Rethinking U.S. Combat Airpower Modernization

How Small Changes Could Make A Big Difference

INTRODUCTION

The first half of 2001 could be a watershed period for the U.S. defense program. In just six months, we will see a change of presidential administrations, a second Quadrennial Defense Review (QDR), a final report from the Commission on National Security/21st Century, and a downselect in the Joint Strike Fighter competition. Of the issues that figure to be most hotly debated during this period, perhaps none is more important than combat airpower modernization. Decisions made on this critical issue will shape America's military capabilities and defense aerospace industry for decades to come.

Over the past several years, in support of both government and corporate clients, Hicks & Associates, Inc. has studied several issues pertinent to this debate, including the future security environment and DoD investment

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priorities for meeting the challenges therein. This experience has led us to three interrelated conclusions:

- new operational concepts are necessary to address the emerging anti-access problems associated with the proliferation of weapons of mass destruction and advanced conventional weapons;
- overcoming these challenges is a near-term imperative that will necessarily involve existing forces and those on the immediate horizon—i.e., we cannot await a transformation of U.S. forces 15-30 years hence; and
- better synergy between longer- and shorter-range airpower assets (both land- and sea-based) will be an essential element of the solution.

Recently, the prominent question in the airpower debate has been whether the U.S. can afford three new tactical aircraft programs: the Air Force F-22, the Navy F/A-18E/F, and the tri-Service Joint Strike Fighter (JSF). In this paper, we focus not on affordability but on strategic utility. We ask: Will the combat airpower modernization plan, as currently constituted, allow the U.S. to respond effectively to emerging strategic challenges? If not, what changes could be made to improve the strategic return on our airpower investment?

To address these questions, we first outline the current U.S. warfighting strategy and its supporting force modernization plan, focusing on combat airpower. Next, we examine the emerging challenges to U.S. strategy, focusing specifically on the strategy's underlying assumptions. We then propose a concept of operations designed to address emerging strategic challenges. Finally, we assess the ability of the current airpower plan to support this concept and explore measures to make it more robust.

While this paper is longer and has a stronger element of advocacy than our usual product, we think it is necessary to discuss how new operational concepts, when combined with relatively small adjustments in planned forces, can yield a major improvement in overall combat capabilities. Of course, the concept of operations we propose for consideration still has several elements that require further investigation. Nevertheless, it is an example of the efforts we believe will be needed in the QDR and elsewhere to meet emerging strategic challenges in the near- to mid-term with existing or programmed forces while, at the same time, planning for a more thorough transformation of U.S. forces over the long-haul.

Emerging Challenges To U.S. Warfighting Strategy

Evolving U.S. Theater Warfighting Strategy and Force Posture

Strategy. As the world's only superpower, the United States has vital interests and security commitments in virtually every corner of the world. Indeed, it is often said that security, *per se*, is the United States' most valuable "export." For the United States to maintain its unprecedentedly favorable global position, U.S. forces must be able to protect our global interests and fulfill our security commitments at an acceptable cost (measured in political, economic and human terms). The key to doing so, as the National Defense Panel (NDP) argued, is the "ability to project combat power rapidly and virtually unimpeded to widespread areas of the globe."[1]

Accordingly, *Joint Vision 2010*, the Department of Defense's (DoD) blueprint for the development of future U.S. warfighting capabilities, declares that "power projection, enabled by overseas presence, will likely remain the fundamental strategic concept of our future force."[2]

[1] NDP, *Transforming Defense: National Security in the 21st Century* (Washington, DC: Department of Defense, 1997), p. 12.

This basic strategy applies across the spectrum of conflicts for which the U.S. must project combat power far beyond its shores—from so-called small-scale contingencies, or SSCs, to major theater wars, or MTWs—and is unlikely to change so long as America remains globally engaged. Current and planned U.S. power projection strategy is nearly identical to that which served America so well during the 1991 Persian Gulf War. That is, the U.S. plans to respond to regional aggression by rapidly deploying large numbers of mostly short-range air, land, and sea forces to the region, or "theater", of conflict. Once in the theater, U.S. forces' primary warfighting objectives are to halt the invasion, build-up combat power, and evict the aggressor with a massive combined-arms counteroffensive.

Forces. Largely because of its superior responsiveness, land-based airpower, staging operations from bases inside the theater, would be expected to carry a large share of the warfighting load during the "halt phase." Carrier-based airpower and sea-based cruise missile platforms, if near the scene at the commencement of hostilities, would provide significant early firepower. The later-arriving armored divisions would form the centerpiece of the "counteroffensive" phase. The current force modernization plan is designed to support this strategy, meaning that tomorrow's U.S. forces will look, and to a great extent, fight much like today's.

Specifically, the power projection burden will continue to fall on the shoulders of the three major legacy force elements: Air Force fighter wings (20 planned—13 active, 7 reserve), Navy aircraft carrier battle groups (11 planned—10 active, 1 reserve), and Army and Marine ground divisions (22 planned—13 active, 9 reserve). By 2010, all three force elements will have taken, or will have begun taking, delivery of follow-on versions of their capital weapon systems, effectively extending these systems' strategic and budgetary primacy well into the 21st century.

