁸ Title 10, U.S. Code, Subtitle C, Part I, Chapter 507, §5062 (a).

⁹ Title 10, U.S. Code, Subtitle C, Part I, Chapter 507, §5063 (a).

¹⁰ Ibid.

¹¹ U.S. Congress, House, Armed Services Committee, *Panel on Roles and Missions Report* (Washington DC: U.S. Congress, January 2008), 87.

than the language directing the Air Force to rely on the other Services to support its air and space operations, the law clearly undermines the concept of joint interdependence within the Navy and the Marine Corps, and to a lesser degree within the Army as well.

Service Functions are the assigned responsibilities and missions of the Armed Forces as defined in the National Security Act of 1947. Department of Defense Directive 5100.1 specifies functions of the Services and U.S. Special Operations Command and mandates a surprising degree of duplication in effort.¹² On the one hand, it calls for the Military Departments to “produce interoperable forces, to assist each other in the accomplishment of their respective functions, and to plan for the use of the intrinsic capabilities of resources of the other Services that may be made available.”¹³ However, the directive also creates many collateral functions and allows each Service to operate organic land vehicles, aircraft, spacecraft or space systems, and ships or craft.¹⁴ The directive requires the Services to coordinate on all matters of joint concern and states collateral functions shall not be used as the sole basis for additional force requirements; however, the tension between joint interdependence and Service unilateralism is palpable in this document.¹⁵ (For a detailed list of Service functions see Appendix A). To understand how these roles and functions originated and why joint interdependence has remained elusive, it is necessary to explore the history of the Services.

¹² U.S. Department of Defense, *DODD 5100.1 Functions of the Department of Defense and its Major Components*, (Washington DC: U.S. Department of Defense, August 2002), 4.

¹³ Ibid, 13.

¹⁴ Ibid, 14.

¹⁵ Ibid, 14.

Service Origins

The Services were created during the American Revolution and were not envisioned to work together or to depend upon each other.¹⁶ Article 1, Section 8 of the United States Constitution formalized their existence and gave Congress the power to provide for the common defense by raising and supporting armies, and by providing and maintaining a Navy.¹⁷ The young republic, with its militia traditions, established a small standing Army under the War Department in 1789.¹⁸ The Navy, with its organic Marine Corps, was established under the separate Department of the Navy in 1798.¹⁹ Roles and missions were created around the land and sea environments, and from the beginning duplicate capabilities within the Army and Marine Corps generated significant friction between the two Departments.²⁰ This friction has produced a long history of prominent members of the Army attempting to eliminate the Marine Corps as a separate Service.²¹ This duplication trend continued with the advent of military aviation when both the Army and the Navy pursued robust aviation capabilities.

The Army and the Navy each developed large standalone warfighting capabilities during WWII. The Army (War Department) built a ship inventory so large it rivalled that

¹⁶ Peter W. Matisoo, "Enabling Joint Interdependence through Capability Portfolio Management," (master's thesis, Joint Forces Staff College, 2008), 10.

¹⁷ U.S. Constitution, art. 1, sec. 8.

¹⁸ Raymond K. Bluhm, *U.S. Army: A Complete History*, (Arlington, Va: Army Historical Foundation, 2004), 128.

¹⁹ Jon T. Hoffman, *USMC: A Complete History*, (Quantico, Va: Marine Corps Association, 2002), 26.

²⁰ W. J. Holland, *The Navy*, (Washington, DC: Naval Historical Foundation, 2000), 14.

²¹ Victor H. Krulak, *First to Fight: An Inside View of the U.S. Marine Corps*, (Annapolis, Maryland: Naval Institute Press, 1984), 113-119.

of the U.S Navy, while the Navy Department, through the Marine Corps, built a land force of nearly 500,000 troops.²² Additionally, both Departments built huge aviation arms. The Army's Air Corps, grew to a peak size of over 2.4 million men and women in service and nearly 80,000 aircraft in 1944.²³ At the same time, the U.S. Navy grew its aviation arm to a total of nearly 40,000 carrier and land-based aircraft.²⁴ Each military Department was granted autonomy to decide how it would fight, and how it would organize, train, and equip its combat forces. This prerogative to build standalone warfighting capacity became embedded in Service culture and the inclination remains present today. The influence of this Service unilateralism is evidenced by the "rivalry in the Pacific," where the two Departments' forces led by General Douglas MacArthur and Admiral Chester W. Nimitz were allowed to operate independently, rather than make the hard decision to select one overall commander.²⁵

Following World War II, the United States attempted to reign in its vast military and gain both operational and economic efficiency through unification of the two military departments.²⁶ President Truman was particularly concerned with what he saw as unnecessary duplication and lack of cooperation between the War and Navy departments.²⁷ The Army agreed with the President and advocated for a single service

²² Bill Owens, *Lifting the Fog of War* (Baltimore: The John Hopkins University Press, 2001), 161.

²³ Bernard C. Nalty, *Winged Shield, Winged Sword: A History of the United States Air Force* Vol. I, (Washington DC: Air Force History and Museums Program, 1997), 378.

²⁴ Owens, *Lifting the Fog of War*, 161.

²⁵ Ibid.

²⁶ Clark Clifford, *Counsel to the President* (New York: Random House, 1991), 147.

²⁷ Ibid, 146.

with land, sea, and air components.²⁸ The Navy and Marine Corps strongly disagreed and petitioned Congress to reject unification efforts over fears of losing their organic land and aviation arms.²⁹ In the end, the naval lobby prevailed and the resultant 1947 National Security Act was a compromise between those who favored unification and those who supported continued Service autonomy.

The 1947 National Security Act paradoxically directed elimination of duplication while at the same time encouraging Service autonomy. The retention of aviation elements in all the Services is a prime example of parochial Service influence and Congressional unwillingness to direct joint interdependence.³⁰ The Act merged the War Department and the Department of the Navy into one Department headed by a Secretary of Defense, and created a separate land Air Force. Service autonomy, however, was enforced with each Service retaining the responsibility to organize, train and equip their forces and by prohibiting the merging of Service components.³¹ The Secretary of Defense was made responsible for providing unified strategic direction and eliminating unnecessary duplication, but lacked the authority to do so. The Act specifically directed the Secretary of Defense to:

²⁸ Ibid, 147.

²⁹ Richard I. Wolf, *The United States Air Force Basic Documents on Roles and Missions*, (Ft. Belvoir: Defense Technical Information Center, 1987), 61.

³⁰ Matisoo, "Enabling Joint Interdependence," 15.

³¹ National Security Act of 1947, Public Law 80-253, Section 202.

...take appropriate action (including the transfer, reassignment, consolidation, or abolition of any function, power, or duty) to provide more effective, efficient, and economical administration and operation, and to eliminate duplication, in the Department of Defense.³²

While this wording seems impressive, the large scale duplication of air and land arms was now codified in law and beyond the Secretary's control. Furthermore, the authority of the Secretary of Defense over the individual Services was limited at first by his equal status with the Service Secretaries, and ultimately by the Services' budgetary autonomy.

The Key West Agreement of 1948 was another attempt to reduce Service duplication of effort. The agreement sought to clarify Service roles and missions, reduce inter-service tensions, and facilitate joint operations.³³ The document outlined core competencies of each Service and directed "maximum practicable integration ... to produce an effective, economical, harmonious and businesslike organization which will insure the military security of the United States."³⁴ Responsibilities were divided as follows: the Army would be responsible for ground operations, the Navy for sea operations, the Air Force for air operations, and the Marine Corps for amphibious operations.³⁵ Ultimately, however, the Key West Agreement stopped short of demanding joint interdependence and the Services continued to pursue organic capabilities through their statutory missions to organize, train and equip. Since this time little has changed in the way of joint interdependence.

³² Ibid.

³³ The Key West Agreement of 1948 is the unofficial name for the Presidential Directive entitled "Functions of the Armed Forces and Joint Chiefs of Staff," see Wolf, *Air Force Roles and Missions*, 151.

³⁴ Ibid, 155.

³⁵ Ibid, 152.

Status of the Joint Team

*...Separate ground, sea and air warfare is gone forever. If ever again we should be involved in war, we will fight it in all elements with all Services, as one single concentrated effort. Peacetime preparatory and organizational activity must conform to this fact. Strategic and tactical planning must be completely unified, combat forces organized into unified commands, each equipped with the most efficient weapons systems that science can develop, singly led and prepared to fight as one regardless of Service.*³⁶

It has been 51 years since President Eisenhower uttered these historic words to Congress. In that time there have been many successes and failures on the road towards creating this joint team. The term “joint” is everywhere in the Armed Forces: “joint interdependence” is the stated goal; there is talk of systems being “born joint;” Joint Inter-Agency Task Forces (JIATFs) are the standard; and this paper is being written as the author attends the Joint Advanced Warfighting School at the Joint Forces Staff College. Joint Pub 1 declares “twenty years after the Goldwater-Nichols Department of Defense (DOD) Reorganization Act (Title 10, U.S. Code [USC], Section 151-155) directed actions to remove the institutional barriers to jointness, the Armed Forces of the United States is a joint team.”³⁷ Indeed, while not perfect, there has been incredible progress in making the Armed Forces more effective and interoperable in joint operations. These improvements at the tactical level are largely the result of training and

³⁶ U.S. President Dwight D. Eisenhower, “Special Message to the Congress on Reorganization of the Defense Establishment,” April 3, 1958.

³⁷ U.S. Joint Chiefs of Staff, *Joint Publication 1, Doctrine for the Armed Forces of the United States* (Washington DC: U.S. Joint Chiefs of Staff, 02 May 2007 incorporating change 1 dated 20 Mar 2009), I-2.

educational improvements; however, collaboration at the strategic or Service level has been more elusive.

Eisenhower envisioned a force that not only worked well together, but was also efficient. While effectiveness must come before efficiency, efficiency is no less important to the national defense. The Nation has a finite amount of resources with which to confront a broad spectrum of challenges. These include: violent transnational extremist networks; hostile states armed with weapons of mass destruction; rising regional powers; emerging space and cyber threats, natural and pandemic disasters, and a growing competition for resources.³⁸ Efficiency is inherent in the concept of “joint interdependence.” Unfortunately, progress in this aspect of jointness continues to be limited.

Throughout the Nation’s history true joint interdependence has emerged only out of tactical necessity, real or perceived. One such example, the Air Force and Army cooperation on the concept of “AirLand Battle,” provided a glimpse into what can be achieved through truly interdependent operations.³⁹ The concept developed out of the Army’s necessity to deal with a numerically superior Soviet land threat in Western Europe without relying on nuclear weapons. General Donn Starry, of the Army’s Training and Doctrine Command (TRADOC), noted air power could be used to “stretch the battlefield” and provide a qualitative counter to Soviet mass.⁴⁰ He reached out and

³⁸ U.S. Department of Defense, *National Defense Strategy* (Washington DC: U.S. Department of Defense, June 2008), 1.

³⁹ U.S. Department of Defense, Historical Office United States Army Training and Doctrine Command, *From Active Defense to AirLand Battle: The Development of Army Doctrine, 1973-1982*. (Fort Monroe, VA, 1984), 62.

⁴⁰ Ibid.

worked closely with Air Force General Bill Creech, the commander of Tactical Air Command, to produce joint training, doctrine, and acquisition programs focused on this tactical problem. Together these two influential leaders overcame Service parochial interests and built a joint interdependent solution to a clear tactical problem.⁴¹ Unfortunately, episodes like AirLand Battle have proven to be the exception rather than the rule with regard to Service cooperation.

