
CSBA
Center for Strategic and Budgetary Assessments
TOWARD A BALANCED COMBAT AIR FORCE
MARK A. GUNZINGER AND DAVID A. DEPTULA

TOWARD A BALANCED COMBAT AIR FORCE

MARK A. GUNZINGER

DAVID A. DEPTULA

2014

About the Center for Strategic and Budgetary Assessments

The Center for Strategic and Budgetary Assessments (CSBA) is an independent, nonpartisan policy research institute established to promote innovative thinking and debate about national security strategy and investment options. CSBA's goal is to enable policymakers to make informed decisions on matters of strategy, security policy and resource allocation. CSBA provides timely, impartial, and insightful analyses to senior decision makers in the executive and legislative branches, as well as to the media and the broader national security community. CSBA encourages thoughtful participation in the development of national security strategy and policy, and in the allocation of scarce human and capital resources. CSBA's analysis and outreach focus on key questions related to existing and emerging threats to U.S. national security.

ABOUT THE AUTHORS

Mark A. Gunzinger is a Senior Fellow at the Center for Strategic and Budgetary Assessments. Mr. Gunzinger has served as the Deputy Assistant Secretary of Defense for Forces Transformation and Resources. A retired Air Force Colonel and Command Pilot, he joined the Office of the Secretary of Defense in 2004. He was appointed to the Senior Executive Service and served as Principal Director of the Department's central staff for the 2006 Quadrennial Defense Review (QDR). Following the 2006 QDR, he was appointed Director for Defense Transformation, Force Planning and Resources on the National Security Council staff.

Mr. Gunzinger holds a Master of Science degree in National Security Strategy from the National War College, a Master of Airpower Art and Science degree from the School of Advanced Air and Space Studies, a Master of Public Administration from Central Michigan University, and a Bachelor of Science in Chemistry from the United States Air Force Academy. He is the recipient of the Department of Defense Distinguished Civilian Service Award.

David A. Deptula is the Dean of the Mitchell Institute for Aerospace Studies and holds the Risner Chair at the Center for Character and Leadership Development, U.S. Air Force Academy. He is a highly decorated military leader who transitioned from the Air Force as a Lieutenant General in 2010. General Deptula has significant experience in combat and leadership in several major joint contingency operations. He was the principal attack planner for the Desert Storm air campaign; commander of no-fly zone operations over Iraq in the late 1990s; directed the air campaign over Afghanistan in 2001; has twice been a Joint Task Force Commander; was the air commander for the 2005 South Asia tsunami relief; and also served on two congressional commissions charged with outlining America's future defense posture. He has piloted more than 3,000 flying hours—400 in combat—to include multiple command assignments in the F-15. In his last assignment as the Air Force's first Deputy Chief of Staff for Intelligence, Surveillance, and Reconnaissance (ISR), he transformed America's military ISR and remotely piloted aircraft enterprises. He is a pioneer in conceptualizing, planning, and executing national security operations accomplishing several "firsts" in the command of joint forces, planning and execution of aerospace power, ISR, and improving international relationships.

General Deptula holds a Bachelor of Arts degree in Astronomy and a Master of Science degree in Systems Engineering both from the University of Virginia; a Master of Science degree in National Security Strategy from the National War College; and is a graduate of the Armed Forces Staff College and the USAF Fighter Weapons School. He is the recipient of the Aviation Week & Space Technology Laureate Award for extraordinary accomplishment in national defense and the 2010 General Arnold Award, the Air Force Association's highest honor to a military member in the field of national security.

ACKNOWLEDGEMENTS

The authors would like to thank the CSBA staff for their assistance with this report. Special thanks go to Dr. John Stillion, Todd Harrison, Bryan Clark, and Eric Lindsey for their contributions. The analysis and findings presented here are solely the responsibility of the authors.

CONTENTS

I. THE NEED FOR A REASSESSMENT

America's land-based and sea-based combat air forces (CAF) have long provided it with an asymmetric advantage over its enemies. Since before the Second World War, the United States is the only nation that has created and sustained an operational fleet of military aircraft that is capable of striking targets at global ranges. Over the last twenty years, combat aircraft equipped with precision-guided munitions (PGMs), advanced sensors, and other mission systems have played pivotal roles during conflicts in the Balkans, the Middle East, and South Asia.

Today, the Department of Defense (DoD) is at a strategic inflection point. In the aftermath of years of counterinsurgency warfare, it is trying to create a future force that will be effective in operational environments that are becoming increasingly contested. America's recent focus on counterinsurgency operations has given China, Iran, North Korea, and other competitors breathing room to develop anti-access/area-denial (A2/AD)[1] capabilities that could threaten U.S. access to areas of vital interest. The proliferation of guided ballistic and cruise missiles, anti-satellite weapons, cyber threats, integrated air defense systems (IADS), and other asymmetric threats are intended to erode the U.S. military's ability to effectively intervene in crisis situations and constrict the freedom of action to which it has become accustomed.

In air campaign terms, these A2/AD capabilities mean that U.S. air dominance in future wars cannot be taken for granted. Command and control networks may not be secure. Theater air bases may not be sanctuaries from enemy attack, and non-stealthy intelligence, surveillance, and reconnaissance (ISR) and strike aircraft—manned as

[1] As described by DoD, anti-access capabilities, such as guided ballistic missiles and anti-ship weapons, are used by an adversary to delay or prevent the deployment of opposing forces to a theater of operations. Area-denial capabilities, such as advanced air defense networks and guided rockets, artillery, mortars, and missiles (G-RAMM), are used to restrict the freedom of action of an opposing force once it is in a theater of operations. See Department of Defense, *Joint Operational Access Concept Version 1.0* (Washington, DC: DoD, January 17, 2012), pp. 6–7.

well as unmanned—may not be able to penetrate hostile airspace without incurring unacceptable losses. Moreover, enemy anti-ship ballistic and cruise missiles that are supported by space-based sensors and long-range surveillance aircraft may force U.S. aircraft carriers to operate a thousand miles or more offshore. These distances exceed the Navy's current carrier-based, short-range fighters' ability to reach inland target areas.

The Pentagon has also said that it intends to rebalance its capabilities to support the administration's strategic pivot toward the Asia-Pacific region. This rebalanced force will include long-range combat aircraft that are capable of overcoming the region's tyranny of distance, can "strike quickly from over the horizon,"[2] and are less reliant on non-stealthy aerial refueling aircraft and close-in theater bases.

Unfortunately, progress toward creating a rebalanced force is threatened by a $1 trillion cut in defense spending along with a growth in military pay and benefits[3] that crowds out funds needed for research and development (R&D) and procurement. Bureaucratic politics also threaten to maintain established budget shares for each of the Services instead of funding capabilities relative to their contributions to the nation's security. Owing to Congressional resistance, DoD is also unable to close its unneeded bases and facilities. Sustaining this excess infrastructure is but an additional tax on the defense budget that reduces the Pentagon's ability to rebalance the U.S. military.

This report suggests that it is time for DoD and the Congress to take a hard look at the mix of combat air forces that will be needed to sustain America's asymmetric airpower advantage. In particular, it argues that they should give precedence in the current age of austerity to fielding new long-range ISR and strike aircraft that will bolster the U.S. military's Asia-Pacific posture and enable it to project power rapidly when and where needed.