Airpower replacements are planned on a roughly one-for-one basis. The Air Force, for example, plans to replace its multi-role F-16s and A-10s and its air superiority F-15s with the Joint Strike Fighter (JSF) and F-22, respectively. The Navy, meanwhile, will replace its multi-role F-14s with multi-role F/A-18E/Fs, its multi-role F/A-18Cs with JSFs, and its electronic warfare/lethal defense suppression EA-6Bs with F/A-18"Gs". The Marines also plan to replace their F/A-18C/Ds and AV-8Bs with JSFs. All told, the three Services plan to spend up to $340 billion on over 3,700 new short-range fighters.[3] By contrast, the U.S. does not plan to begin replacing its fleet of 185 global strike aircraft (93 B-1Bs, 71 B-52Hs and 21 B-2As) until 2037, when the Air Force says its "follow-on to the current bomber capability" will reach initial operational capability (IOC)—and by which time the B-2A, B-1B, and B-52H fleets will have logged 44, 52, and 84 years of service, respectively.

Thus, under current plans, the primary differences between the U.S. airpower forces of today and those of 2010-2030 will lie not in the numbers or types of platforms but rather in the quality of both their weapons and supporting information infrastructure. Through revolutionary advances in information-based technology, future U.S. forces will be best characterized by a growing capability to detect, identify, and track a greater number of targets, over a larger area, for a longer time, and to process and distribute this data more rapidly and efficiently. Through advances in precision strike-related technologies, U.S. forces will be capable of attacking a greater number of targets, over a greater area, more quickly, and with increasing accuracy and lethality.

On the positive side, U.S. forces are likely to remain dominant over the medium-term within

[2] Shalikashvili, General John M., then-Chairman, U.S. Joint Chiefs of Staff, *Joint Vision 2010: America's Military, Preparing for Tomorrow* (Washington, DC: Department of Defense, 1996), p. 3.
[3] The total number of planned tactical aircraft is 3,739. The Air Force plans to procure 1,763 JSFs and 339 F-22s; the Navy 480 JSFs and 548 F/A-18E/Fs; and the Marines 609 JSFs. Source: Congressional Budget Office.

assumed theater warfighting scenarios. This is due primarily to an absolute and growing U.S. superiority in C4ISR (command, control, communications, computers, intelligence, surveillance and reconnaissance) and precision strike, and superior equipment, personnel, training and readiness and leadership. No adversary, or combination of adversaries, is likely to be capable of seriously challenging the United States during the next 10-20 years—once U.S. forces are fully assembled in the theater of conflict.

On the negative side, U.S. power projection strategy appears extremely sensitive to any real-world deviations from its underlying assumptions about the future conflict environment. Among the many assumptions informing DoD's theater warfare scenarios, there are two upon which the overall success of U.S. power projection strategy hinges: 1) U.S. forces will have *time* to deploy to the theater in sufficient numbers before the onset of hostilities, and 2) they will have ready access to theater ports, bases, airfields and coastal waters. Unfortunately, tomorrow's conflict environment appears to be evolving away from the narrowly defined conflict scenarios to which U.S. power projection strategy is tailored and in which U.S. forces have been and are being designed to fight.

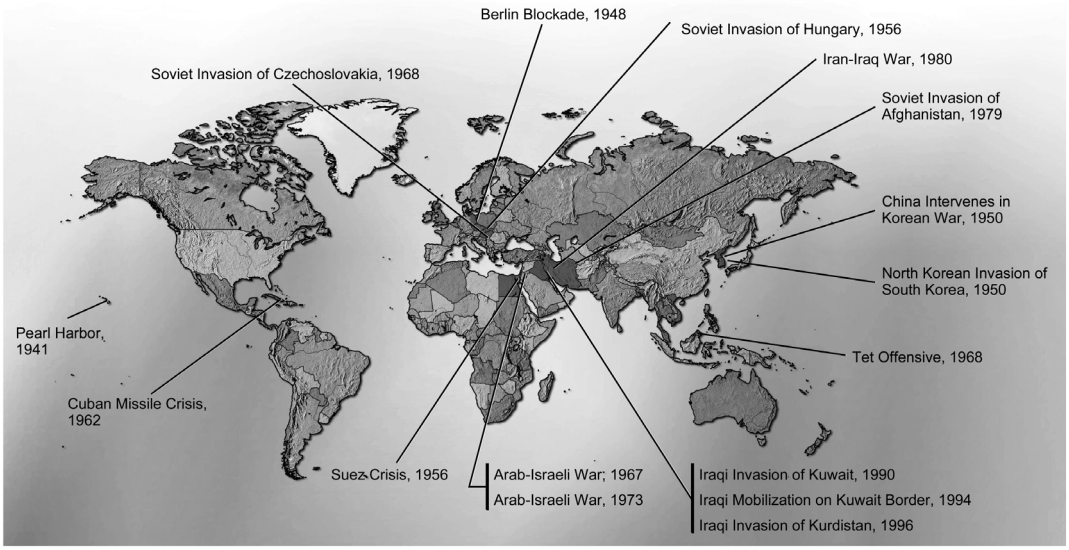
The Eroding Plausibility of the Time and Access Assumptions