Service cultures and parochialisms continue to discourage joint interdependence and contribute to the tendency for each Service to pursue organic capabilities as they compete amongst themselves for limited resources and primacy of operating concepts.⁴² These tendencies are fundamental and perpetuated by the individual Services' budgetary influence inherent in their responsibility to organize, train, and equip their respective forces. Nowhere is this more evident than in the Navy with its long tradition of autonomous operations. During the Cold War, for example, the Navy designed combat units to fight the Soviet Navy with the assumption it would operate in isolation from the other Services.⁴³ According to Admiral Owens, former Vice Chairman of the Joint Chiefs of Staff, it was the Navy's goal during this time to "have the ability to fight and win on its own, rather than to contribute to an overall joint battle plan."⁴⁴ Joint operations for the Navy meant operations with their organic Marine Corps, which in turn

⁴¹ Ibid.

⁴² Matisoo, "Enabling Joint Interdependence," 3.

⁴³ Owens, *Lifting the Fog of War*, 158.

⁴⁴ Ibid, 159.

jealously guarded its own organic naval (transport) and air arms.⁴⁵

More recently, the Army's pursuit of the Joint Cargo Aircraft represents a clear effort to avoid joint interdependence. Distrust at the Service level led the Army to seek an organic fixed-wing intra-theatre airlift fleet, rather than justify the requirement and provide political and financial support to the Air Force to meet that requirement. Such tendencies have made duplication among the Services the norm, and according to Admiral Owens, once established redundant programs become "heavily vested" as they compete for operational priority and future funding.⁴⁶

Resource competition and Service parochialism are intrinsically linked. In times of plenty, each Service is content with its share of the budget and sets about expanding its organic capabilities / programs, often with overly optimistic expectations about future funding. When the political will changes and financial pressure increases, the Nation can be left with multiple programs each based on a different strategic / Service goal. When this happens, Service parochialism flares and elected leaders have to either pick one program and hope it matches the Nation's strategic needs or underfund all of the programs.⁴⁷ Over the years, there have been many attempts to address this issue and achieve a more balanced and efficient joint military capability. A series of boards, committees, and reports have been created with this goal in mind.⁴⁸ The Joint Requirements Oversight Council (JROC) is a prime example. The council produces a set

⁴⁵ Ibid.

⁴⁶ Ibid.

⁴⁷ U.S. Congress, House. *Panel on Roles and Missions Report*, 88.

⁴⁸ U.S. Department of Defense, Office of the Vice Chairman of the Joint Chiefs of Staff. *Planning in a Revolutionary Era*, Open-file report (Washington, DC: Government Printing Office, 1996), 20-22.

of joint requirements that are submitted to Service programmers in the form of JROC memorandums. These memos often seek efficiency and political buy-in by recommending joint programs. One such memorandum was issued for the JSF program. These joint requirements in turn compete with Service priorities for limited resources.⁴⁹

Historically, the Services have made many arguments for the necessity of maintaining their duplicate and widely overlapping organic capabilities. According to Admiral Owens, their strongest argument has been “the friction and fog of war required them to compensate for the unexpected and surprising events that crop up in combat.”⁵⁰ Indeed, this argument and the sheer size of the U.S. Defense budget has made it possible for the Nation to maintain the “wasteful luxury” of “four air forces, three armies, two strategic missile forces, and one and a half navies.”⁵¹ Some have argued, this Service unilateralism is important because it fosters unique thought, provides beneficial competition, and reinforces Service core competencies which in turn generate policy options and comparisons.⁵² Still others contend the distinctiveness of the Services, their separate academies, unique uniforms, traditions, and cultures, help maintain public support for the Armed Forces.⁵³ These arguments have led to what has become known as “the paradox of joint culture.”⁵⁴ This paradox refers to what some see as a choice

⁴⁹ Bill Owens, “Making the Joint Journey,” *Joint Forces Quarterly* (Spring 1999): 92.

⁵⁰ Owens, *Lifting the Fog of War*, 159.

⁵¹ Harvey Sapolsky, “Interservice Competition: The Solution, Not the Problem,” *Joint Forces Quarterly*, no. 15 (Spring 1997): 51.

⁵² *Ibid*, 52.

⁵³ *Ibid*, 52.

⁵⁴ David T. Fautua, “The Paradox of Joint Culture,” *Joint Forces Quarterly*, no. 26 (Autumn 2000): 81.

between Service culture and joint culture; the former essential to Service effectiveness, and the latter essential to the creation of a truly joint interdependent DOD.⁵⁵

This joint culture is essential to achieving Eisenhower's vision. Such a culture would reward diversity, strengthen core competencies, and achieve a more capable interdependent joint force. In his words, a force "equipped with the most efficient weapons systems that science can develop."⁵⁶ In this context, the word efficient refers to the accomplishment of mission. It captures the idea of systems specialized for the roles and missions of each Service, but interoperable with the other Services. Today, we call this being "born joint" (i.e., conceptualized and designed with joint architectures and acquisition strategies).⁵⁷ Joint architecture means interoperability and includes things such as compatible radios, data-links, and weapons. This concept of "born joint" is often confused with joint acquisition programs.

Joint Acquisition Programs

Joint acquisition programs were developed in an effort to make the acquisition of duplicate capabilities among the Services as efficient as possible. A joint acquisition program is one in which two or more Services pool their resources to buy a common platform.⁵⁸ In the DOD, they are the logical consequence of the duplication of effort among Services, such as aviation elements in all the Services. Joint acquisition, by its

⁵⁵ Ibid, 86.

⁵⁶ U.S. President Dwight D. Eisenhower, "Special Message to the Congress on Reorganization of the Defense Establishment," April 3, 1958.

⁵⁷ U.S. Joint Chiefs of Staff, *Joint Publication 1, Doctrine for the Armed Forces of the United States* (Washington DC: U.S. Joint Chiefs of Staff, 02 May 2007 incorporating change 1 dated 20 Mar 2009), I-2.

⁵⁸ David L. McNicol, *Joint Acquisition: Implications from Experience with Fixed-Wing Tactical Aircraft* (Institute for Defense Analysis, IDA Paper P-4049, September 2005), 1.

nature, involves compromises on requirements. Consequently, at least one of the participating Services may obtain a system less capable than one optimized for its own requirements. Conversely, a Service participating in a Joint acquisition may receive a system more capable and expensive than necessary for their requirements alone. A joint program, however, theoretically acquires the system at lower overall cost than the combined cost of multiple alternative single-Service programs. The idea is that the funds freed by the cost avoidance can be used to acquire other, theoretically Service-specific, capabilities that support joint interdependence.⁵⁹ There is a contradiction at the heart of this argument, namely by focusing on how efficiently joint programs acquire duplicate capabilities in multiple Services it perpetuates the underlying inefficiency that made the program necessary to begin with.

Fundamentally, joint acquisition programs are the antithesis of joint interdependence. By each Service operating the same platform, they are inherently interoperable. The problem, however, is that this also means they inherently bring only the same capabilities to the fight. Thus, the irony is that while joint acquisition programs make it easier for Services to work together, they make it less necessary for them to do so. Importantly, while a joint acquisition program like the F-35 is necessarily “born joint,” a Service-specific program can also be “born joint.” The two concepts are not mutually exclusive, and joint acquisition programs compete for limited resources alongside Service programs with joint architectures.

Supporters of joint acquisition argue these programs are not purely redundant because they allow Services to provide the same capability, but in their own domain. For

⁵⁹ Ibid.

example, the JSF program provides the Air Force with a land-based strike fighter, the Navy with a sea based strike fighter, and the Marine Corps with STOVL strike fighter as part of their combined arms team for amphibious landings. This argument, however, ignores the fact that today and in the future the U.S. military plans to employ together. Most recently, the 2010 QDR signalled increased emphasis on littoral operations and a shift away from blue-water capabilities. With this in mind, it is hard to imagine the Marine Corps undertaking an amphibious assault where either the Navy, Air Force, or both would not be in a position to offer air support. The Marine Corps argument for organic fixed-wing airpower has more to do with training, and more to do with the idea that every Marine is a rifleman first, than with providing airpower in the amphibious domain. The Marine Corps believes that the rifleman background of their pilots makes them more in-tune with the requirements of the Marines they are supporting on the ground.⁶⁰ This argument is a fundamental rejection of jointness and implies that Air Force and Navy pilots are somehow less qualified to provide CAS for Marines.

The DOD has demonstrated a preference for joint acquisition programs. This preference is logical, from an efficiency stand point, within the same mission area (i.e. strike fighters) but has recently been expanded across mission areas. Such was the case with the choice of the joint / multi-role F-35 over the USAF F-22. In this debate, the F-22 was often criticized for being a Service-specific, single-mission program, born out of the Cold War. However, as mentioned in Chapter II, the F-22 (ATF program) originally was conceived as a joint air superiority program to replace the USAF F-15 and the Navy F-14. The F-22 program became Service-specific only after the Navy opted out of the

⁶⁰ Marion F. Sturkey, *Warrior Culture of the U.S. Marines* (Plum Branch, SC: Heritage Press International, 2003), 114.

program and focused instead on its own Service-specific program, the AEGIS weapons system. The AEGIS weapons system is essentially a ship-based SAM system. In doing so the Navy opted for a ship-based solution instead of a fighter-based solution to fulfill its air superiority mission at sea. Similar to the F-22, the AEGIS weapons system is a highly-specialized, Service-specific program developed during the Cold War. Both systems are highly effective and the U.S. military is far more capable and flexible by having both of these specialized weapons systems in the inventory than it would have been with only one or the other.

Chapter Summary

To achieve President Eisenhower's vision to "fight (war) in all elements with all Services, as one single concentrated effort...each equipped with the most efficient weapons systems that science can develop" the DOD must embrace true joint interdependence.⁶¹ Although the Services clearly continue to improve their ability to conduct joint combat operations, at the Service level they have failed to take advantage of acquisition strategies centered on joint interdependence. The Services were organized around their individual combat domains and were not institutionalized to work together. Several reform efforts have attempted to mandate the creation of a single joint interdependent team, but these efforts have been hampered by the influence of the Services and the unwillingness of the Congress to direct joint interdependence. Service unilateralism has produced functional redundancy and duplication as each strives to deliver standalone warfighting capabilities. Joint acquisition programs were created in an effort to make the purchase of these duplicate capabilities more efficient. Joint

⁶¹ Eisenhower

acquisition programs, therefore, reinforce Service unilateralism by allowing each Service to maintain the same organic capability. This increases interoperability while reducing interdependence. The result is an inefficient system that is acquired a little more efficiently. Additionally, if reduced budgets or program cost overruns bring these joint acquisition programs into competition with programs that support Service core competencies, there is the potential for them to negatively influence overall Defense posture. This concept is explored in the next chapter on strategy and risk.