In addition to the rise of A2/AD threats and growing emphasis on the Asia-Pacific—a region of vast distances—the need to develop a new, balanced CAF is a function of the Pentagon's aging inventory, which is dominated by systems designed and built one or two generations ago. These aircraft are increasingly incapable of operating

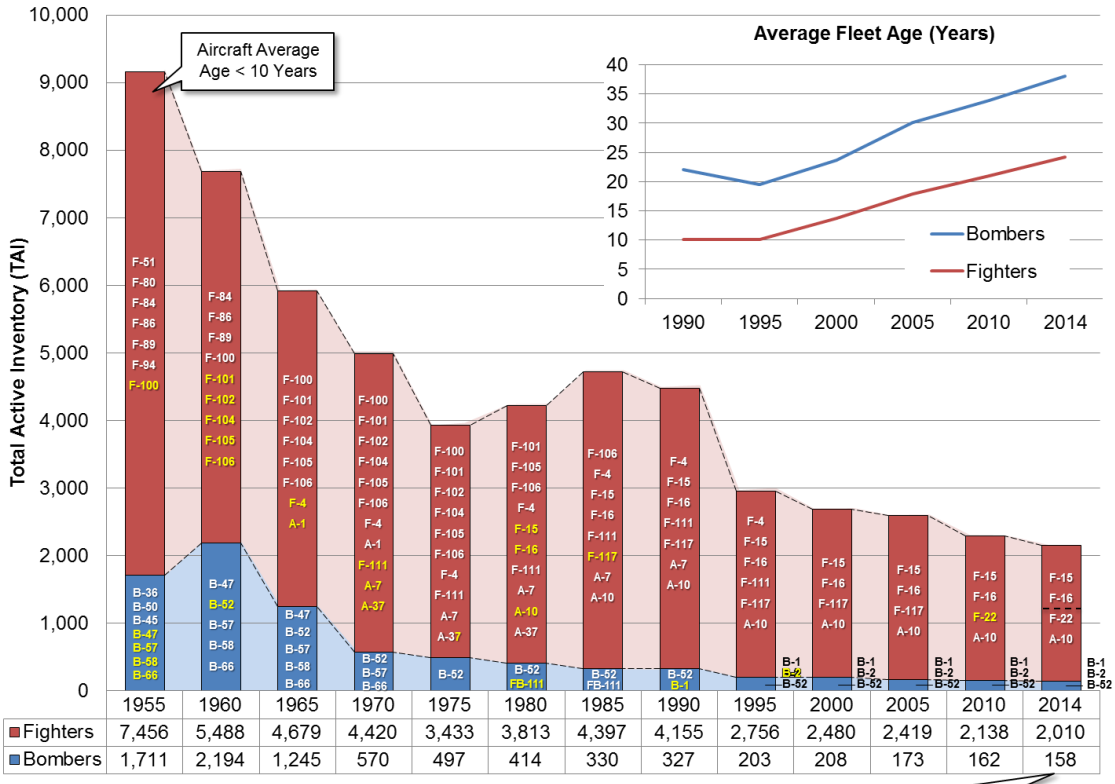
---

[2] Department of Defense (DoD), *Defense Budget Priorities and Choices* (Washington, DC: DoD, January 2012), p. 5.

[3] This $1 trillion reduction is relative to the ten-year projection in the FY2012 President's Budget. According to General Martin E. Dempsey, DoD's personnel costs may soon consume 60 percent of its budget. Left unchecked, continued growth in personnel costs could result in a situation where the Pentagon may not be able to afford to buy new weapons systems. See Julian Barnes, "U.S. Military Eyes Cut to Pay, Benefits," *Wall Street Journal*, November 17, 2013, available at http://online.wsj.com/news/articles/SB10001424052702303755504579204141223865178.

over long distances and in contested conditions. Fourteen years into the 21st century, the U.S. military is still living off investments in combat aircraft that were made prior to or during the Reagan administration. For instance, the Air Force's combat force primarily consists of aging A-10s, F-15s, F-16s, B-1s, B-52s, B-2s, and a handful of new F-22s. Overall, the Air Force's CAF is the smallest and oldest that it has ever fielded (see Figure 1).

FIGURE 1: AIR FORCE FIGHTER AND BOMBER INVENTORIES SINCE 1955



	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2014
Fighters	7,456	5,488	4,679	4,420	3,433	3,813	4,397	4,155	2,756	2,480	2,419	2,138	2,010
Bombers	1,711	2,194	1,245	570	497	414	330	327	203	208	173	162	158

	Total Aircraft Inventory (TAI)	Primary Mission Aircraft Inventory (PMAI)	Average Age
Fighters	2,010	1,161	24 years
Bombers	158	96	38 years

(Assumes A-10s remain in the force in 2014)

The Department of the Navy is in a similar predicament. Although the Marine Corps operates the newer F/A-18, it continues to rely on non-stealthy AV-8B vertical/short takeoff and landing (V/STOL) ground attack aircraft that were designed in the 1970s. The Navy's fixed-wing combat aircraft force is not as old as the Air Force's CAF because it is just completing its F/A-18 fighter program. However, the F/A-18 is non-stealthy, and the wisdom of deploying carriers within range of anti-ship ballistic

and cruise missiles so their short-range fighters can reach their objective areas is doubtful at best.[4]

The failure to rebalance the CAF over the last twenty years is in no small part due to the fact that the defense procurement holiday of the post-Cold War 1990s was followed by the need to invest in capabilities such as ISR systems, unmanned aircraft, tactical lift, and Mine Resistant Ambush Protected (MRAP) vehicles to support counterinsurgency operations in Iraq and Afghanistan. This has had a predictable impact. While it is true that DoD's procurement budget grew significantly after 2001, many new ISR and strike capabilities that it procured for overseas contingency operations are unsuitable for power-projection operations over long ranges and in contested environments. In particular, today's workhorse unmanned aerial vehicles (UAVs) such as the MQ-1 Predator and MQ-9 Reaper are optimized to provide ISR with some light strike against small and very specific individual targets, are non-stealthy, and thus can only operate in permissive airspace.

It is fair to say that U.S. combat aircraft designed in the Cold War era are far more capable today than when they first rolled off the assembly line. Giving them the ability to deliver PGMs and funding periodic systems upgrades have greatly improved their mission effectiveness. The fact that fewer upgraded combat aircraft are now needed per mission has helped enable DoD to reduce the overall size of its CAF over the last twenty years.

There are, however, limits to the benefits that can be realized by upgrading geriatric aircraft. With the exception of a small number of stealthy F-22s and B-2s, DoD's fighters and bombers have lost their ability to operate in high-threat areas without the risk of significant losses or the need for very large supporting force packages to suppress enemy air defenses. In the case of the B-52 and B-1, which are fifty and thirty years old respectively, there is also the risk that their airframes will age-out before significant numbers of new bombers can join the force. DoD's ability to further improve the capabilities of its legacy aircraft is also limited by their highly individualized, unique, and non-modular designs. To sustain its asymmetric aerospace advantage, the U.S. military will need new combat aircraft that can perform missions in modern threat environments, can operate over long ranges, and

[4] Secretary of Defense Robert M. Gates observed that "Cyber and anti-satellite warfare, anti-air and anti-ship weaponry, and ballistic missiles could threaten America's primary way to project power and help allies in the Pacific—in particular our forward bases and carrier strike groups. This would degrade the effectiveness of short-range fighters and put more of a premium on being able to strike from over the horizon." See Robert M. Gates, "Air Force Association Convention," speech presented at the Air Force Association Convention, National Harbor, MD, September 16, 2009.

have the capacity to adapt their capabilities to counter new threats as they emerge in the future.

In what may prove to be a brief strategic pause following the end of major operations in Iraq and Afghanistan, Congress and DoD have the opportunity to accord priority to developing a next-generation, balanced CAF comprised of aircraft with the range, survivability, and connectivity with other combat systems needed to operate effectively over extended ranges and in contested environments. Sufficient resources must be allocated to support these priorities, rather than continuing to allocate a "fair share" of the defense budget to each of the Military Departments.

II. THINKING ABOUT A BALANCED CAF

A Different Capabilities Mix

Creating a balanced CAF that is effective in contested environments will require a mix of capabilities that is quite different from today's mix. The U.S. military's CAF largely consists of non-stealthy fighter aircraft that have combat radii of approximately 800 nautical miles (nm) or less, making it highly dependent on the availability of refueling aircraft and secure, close-in land and sea bases. This creates opportunities for potential aggressors. China, Iran, and North Korea, for example, could use their growing inventories of surface-to-surface and air-to-ground guided missiles to threaten bases[5] and, in China's case, aircraft carriers the U.S military currently depends upon to sustain a high tempo of air operations. They could also attack large, non-stealthy air refueling tankers that short-range fighters depend on to reach their objectives. Furthermore, a U.S. CAF that remains excessively biased toward short-range capabilities would permit enemies to concentrate their resources on defending their borders while using the strategic depth of their interiors as sanctuaries to stage long-range missile strikes and other offensive operations.