Time

DoD's "base-case" scenario for Southwest Asia (SWA) assumes that U.S. forces will have nearly two weeks of reinforcement time, or "actionable" warning time. DoD plans also assume that during this period the U.S. would be able to deploy some twelve Air Force fighter squadrons, two to three brigades of Army and Marine forces, and one to two Navy carrier battlegroups to the theater (in addition to the one assumed to be on-station prior to the enemy mobilization).[4]

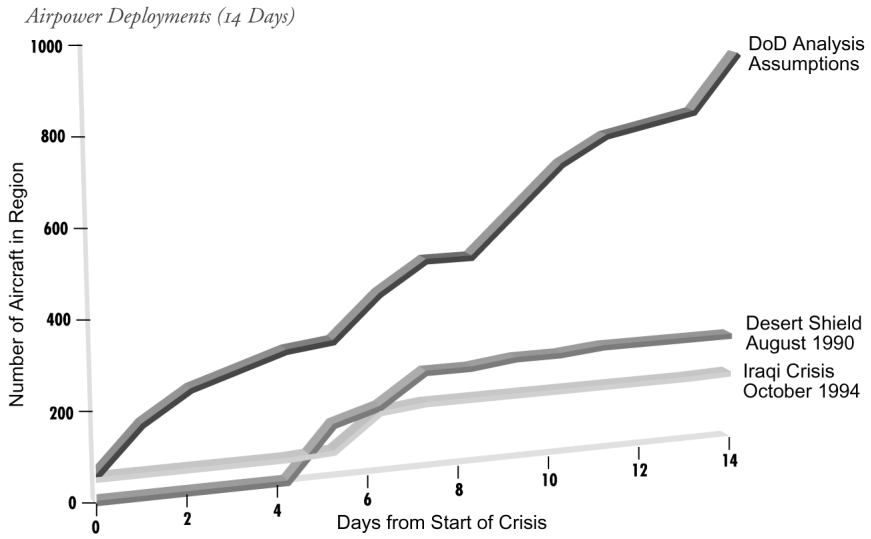
Would an adversary really wait 14 days to attack while the U.S. undertook a full-scale force mobilization? Could the U.S. really deploy so many aircraft to the theater so quickly? History suggests not. Figure 1 illustrates the cases in which the U.S. was surprised by major conflicts or crises affecting U.S. national security. Meanwhile, Figure 2 compares DoD assumptions regarding airpower deployment rates with actual U.S. airpower deployment

Figure 1 – Actionable Warning? Military Surprises, 1941-Present



[4] Ochmanek, David, and Zalmay Khalilzad, "Rethinking U.S. Defense Planning", *Survival*, vol. 39, no. 1, Spring 1997, p. 43.

Figure 2 – The Analytical World vs. the Real World: DoD Airpower Deployment Rate Assumptions vs. Actual Airpower Deployment Rates



Source: Robert W. Chandler and John R. Backschies, *The New Face of War: Weapons of Mass Destruction and the Revitalization of America's Transoceanic Military Strategy* (McLean, VA.: AMCODA Press, 1998)

rates during two separate Iraq crises, the August 1990 invasion of Kuwait and Iraq's October 1994 mobilization on the Kuwaiti border. Together, they help illustrate that: 1) historically, surprise has been the rule, not the exception, and 2) when we do respond to enemy action, it takes us much longer to deploy large numbers of combat aircraft to the theater than we officially assume. As a result, adversaries attacking with little or no warning will likely have a "window of opportunity" during which their forces can advance either unopposed or opposed by only a skeletal forward-based force.

Given potential adversaries' extremely close proximity to their would-be victims, it is likely that they could achieve at least their initial military objectives before the U.S. could respond. In early August 1990, for example, the CIA estimated that Saddam's troops could have reached the Saudi capital of Riyadh from their positions in Kuwait in three days; it had taken them less than a day to overrun Kuwait City. By contrast, it was not until October (i.e., 60+ days later) that CINCCENTCOM Gen. Norman Schwarzkopf could guarantee a successful defense of the kingdom.[5]

The potential cost of being unable to halt an enemy's initial thrust can be high. For example, the cost of redressing aggression (measured in terms of time, money and casualties) is often driven by the amount of territory initially surrendered. Enemy forces, once allowed to dig in and disperse, become far less vulnerable, especially to air attack. Early success by the enemy can also hamper U.S. regional coalition building efforts. Would-be regional allies—whose bases may be critical to the deployment of U.S. forces—may be more likely to remain neutral if the U.S. is perceived to be losing control of the situation.