CHAPTER 4 – STRATEGY & RISK

The realities of the post-Cold War, post-9/11 world have taken the United States in a new strategic direction. As evidence, the 2008 National Defense Strategy now formally considers nation building, stabilization, and peacekeeping missions just as important as deterring and defeating conventional enemy combatants.¹ Facing a broader array of threats both overseas and at home, as well as huge financial pressures to cut costs, the United States is reassessing its recapitalization needs. According to Defense Secretary Gates:

The defining principle of the Pentagon's new National Defense Strategy is balance. The United States cannot expect to eliminate security risks through higher defense budgets, to do everything and buy everything. The Department of Defense must set priorities and consider inescapable tradeoffs and opportunity costs.²

Gates' strategy seeks a balance between prevailing in the current conflicts and preparing for other contingencies. It also seeks balance between institutionalizing capabilities such as counterinsurgency and foreign military assistance and maintaining the United States' existing conventional and strategic technological edge against other military forces.³

This search for balance has profound implications for DOD tactical aircraft recapitalization. The older platforms described in Chapter II are fast approaching the end

¹ U.S. Department of Defense, *National Defense Strategy* (Washington DC: U.S. Department of Defense, June 2008), 2.

² Robert M. Gates, "A Balanced Strategy: Reprogramming the Pentagon for a New Age," *Foreign Affairs*, January/February 2009, 1.

³ Ibid.

of their service life and the ongoing demands of overseas contingency operations have accelerated this process. The acquisition programs slated to replace these older platforms are designed for a conventional, peer-adversary threat and are expensive and have excess capability for the current conflict. In response to this, Secretary Gates stated “the DOD has to consider whether in situations in which the United States has total air dominance, it makes sense to employ lower-cost, lower-tech aircraft that can be employed in large quantities and used by U.S. partners.”⁴ Such low-end capability would have to be balanced against threats at the other end of the spectrum. In 2007, then secretary of the Air Force Michael Wynne, in response to cuts in the F-22 program, warned, “[i]f you as Americans want to be coerced, we’re starting down that road.” He added, “[y]ou need to make sure we have air dominance and that our enemies believe we have air dominance.”⁵ Finding the correct balance both within tactical aviation and the overall Defense establishment is of critical importance.

This chapter examines strategy and risk. It begins with a brief overview of strategy development to include the internal and external pressures that influence U.S. strategy. Next, it looks at risk assessment in general, before focusing on the risks implied by the proposed fighter recapitalization plans.

Strategy Development

A popular definition of strategy is “the calculation of objectives, concepts, and resources within acceptable bounds of risk to create more favorable outcomes than might

⁴ Ibid, 4.

⁵ Michael Sirak, “Wynne: Maintaining Air Dominance Requires Greater National Commitment,” *U.S. Air Force Aim Points*, 21 September 2007, <http://aimpoints.hq.af.mil/display.cfm?id=21375&Printer=yes> (Accessed on line 7 October 2009), 2.

otherwise exist by chance or at the hands of others.”⁶ For defense, strategy is about determining what to do with the nation’s finite resources in order to best protect the country. Strategy is proactive and should be evolving constantly based on both internal and external environmental pressures. Today, U.S. strategy is evolving based on the increasingly real threat of strategic exhaustion.⁷ The United States cannot afford to defend against every threat everywhere, nor can it afford to nation-build in every failed state with its military. A think-tank report from 2008 summed it up well by saying “the greatest dangers facing America today are overreaction and overextension.”⁸

Throughout the country’s history, whenever defense budgets are reduced, there is a corresponding search for efficiency in order to deliver the security the nation demands within the bounds of the resources available. As discussed in Chapter III, this search for efficiency and unity of effort, through joint interdependence, has been problematic. According to the U.S. House of Representatives Committee on Armed Services, “[e]very twenty or thirty years, we seem to realize that our national security institutions are driven not by our country’s strategic needs but by petty organizational interests, political expediency, or plain inertia.”⁹ These organizational interests, political expediency, and inertia are part of the internal environment that influences strategy development. Other internal pressures include Service parochialism, civil-military relations, and budget

⁶ Harry R. Yarger, “Strategic Theory For the 21st Century: The Little Book on Big Strategy.” *Strategic Studies Institute* (February 2006), 31.

⁷ Shawn Brimley, Michele A. Flournoy and Vikram J. Singh, *Making America Grand Again: Toward a New Grand Strategy* (Washington DC, Center for a New American Security: June 2008), 16.

⁸ Ibid.

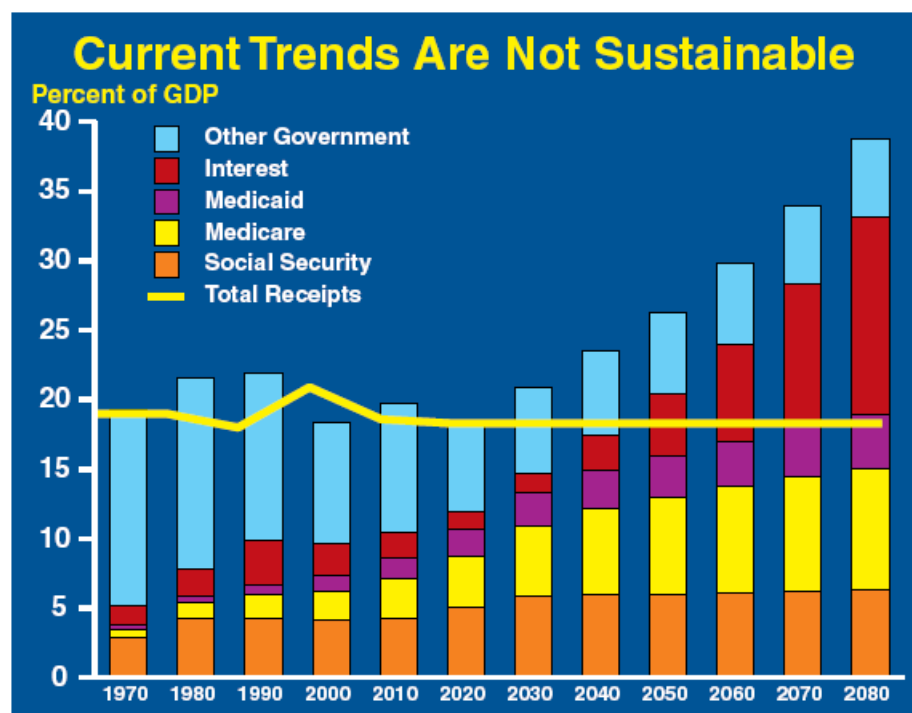
⁹ U.S. Congress, House, Committee on Armed Services, *Panel on Roles and Missions Report* (January 2008), 6.

constraints. Since Service parochialism was discussed extensively in Chapter III, this section will focus on civil-military relations and budget constraints.

Internal Pressures

Financial pressures are a major factor in strategy development. Through mid 2009, the United States spent roughly \$200 billion dollars in Afghanistan and \$700

Figure 3. Trends in U.S. Federal Spending as a Percentage of GDP



Source: Government Printing Office, *The Nations Fiscal Outlook*, <http://www.gpoaccess.gov/USbudget/fy09/pdf/budget/outlook.pdf> (accessed 12 November 2009).

billion dollars in Iraq.¹⁰ The cost of these wars, combined with the Bush administration's efforts to stimulate the economy post 9-11, resulted in deficit spending during the last

¹⁰ Steven M. Kosiak, "Cost of the Wars in Iraq and Afghanistan, and the Other Military Operations through 2008 and Beyond" (Washington DC: Center for Strategic and Budgetary Assessments, 2008), iii. Actual appropriations totals were \$187 billion in Afghanistan and \$687 billion in Iraq.

eight years of the Global War on Terror (GWOT). This deficit spending was exacerbated last year as the nation entered its worst economic recession in 30 years and set a new record with a \$1.4 trillion Federal budget deficit in FY2009.¹¹ Figure 3 shows how even without these recent events, the current trends in Government spending are not sustainable. The Obama administration has not forecast any dramatic cuts in the Defense budget; however, as the largest discretionary part of the federal budget, it is often a target during times of financial pressure. Additionally, the Obama administration has begun to pursue a domestic agenda with the potential to increase mandatory Government spending on entitlement programs. Examples include the recent health care reform and stimulus package.¹²

This disturbing financial situation complicates the country's military recapitalization decisions, since there is likely to be less money available in the Federal budget for the military at the same time a large recapitalization bill is coming due. The procurement cost of new aircraft is only the most visible part of this problem. Less visible are the maintenance and upgrade costs of older aircraft (necessitated by acquisition delays and reductions), and budget pressures directly related to the wars in Iraq and Afghanistan.¹³ These war-related budget pressures include increased investment in Intelligence Surveillance & Reconnaissance (ISR) assets and "reset" costs related to

¹¹ The largest budget deficit prior to 2009 was \$524 billion in 2008.

¹² Sherly Gay Stolberg and Robert Pear, "Obama Signs Health Care Overhaul Bill, With a Flourish," New York Times, 23 March 2010, <http://www.nytimes.com/2010/03/24/health/policy/24health.html> (accessed 26 March 2010).

¹³ Anthony H. Cordesman, Arleigh A. Burke and Hans Ulrich Kaeser, *America's Self-Destroying Airpower: Becoming Your Own Peer Threat* (Washington DC: Center for Strategic and International Studies, 16 December 2008), 4.

aircraft loss and accelerated wear.¹⁴ Additionally, the acquisition programs designed to replace this aging equipment are increasingly more expensive. Faced with these realities, programs to recapitalize conventional combat capability have been pushed to the right, reduced, or eliminated. Those that have survived have tended to be joint programs.

The timing of this recent push to cut costs and divest conventional capability has raised questions about the degree to which the decisions were strategically informed. The decisions announced on April 6, 2009 to inform the FY 2010 budget request were notably off cycle with Congressionally-mandated defense strategic review processes.¹⁵ In theory, the National Security Strategy (NSS) issued by the White House sets the parameters for the National Defense Strategy (NDS) issued by DOD as part of the Quadrennial Defense Review (QDR) process, and defense strategy in turn shapes budget choices.¹⁶ In this case, the budget choices came before an NSS and the QDR. As of this writing the Obama administration has yet to publish a National Security Strategy and the QDR was not released until early February 2010.

The QDR is intended to be a rigorous, inclusive review process that weighs assessments of the strategic environment, requirements, and gaps and overlaps in current capabilities. This review process was considered particularly relevant since, prior to this QDR, there had been no formal DOD analysis supporting a conclusion that 187 F-22s

¹⁴ Ibid.

¹⁵ Pat Towell, *Defense: FY2010 Authorization and Appropriations* (Washington DC: Congressional Research Service R40567, December 14, 2009), 24.

¹⁶ The *Goldwater-Nichols Act of 1986* established the permanent requirement for the President to submit a NSS report to Congress annually. That report is ordinarily due on the date the President submits the budget for the following fiscal year, but in the first year of a new Administration, it is due 150 days after the President takes office. By law a new NSS was due on June 19, 2009.

would be operationally sufficient.¹⁷ A recent Congressional research report made a similar observation stating:

In light of the QDR now in progress, it is premature for DOD to declare that 187 F-22s would be sufficient. DOD has deferred a number of other defense program questions to the QDR; it is inconsistent for DOD to not do so with the F-22, particularly if the QDR is considering a possible change in U.S. military strategy.¹⁸

The fact that such long-term strategic decisions were made well before the QDR was complete, and before Congress had a chance to review the results, leads to the conclusion that the QDR had a prescribed outcome in mind and its results were shaped to conform to political desires.