In contrast, a CAF with a more balanced mix of stealthy and non-stealthy, short- and long-range ISR/strike aircraft could create a multi-dimensional problem, enabling U.S. commanders to hold at risk future target sets that have large numbers of

[5] A news website associated with the Chinese government has reported that China's H-6K bomber "meets the requirements of the PLA Air Force to possess the capability to launch strategic missile attacks against U.S. military facilities and those of its allies in the Western Pacific." The PLA Air Force may even be able to use their bomber-launched CJ-10 cruise missiles to attack airbases in Japan without leaving the borders of China. See "H-6K Can Strike Regional Targets Without Leaving Chinese Airspace," *Want China Times*, December 26, 2013, available at http://www.wantchinatimes.com/news-subclass-cnt.aspx?id=20131226000140&cid=1101.

hardened, deeply buried, mobile, and rapidly relocatable targets.[6] Moreover, a CAF with significant numbers of stealthy, long-range ISR/strike aircraft will be better able to operate in contested environments and rapidly "swing" from one theater to another to deter, compel, or punish multiple aggressors. These objectives are now identified by the Defense Department as top priorities for its force planning.

Absent a shift toward a more balanced CAF, our future air forces may be forced to fight on the peripheries of large, contested battlespaces in the Western Pacific, Persian Gulf, and other regions. This would likely require U.S. commanders to resort to using standoff attack weapons such as cruise missiles that are less effective against relocatable or hardened/deeply buried targets due to their long flight times and small payloads. Relying only on cruise missiles to attack tens of thousands of targets in a future air campaign could also be prohibitively expensive compared to using a mix of standoff weapons and lower-cost, ground-attack PGMs with short flight times that can be dropped by penetrating aircraft.[7]

Moving in the Right Direction?

To its credit, the Pentagon is showing signs that it is serious about developing a more balanced CAF capable of creating and sustaining an effective density of surveillance and strike capabilities in all threat environments. In addition to fielding fifth generation stealth fighters such as the F-22 and F-35, the Air Force's new long-range ISR/strike aircraft—currently labeled by DoD as the long-range strike bomber, or LRS-B—has the potential to perform strike, electronic attack, and other combat functions with persistence. Over the last few years, the Air Force has made plans for procuring eighty to one hundred penetrating LRS-Bs to begin replacing its aging bombers.[8] With sufficient range, payload, and stealth, manned systems such as the LRS-B that are capable of exchanging information with other combat aircraft could create effects across larger areas of regard compared to today's increasingly vulnerable and range-limited force.

DoD could amplify the effects that manned ISR/strike aircraft can create by pairing them with a new generation of survivable, multi-mission, and increasingly

[6] For a more complete assessment of the need for a new penetrating capabilities, see Mark Gunzinger, *Sustaining America's Advantage in Long-Range Strike* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010).

[7] For a cost comparison, see Thomas Hamilton, *Comparing the Cost of Penetrating Bombers to Expendable Missiles over Thirty Years* (Santa Monica, CA: RAND Project Air Force working paper WR-778-AF, August 2010).

[8] While most of its desired characteristics remain classified, DoD has announced the LRS-B will eventually be capable of delivering nuclear as well as conventional weapons and may someday fly without human crews onboard.

autonomous UAVs. Over the last decade, UAVs such as the MQ-1 Predator and MQ-9 Reaper have become a significant part of joint force operations. From less than 170 unmanned aircraft in 2001, the Pentagon's UAV force now totals over 11,300 aircraft of varying sizes and configurations.[9] While they vary from small, short-range aircraft that can be carried and launched by individuals to large, long-range, high-altitude reconnaissance systems that can fly more than twenty-four hours without refueling, today's UAVs share a set of common characteristics: they are nearly all non-stealthy and designed to perform ISR missions.[10]

Emerging threats and the Asia-Pacific pivot highlight the need for DoD to develop new UAVs that are survivable in A2/AD environments, can operate over the vast distances of the Asia-Pacific region, and have the ability to perform strikes and other missions as well as serve as ISR sensors. Multi-mission, penetrating, and semi-autonomous UAVs teamed with manned aircraft acting as airborne battlespace controllers could extend the reach of the CAF and increase the density of weapons it can place in target areas. The Navy in particular has an opportunity to develop a stealthy unmanned *combat* air vehicle (UCAV) within the next decade that could greatly extend the reach and offensive punch of its carrier air wings. A sea-based UCAV that can penetrate high-threat areas to act as the eyes of the fleet as well as attack targets with precision would complement the LRS-B and other manned and unmanned combat systems.

Of course, the LRS-B, UCAVs, and other new combat aircraft will come at a cost. According to DoD's own estimates, LRS-Bs may cost approximately $550 million per copy. New programs will be difficult to fund considering the squeeze on the defense budget and the need to fund other military modernization priorities. This makes it imperative for DoD to establish the right set of key performance parameters (KPPs) for new CAF capabilities before it creates programs of record to develop and procure them. In an age of austerity, the Pentagon will not have the luxury of buying its way out of mistakes it makes at the front end of its requirements definition process.

---

[9] Ed Wolski, *Unmanned Aircraft Systems* (Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics [OUSD/AT&L] briefing, January 9, 2009), slide 6; and Dyke Weatherington, *Unmanned Systems Integrated Roadmap FY2013–2038* (OUSD/AT&L briefing, April 2013), slides 5, 9.

[10] Approximately 97 percent of all MQ-1 and MQ-9 sorties over the past decade have been used to conduct ISR.

KPPs for Future CAF Capabilities: Getting the Basics Right

The Defense Department defines KPPs as "performance attributes of a system considered critical to the development of an effective military capability."[11] In plain English, a Service establishes multiple KPPs for a new weapon system, including attributes for its affordability, range/persistence, payload and weapons capacity, interoperability, sustainability, and even related training and force protection needs. A comprehensive discussion of all possible KPPs is beyond the scope of this report. We instead focus on the most important KPPs for new long-range ISR/strike aircraft: requirements for their basic shape, size, weight, and capacity to generate electric power and internal cooling. They are considered the most important KPPs because they establish a baseline for the new aircraft to survive and perform missions effectively in future threat environments.

First, the basic shape of an aircraft's body and wing structure, which is also known as its planform, is the largest single factor that defines its ability to avoid detection by enemy radars and other air defense systems.[12] It is critical to design the right planform for a new aircraft at the start of its development, since it is nearly impossible—and very costly—to significantly modify an aircraft's basic shape once it transitions from the development and test stage into production. Second, an aircraft's shape, size, and weight determine the capacity of its weapons bay, the amount of fuel it can carry (which is a determinant of its range and endurance), and other useful payloads. Third, an aircraft's ability to generate electrical power and keep its internal electronics cool determine its potential to operate mission systems such as an active electronically scanned array (AESA) radar, a self-defense suite, and other offensive and defense components.[13]

---

[11] See the *Glossary of Defense Acquisition Acronyms and Terms* (Fort Belvoir, VA: Defense Acquisition University, December 2012), available at https://dap.dau.mil/glossary/pages/2127.aspx. KPPs typically have "a threshold representing the minimum acceptable value achievable at low-to-moderate risk, and an objective, representing the desired operational goal but at higher risk in cost, schedule, and performance."

[12] For more information on how the shape of an aircraft and other design factors can reduce its radar cross section, see Rebecca Grant, *The Radar Game* (Arlington, VA: IRIS Independent Research, 1998). According to Grant: "The primary method for reducing radar cross section was to shape the aircraft's surface so that it deflected radar return in predictable ways." Grant, *The Radar Game*, p. v. An aircraft's low observability characteristics are further enhanced by radar absorbent materials and other stealth technologies.

[13] In the future, combat aircraft that can generate sufficient power may be able to carry directed energy weapons such as lasers and high-power microwave systems. For more information on emerging directed energy weapons, see Mark Gunzinger and Chris Dougherty, *Changing the Game: The Promise of Directed Energy Weapons* (Washington, DC: Center for Strategic and Budgetary Assessments, 2012).