In short, the United States must travel thousands of miles to engage adversaries positioned just hundreds of miles from vital U.S. interests. This proximity advantage provides regional adversaries who attack without warning an opportunity to achieve core objectives before U.S. forces can arrive in-theater in numbers sufficient to stop them. Accordingly, there is little reason to assume adversaries will cede this critical advantage in future conflicts.

[5] Atkinson, Rick *Crusade: The Untold Story of the Persian Gulf War* (New York: Houghton Mifflin, 1994) pp. 53-54.

Access

If the first lesson of the Gulf War was "don't give America six months," the second was "don't give America a safe place to park." The access challenge stems primarily from prospective U.S. adversaries having learned the latter, and from the rapid diffusion of military technologies providing them with new and affordable capabilities for challenging U.S. expeditionary forces.[6] While the Gulf War showed U.S. forces to be virtually unstoppable once in-theater and operating from sanctuary, it also revealed their dependence on such favorable conditions.

Future competitors are likely to exploit this Achilles Heel. Repeating a theme common to Defense Science Board Studies since the mid-1990s, the 1999 DSB Task Force on Globalization and Security, citing global military-technological leveling as the "engine of the emerging anti-access threat," said that nations preparing for potential conflict with the U.S. are "channeling their more limited resources into now widely-available (and increasingly affordable) capabilities, conventional and unconventional, that could allow them to deny U.S. forces both rapid access to the theater and sanctuary once in-theater."[7] In 1995, another DSB study estimated that even with serious resource constraints, regional adversaries could develop a robust anti-access force by 2010.[8] Most discussions of the anti-access threat focus on weapons of mass destruction, or WMD. Advanced conventional weapons, however, also have great utility in this regard; both are discussed below.

Weapons of Mass Destruction. Potential U.S. adversaries view WMD as the great battlefield "equalizer"—the means for "devaluing" U.S. military might by exploiting not only America's clear dependence upon access to ports, airfields and military facilities in the theater of conflict, but also our perceived aversion to military casualties. The consensus within the U.S. intelligence community is that those countries most likely to challenge the U.S. militarily over the next two decades either possess, or are actively pursuing, nuclear, chemical and/or biological weapons and the means to deliver them throughout their respective regions.

Adversaries could deliver WMD via ballistic or cruise missiles, strike aircraft, terrorists, or special operations forces, and may have several different objectives for doing so, or for simply threatening to do so. They may seek to deter or delay a U.S. response by raising, perhaps prohibitively, the perceived cost of intervention with the threat of mass casualties. They could coerce their neighbors into denying U.S. and allied forces access to their ports, airfields, bases, coastal waters and airspace with the threat of WMD retaliation. Or they may try to severely disrupt U.S. and allied deployments and/or combat operations with WMD

[6] Though the focus of this section is on the military-technical anti-access challenge, geographical and political factors may also serve to limit U.S. forces' ability to gain rapid access to a region. The geographical access challenge is fairly straightforward. Simply stated, future conflicts are possible in regions (e.g., Central Europe, Central Asia, South Asia, East Asia/China, and Africa) far inland from friendly bases and/or absent a viable basing infrastructure. The political access challenge arises when would-be regional hosts balk at accepting U.S. forces. Political access constraints are not new. America's strategic sensitivity to forward-basing constraints, however, is now greater than ever. This is due primarily to an increased U.S. reliance on temporary and contingency basing arrangements—a measure necessitated by both the erosion of America's once-vast Cold War overseas basing network, and by the rising importance of regions to which this network never truly extended (e.g., the Persian Gulf). Such arrangements can be more susceptible (than permanent forward basing) to unanticipated, circumstantial political factors that could impede the actual use of designated facilities during crises. The problem is not, as is commonly thought, limited to outright denials of access to bases and related infrastructure. Increasingly, foreign hosts have been delaying acceptance of U.S. forces and restricting the use of their facilities by forces already in-theater. Recent experience indicates that the U.S. is likely to encounter a combination of denials, delays and restrictions when deploying large numbers of forces to multiple countries in a region. Factors that may limit regional states' willingness to grant U.S. forces access, even during crises, include: domestic opposition to the presence of U.S. forces; regional pressures to limit facilitation of U.S. military operations; intimidation or fear of aggressor retaliation; and linkage to/leverage for other issues.

[7] Defense Science Board, *Final Report of the Task Force on Globalization and Security* (Washington, DC: Department of Defense, 1999), p. 25.