Which acquisition programs survive and receive funding is a function of civil-military relations and, ultimately, politics. Both the executive and legislative branches rely on the military for expertise in making these programmatic decisions. The political leadership and the American people expect their military to faithfully execute the guidance provided by elected officials. Yet, the American people also demand their military perform professionally and win the Nation's wars.¹⁹ This dichotomy is brought to the forefront when the Service Chiefs are asked to testify in front of Congress. The Service Chiefs are expected to give their professional military opinion on acquisition programs without regard to how their civilian superiors in the executive branch might feel on any particular topic. A recent example was the testimony of former Air Force

¹⁷ Jeremiah Gertler, *Air Force F-22 Fighter Program: Background and Issues for Congress* (Washington D.C.: CRS RL31673, December 22, 2009), 30.

¹⁸ Ibid, 32.

¹⁹ Yarger, "Strategic Theory For the 21st Century," 51.

Chief of Staff General Moseley and Air Force Secretary Wynne on the need for the F-22.

It was reported in the press, and later confirmed by Wynne, that their reluctance to support a total of no more than 183 F-22s was the key factor leading to their resignations.²⁰ This example highlights a potential pitfall for strategists:

Strategists, particularly when over-focused on immediate demands of decision makers, often fail to look to the future with sufficient depth of analysis and act too late to create positive strategic effects at relatively low costs. Relying on expediency...in lieu of proper strategic thinking ignores the advantages that accrue from intended cumulative effects and increases the costs for and risks to the state's security.²¹

Because of the nature of our governmental system, it is easy to let short-term political and fiscal demands trump long-term strategic thinking, especially with tactical aircraft acquisition programs.

As described in Chapter II, it is often politically and fiscally expedient to delay or reduce annual buys of tactical aircraft. Such short-term decisions can have lasting effects on the viability of an acquisition program and the strategic risk to the Nation's security. From a purely fiscal perspective, they deny the Nation a suitable return on its Research and Development (R&D) investment. The decision to end F-22 production at 187 aircraft, before the F-35 is tested or proven, is a good example. Another year of F-22 production (20 F-22s per year at \$140 million per aircraft) would cost less than \$3 billion dollars.²² This is less money than the U.S. Government spent on the controversial Cash-

²⁰ John T. Bennett. "Wynne Talks About His Tenure, Termination." *Defense News*. July 14, 2008.

²¹ Yarger, "Strategic Theory For the 21st Century," 34.

²² U.S. Department of the Air Force, SAF/FMB, "Committee Staff Procurement Backup Book: Fiscal Year (FY) 2010 Budget Estimates, Aircraft Procurement, Air Force," Vol. 1, May 2009, P-40 No. 3, 1.

for-Clunkers program and represents less than 0.00084% of the 2010 U.S. budget.²³ This decision, however, bets the future of fifth-generation fighter aircraft production on the untested F-35 program and highlights the integral part resources play in strategy development. Resources are almost always limited at the strategic level; however, allocating inadequate resources for a strategic concept is a recipe for disaster. If the F-35 program proves inadequate the recovery from this strategic error will likely require even greater expenditures in the future.

External Pressures

External pressures include the potential conventional and irregular threats, as well as the overall international security environment. While President Obama has yet to publish a National Security Strategy, the following quote from his speech at Oslo, Norway highlights his belief in the need for a strong military and his willingness to use that force if necessary:

I face the world as it is, and cannot stand idle in the face of threats to the American people. For make no mistake: evil does exist in the world. A non-violent movement could not have halted Hitler's armies. Negotiations cannot convince al Qaeda's leaders to lay down their arms. To say that force is sometimes necessary is not a call to cynicism - it is a recognition of history; the imperfections of man and the limits of reason.²⁴

Additionally, the Secretary of State recently underscored the strategic imperative of U.S. global engagement and protection and the necessity that, "America will extend its

²³ U.S. Department of Transportation, Office of Public Affairs, "Cash for Clunkers Payout Nearly Complete," 25 September 2009 (U.S Department of Transportation, Washington DC, 2009) <http://www.cars.gov/files/official-information/September25PR.pdf> (accessed 26 March 2010) and U.S. Office of Management and Budget, "A New Era of Responsibility Renewing America's Promise," (U.S. Government Printing Office, Washington DC, 2009), 114, http://www.whitehouse.gov/omb/assets/fy2010_new_era/A_New_Era_of_Responsibility2.pdf (accessed 26 March 2010).

²⁴ President Obama's Nobel Peace Prize acceptance speech in Oslo, Norway, 10 December 2009.

umbrella of Defense to protect its allies.”²⁵ A 2009 article by former Secretary of the Air Force Wynne questioned whether the U.S. would be capable of providing that umbrella in the future if the cuts in conventional capability Secretary Gates has recommended are allowed to stand.²⁶ In this article, Wynne asserts recent U.S. dominance of the skies has falsely led some to assume other nations will not challenge that dominance in the future. This assumption fosters the short-sighted belief that modern fighters are not worth their cost and the U.S. should instead focus on irregular conflict.²⁷

While the National focus has shifted to irregular warfare, there are still conventional threats and treaty obligations that demand the United States maintain its conventional forces. Secretary Gates noted Russia’s use of conventional military power against Georgia in August 2008 was, “a stark reminder that nation-states and their militaries do still matter.”²⁸ The Defense Secretary went on to say that “both Russia and China have increased their defense spending and modernization programs to include air defense and fighter capabilities that in some cases approach the United States’ own.”²⁹ This assertion was reinforced by the claim of the deputy chief of China’s air force, in November 2009, that China will field a fighter with F-22-like qualities within the next 8

²⁵ Mike Wynne, “Holes in US Defense Umbrella: Wynne,” *DOD Buzz online Defense and Acquisition Journal*, 27 August 2009, <http://www.dodbuzz.com/2009/08/27/holes-in-us-defense-umbrella-wynne/> (Accessed 8 October 2009).

²⁶ Ibid.

²⁷ Andrew T. Slawson, “Air Power’s First Among Equals: Why Air Superiority Still Matters” (master’s thesis, JFSC, 2008), 2.

²⁸ Gates, “A Balanced Strategy,” 3.

²⁹ Ibid.

to 10 years.³⁰ Similarly, following a successful flight of the new Sukhoi T-50 fighter, Russia's Prime Minister Vladimir Putin claimed the first batch of Russian fifth-generation fighters would go into service in 2013.³¹ The Russian T-50 is a joint venture between Russia and India to design a fighter with: "greater agility, sustained supersonic-flight capability in non-afterburning mode, low radar visibility, low heat signature, as well as enhanced take-off and landing performance."³² While Russia's timetable does seem overly optimistic, there is no doubt that Russia, China, and India are all pursuing fifth-generation fighters.

China has focused heavily on its anti-access and area-denial capabilities and this is often cited as a reason for the U.S. to pursue more robust conventional capabilities. Others feel the U.S. should avoid a potential arms race with China, arguing:

The belief in the inevitability of conflict [with China] can become one of its main causes. Each side, believing it will end up at war with the other, makes reasonable military preparations which are then read by the other side as confirmation of its worst fears.³³

Regardless of how one interprets China's military build up, the DOD faces a daunting challenge in preparing for the broad scope of potential conflicts for which it could be

³⁰ Ted Parsons, "China's Fifth-Generation Fighter To Fly 'Soon,'" *Jane's Defence Weekly*, November 12, 2009; Bradley Perrett, "China Close To Testing Next-Gen Fighter," *Aviation Week & Space Technology*, November 16, 2009; Bill Gertz, "New China Fighter," *Washington Times*, November 12, 2009: B1.

³¹ RIA Novosti, "Russia to start receiving fifth-generation fighters in 2013," RIA Novosti, Moscow, January 29, 2010, http://en.rian.ru/military_news/20100129/157715602.html (accessed February 17, 2010).

³² Glen Pew, "Sukhoi T-50 First Flight," January 29, 2010, http://www.avweb.com/avwebflash/news/Sukhoi_t50_first_flight_201932-1.html (accessed February 17, 2010).

³³ Stephen Van Evera, *How to Make America Safe: New Policies for National Security*, (Cambridge, MA: Tobin Project, 2006), 73-78.

called upon to engage. Currently, the Services' conventional modernization programs seek a 99% solution over a period of many years, while ongoing counterinsurgency missions require 75% solutions over a period of months.³⁴ Secretary Gates is seeking a balance between these two competing demands, and has chosen to divest some conventional capability to achieve that balance. How successful this balancing act will be is questionable, especially in light of acquisition reform studies which claim the defense enterprise is unable to effectively determine, prioritize and deliver capabilities to the joint warfighter.³⁵

Risk Assessment

*Risk is an assessment of the balance among what is known, assumed, and unknown, as well as the correspondence between what is to be achieved, the concepts envisioned, and the resources available. Risk assessment is not just a measure of the probability of success or failure. It is also an assessment of the probable consequences of success and failure. Risk weighs the potential advantages and disadvantages of adopting the strategy.*³⁶

This section looks at risk assessment in general before focusing on the risks associated with the current DOD fighter recapitalization plan. These include strategic and tactical risks concerning the plan as envisioned as well as those associated with the F-35 program itself.

³⁴ Gates, "A Balanced Strategy," 4.

³⁵ U.S. Department of Defense, *Joint Defense Capabilities Study Final Report*. January 2004, iii. This is the most current report of its type as of the time of this report and its observations and conclusions are still valid today.

³⁶ Yarger, "Strategic Theory For the 21st Century," 63.

Strategic Risk

A key assumption in the DOD's current plan is that focusing on one platform will increase efficiency. This search for efficiency has potential risks for effectiveness. Having one platform for the majority of U.S. tactical aviation seeks to create interoperability through standardization. While this standardization may achieve cost savings thru efficiency, in war it can make life easier for the enemy. It reduces the amount of uncertainty the enemy faces allowing him to focus resources and attention on countering a single threat instead of many; in this sense, efficiency can actually act as the opposite of effectiveness.³⁷ The following quote highlights a risk from the type of cost/benefit analysis that led to the current DOD fighter recapitalization plan.

[C]ost/benefit calculations may very well indicate the superiority of a single large platform (such as a battleship) to several smaller ones because, ton for ton, crewmember for crewmember, and dollar for dollar it can put more tons of high explosive on a target in a given period of time. In war, however, this advantage has to be balanced against the fact that putting all one's eggs in a single basket is dangerous...³⁸

In this quote the example used is a battleship; however, it applies as well to the current recapitalization plan. On paper, a single large joint / multi-role program may appear to be superior to several smaller Service-specific / specialized programs because, dollar for dollar, it can carry more weapons and has both air-to-ground and air-to-air capability. In reality however, this large joint / multi-role program (F-35) represents many compromises and is best described as a "middle" capability. It is too sophisticated and

³⁷ Martin Van Creveld, *Technology and War: From 2000 B.C. to the Present* (New York: The Free Press, 1991), 319.

³⁸ Ibid.

expensive for relatively low-end or irregular conflicts, while it simultaneously lacks capabilities needed to address challenges at the high-end of the military spectrum.³⁹ For low-end conflict, Joint Force Commanders might be reluctant to use the platform because it is expensive and over-matches a threat that does not require stealth or advanced fifth-generation capabilities. Similarly, the F-35 is not optimized for air-to-air combat. Against a high-end, near-peer air threat, JFCs may determine an F-35-only air superiority force is outmatched by an enemy's fifth-generation air superiority fighter force.