The B-52 and B-1 may be the premier examples of the operational flexibility gained by having combat aircraft with large, useful payloads and multiple engine-driven electric generators. First developed in the early 1950s to deliver nuclear weapons, the venerable B-52 "BUFF" has been modified to carry nearly every air-delivered PGM in the U.S. inventory in addition to being equipped with a modicum of modern ISR sensors. Similarly, B-1 bombers now in their third decade of service have been modified to carry a variety of PGMs and have received upgraded mission systems. B-1s also carry Sniper targeting pods that provide "positive target identification, autonomous tracking, coordinate generation, and precise weapons guidance from extended standoff ranges."[14]

While the large useful payloads and power generation capacity of the B-52 and B-1 give them the potential to accept new mission systems and carry a wide range of weapons, it is impossible to modify their basic planforms to significantly improve their low observability characteristics. Long-range, penetrating ISR/strike aircraft that will be required to penetrate highly contested threat environments in the future—such as the LRS-B—must be designed from the ground-up with this requirement in mind.

Cost and Capability Growth as KPPs

The Air Force has established the LRS-B as one of its top modernization priorities and a capability that will be critical to creating a stable Asia-Pacific defense posture and enabling new operational concepts, such as AirSea Battle, to counter A2/AD threats. The Navy, for its part, has prioritized the development of a new long-range unmanned aircraft that will "radically change the way presence and combat power is delivered from aircraft carriers by conducting surveillance and strike missions at extreme distances and over very long periods of time."[15] Both Services have stressed that their respective aircraft's unit cost will be a major factor in determining the design that they will ultimately choose to procure.

In addition to establishing the right basic design criteria for new long-range ISR/strike aircraft, DoD should consider all of the ramifications of establishing cost as a KPP. It is without question that avoiding "99 percent exquisite…platforms that are so costly" in favor of developing "80 percent capability solutions…that can be

[14] See "Air Combat Command Fact Sheet: B-1 Sniper Pod," Air Combat Command Office of Public Affairs, June 2008, available at http://www.ellsworth.af.mil/shared/media/document/AFD-080606-047.pdf.

[15] Secretary of the Navy Ray Mabus, "Unmanned Aircraft at Sea Greatly Extend the Navy's Reach and Sustainability," *U-T San Diego*, July 14, 2013, p. 25.

produced on time, on budget and in significant numbers"[16] could help reduce the price tag of new combat aircraft. The Air Force is correct when it says that leveraging existing technologies will help keep the LRS-B affordable and notes that significant growth in its unit cost could reduce the number that it can afford to buy.

However, as DoD continues to adjust to the current austere budget environment, there is a risk that fiscal pressures could drive it toward buying long-range ISR/strike platforms that are optimized for today's threats and missions and have little margin (e.g., sufficient excess space, weight, power, cooling, and low observability characteristics) to adapt over time. In this sense, while buying 80 percent capability solutions *could* be less expensive in the near-term, it may actually end up costing DoD *more* in the future if a completely new program is needed to develop another aircraft with more capability. Near-sighted, build-for-today acquisition strategies may render the issue of "affordability" moot, as affordability must also be assessed in the context of a capability's mission effectiveness over its projected lifespan.

Cost as a KPP could also affect the defense industrial base's willingness to innovate. Should DoD focus on buying the lowest cost design and fail to give credit to future growth potential, aircraft designers may not be highly incentivized to innovate and propose new designs that exceed the minimum basic performance parameters.

More effective acquisition strategies would encourage designers to seek the best balance between cost as a KPP and a set of flexible capability requirements. These strategies would have three key elements. First, a Service could establish KPPs with growth margins to encourage aircraft designers to consider tradeoffs between potential capabilities. For instance, establishing *excess* space, weight, power, and cooling capacity as KPPs could encourage industry to build performance margins into their proposed designs that would enable a Service to upgrade the aircraft's capabilities over time. Second, each KPP for a new aircraft could have a minimally acceptable threshold value and an ambitious objective value to bound the tradespace for aircraft designers. Designers would then be encouraged to pursue the ambitious objective within the limits established by the cost KPP. Finally, a Service should be prepared to revise a new aircraft's cost KPP if subsequent analysis shows that it is simply too low to permit industry to create designs that have an acceptable mix of capabilities.

[16] Secretary of Defense Robert M. Gates, speech presented at the Army War College, Carlisle, PA, April 16, 2009, available at http://www.defense.gov/transcripts/transcript.aspx?transcriptid=4404. Gates states that he had "concluded we needed to shift away from the 99-percent exquisite service-centric platforms that are so costly and so complex that they take forever to build, and only then in very limited quantities. With the pace of technological and geopolitical change and the range of possible contingencies, we must look more to the 80 percent solution, the multi-service solution that can be produced on time, on budget and in significant numbers."

Intentionally planning to enhance an aircraft's capabilities over time could also reduce the up-front sticker shock of the LRS-B and other new CAF capabilities. Instead of buying them with all desired mission functionalities when they first roll off the assembly line, it may be possible to equip new combat aircraft with the most essential systems and plan future block upgrades to keep pace with emerging technologies and threats as funding permits. In time, DoD could invest in designing aircraft that are truly modular—capable of changing their on-board weapons systems and possibly even their configurations to meet different mission needs and operate against different threats.

In summary, it would seem to be a waste of resources to buy new CAF weapon systems that are survivable today but would likely fare poorly against future threats, when alternative designs could help avoid the problem of premature obsolescence. Considering the prospective long operational lives of LRS-Bs, UCAVs, and other potential ISR/strike aircraft, it makes sense to design them with the intention to incorporate new technologies as they emerge.

Other Capability Considerations

The U.S. military needs a future CAF that will be able to operate over long ranges and in all threat conditions. Creating operational concepts that explain how new ISR/strike aircraft will be integrated with other weapons systems in the U.S. reconnaissance-strike complex would help identify other capabilities that they may need.

A system of military systems that combines wide area sensors, command and control networks, and precision-guided munitions (PGMs) has been described as a "reconnaissance-strike complex," or RSC.[17] According to Barry Watts, these weapons systems in combination potentially would, "not merely make current forces marginally better in fighting with existing operational concepts and organizations, but would revolutionize war's conduct."

The emergence of an American RSC over the last thirty years has provided the U.S. military with a significant comparative advantage over its adversaries. Advanced sensors, command, control, computers, communications, and ISR (C4ISR) networks, and new precision-guided munitions have dramatically shortened decision and reaction times as well as reduced the number of weapons systems it takes to achieve effects across the battlespace.

[17] Barry D. Watts, *The Maturing Revolution in Military Affairs* (Washington, DC: Center for Strategic and Budgetary Assessments, 2011).

The U.S. military is now at a juncture where the speed of information, advances in stealth and precision strike, next-generation sensors, and other technologies will permit it to take the next step toward integrating land, air, and sea capabilities in the future RSC.[18] New joint operational concepts could help explain how information-age aerospace systems could be linked with sea and land-based weapons systems in ways that will enhance their combined effectiveness and compensate for the vulnerabilities of each.[19] Such a highly interconnected, ISR-strike, maneuver, and sustainment complex that leverages information age technologies to conduct distributed operations could be described as a "combat cloud." This concept is somewhat analogous to "cloud computing,"[20] which is based on using a network (e.g., the Internet) to rapidly share information across a highly distributed system-of-systems. Instead of combining the computing power of multiple servers, however, a combat cloud would capitalize on C4ISR networks to rapidly exchange data across an all-domain architecture of "sensors and shooters."

A highly interconnected combat cloud may be capable of employing fewer modern weapons systems to achieve higher levels of effectiveness across larger areas of influence compared to legacy operational concepts and systems.[21] For example, instead of relying on traditional approaches that required airmen to assemble fighters, bombers, and supporting aircraft into major packages to attack particular targets, a combat cloud could integrate complementary capabilities into a single, combined "weapons system" to conduct disaggregated, distributed operations. A distributed, all-domain combat cloud that is difficult to attack effectively would also complicate an enemy's planning and compel it to dedicate more resources toward its defense.

---

[18] This shift will not come easy, as many in the U.S. military have been inculcated with a belief that airpower should only be used as a supporting arm of land and sea operations.

[19] Achieving this cross-domain synergy—defined by DoD as the "complementary vice merely additive employment of capabilities across domains in time and space"—would be the major focus of a complex of combat systems capable of conducting integrated operations in, from, and through all domains. See the *Capstone Concept for Joint Operations: Joint Force 2020* (Washington, DC: Joint Chiefs of Staff, September 10, 2012), p. 7, available at http://www.dtic.mil/futurejointwarfare/concepts/ccjo_2012.pdf.