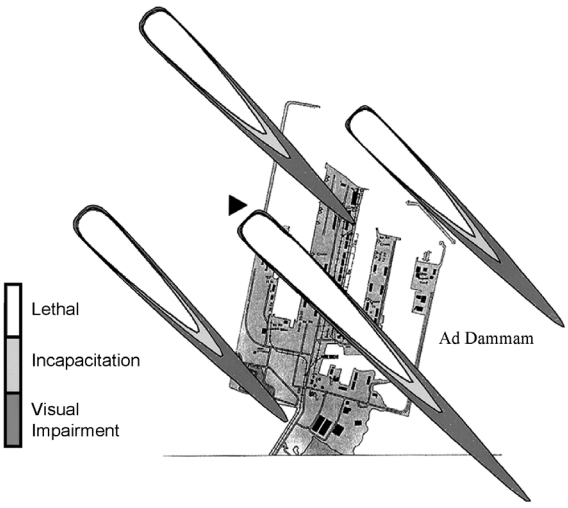
[8] Defense Science Board, *1995 Summer Study: Investments for 21st Century Military Superiority*, Summary Briefing, November 1995.

strikes against major air ports of debarkation (APODS); massed ground forces; ground force bases and assembly areas; rear-area supply and support facilities; and main operating bases for theater-based aircraft.

Perhaps the most inviting targets, however, would be the few major regional seaports of debarkation (SPODs) that would invariably comprise the linchpin of America's strategic lift capability—and thus our ability to introduce and/or sustain large numbers of theater ground and air forces.[9] A cursory look at the results of detailed targeting and weapon effects analysis of chemical and nuclear attacks against major SPODs helps illustrate the potentially dramatic impact of such attacks on U.S. power projection operations.[10]

Figure 3 depicts an Iraqi chemical strike against the Saudi port of Ad Dammam. Five relatively inaccurate (1 km CEP) VX-armed Scud missiles are launched against the sprawling port; four missiles impacted within the port area, contaminating major portions of the Ad Dammam facilities at lethal levels.[11] The combined effects of actual and "virtual" (post-strike absenteeism) casualties among civilian port workers, the impracticality of rapid decontamination, and the debilitating effects of MOPP (protective) gear would, according to the analysis, effectively shut the port down indefinitely, or so long as the attacker was able to maintain contamination levels (requiring re-strike every 24 hours). Simulations of chemical attacks against airbases yielded similar conclusions: major portions of the base are contaminated, and airlift throughput and fighter sortie rates plummet as casualties mount and MOPP gear constraints take effect. Simulated low-yield nuclear strikes were even more devastating. In most scenarios, virtually all military and civilian personnel present at the time of the attack were killed or incapacitated, while most of the key equipment (e.g., ships and aircraft) was completely destroyed.

Figure 3 – Simulated Scud/VX Attack on Port Ad Dammam, Saudi Arabia



While the effects of biological attacks on ports and airfields may have different characteristics in terms of onset of illnesses, they can be equally effective in degrading port operations, if not more debilitating than chemical attacks.[12]

[9] To put U.S. reliance on such facilities in perspective, it is helpful to consider that over 95% of all materiel transported in Operations Desert Storm and Desert Shield was sealifted to the theater. Over 85% of this material was transported by vessels requiring modern ports (e.g., deep-draft piers, cargo handling cranes, etc.) for offloading; and over 90% of all sealifted tonnage passed through the two modern ports on the Saudi Persian Gulf coast—Ad Dammam and Al Jubayl—both of which were within range of Iraqi Scud missiles.

[10] The analysis that follows is taken from Greg Weaver and J. David Glaes, Science Applications International Corporation, *Inviting Disaster: How Weapons of Mass Destruction Undermine U.S. Strategy for Projecting Military Power* (McLean, VA.: AMCODA Press, 1997). The authors conducted detailed simulations of nuclear and chemical attacks against Ad Dammam and three major Saudi airbases (Dhahran, Taif, and Riyadh) and assessed their strategic and operational implications.

[11] Ad Dammam and Al Jubayl are very similar facilities from both a power projection and WMD vulnerability perspective. Generally speaking, adversaries could achieve the same effects against Al Jubayl as they would against Ad Dammam. In fact, because the facilities at Al Jubayl cover a somewhat smaller area than do those at Ad Dammam, the effects of chemical attacks would likely be more severe.

[12] See, for example, Gregory F. Treverton and Bruce W. Bennett, "Integrating Counterproliferation into Defense Planning," *RAND QDR Conference Proceedings* (Santa Monica, CA: RAND Corporation, 1997), pp. 2-3.

In short, weapons of mass destruction provide future adversaries with a wide range of options for directly or indirectly denying or impeding U.S. access to the theater, and for severely degrading the capabilities of those forces the U.S. does manage to deploy.

Conventional Anti-Access Forces. Advanced conventional weapons are emerging as a similarly potent component of a future adversary's anti-access arsenal. Conventional anti-access weapons can be grouped into two broad categories: those designed for use against land-based targets and those used primarily for sea control and/or denial.