Tactical Risk

The principal and acknowledged risk of the current DOD fighter recapitalization plan is to the future ability of the U.S. to establish rapid air dominance. Air dominance is an essential precursor to all joint operations and is often taken for granted. Plans to offset future risk to air dominance by acquiring more F-35s sooner are based on a faulty assumption that F-35s and F-22s are interchangeable. This assumption is evident in statements like the following from the CJCS to the Senate Armed Services Committee: “In the air, [maintaining] this [conventional] advantage requires sufficient strike aircraft...capable of assuring air superiority.”⁴⁰ The truth is, strike aircraft, such as the F-35 and even more so the F/A-18E/F, would be hard pressed to handle even today's high-end air threat let alone a future fifth-generation enemy air threat. The F-35 is not optimized for air-to-air combat just as the F-22 is not optimized for air-to-ground combat. The airplanes were designed to complement each other. In fact, the F-35 design

³⁹ Thomas P. Ehrhard, *An Air Force Strategy for the Long Haul* (Washington D.C.: Center for Strategic and Budgetary Assessments, 2009), xii and xiv.

⁴⁰ Admiral Michael G. Mullen, USN Chairman of the Joint Chiefs of Staff, *Posture Statement Before the 111th Congress Senate Armed Services Committee*, February 2, 2010, 15.

specifically omitted many air dominance capabilities to save money, on the assumption there would be significant numbers of F-22s in the force to provide air dominance.⁴¹ The F-22 employs at nearly twice the altitude and at 50 percent greater airspeed, carries twice as many air-to-air weapons, is twice as maneuverable, and has a better all-aspect-signature than the F-35.⁴² These attributes make the F-22 significantly more lethal and survivable than the F-35 against advanced fighter and SAM threats. According to some experts the speed and altitude advantage of the F-22 “increases its survivability and its weapons effects by a factor of 3 over the F-35.”⁴³

The fact that the F-22 and the F-35 are designed to have significantly different capabilities is important and underappreciated in the public debate. The F-22 is best described as an air superiority fighter with some air-to-ground capability, and the F-35 in a similar manner is best described as an air-to-ground fighter with some air-to-air capability. This distinction is critically important, since current DOD plans call for the F-35 to mitigate operational risks that can arise from not having enough F-22s to conduct operations in multiple locations at the same time.⁴⁴ Defense Secretary Gates has acknowledged he is deliberately accepting more risk in this area of our national defense. How much risk has been a subject of debate. In June 2009, General John Corley, the Commander of the Air Force Air Combat Command (ACC), stated:

⁴¹ Rebecca Grant, “Losing Air Dominance” (Mitchell Institute Press: September 2008), 22.

⁴² Ibid.

⁴³ Ibid.

⁴⁴ Gertler, *Air Force F-22 Fighter Program*, 34.

At Air Combat Command we have held the need for 381 F-22s to deliver a tailored package of air superiority to our Combatant Commanders and provide a potent, globally arrayed asymmetric deterrent against potential adversaries. In my opinion, a fleet of 187 F-22s puts execution of our current national military strategy at high risk in the near to mid-term. To my knowledge, there are no studies that demonstrate 187 F-22s are adequate to support our national military strategy. Air Combat Command analysis, done in concert with Headquarters Air Forces, shows a moderate risk force can be obtained with an F-22 fleet of approximately 250 aircraft.⁴⁵ [see Appendix B for the full text of this letter]

Presently, the SecDef has prevailed in this debate, however it is important to realize his case is based on the F-35's "advertised" capabilities. The actual level of accepted risk will become clearer as the F-35 moves further into its testing.

Programmatic Risk

There is considerable risk involved in the F-35 program itself. The risks include those inherent to a joint acquisition generically, plus those associated with the fact that the F-35 is an all-aspect Low Observable (LO) aircraft and still early in the testing phase of its development. Programmatically, to keep the total number of F-35s purchased high, and the per-unit cost down, the number of procurement partners must be kept high. However, more partners means more compromises on requirements in order to keep costs under control and to meet timelines. These compromises result in a less-capable system than one optimized around the requirements of a single Service or partner. Furthermore, a decision by any partner to reduce its share of the buy results in increased costs for all partners. Increased costs lead to lower annual production rates and to further increases in per-unit cost. Adding to these difficulties is the fact that the DOD has a poor track record

⁴⁵ John D. W. Corley, General USAF, Commander Air Combat Command, letter to U.S. Senator Saxby Chambliss, 9 June 2009, available online at <http://www.airforce-magazine.com/DRArchive/Pages/2009/June%202009/June%2017%202009/HighRisk.aspx>.

of procuring all-aspect LO aircraft. Of the four programs invested in to date only 267 of the planned 2,400 will actually be fielded.⁴⁶ There are many examples in the press that highlight these risks.

Recent decisions and signals from the U.S. Navy have given other F-35 program partners reason for concern. A Defense News article in mid-2008 claimed that “the Navy has never been a fan of the program” noting that in 2002, the Service cut its JSF order by hundreds of aircraft under a plan to integrate Navy and Marine air forces, pushing up the predicted per-unit cost.⁴⁷ The article went on to claim that the Navy recently, “balked at funding its share of the JSF program, but eventually found the money after being told to do so by Deputy Defense Secretary Gordon England.”⁴⁸ Similarly, in 2006, the Navy circulated briefings urging delay of the STOVL jet that drew a furious response from the Marine Corps and U.K., and again Deputy Secretary England intervened on behalf of the program.⁴⁹ The response to these U.S. Navy programmatic signals demonstrates the political sensitivity of the F-35 program and the impact partner participation can have on JSF purchase price.

Another risk for the F-35 program concerns its propulsion. The administration has proposed terminating the F-35 alternate engine program in an effort to curb the troubled program’s escalating costs. The General Electric/Rolls-Royce F136 engine was

⁴⁶ 2,400 assumes that F-22 production does end at 187 aircraft and includes F-117s, B-2s, and F-22s, Barry Watts, *The F-22 Program in Retrospect* (Washington DC: Center for Strategic and Budgetary Assessments, August 2009), 2.

⁴⁷ Vago Muradian, “Navy Struggles With ‘Fighter Gap’: May Buy More F/A-18s, Delay F-35 Purchase,” *DefenseNews*, 7 April 2008, <http://www.defensenews.com/story.php?i=3466832> (accessed 12 November 2009).

⁴⁸ Ibid.

⁴⁹ Ibid.

to be developed as an alternative to the Pratt and Whitney F135 engine which currently powers the F-35 to provide competition and reduce program risk. The issue is highly political, and the U.K. could potentially pull its support of the F-35 if the alternate engine program is terminated.⁵⁰ The F-35 is a single engine aircraft and as such would be more vulnerable to engine malfunctions. Those supporting an alternate engine note that F-35s are to constitute the majority of future U.S. fighters, and that using a single type of engine in all F-35s creates a risk of all F-35s being grounded in the event of a problem with that engine. These fears are not unfounded. The Marine Corps grounded 106 AV-8B Harriers in July 2000 after a faulty engine bearing was cited as the cause of a crash.⁵¹ Similarly, 18% of the Navy's grounding bulletins from 1997 to 2006 were due to engine issues. Finally, the Air Force has experienced two system-wide fleet stand-downs due to engine issues since 1990.⁵²

There are already signs that the F-35 program is falling victim to the same cost increases and delays that plagued the F-22 program and DOD acquisitions in general. In consecutive annual program assessments, the Cost Assessment and Program Evaluation (CAPE) office joint estimate team has found the program needs billions more in funding and could face up to two years in additional delays. One estimate said \$16 billion more is needed to avoid major trouble and predicted two years of possible delays.⁵³ Some

⁵⁰ George Cahlink, "U.K. Procurement Chief Warns Backup Engine Dispute Threatens JSF Deal," *Defense Daily*, March 15, 2006.

⁵¹ Mark Oliva, "Pilots defend Harrier jet," *Stars and Stripes* (Pacific Edition), January 19, 2003.

⁵² "JSF Engine Second Source Executive Summary," Whitney, Bradley, and Brown Consulting; December 2006, Slide 23.

⁵³ Jeremiah Gertler, *F-35 Joint Strike Fighter (JSF) Program: Background and Issues for Congress* (Washington D.C.: Congressional Research Service RL30563, December 7, 2009), 61.

observers are concerned additional cost growth on the F-35 program might be large enough to trigger what is known as a Nunn-McCurdy cost breach, which would require DOD to report to Congress and take drastic actions to restructure the program and curb cost growth.⁵⁴

In an effort to arrest these trends, the administration has chosen to prioritize the F-35, accepting more risk if necessary to make the F-35 work. In November 2009, the Secretary of Defense announced plans to accomplish this by accelerating production even while the aircraft is still in the early stages of testing and even forego some testing to stay on schedule.⁵⁵ This announcement came despite a GAO report criticized the \$33 billion effort to accelerate F-35 procurement as creating, “very significant financial risk” in part due to a lack of flight testing prior to procuring large numbers of the aircraft.⁵⁶ More recently, however, the administration reversed its position acknowledging the program’s problems were more serious and that a ramp up in early F-35 production would not be sufficient or wise. Current plans call for the DOD to pump billions of extra dollars into the F-35 program, extend the aircraft’s development by at least one year, and delay rather than accelerate the purchase of 100 F-35s.⁵⁷

⁵⁴ Ibid, 60.

⁵⁵ John T. Bennett, “Carter: Plan Afoot to Halt F-35 Cost Hikes, Delays,” *DefenseNews*, 9 November 2009, <http://www.defensenews.com/story.php?i=4367942&c=AME&s=AIR> (accessed 12 November 2009).

⁵⁶ U.S. Government Accountability Office, *Joint Strike Fighter: Accelerating Procurement before Completing Development Increases the Government’s Financial Risk*, GAO-09-303, March 12, 2009, <http://www.gao.gov/new.items/d09303.pdf> (accessed December 12, 2009).

⁵⁷ Marcus Weisgerber and Jason Sherman, “Appropriations Bill Funds Development Of Second F-35 Engine,” *Inside the Air Force Online*, 18 December 2009, http://insidedefense.com/secure/display.asp?docnum=AIRFORCE-20-50-11&f=defense_2002.ask. (accessed February 9, 2010).

With all this in mind, the DOD fighter recapitalization plan is not without potential advantages. If the F-35 program overcomes its current difficulties and delivers a capable platform at a cost that allows it to be procured in the planned numbers by the U.S. and its allies, there is potential for greater efficiency in maintenance and training, as well as greater coalition participation in future conflicts. According to a January 2010 Air Force Magazine piece, for some in the Pentagon, the F-35 is “as much an alliance-building tool as it is an airplane,” and Lockheed Martin executives have emphasized that vision.⁵⁸ George Standridge, Lockheed’s Vice President for Business Development, said in 2009, “The F-35 is a state-of-the-art platform, but more importantly, it is a means to shared security.”⁵⁹ This strategy has obvious appeal to the current administration, which has stated a preference for less unilateral action by the United States in the future.⁶⁰

Chapter Summary

The United States is moving in a new strategic direction and seeking a balance between irregular and conventional capabilities. This search for balance has profound implications for DOD tactical aircraft recapitalization. Resources will always be limited, and capability prioritization is needed. While the national focus has shifted to irregular warfare, there are still conventional threats and treaty obligations that demand the United States maintain its conventional forces. Assessing risk is essential to determining which capabilities are divested. Current DOD plans for fighter recapitalization represent the fiscally and politically expedient decision to focus on one program, the joint / multi-role

⁵⁸ Marina Malenic, “Fighters Far and Wide,” *Air Force Magazine*, January 2010, 62.