[20] The U.S. Department of Commerce National Institute of Standards and Technology defines cloud computing as: "A model for enabling ubiquitous, convenient, on- demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." See Peter Mell and Timothy Grant, *NIST Definition of Cloud Computing, Special Publication 800–145* (Gaithersburg, MD: National Institute of Standards and Technology, September 2011), p. 2.

[21] Jam resistant, low probability of intercept and detection data links that permit aircraft operating in contested areas to communicate effectively will be critical enablers of a combat cloud.

Considering emerging adversary electronic attack, anti-satellite weapons, and cyber threats, future CAF capabilities should be capable of operating in areas where precision navigation and timing (PNT), threat warning, and target cueing information from off-board sources may be disrupted. Equipping manned and unmanned ISR/strike aircraft with secure, jam/intrusion-resistant communications links and terminals will help enable them to share battlespace information with other systems in all operating domains. New, on-board enhanced inertial navigation systems (INS)[22] may become adjuncts to or temporary replacements for PNT information provided by today's space-based Global Positioning System (GPS) network. The development of new robotic ISR/strike aircraft that incorporate the latest in autonomous technologies could help reduce the need for space-based PNT and other information provided by off-board sensors. These autonomous capabilities are now more science fact than science fiction. The Navy's X-47B has already demonstrated its ability to perform the challenging tasks of launching and landing on an aircraft carrier without human direction and may soon demonstrate its ability to conduct automatic air refueling with other aircraft.

Right-Sizing New Penetrating Long-Range ISR/Strike Capabilities

According to Secretary of Defense Chuck Hagel, the Pentagon will prioritize developing "a smaller, modern, and capable military over a larger force with older equipment" as it struggles to adapt to post-war budget realities.[23] This continues DoD's practice of funding modernization programs partially at the expense of current force structure and pursuing new capabilities. As General Mark Welsh and other senior military leaders have pointed out, "quantity does have a quality all its own" for a CAF that is globally capable.[24] In addition to developing new aircraft with the right capability attributes, the next long-range ISR/strike force should be sized to support air campaigns in more than one theater rather than to constrain it to meet arbitrary cost caps such as the one that truncated the F-22 force at 187

[22] Inertial navigation systems measure acceleration vectors and heading and therefore provide information on the location of a moving vehicle relative to a known starting position.

[23] Secretary of Defense Chuck Hagel, as quoted by Cheryl Pellerin, "Hagel: Six Priorities Shape Future Defense Institutions," American Foreign Press Service, November 5, 2013, available at http://www.defense.gov/news/newsarticle.aspx?id=121054.

[24] John Tirpak, "Evolving the 21st Century Air Force," Air Force Magazine, November 2012, available at http://www.airforcemag.com/MagazineArchive/Pages/2012/November%202012/1112evolving.aspx

aircraft.[25] This section briefly addresses the size of the bomber force to illustrate this point.

In 1993, DoD's Bottom-Up Review determined that a force of "up to 184 bombers (B-52H, B-1, B-2)" [26] would be adequate to support two nearly simultaneous conventional major regional contingency (MRC) operations resembling the First Gulf War. One hundred of these bombers were deemed sufficient to support objectives such as halting invading armor forces and attacking high-value enemy targets during the opening phases of a single MRC (see Table 1). [27]

TABLE 1: EVOLVING GUIDANCE FOR SIZING THE BOMBER FORCE

DoD Strategic Review	Guidance
1993 Bottom-Up Review	184 bombers (100 for one major regional contingency)
1997 QDR	142 operational bombers
2001 QDR	112 combat-coded bombers
2010 QDR	96 PMAI bombers
Future?	80 LRS-B + 20 B-2 = about 85 PMAI penetrating aircraft

Four years after the Bottom-Up Review, the 1997 Quadrennial Defense Review (QDR) directed the Air Force to maintain "a total fleet of 187 bombers, 142 of them assigned to operational units" to sustain the nation's strategic deterrence posture and fight two wars should deterrence fail.[28] The 2001 QDR decreased this target to 112

[25] According to Barry Watts, the F-22 force was "sized primarily as a consequence of fiscal constraints…rather than by future U.S. operational requirements for air superiority." Barry D. Watts, *The F-22 Program in Retrospect* (Washington, DC: Center for Strategic and Budgetary Assessments, December 2009), p. 4.

[26] Office of the Secretary of Defense (OSD), *Report on the Bottom-Up Review* (Washington, DC: OSD, October 1993), p. 28. It is interesting to note that the B-2 has often been criticized as a program that was too expensive. Although the 21 B-2s that were produced cost nearly $2 billion each if the program's total development and procurement costs are counted, their unit price would have been less than $850 million in FY2014 dollars if DoD had procured all 132 aircraft requested by the Air Force. See Headquarters United States Air Force, *The Case for the B-2: An Air Force Perspective* (Washington, DC: Department of the Air Force, June 1990), p. 19.

[27] *Report on the Bottom-Up Review*, p. 19.

[28] Office of the Secretary of Defense, *Report of the Quadrennial Defense Review* (Washington, DC: OSD, May 1997), Section 5.

combat-coded bombers, and the 2010 QDR cut the bomber fleet to a maximum of 96 primary mission aircraft.[29]

In January 2011, Defense Secretary Robert Gates announced his decision to begin replacing DoD's aging global ISR/strike force with a "new long-range, nuclear-capable penetrating bomber."[30] Air Force Secretary Michael Donley revealed the Service intended to procure eighty to one hundred LRS-Bs. A few months after this announcement, Gates kicked off another "comprehensive strategic review" to assess how DoD could reduce its spending by $487 billion over ten years.[31] This review culminated with the release of the administration's 2012 *Defense Strategic Guidance* which was intended to begin the task of modernizing the U.S. military after a decade of counterinsurgency warfare. The *Defense Strategic Guidance* emphasized the need to rebalance DoD's "force structure and investments toward the Asia-Pacific and Middle East regions" as well as create a joint force that will be capable of projecting power in A2/AD environments and operating with less reliance on vulnerable regional bases.[32]

In retrospect, Gates' January 2011 decision to procure eighty to one hundred LRS-Bs appears to have been informed primarily by assessments that were completed well prior to the administration's new-found emphasis on A2/AD threats and decision to pivot to the Asia-Pacific.[33] This brings into question how many penetrating LRS-B aircraft may actually be needed to field a CAF capable of addressing the growing need for long-range, stealthy ISR and strike systems. In fact, the U.S. Government Accounting Office reached a similar conclusion after it assessed three 2010 DoD reports to Congress on its future fighter requirements: "Analyses underpinning shortfall projections and future force requirements were based on strategic level guidance, threat scenarios, and force planning constructs that had changed by the time the three reports were issued."[34] Considering pressures to reduce federal

[29] Office of the Secretary of Defense, *Quadrennial Defense Review Report* (Washington DC: OSD, February 2010), p. xvii.

[30] Secretary of Defense Robert M. Gates, speech presented at the Pentagon, Arlington, VA, January 6, 2011, available at http://www.defense.gov/transcripts/transcript.aspx?transcriptid=4747.

[31] This was an arbitrary savings target that was established with little if any analyses of the impact on the U.S. defense posture and without input from the Department of Defense.

[32] Department of Defense, *Defense Budget Priorities and Choices* (Washington, DC: DoD, January 2012), p. 5.

[33] See Department of Defense, *Sustaining U.S. Global Leadership: Priorities For 21st Century Defense*, (Washington, DC: DoD, January 2012), p. 2.

[34] *Tactical Aircraft: Air Force Fighter Reports Generally Addressed Congressional Mandates, but Reflected Dated Plans and Guidance, and Limited Analyses* (Washington, DC: United States Government Accounting Office, February 2010), p. 3.

spending, it is possible that the eighty to one hundred LRS-B acquisition objective may reflect an assessment of what was considered to be an affordable chunk of the Pentagon's budget rather than analyses of future warfighting scenarios.

Thus a comprehensive review of the future CAF should consider emerging A2/AD threats, the Asia-Pacific pivot, and new operational concepts (e.g., the Pentagon's *Joint Operational Access Concept Version 1.0*)[35] to ensure it is appropriately sized as well as shaped to meet future requirements.