Ballistic and land-attack cruise missiles will pose the greatest conventional threat to land-based U.S. and coalition forces (particularly when massed), and key theater facilities, such as major SPODs and APODs. The magnitude of the conventional missile threat is expected to increase dramatically over the next two decades as both ballistic and cruise missiles become longer-ranged and more accurate (e.g., through commercially-available satellite and inertial navigation systems), as countermeasures (e.g., submunitions and, in the case of cruise missiles, low observable or "stealth" technology) are developed to defeat defenses, and, above all, as they become cheaper and thus more plentiful. Regional cruise missile inventories, for example, could reach into the thousands, although only a small percentage are expected to be stealthy. It is, however, the "numbers issues" that most worry missile defense technologists and military planners. So-called "saturation" attacks could quickly overwhelm U.S. and allied missile defenses, and pose a serious challenge to U.S. efforts to rapidly deploy large numbers of forces into ports, airfields, and bases within missile range and to operate those forces effectively.[13]

The maritime anti-access threat is more diverse, comprised of air-delivered, shore- and surface-based, and undersea elements. The primary air-, shore- and surface-delivered weapons are sea-skimming anti-ship cruise missiles (ASCMs) such as the Russian SS-N-2 *Styx*, Chinese CSS-2 *Silkworm* and C-802 *SACCADE*, and French *Exocet*. These weapons can be delivered effectively from strike aircraft, fast patrol boats (such as the Chinese-built *Houdong*), fixed or mobile shore batteries and, eventually, submarines. Flying just above the water's surface at or close to supersonic speeds, ASCMs are very difficult to detect, much less shoot down, and can be used to devastating effect, even against large capital ships.[14]

Submarines and anti-ship mines comprise the undersea component of the maritime anti-access threat. Diesel submarines such as Russia's *Kilo*-class boats are the subs of choice for countries (e.g., Iran and China) interested in controlling littoral access or chokepoint transit. These subs are as quiet or quieter and much less costly than their nuclear-powered counterparts. Technological advances are expected to yield over the next 10-15 years major improvements in stealth and undersea endurance—both of which will increase their survivability—and in lethality, with the availability of advanced (e.g. wake-homing) torpedoes and of submerged-launch capability for ASCMs.

Mine technology is also advancing—and proliferating—to the extent that some experts consider them a more potent future threat to surface vessels than submarines. Capabilities

[13] Recent DoD-sponsored analyses suggest that these concerns are warranted. A 1999 study by RAND's Project Air Force, for example, concluded that with a total force of only 100 GPS-guided M-9 and M-18 ballistic missiles and 46 small GPS-guided cruise missiles (costing a total of only about $160 million), an adversary could achieve a 90% probability of kill, or Pk, against all aircraft on the parking ramps at Dhahran, Doha, Riyadh Military and Al Kharj airbases in Saudi Arabia, while also attacking the tent cities and U.S. anti-missile batteries (e.g., Patriot or THAAD) at each of these bases. See: Stillion, John and David Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks: Technology, Scenarios, and U.S. Air Force Response*, MR-1028-AF (Santa Monica, CA: RAND, 1999), p. xiv-xv.

[14] In the 1982 Falklands War, for example, Argentina was able to severely constrain British Royal Navy operations with an anti-ship cruise missile force of just five subsonic French *Exocets* and two *Exocet*-capable aircraft (French *Super Entendards*). The Argentines sank two Royal Navy vessels (a destroyer ironically on *Exocet* watch, and a container ship serving as a carrier decoy) and damaged a third (a cruiser), killing 45 British sailors in all.

either currently or soon available on the open market include Spanish and Italian moored and bottom-resting "influence" mines (triggered by an overhead ship's magnetic field or its acoustic signature), and Russian and Chinese propelled-warhead mines, which act as bottom-based torpedoes. Other advancements include the use of remote detonation control, and of plastic casings that would make mines nearly impossible to detect with current minehunting systems.

Collectively, these maritime anti-access systems could represent an effective, relatively low-cost threat to U.S. sealift vessels, which often must steam through narrow chokepoints and through the littoral to reach friendly ports, and to U.S. warships operating close-in. Moreover, as the range and lethality of these systems—and ASCMs in particular—increase over time, it will force U.S. carriers and cruise missile platforms to standoff further and further from the littoral.

Future U.S. competitors' anti-access capabilities will likely improve greatly as they tap into space capabilities previously available only to the major powers. Space-based communications, surveillance, and navigation services and equipment will become widely available on a commercial basis. Satellite communications using low- and medium-earth orbit constellations will soon provide reliable wide-band Internet access to all corners of the globe. The surveillance satellite market will also evolve fairly rapidly, with four or five suppliers scheduled to provide, by year's end, visible and multi-spectral images of 1 meter quality (or better) to commercial customers and to military customers in states unable to develop and field the capabilities indigenously.[15] The availability of such precise and up-to-date surveillance and communications information, coupled with reliable positioning and timing data from the Global Positioning System or from Russia's GLONASS could give potential adversaries unprecedented and relatively cheap missile targeting capability. Exploitation of the commercial space market would allow even highly resource-constrained adversaries to monitor the location of, target, and precisely attack U.S. forces in the field, at theater bases, ports and airfields, and moving through critical naval chokepoints.