⁵⁹ Ibid.

⁶⁰ Barrack Obama, “Renewing American Leadership,” *Foreign Affairs*, July/August 2007, 7.

F-35. This decision calls for the divestment of some critical specialized capability at both the high and low end of the threat spectrum in favor of a multi-role middle capability in three Services and the partner-building potential of foreign sales to allies.

This is a high-risk plan on many levels. Strategically and programmatically, the F-35 is early in its testing and there are signs the program is likely to fall victim to the same cost increases and delays that have created the overall downward trend in acquisition. If this happens, the F-35 could be procured later and in smaller numbers or, alternatively, it could require more Department resources to acquire and further divestment of capability in other areas. Any of these outcomes could further increase the Nation's strategic risk. Even if the program were able to get back on schedule and under budget, the DOD is accepting high risk with this plan. If the future only holds more unconventional conflicts such as Iraq and Afghanistan, the F-35 is expensive and less suited to the task than cheaper A-10s or even propeller driven aircraft. Similarly, if future combat requires rapid air dominance against a near-peer competitor, the F-35 is not optimized for air-to-air combat and is ill-suited to make up for a lack of F-22s.

CHAPTER 5 – CONCLUSIONS & RECOMMENDATIONS

This research set out to prove that the trend in tactical aircraft acquisition towards fewer platforms, and towards only multi-role / joint platforms, is contrary to the concept of joint interdependence, unacceptably increases strategic and tactical risk, and fails to provide the efficiency that motivated the trend to begin with. In the preceding chapters, this paper highlighted the downward trend in tactical aviation acquisition. Since 1992, the number of tactical aircraft has decreased 40% and the number of platforms has decreased 50%. Current DOD recapitalization plans call for the number of platforms to be cut in half again to three multi-role platforms. Furthermore, of the three platforms, one joint platform (the F-35) is to account for the vast majority of the tactical aircraft fleet (93% of the fifth-generation fleet and 78% of the total fleet). This “one-size-fits-all” approach accepts high risk to one aspect of our national defense in order to gain efficiency which is unlikely to materialize.

The key contributing factors to this trend are the lack of a coherent acquisition strategy above the Service level, ambitious capability goals, and long procurement times. Planning in isolation has led the Services to unrealistic expectations of future funding and overall program size and, therefore, annual production rates. Lower annual production rates, coupled with ambitious capability goals and longer procurement times, greatly increase program costs. These factors were revealed during the review of current tactical aircraft acquisition programs. This trend is both supported by and is perpetuating the Services’ resistance to joint interdependence.

Joint interdependence is the key to attaining true efficiency and effectiveness in the DOD and is the Department’s stated goal. “Joint” has become a buzzword and while

the Services have embraced jointness in execution, they have resisted it in their long-term planning and acquisitions. The history of the Services, especially the Navy and Marines Corps, reveals an impetus to work alone; and efforts to mandate interdependence have been hampered by advocates of continued autonomy of the Services. The desire to deliver stand-alone warfighting capability has produced functional redundancy and duplication among the Services. These expensive luxuries manifest themselves in multiple air arms, land arms, and the like. Joint acquisition programs were created in an effort to make acquiring and maintaining these duplicate capabilities as efficient as possible. Joint acquisition programs, therefore, reinforce Service unilateralism and provide a “joint” blessing for Services to maintain organic capability. This approach increases interoperability but reduces interdependence and reinforces a fundamentally inefficient system by acquiring it a little more efficiently.

If joint acquisition programs compete with programs that support Service core competencies, there is the potential for them to negatively influence overall Defense posture. When resource priorities shift, elected leaders have to either pick one program and hope it matches the Nation’s strategic needs or underfund all of the programs. Current DOD plans represent the fiscally and politically expedient decision to focus on one program, the joint / multi-role F-35. This decision puts the Air Force’s long-term ability to provide its air dominance core competency at high risk in favor of a duplicate advanced air-to-ground capability in three Services and key allies. There is considerable risk involved in this plan even if it goes as designed.

Strategically, the F-35 is early in its testing and there are signs the program is likely to fall victim to the same cost increases and delays that have created the overall

downward trend in acquisition. If this happens the F-35 could be procured later and in smaller numbers. Alternatively, it could require more Department resources and further divestment of capability in other areas to find the “offsets.” Any of these outcomes could further increase the Nation’s strategic risk. Even if the program were able to get back on schedule and under budget, the DOD is accepting high risk with this plan. The F-35 represents a middle-of-the-road capability, overmatched for unconventional conflicts like Iraq or Afghanistan, and under-matched against a high-end air threat. Relying on uncertain IOCs for the F-35 to make up for a lack of F-22s means, in the near term, using old fourth-generation fighters, and in the long term F-35s to augment the critical air-superiority mission. By ending the F-22 program before the F-35 is fielded (or even 5% complete with its flight testing), the current DOD fighter recapitalization plan is essentially “doubling-down” on a joint acquisition program that already has considerable risk.

As an officer, to be “joint” means first being good at what you do, and then being capable of and willing to work together with other Services. The same is true for platforms. Being “joint” does not mean every Service must have the same capabilities and/or equipment. In fact, the challenges the Nation faces are best met when each Service contributes their unique but complementary capabilities. Ultimately, effectiveness must be prioritized over efficiency. Services should not be allowed to sacrifice their core-missions to achieve the perceived cost savings of a common platform for all. Instead, by reducing the Services’ duplication of effort and improving core competencies, the DOD can create greater joint interdependence and true efficiency.

George Washington wrote in 1780 that “there is nothing likely to produce peace as to be well prepared to meet an enemy.”¹ Even if the F-35 is successfully procured on schedule and at or under cost estimates, there is considerable risk that the resulting force will not be better prepared to meet a future enemy. The conventional wisdom has been that fewer large joint acquisition programs are preferable to a larger number of smaller Service-specific programs. This logic represents a false choice between effectiveness and efficiency and ignores the underlying problem. The real question should be whether or not to maintain duplicate capabilities in multiple Services. Even if politically impossible for the nation to overcome its historical inertia and divest its duplicate capabilities among the Services, one must ask: Can the joint program be procured at a cost that does not jeopardize other areas of the national defense? If the cost of these duplicate capabilities / joint programs becomes so large it encompasses the entire recapitalization budget, then the programs become self-defeating.

The following recommendations are made in the interest of correcting the situation and achieving a truly interdependent joint team:

1. Stop the trend. Adopt and enforce a comprehensive DOD-wide acquisition strategy. Such a strategy must be coupled with less ambitious capability goals / technical risk and more realistic cost / schedule estimates in acquisition. This strategy should also avoid large joint acquisition programs and allow a larger number of smaller Service-specific programs to proceed further in development. Doing so will encourage greater accountability and make program cancellations

¹ Peter T. Tsouras, *Warrior's Words* (London: Arms and Armour Press, 1993), 332.

less costly financially, politically and strategically. Ultimately, programs must be required to prove themselves effective and affordable before making plans to procure them in large numbers.

2. Divest duplicate capabilities among the Services, not Service core competencies. Not everything labelled “joint” is good. Joint programs encourage Services to maintain their duplicate capabilities. Why does the Marine Corps need an organic fifth-generation fighter? One could say it does not, but should instead become more “joint” in its doctrine and training. The Marine Air and Ground Task Force (MAGTF) should become a Joint Air and Ground Task Force (JAGTF) and should include interdependence on air assets from the other Services. The Marine Corps requirement for the F-35B evaporates when one no longer assumes the Marines will operate alone, and instead assumes they will employ as part of a joint interdependent team.

Current DOD plans call for the nation to accept high risk in its ability to achieve rapid air dominance so the Marine Corps can maintain an organic fixed-wing fighter capability and not rely on other Services for air power. Cancelling the U.S. buy of the F-35B would be a good first step towards joint interdependence and could help control escalating costs in the F-35 program.

3. Sell F-22s to the nation’s closest allies and use the opportunity to keep the production line open. Continue U.S. F-22 production to achieve the Service-stated medium risk force of 243 aircraft. Continued production of the F-22 would

help offset the increasing risk that the F-35 will fall short of cost and performance goals.

The current DOD trajectory is off course. Pursuing a “one-size-fits-all” solution while ignoring the duplication of effort within the DOD jeopardizes our future national security and moves us further away from the true solution of joint interdependence. As the nation attempts to institutionalize nation building capability within the military and faces the possibility of future austere budgets it cannot afford to acquire a high risk conventional force that fails to deliver appreciable cost savings. Although the scope of this paper was limited to tactical aircraft recapitalization, the ideas expressed can certainly be applied outside this small section of our national defense. Development of the Joint Cargo Aircraft, the V-22, and Joint Unmanned Aerial Vehicles (UAVs) follow similar patterns and beg similar questions.

APPENDIX A

The information in this appendix was consolidated from U.S. Department of Defense *Directive 5100.1: Functions of the Department of Defense and Its Major Components*. Washington DC: U.S. Department of Defense, 1 August 2002.

The main functions of the Department of the Army are to organize, train, and equip forces to:

1. Defeat enemy land forces
2. Seize, occupy, and defend land areas
3. Conduct air and missile defense and space operations unique to the Army
4. Occupy territories abroad, pending transfer of this responsibility
5. Conduct joint amphibious, airborne, and space operations
6. Support and conduct special operations & psychological operations
7. Operate land lines of communication.

A collateral function of the Army is to train forces to interdict enemy sea, space and air power, and communications through operations on or from land.

The main functions of the Department of the Navy are to organize, train, and equip forces to:

1. Seek out and destroy enemy naval forces
2. Suppress enemy sea commerce
3. Gain and maintain general naval supremacy
4. Control vital sea areas and to protect vital sea lines of communication
5. Establish and maintain local superiority (including air) in naval operations area
6. Seize and defend advanced naval bases
7. Conduct land, air, and space operations essential to a naval campaign.

The main functions of the Marine Corps within the Department of the Navy are to organize, train, and equip forces to:

1. Seize or defend advanced naval bases
2. Conduct land operations essential to the prosecution of a naval campaign.
3. Provide detachments and organizations for service on armed Navy vessels
4. Provide security detachments for property protection at naval stations/bases

Additional functions of the Navy include:

1. Provide forces for strategic nuclear warfare to support strategic deterrence
2. Reconnaissance, antisubmarine warfare, protection of shipping, aerial refueling and minelaying, including the air and space aspects thereof, and controlled minefield operations
3. Provide the afloat forces for strategic sealift.
4. Provide air support essential for naval operations

5. Appropriate air and missile defense and space operations unique to the Navy
6. Effective prosecution of electronic warfare operations and, as directed, support of other forces.
7. Furnish aerial photography as needed for Navy and Marine Corps operations
8. Provide sea-based launch and space support for the DOD when directed
9. Operate sea lines of communication.
10. Support and conduct special operations and psychological operations

The collateral functions of the Navy and the Marine Corps include the following:

1. To interdict enemy land power, air power, space power, and communications through operations at sea.
2. To conduct close air and naval support for land operations.
3. To furnish aerial imagery for cartographic purposes.
4. To be prepared to participate in the overall air and space effort, as directed.
5. To establish military government pending transfer of that responsibility

Other responsibilities of the Navy and the Marine Corps include the following:

1. To provide air and land transport essential for naval operations and not otherwise provided for.
2. To provide and operate sea transport for the Armed Forces other than that which is organic to the individual Services.
3. To develop doctrine and procedures for close air support for naval forces and for joint forces in amphibious operations.