In order to maintain sufficient capabilities to support combatant commanders, the Air Force organizes its forces into Air Expeditionary Forces or AEFs. Each AEF is a "mini-air force" and has sufficient numbers and types of mission aircraft and personnel to conduct the core missions of the Service[36] when called upon by combatant commanders. The Air Force maintains a total of ten AEFs at various levels of readiness to ensure it always has at least several AEFs ready to deploy, engage, and fight over global ranges. If one squadron of twelve combat-coded long-range ISR/strike aircraft per AEF is needed to engage forward and project power, a force of 120 aircraft would be required for ten AEFs. As a rule of thumb, approximately 25 percent of a total force of combat aircraft is also needed to support test and training operations, and another 20 percent is added for an attrition reserve and backup aircraft inventory.[37] Adding these numbers up results in a fleet of 174 long-range, penetrating LRS-B (see Table 2).

[35] Department of Defense, *Joint Operational Access Concept Version 1.0* (Washington, DC: DoD, January 17, 2012). Also see Joint Chiefs of Staff, *Capstone Concept for Joint Operations: Joint Force 2020* (Washington, DC: DoD, September 10, 2012).

[36] The Air Force has five enduring core missions: air and space superiority; intelligence, surveillance, and reconnaissance; rapid global mobility; global strike; and command and control.

[37] Attrition reserve aircraft are "procured for the specific purpose of replacing the anticipated losses of aircraft because of peacetime and/or wartime loss or damage." Backup inventory aircraft are "in addition to the primary aircraft inventory that permit scheduled and unscheduled depot-level maintenance, modifications, inspections, repairs, and other events without reduction of aircraft available for the assigned mission." See "Standardized Terminology For Aircraft Inventory Management" in *Chairman of the Joint Chiefs of Staff Instruction 4410.01G* (Washington, DC: DoD October 2013), p. A-1.

TABLE 2: NOTIONAL LRS-B FORCE SIZED FOR 10 AIR EXPEDITIONARY FORCES

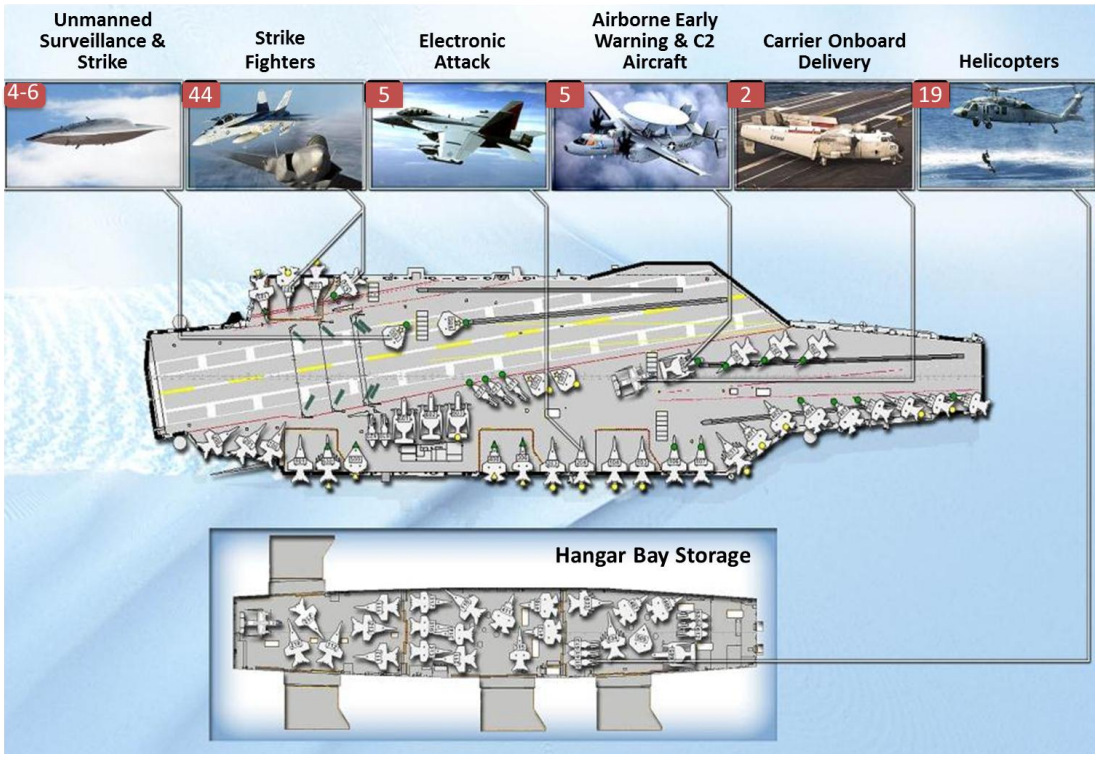
	Number of LRS-B
1 squadron of 12 PMAI aircraft for each of 10 AEF	120
25 percent for test and training	30
20 percent for backup and attrition inventory	24
Total	174

Should twenty B-2s remain in the operational inventory, the number of an objective penetrating LRS-B force could be reduced to 154 aircraft. This number is still less than the bomber force sized by the 1993 Bottom-Up Review to support two MRCs in conditions that were highly permissive relative to the operational environments that are now envisioned by DoD's own planning documents. To be sure, the number derived here is based on traditional force planning metrics. That being said, the rise of A2/AD forces and increasingly non-permissive operating environments along with the shift in emphasis to the expansive Asia-Pacific region strongly suggests that even this number may be too low.

As called for in the *Defense Strategic Guidance*, similar to the LRS-B, the Navy's future long-range ISR/strike force should also be sized for potential conflicts in the Asia-Pacific and Persian Gulf. The Navy's 2012 aviation vision indicates it may field four to six unmanned surveillance and strike platforms per aircraft carrier in addition to forty-four manned strike fighters, five manned electronic attack fighters, and other fixed- and rotary-wing capabilities (see Figure 2).

These unmanned systems could have an unrefueled combat radius of 1,300 to 1,500 nm or even greater, a range that is almost twice the combat radius of current-generation manned fighters. Given the ability to refuel inflight, a stealthy Navy UCAV could persist in a non-permissive environment to provide ISR and precision strike for twenty-four hours or more.

FIGURE 2: WHY ONLY 4 TO 6 UNMANNED AIRCRAFT PER CARRIER?



Carrier-based UCAVs teamed with sufficient numbers of other penetrating, long-range UAVs and LRS-Bs could greatly increase the density of combat aircraft that could be sustained in an A2/AD environment compared to today's CAF. Combined, these new long-range capabilities would help create a combat cloud with the persistence and payloads needed to find, fix, track, target, and engage high-value mobile targets such as missile transporter erector launchers and SAM systems. Just as important, a long-range UCAV could enable the Navy's carriers to operate at sea outside the range of many shore-based anti-ship ballistic and cruise missiles that, according to the Chief of Naval Operations (CNO), Admiral Jonathan Greenert, will "limit the ability of manned platforms to get close to an adversary in wartime."[38] Thus it would seem that a significant portion of the future sea-based CAF should consist of multi-mission UCAVs that, as the CNO concluded, "will expand the reach and persistence of the future [carrier] air wing."[39]

[38] Admiral Jonathan Greenert, "Statement of Jonathan Greenert Before the Congress on FY2013 Department of Navy Posture," March 2012, p. 12, available at http://www.navy.mil/cno/120316_PS.pdf.

[39] Ibid., p. 12.

III. THE BUDGET AND THE INDUSTRIAL BASE

Will the Air Force and Navy be able to fund the development and procurement of a new generation of ISR/strike aircraft in an era of austerity? The answer to this question will depend upon the availability of sufficient resources in the face of a shrinking defense budget and the U.S. defense industrial base's ability to adjust to changes in development programs that are the result of budget constraints.