To sum up, U.S. theater warfighting strategy, centered on the fundamental concept of U.S.-based projection of land, air and sea forces, rests on a set of assumptions about future conflict that are becoming increasingly tenuous. Consequently, there is growing risk inherent in U.S. warfighting strategy. Strategic risk is defined here as a discernible decrease in America's capability to protect militarily its vital interests at acceptable cost. Absent significant changes in the U.S. approach to power projection, this risk will likely rise precipitously over the coming decades as the anti-access threat fully emerges.

Toward A Near-Term Solution To The Power Projection Challenge

The Global Reconnaissance-Strike Concept: Massing Firepower, Not Forces

To meet emerging strategic challenges, the U.S. must find an approach to power projection that is far less sensitive to the time and access assumptions. Put another way, the U.S. must increase its global responsiveness while decreasing its theater "footprint" and thus its dependence upon theater access for the projection of military power. This necessitates what would amount to an inversion of the prevailing U.S. joint concept of operations (CONOPS) for theater warfighting.

In the current construct, forces staging operations from bases inside the theater would provide the bulk of U.S. firepower during all phases of major theater war, including the critical halt phase. Since the Gulf War, however, many in the national security community have

[15] DSB, *Final Report of the Task Force on Globalization and Security*, p. 24.

espoused the concept of essentially importing massive firepower to the theater from both the sea and from land bases well outside the theater in order to execute the halt much more rapidly—and from a safe distance—and to enable the safe deployment of follow-on joint forces. Supporters of such an approach include retired Air Force General Charles A. Horner, commander of coalition air forces during Desert Storm. Testifying before Congress in 1996 on the issue of "rogue state" WMD proliferation and its implications for U.S. defense planning, Horner said that:

> "The proliferation of WMD and ballistic missiles means that our current strategy of pouring hundreds of fighters and hundreds of thousands of troops into our enemy's backyard is no longer viable. The best hedge against the emerging WMD threat is to shift as much of the power projection burden as we can—as fast as we can—to long-range systems capable of fighting effectively from beyond WMD range."[16]

Until very recently, however, advocates of what has been termed the "Global Reconnaissance Strike" (GRS)[17] concept faced a major obstacle: no operational evidence of the concept's viability. The Kosovo War, however, lent unexpected credence to this alternative approach.

During NATO's Operation ALLIED FORCE, U.S. global strike aircraft operating out of Missouri and the United Kingdom, and U.S. carrier aircraft and standoff weapon platforms operating from the Adriatic Sea delivered roughly two-thirds of the total allied firepower—while representing less than 20 percent of the U.S. strike assets committed to the campaign. Through the first eight weeks of the 11-week war, six B-2As flying out of the 509th Bomb Wing at Whiteman AFB, Missouri, alone struck over a third of all the targets in Serbia. On the foulest-weather nights, the B-2As, each armed with 32,000 pounds of GPS-guided precision bombs deliverable in any weather, were the lone NATO strike aircraft option.

While few doubt the Navy's ability to bring significant firepower to bear from the sea, many have argued that aircrew fatigue would prevent the Air Force from sustaining global strike aircraft operations from outside the theater for an extended period. For example, a RAND report issued prior to the Kosovo war lauded, in principle, the concept of countering the access challenge by staging air operations from regional bases far outside (~4,000 nm) the theater, but said that "crew fatigue considerations" would limit aircraft with subsonic cruising speeds (i.e., all current global strike aircraft) to a 2,000 nautical mile tether for sustained operations. Beyond this range, missions would exceed eight hours in duration, which, the authors argue, is not sustainable.[18]

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[16] Horner, General Charles A. (USAF, Ret.), prepared statement before the House National Security Procurement Subcommittee Hearing on Military Modernization, 12 September 1996.

[17] See, for example, Chandler, Robert W. and John R. Backschies, *The New Face of War: Weapons of Mass Destruction and the Revitalization of America's Transoceanic Military Strategy* (McLean, VA: AMCODA Press, 1998), p. 17.

[18] Stillion and Orletsky, *Airbase Vulnerability to Cruise-Missile and Ballistic-Missile Attacks*, p. 54. The authors also argue that sorties of eight hours or longer could not produce the "one sortie per day, per aircraft" tempo they cite as necessary to achieve the required operational intensity. However, the notion that "intense combat operations" require each aircraft participating in the operation to fly one sortie per day appears rooted, speciously, in an assumption that small-payload aircraft (i.e., tactical fighters) are conducting the attacks. Operational intensity is measured not by *sorties* per day—at least not in the enemy's eyes—but rather by *firepower delivered or targets destroyed* per day. If large payload aircraft are conducting the strikes, then many fewer aircraft sorties per day—and thus a lower aircraft sortie rate—would be required to achieve whatever objective firepower delivery/target destruction rate had been set by the theater air commander. The B-1B, for example, carries 12 times as many 2,000-lb precision bombs (24) as an F-16 (two). Even if the B-1B were flying only one sortie every three days—the sortie rate achieved by the U.S.-based B-2As participating in ALLIED FORCE—it would still deliver four times the firepower (24 tons vs. six tons) over that period as an F-16 operating at a one-sortie-per-day clip (or twice as much as an F-16 flying a more ambitious two sorties per day). This is not to say that the U.S. can simply hammer an enemy one day, give him a six-day respite, then hammer him again. Quite the opposite, the U.S. would likely want aircraft delivering weapons round-the-clock. All this says is that with large-payload aircraft, the U.S. would need fewer airplanes over enemy territory at any given time to maintain this level of combat intensity.