The main functions of the Department of the Air Force are to organize, train, and equip forces to:

1. Defend the United States against air and space attack
2. Gain and maintain general air and space supremacy
3. Defeat enemy air and space forces
4. Conduct space operations
5. Control vital air areas
6. Establish local air and space superiority, except as otherwise assigned
7. Appropriate air and missile defense and space control operations
8. Conduct strategic air and missile warfare
9. Participate in joint amphibious, space, and airborne operations
10. Provide close air support and air logistic support to the Army and other forces, as directed, including airlift, air and space support, resupply of airborne operations, aerial photography, tactical air reconnaissance, and air interdiction of enemy land forces and communications.
11. Provide air transport for the Armed Forces, except as otherwise assigned.
12. Develop doctrines and equipment for air and space defense from land areas
13. Provide forces to furnish aerial imagery for use by the Army and other Agencies as directed, including aerial imagery for cartographic purposes.

14. Provide launch and space support for the DOD, except as otherwise assigned.
15. Develop doctrines and equipment for Air Force forces for space operations.
16. Provide land-based tanker forces for strategic operations and deployments of aircraft of the Armed Forces and Air Force tactical operations, except as otherwise assigned
17. Operate air and space lines of communications.
18. Support and conduct of special operations and psychological operations
19. Conduct electronic warfare operations and, as directed, support other forces

Collateral functions of the Air Force include the following:

1. Surface sea surveillance and anti-surface ship warfare by air/space operations.
2. Antisubmarine warfare and anti-air warfare operations to protect sea LOCs
3. Aerial mine-laying operations.
4. Air-to-air refueling in support of naval campaigns.

Other responsibilities of the Air Force include the following:

1. With respect to airborne operations, provide Air Force forces for the air movement of troops, supplies, and equipment in joint airborne operations, including parachuted and aircraft landings.
2. With respect to close air support of ground forces, develop, doctrines and procedures, except as provided for in Navy responsibilities for amphibious operations and in responsibilities for the Marine Corps.

APPENDIX B



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR COMBAT COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA

OFFICE OF THE COMMANDER
205 DODD BOULEVARD SUITE 100
LANGLEY AFB VA 23665-2788

JUN 9 2009

The Honorable Saxby Chambliss
416 Senate Russell Office Building
United States Senate
Washington, DC 20510-1007

Dear Senator Chambliss

Thank you for your letter and the opportunity to comment on the critical issue of F-22 fleet size. At Air Combat Command we have held the need for 381 F-22s to deliver a tailored package of air superiority to our Combatant Commanders and provide a potent, globally arrayed, asymmetric deterrent against potential adversaries. In my opinion, a fleet of 187 F-22s puts execution of our current national military strategy at high risk in the near to mid-term.

To my knowledge, there are no studies that demonstrate 187 F-22s are adequate to support our national military strategy. Air Combat Command analysis, done in concert with Headquarters Air Force, shows a moderate risk force can be obtained with an F-22 fleet of approximately 250 aircraft.

While OSD did not solicit direct input from Air Combat Command, we worked closely with our Headquarters in ensuring our views were available. We realize the tough choices our national leadership must make in balancing current warfighting needs against the fiscal realities our Nation faces.

The F-22, a critical enabler of air dominance, plays a vital role and indispensable role in ensuring joint freedom of action for all forces and underpins our ability to dissuade and deter. Thank you for your continued support of the US Air Force and Air Combat Command.

Sincerely

A handwritten signature in black ink, reading "John D.W. Corley".

JOHN D.W. CORLEY
General, USAF
Commander

Global Power For America

Source: John D. W. Corley, General USAF, Commander Air Combat Command, letter to U.S. Senator Saxby Chambliss, 9 June 2009, available online at <http://www.airforce-magazine.com/DRArchive/Pages/2009/June%202009/June%2017%202009/HighRisk.aspx>.

BIBLIOGRAPHY

- Augustine, Norman R. *Augustine's Laws*. 6th ed. Reston: American Institute of Aeronautics and Astronautics Inc., 1997.
- Barkoviak, Michael. "Lockheed Martin F-35 Testing, Purchasing Will Slow in 2010." *DailyTech*. January 25, 2010. <http://www.dailytech.com/Lockheed+Martin+F35+Testing+Purchasing+Will+Slow+in+2010/article17484.htm> (accessed 8 February 2010).
- Bennett, John T. "Carter: Plan Afoot to Halt F-35 Cost Hikes, Delays." *Defense News*, November 9, 2009. <http://www.defensenews.com/story.php?i=4367942&c=AME&s=AIR> (accessed November 12, 2009).
- . "Wynne Talks About His Tenure, Termination." *Defense News*. July 14, 2008.
- Bluhm, Raymond K. *U.S. Army: A Complete History*. Arlington, Va: Army Historical Foundation, 2004.
- Brimley, Shawn, Michele A. Flournoy and Vikram J. Singh. "Making America Grand Again: Toward a New Grand Strategy." Washington DC: Center for a New American Security, June 2008.
- Cahlink, George. "U.K. Procurement Chief Warns Backup Engine Dispute Threatens JSF Deal." *Defense Daily*. March 15, 2006.
- Capaccio, Tony. "Gates Calls for Delay in Pentagon Purchases of Lockheed F-35s." *Bloomberg.com*. January 7, 2010. <http://www.bloomberg.com/apps/news?pid=20601109&sid=aK6UwiltYSBU> (accessed 8 February 2010).
- Clifford, Clark. *Counsel to the President*. New York: Random House, 1991.
- Cohen, William S. Secretary of Defense. Letter to U.S. Rep. Jerry Lewis. 22 June 2000. The text of letter made available by *Inside the Air Force* on June 23, 2000.
- Cordesman, Antony H., Arleigh A. Burke and Hans Ulrich Kaeser. *America's Self-Destroying Airpower: Becoming Your Own Peer Threat*. Washington DC: Center for Strategic & International Studies, December 16, 2008.
- Corley, John D. W. General USAF, Commander Air Combat Command. Letter to U.S. Senator Saxby Chambliss. 9 June 2009. available online at <http://www.airforce-magazine.com/DRArchive/Pages/2009/June%202009/June%2017%202009/HighRisk.aspx>.

- Donley, Michael and Norton Schwartz. "Moving Beyond the F-22." *The Washington Post*, April 13, 2009.
- Ehrhard, Thomas P. *An Air Force Strategy for the Long Haul*. Washington D.C.: Center for Strategic and Budgetary Assessments, 2009. http://www.csbaonline.org/4Publications/PubLibrary/R.20090917.An_Air_Force_Strat/R.20090917.An_Air_Force_Strat.pdf. (accessed October 10, 2009).
- Fautua, David T. "The Paradox of Joint Culture." *Joint Forces Quarterly*, no. 26 (Autumn 2000): 81.
- Fomin, Andre. "SU-35: A Step Away from the Fifth Generation." *Take-off*, June 2007.
- Freedburg, Sydney J. Jr. "Aging Aircraft." *National Journal*, 14 March 2008: cover story.
- Gates, Robert M. "A Balanced Strategy: Reprogramming the Pentagon for a New Age." *Foreign Affairs*, January/February 2009.
- Gertler, Jeremiah. *Air Force F-22 Fighter Program: Background and Issues for Congress*. Washington DC: Congressional Research Service RL31673, December 22, 2009.
- . *F-35 Joint Strike Fighter (JSF) Program: Background and Issues for Congress*. Washington DC: Congressional Research Service RL30563, December 7, 2009.
- Gertz, Bill. "New China Fighter: Inside the Ring." *Washington Times*, November 12, 2009, <http://www.washingtontimes.com/news/2009/nov/12/inside-the-ring-31336833/?page=5> (accessed December 18, 2009).
- Grant, Rebecca. "Losing Air Dominance." Mitchell Institute Press: September 2008.
- Hildebrandt, Erik. "Boeing's Super Hornet Cleared for International Sales." *Defense Daily*, August 7, 2001, <http://www.defensedaily.com/articles/dd/2001/dd0807013.html> (accessed December 17, 2009).
- Hoffman, Jon T. *USMC: A Complete History*. Quantico, Va: Marine Corps Association, 2002.
- Holland, W. J. *The Navy*. Washington, DC: Naval Historical Foundation, 2000.
- Kosiak, Steve, and Barry Watts. "US Fighter Modernization Plans: Near-Term Choices." Washington, DC: Center for Strategic Budgetary Assessments, 2007.

- Kosiak, Steven M. "Cost of the Wars in Iraq and Afghanistan, and the Other Military Operations through 2008 and Beyond." Washington DC: Center for Strategic and Budgetary Assessments, 2008.
- Krulak, Victor H. *First to Fight: An Inside View of the U.S. Marine Corps*. Annapolis, Maryland: Naval Institute Press, 1984.
- Lockheed Martin. "Stealth." linked from *Lockheed Martin Home Page*.
http://www.lockheedmartin.com/capabilities/air_power/stealth/index.html
(accessed February 12, 2010).
- . "F-35." Linked from Lockheed Martin Home Page.
<http://www.lockheedmartin.com/products/f35/index.html> (accessed February 10, 2010).
- Malenic, Marina. "Fighters Far and Wide." *Air Force Magazine*, January 2010.
- Mann, Paul. "Senate Group Urges Pentagon Reorganization." *Aviation Week and Space Technology*, 21 October 1985.
- Matisoo, Peter W. "Enabling Joint Interdependence through Capability Portfolio Management." Master's thesis, Joint Forces Staff College, 2008.
- Matthews, William. "Senate F-22 Foes Outnumbered But Still Fighting." *Defense News*, July 14, 2009. <http://www.defensenews.com/story.php?i=4187281> (accessed November 14, 2009).
- Mullen, Michael G. Admiral, USN, Chairman of the Joint Chiefs of Staff. *Posture Statement Before the 111th Congress Senate Armed Services Committee*. February 2, 2010.
- Muradian, Vago. "Navy Struggles With 'Fighter Gap': May Buy More F/A-18s, Delay F-35 Purchase." *DefenseNews*, 7 April 2008.
<http://www.defensenews.com/story.php?i=3466832> (accessed 12 November 2009).
- McNicol, David L. "Joint Acquisition: Implications from Experience with Fixed-Wing Tactical Aircraft." Institute for Defense Analysis, IDA Paper P-4049, September 2005.
- Nalty, Bernard C. *Winged Shield, Winged Sword: A History of the United States Air Force* Vol. I. Washington DC: Air Force History and Museums Program, 1997.
- Obama, Barack. "Renewing American Leadership." *Foreign Affairs*. July/August 2007.