Resource Challenges

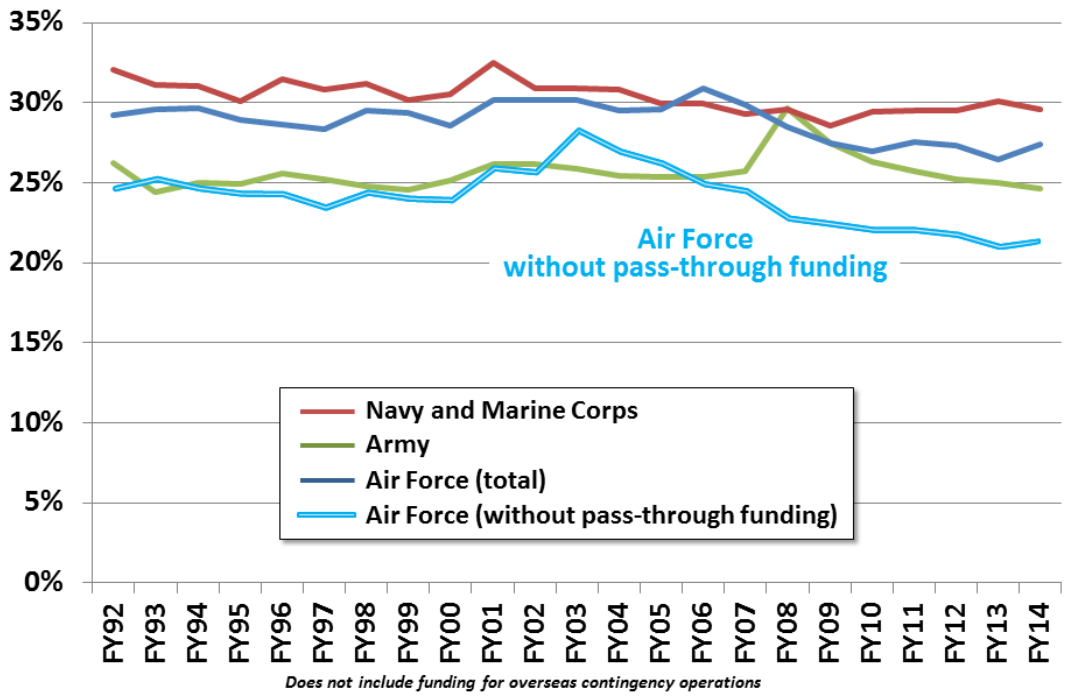
Today, the Air Force and Navy are struggling to maintain their current readiness, sustain a force structure that is aging, and fund needed modernization programs with smaller budgets. Given these pressures, it is unlikely that they will be able to find sufficient resources from within their existing budgets to buy significant numbers of new, stealthy, long-range ISR/strike aircraft. Creating a balanced CAF will require the support of both the Congress and DoD's civilian leadership. Congress could help by acting on DoD's proposals to retire older, single-mission aircraft, reduce buys of vulnerable littoral combat ships (LCS), cut our most expensive weapon system (manpower),[40] shed excess infrastructure, and manage the growing cost of military pay and benefits programs.

For its part, DoD's civilian leadership can adjust its funding priorities to enable the U.S. military to operate effectively in contested environments and in the Asia-Pacific region, which is characterized by vast distances and dominated by the air and maritime domains. The Pentagon has signaled its willingness to shift resources to

[40] Particularly military personnel needed for large-scale, long-duration stability operations.

better align its budget with its strategic priorities.[41] DoD's last two budgets indicate that a small shift in favor of the Air Force may already be underway, in part to support the LRS-B program. While this shift may be a leading indicator of the weight that DoD now places on new long-range ISR/strike capabilities, it does not significantly reverse cuts in the Air Force's budget share that began ten years ago (see Figure 3).[42]

FIGURE 3: SERVICE DEPARTMENT SHARES OF DOD BUDGET AUTHORITY[43]



It is also important to understand that the Air Force's budget includes "pass-through" funding for national intelligence-related programs that it does not control. Without pass-through funding, the Air Force's share of the FY2014 President's Budget was a little over 21 percent. This is significantly less than the 27 percent and 29 percent apportioned to the Army and the Department of the Navy, respectively.

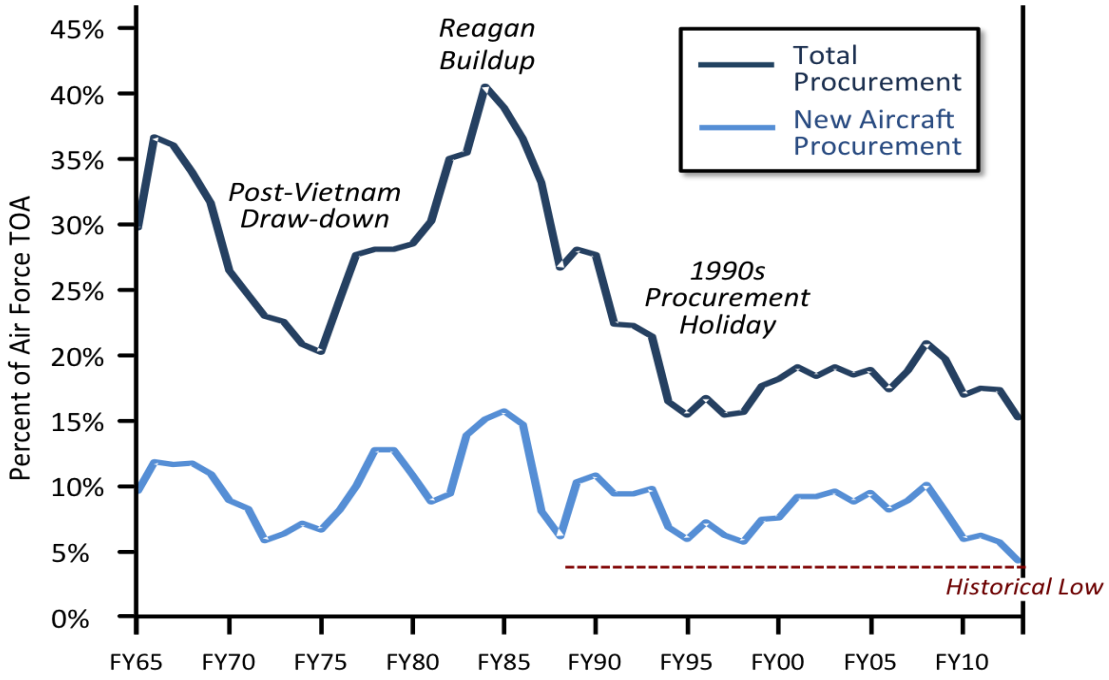
[41] A common myth is that DoD apportions it budget (excluding overseas contingency funding) across the service departments in roughly equal shares. As pointed out by Todd Harrison, this apportionment has actually varied significantly during previous post-war defense drawdowns. See Harrison, *Chaos and Uncertainty*, pp. 19–21.

[42] For a description of Air Force "pass through" non-discretionary funding, see Adam J. Herbert, "Beyond the Blue Budget," *Air Force Magazine*, April 2010, p. 22.

[43] Data derived from Office of the Under Secretary of Defense (Comptroller), *National Defense Budget Estimates for FY2014* (Washington, DC: DoD, May 2013), Table 6–10, and other DoD sources.

The combination of a smaller budget share relative to the other Services, the "tax" imposed by the need to maintain unwanted bases and force structure, and other fiscal pressures have had a predictable impact on Air Force procurement. The Air Force is now spending about 5 percent of its total obligation authority (TOA) to buy new aircraft, which is even less than the share it devoted during the post-Cold War "procurement holiday" of the mid-1990s (see Figure 4). This is all the more remarkable when one considers that in the 1990s the Air Force and Navy had a large inventory of relatively new aircraft built during the 1980s and were retiring their oldest aircraft as part of DoD's post-Cold War drawdown.

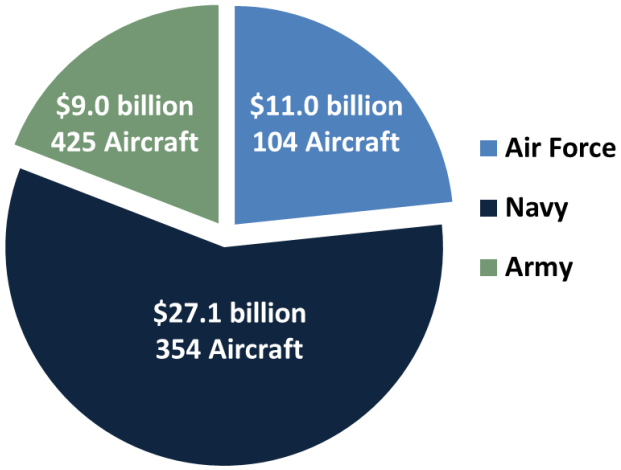
FIGURE 4: AIR FORCE NEW AIRCRAFT PROCUREMENT FUNDING



By way of comparison, the Air Force's proposed aircraft procurement budgets for FY2013 and FY2014 total $10.1 billion, a level of investment that is close to what the Army requested for new aircraft over the same period (see Figure 5).[44]

[44] Data derived from *Defense Budget Materials for FY2014 Procurement Programs (P-1) Amendment* published by the Office of the Under Secretary of Defense (Comptroller), available at http://comptroller.defense.gov/Budget2014.html. The figure includes spending for rotary wing and unmanned aircraft.

FIGURE 5: FY2013–14 PROPOSED NEW AIRCRAFT PROCUREMENT



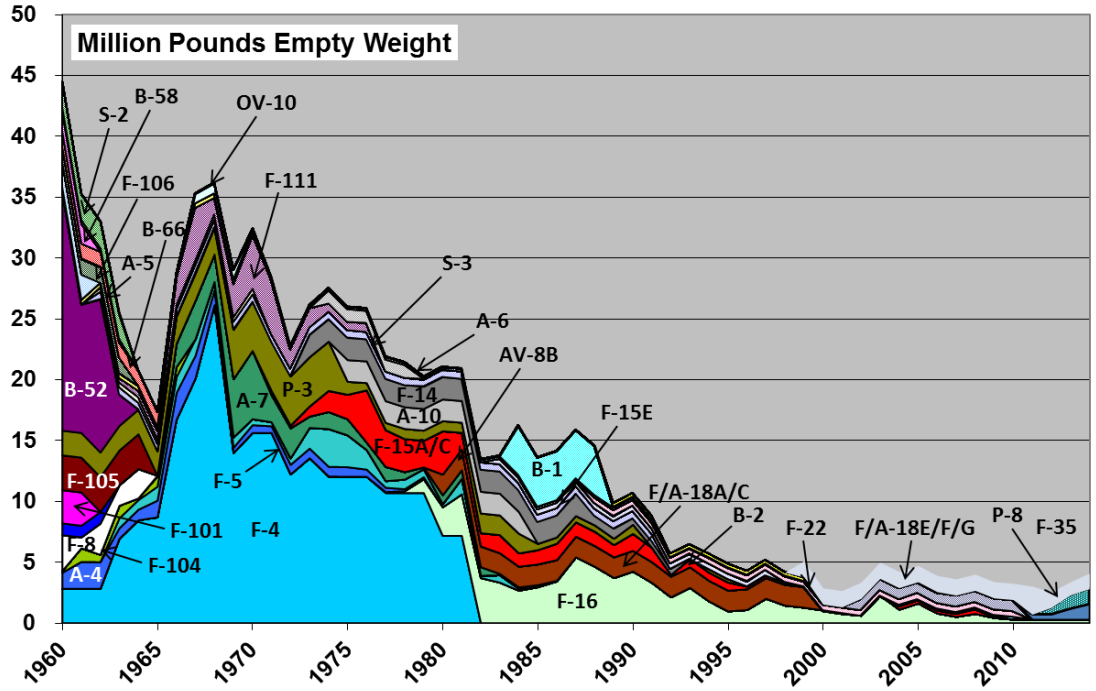
Breaking old budget apportionment habits would be a step toward creating a balanced CAF that sustains our nation's airpower advantage. Doing so shouldn't be considered a zero-sum venture by the Services, especially if new capabilities such as the LRS-B and carrier UCAV are designed to be linchpins of a future balanced *joint* CAF. With the right mission capabilities, the LRS-B and carrier UCAV could reinvigorate an Air Force-Navy partnership to protect the U.S. fleet by using both aircraft to perform wide-area maritime surveillance missions, find and attack enemy warships with ASCMs, and deliver sea mines by air.[45] Similarly, Navy UCAVs operating from aircraft carriers could help suppress air defense threats in support of Air Force penetrating aircraft and standoff cruise missiles that are launched from aircraft, submarines, and warships.

Another Concern: The Defense Industrial Base

Debates over the impact of a $1 trillion cut in planned defense spending relative to the President's FY2012 budget projection typically center on how it will affect DoD's major acquisition programs and current force readiness. Yet attention must also be accorded to the long-term viability of a cornerstone of America's military power—its defense industrial base.

[45] According to General Schwartz and Admiral Greenert, "The rise of Soviet naval power in the late 1970s and early 1980s motivated a new Air Force-Navy partnership, one that lasted for nearly a decade. The Air Force agreed to use long-range B-52 bombers to augment Navy sea-mining capacity, and, as part of the Busy Observer program, to perform maritime surveillance. The Navy also requested that the Air Force take a more active role in maritime surface warfare. These efforts, however, were discontinued after the Soviet Union disbanded and the Cold War ended." See General Norton A. Schwartz and Admiral Jonathan W. Greenert, "Air Sea Battle," *The American Interest*, February 20, 2013, available at http://www.the-american-interest.com/article.cfm?piece=1212#sthash.99dCLe9H.dpuf.

FIGURE 6: EMPTY WEIGHT OF U.S. COMBAT AIRCRAFT PRODUCED



Fifty years ago, DoD was in the process of building six fighters, three bombers, and two antisubmarine warfare aircraft (see Figure 6). These multiple development efforts allowed defense contractors to move their highly skilled aircraft designers and engineers to other programs in the event of funding cuts, program cancellations, or the completion of production runs.

Today, there is one new American fighter in production—the F-35—and three that are about to end their production runs. With the exception of the LRS-B, the P-8 multi-mission maritime aircraft, and possibly a carrier UCAV, there are no other major new combat aircraft in DoD's program of record. This continues a long-term trend where the number of military combat aircraft produced annually has dropped precipitously. Since 1960, U.S. combat aircraft production measured by empty aircraft weight has been cut by almost 90 percent and is now less than a third of the peak level it reached during the Reagan administration. This small number of new programs increases the risk that the U.S. defense industrial base will lack the flexibility to adjust to future program delays or cancellations. This risk could be partially offset by stabilizing CAF programs by providing funding that is not held hostage to the ongoing debate over the defense budget.

IV. CONCLUSION

There are signs that the Defense Department is finally beginning to invest in new manned and unmanned capabilities that could create a balanced CAF. After years of emphasizing the procurement of weapons and enabling capabilities for counterinsurgency warfare, the Pentagon is shifting its emphasis toward funding programs capable of operating effectively in non-permissive, A2/AD environments in the expansive Asia-Pacific region—hence the priority given to fielding a new LRS-B. For the Navy, the unrealized need to date is for a long-range/persistent carrier-based UCAV that is stealthy and can refuel while in flight. There is also a need to explore the potential of other systems and weapons that can strike from over the horizon into contested areas. At the same time, DoD is struggling to reconcile its modernization priorities with a downturn in its budget while being saddled with unwanted force structure and higher operating costs that are driven in part by its inability to divest excess infrastructure. Combined, these challenges threaten to squeeze out investments in badly needed new capabilities such as those described in this paper.

In summary, it is time for Congress and the Defense Department to take a hard look at the mix of combat air forces that will be needed to sustain America's asymmetric airpower advantage. The United States is now the only nation that maintains a CAF that is capable of global operations. This capability advantage is beginning to wane as older systems lose their ability to penetrate and persist in environments that are becoming increasingly contested. Creating a next-generation, balanced CAF that has greater range, survivability, and connectivity with other combat systems compared to today's force will not be easy. Sustaining such an effort will require Congress and DoD to maintain a strategic perspective in the allocation of increasingly scarce defense resources. The alternative is to accept a "business-as-usual" approach that will find the nation's combat air forces progressively less capable of executing a range of key missions essential to preserving vital U.S. interests around the globe.

CSBA
Center for Strategic and Budgetary Assessments

1667 K Street, NW, Suite 900
Washington, DC 20006
Tel. 202-331-7990 • Fax 202-331-8019
www.csbaonline.org