- Office of Assistant Secretary of Defense (Public Affairs). "Cheney Cuts Major Pentagon Aircraft Buys." news release, April 26, 1990.
- O'Hanlon, Michael E. *Budgeting for Hard Power: Defense and Security Spending Under Barack Obama*. Washington, DC: Brookings Institute Press, 2009.
- Oliva, Mark, "Pilots defend Harrier jet." *Stars and Stripes*. (Pacific Edition). January 19, 2003.
- O'Rourke, Ronald. *F-35 Joint Strike Fighter (JSF) Program: Background and Issues for Congress*. Washington DC: Congressional Research Service RL30563, September 16, 2009.
- . *Navy F/A-18E/F and EA-18G Aircraft Procurement and Strike Fighter Shortfall: Background and Issues for Congress*. Washington DC: Congressional Research Service RL30624, October 21, 2009.
- . *Tactical Aircraft Modernization: Issues for Congress*. Washington DC: Congressional Research Service RL33543, July 9, 2009.
- Owens, Bill. *Lifting the Fog of War*. Baltimore: The John Hopkins University Press, 2001.
- . "Making the Joint Journey." *Joint Forces Quarterly* (Spring 1999): 92.
- Parsons, Ted. "China's Fifth-Generation Fighter To Fly 'Soon,'." *Jane's Defence Weekly*, November 12, 2009.
- Perrett, Bradley. "China Close To Testing Next-Gen Fighter." *Aviation Week & Space Technology*, November 16, 2009.
- Pew, Glen. "Sukhoi T-50 First Flight." January 29, 2010.
http://www.avweb.com/avwebflash/news/Sukhoi_t50_first_flight_201932-1.html
 (accessed February 17, 2010).
- PR Newswire. "Lockheed Martin Awarded Additional \$5 Billion in Multiyear Contract to Build 60 F-22 Raptors." PR Newswire Online.
<http://www.prnewswire.com/news-releases/lockheed-martin-awarded-additional-5-billion-in-multiyear-contract-to-build-60-f-22-raptors-52790072.html> (accessed 8 February 2010).
- RIA Novosti. "Russia to start receiving fifth-generation fighters in 2013." RIA Novosti, Moscow, January 29, 2010,
http://en.rian.ru/military_news/20100129/157715602.html (accessed February 17, 2010).

- Sapolsky, Harvey. "Interservice Competition: The Solution, Not the Problem." *Joint Forces Quarterly*, no. 15 (Spring 1997): 50-54.
- Sirak, Michael. "F-35 Nations on Track to Sign New MOU, Says JSF Program Office." *Defense Daily*, November 20, 2006.
- . "Wynne: Maintaining Air Dominance Requires Greater National Commitment." U.S. Air Force Aim Points. 21 September 2007. <http://www.defensedaily.com/articles/dd/2007/dd09210709.html> (Accessed on line 7 October 2009)
- Skelton, Ike. *Whispers of Warriors: Essays on the New Joint Era*. Washington DC: National Defense University Press, 2004.
- Slawson, Andrew T. "Air Power's First Among Equals: Why Air Superiority Still Matters." Master's thesis, JFSC, 2008.
- Smith, Jeffrey R. "Senate Votes 58-40 to End Production of the F-22." *The Washington Post*, July 22, 2009. <http://www.washingtonpost.com/wp-dyn/content/article/2009/07/21/AR2009072100135.html>, (accessed September 18, 2009).
- Sturkey, Marion F. *Warrior Culture of the U.S. Marines*. Plum Branch, SC: Heritage Press International, 2003.
- Sweetman, Bill. *Stealth Aircraft*. Osceola, Washington: Motorbooks International, 1986.
- Taylor, Dan. "Navy Officially Changes IOC For JSF Carrier Variant From 2015 to 2014." *Inside the Navy*, September 21, 2009.
- Thompson, Loren. "Further F-22 Production Is Crucial To Winning Future Wars," *The Lexington Institute Brief*, July 16, 2008.
- Tilghman, Andrew. "Joint Strike Fighter Timeline Moved Up." *NavyTimes.com*, September 18, 2009. <http://trustplatinum.blogspot.com/2009/09/timeline-for-delivery-of-f-35-joint.html> (accessed December 19, 2009)
- Towell, Pat. "Defense: FY2010 Authorization and Appropriations." Washington DC: Congressional Research Service R40567, December 14, 2009.
- Tsouras, Peter T.. *Warrior's Words*. London: Arms and Armour Press, 1993.
- U.S. Congress, House. Armed Services Committee. *Panel on Roles and Missions Report*, January 2008.

- . Armed Services Committee, Subcommittee on Air and Land Forces. *Hearings on Air Force Programs*. 111th Cong., 1st sess., May 20, 2009.
- . Armed Services Committee, Subcommittee on Seapower and Expeditionary Warfare. *Hearings on the Department of the Navy's Aviation Procurement Program*. 111th Cong., 1st sess., May 19, 2009.
- . *Department of Defense Appropriation Act of 1998*. HR 2266. 105th Cong., 1st sess. *Congressional Record* H7656-7710.
- U.S. Congressional Budget Office. *Alternatives for Modernizing U.S. Fighter Forces*. Washington DC: Congressional Budget Office, May 2009.
- . *A Look at Tomorrow's Tactical Air Forces*. Washington DC: Congressional Budget Office, January 1997.
- . *The Long-Term Implications of Current Defense Plans*. Washington DC: Congressional Budget Office, March 2008.
- . *Tactical Combat Forces of the United States Air Force: Issues and Alternatives*. Washington DC: Congressional Budget Office, May 1984.
- U.S. Department of the Air Force. "A-10 Thunderbolt II." linked from *U.S. Air Force Home Page*, <http://www.af.mil/information/factsheets/factsheet.asp?fsID=70> (accessed February 13, 2010).
- . *Affordable Acquisition Approach*. Air Force Systems Command, February 9, 1983.
- . *Air Force Doctrine Document 2-1.1, Counterair Operations*. Washington DC: U.S. Department of the Air Force, 01 October 2008.
- . SAF/FMB, "Committee Staff Procurement Backup Book: FY 2010 Budget Estimates, Research, Development, Test and Evaluation (RDT&E), Descriptive Summaries," Vol. 3, May 2009, 150.
- U.S. Department of Defense. *The Armed Forces Officer*. Washington DC: National Defense University Press, 2007.
- . *Directive 5100.1: Functions of the Department of Defense and Its Major Components*. Washington DC: U.S. Department of Defense, 1 August 2002.
- . *The Implementation of Network-Centric Warfare*. Washington DC: U.S. Department of Defense, 2005.

- . *Joint Defense Capabilities Study Final Report*. Washington DC: U.S. Department of Defense, January 2004.
- . *National Defense Strategy*. Washington DC: U.S. Department of Defense, June 2008.
- . *Quadrennial Roles and Missions Review Report*. Washington DC: U.S. Department of Defense, January 2009.
- . *Quadrennial Defense Review Report*. Washington DC: U.S. Department of Defense, February 6, 2006.
- U.S. Department of Defense, Historical Office United States Army Training and Doctrine Command. *From Active Defense to AirLand Battle: The Development of Army Doctrine, 1973-1982*. Fort Monroe, VA, 1984.
- U.S. Department of Defense, Office of the Vice Chairman of the Joint Chiefs of Staff. *Planning in a Revolutionary Era*. Open-file report, Washington, DC: Government Printing Office, 1996.
- U.S. Department of the Navy. *Fiscal Year (FY) 2010 Budget Estimates, Justification of Estimates*, May 2009, Aircraft Procurement, Navy, Volume I, Budget Activities, 1-4.
- U.S. Department of Transportation. Office of Public Affairs. “Cash for Clunkers Payout Nearly Complete.” 25 September 2009. U.S. Department of Transportation, Washington DC, 2009. <http://www.cars.gov/files/official-information/September25PR.pdf> (accessed 26 March 2010).
- U.S. Government Accountability Office. *Aircraft Development: Reasons for Recent Cost Growth in the Advanced Tactical Fighter Program*, GAO/NSIAD-91-138. Washington DC: U.S. Government Accountability Office, February 1991.
- . *Defense Acquisitions: Assessment of Selected Weapons Programs*, GAO-08-467SP. Washington DC: U.S. Government Accountability Office, March 2008.
- . *Defense Acquisitions: Assessments of Selected Weapons Programs*. Washington DC: U.S. Government Accountability Office, March 2009.
- . *Joint Strike Fighter: Accelerating Procurement before Completing Development Increases the Government’s Financial Risk*, GAO-09-303. Washington DC: U.S. Government Accountability Office, March 2009.
- . *Tactical Aircraft: DOD Needs a Joint and Integrated Investment Strategy*, GAO-07-415. Washington DC: U.S. Government Accountability Office, April 2007.

- . *Tactical Aircraft – Status of the F/A-22 and Joint Strike Fighter Programs*, GAO-04-597T, 25. Washington DC: U.S. Government Accountability Office, March 2004.
- U.S. Government Printing Office. *The Nations Fiscal Outlook*.
<http://www.gpoaccess.gov/USbudget/fy09/pdf/budget/outlook.pdf> (accessed 12 November 2009).
- U.S. Joint Chiefs of Staff. *Joint Publication 1, Doctrine for the Armed Forces of the United States*. Washington DC: U.S. Joint Chiefs of Staff, 02 May 2007 (incorporating change 1 dated 20 Mar 2009).
- . *Joint Publication 3-0 Doctrine for Joint Operations*. Washington DC: U.S. Joint Chiefs of Staff, 17 September 2006 (incorporating change 1 dated 13 Feb 2008).
- . *National Military Strategy*, Washington DC: U.S. Joint Chiefs of Staff, 2004.
- U.S. Office of Management and Budget. “A New Era of Responsibility Renewing America’s Promise.” U.S. Government Printing Office, Washington DC, 2009.
http://www.whitehouse.gov/omb/assets/fy2010_new_era/A_New_Era_of_Responsibility2.pdf (accessed 26 March 2010).
- U.S. President Barack Obama. *Nobel Peace Prize Acceptance Speech, Oslo, Norway*, December 10, 2009.
- U.S. President Dwight D. Eisenhower, “Special Message to the Congress on Reorganization of the Defense Establishment,” April 3, 1958.
- Van Evera, Stephen. *How to Make America Safe: New Policies for National Security*. Cambridge, MA: Tobin Project, 2006.
- Van Creveld, Martin. *Technology and War from 2000B.C. to the present*. New York: The Free Press, 1991.
- Ward, William R. “Joint Cargo Aircraft: Whose Role, Whose Mission?” Research report, Air War College, 2007.
- Watts, Barry. *The F-22 Program in Retrospect*. Washington DC: Center for Strategic and Budgetary Assessments, August 2009.
- Weisgerber, Marcus and Jason Sherman. “Appropriations Bill Funds Development Of Second F-35 Engine.” *Inside the Air Force Online*. 18 December 2009.
http://insidedefense.com/secure/display.asp?docnum=AIRFORCE-20-50-11&f=defense_2002.ask. (accessed February 9, 2010).

Wicke, Russell. "New wings to secure A-10 longevity." May 9, 2008.
<http://www.af.mil/news/story.asp?id=123098096> (accessed February 13, 2010).

Wilkerson, Lawrence. "What Exactly Is Jointness?" *Joint Forces Quarterly* (Summer 1997): 66-68.

Wolf, Richard I. *The United States Air Force Basic Documents on Roles and Missions*. Ft. Belvoir: Defense Technical Information Center, 1987.

Wynne, Mike. "Holes in US Defense Umbrella: Wynne." DOD Buzz online Defense and Acquisition Journal. 27 August 2009, <http://www.dodbuzz.com/2009/08/27/holes-in-us-defense-umbrella-wynne/> (Accessed October 8, 2009).

Yarger, Harry R. "Strategic Theory For the 21st Century: The Little Book on Big Strategy." *Strategic Studies Institute* (February 2006)

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