The B-2A's performance in Kosovo showed that crew fatigue is not a problem and, in the process, established high-volume global precision strike as a viable and sustainable operational concept. B-2A pilots, who regularly train in B-2A simulators for "global power" missions of up to 37 hours in duration, characterized the 30-hour, roughly 12,000-mile round-trips from the U.S. to Serbia as non-taxing. In fact, the ALLIED FORCE missions were, according to the pilots, actually easier than the simulated training missions because of the adrenaline jolt they got mid-way through as they entered Serbian airspace and zeroed in on their heavily defended targets. Air Force Brigadier General Leroy Barnidge, Jr., Commander of the 509th, said after the war that the wing could have sustained operations indefinitely, and that he would only begin to worry about pilot fatigue on missions lasting 40 hours or longer.[19]

By shifting the leading-edge firepower burden to global strike aircraft based outside the theater and to sea-based airpower and standoff platforms, the U.S. could dramatically reduce its strategic dependence on theater base access and increase by an equally significant measure its global responsiveness. Instead of U.S. theater access requirements being driven by the overall combat requirement, they would be driven primarily by the immutable requirement to protect from enemy aircraft and surface-to-air defenses the global strike force; the long-range C4ISR aircraft upon which the global strike force depends; and other key air assets (e.g., tanker/transport aircraft and, eventually, force-protection aircraft such as the Airborne Laser) required to operate in theater airspace.[20] (Because aircraft carrier air wings contain organic air-to-air and lethal/non-lethal SEAD elements, and because much of the battle group's striking power comes from its cruise missile force, which needs no protection, the sea-based strike force could survive largely independently once on-scene.)[21]

At present, the U.S. relies on theater-based tactical aircraft to protect its air assets from enemy fighters. Moreover, tactical aircraft also handle a majority of the lethal and non-lethal (e.g., electronic warfare) suppression of enemy air defenses (SEAD) responsibility. Neither will change unless and until the U.S. either develops long-range air-to-air and SEAD assets or fields autonomously survivable global strike and long-range (likely space-based and/or unmanned) ISR capabilities. Accordingly, while the ability to project power without *any* combat aircraft in the theater is ideal, it is not feasible without the development of wholly new capabilities, and should thus be considered a longer-term force development objective at best.

The U.S. might not even need to reinforce the theater during the first phase of the war if the theater-based protective, or "theater enabling", capability can be concentrated in a small enough number of platforms so as to be forward-deployable in peacetime. Given the current U.S. overseas posture, it is reasonable to assume that the U.S. could forward deploy two-to-four squadrons (roughly 50-100 aircraft) of tactical aircraft year-round in at least three theaters of strategic interest (e.g., Southwest Asia, Northeast Asia and East Asia). The challenge, then, is to be able to concentrate the requisite theater enabling capability into the 50-100 aircraft the U.S. can expect to deploy forward. Forward deploying the theater enabling force would, in effect, make the U.S. global strike force—capable of striking in any theater from U.S. bases in under 24 hours and recovering to forward operating locations 3,000-

[19] Tirpak, John A., "With Stealth in the Balkans," *Air Force Magazine*, October 1999, p. 25.
[20] Even the stealthy B-2A requires some level of protective support. While the B-2A is considered capable of operating autonomously at nighttime—and did so during ALLIED FORCE—during the daytime it would likely require some level of air-to-air protection. In any case, the B-2A, like all other strike aircraft, relies on C4ISR aircraft for targeting and battle management which are highly vulnerable and require protective support at all times.
[21] While an aircraft carrier battlegroup can operate independent of land bases in the theater of conflict, its responsiveness is highly dependent upon its geographic position at the outbreak of hostilities. If the battlegroup is near the theater when the "balloon goes up", it can steam into striking position very quickly, right on the heels of the global strike force. However, if the battlegroup is in rotational transit to or from the theater, it could be several days before its airwing could join the fight. Reinforcing the theater with additional carriers, which would likely come from much farther away, could take a week or more.

5,000 miles from the theater—continuously, if virtually, present in the theater. To fight in a region in which it does not have combat aircraft forward deployed, the U.S. would need only to deploy two to four squadrons of enabling aircraft to the theater. This is a substantially more manageable task in the face of a serious anti-access threat than is attempting to deploy an entire joint warfighting contingent.

The theater enabler role demands not only a highly capable tactical aircraft—i.e., one with advanced air-to-air and substantial air-to-ground capabilities—but also innovative Air Force thinking on how to employ such an aircraft in a dual air-to-air/SEAD role in support of the global strike force and long-range and sea-based C4ISR assets (such as the Air Force's RQ-1A Global Hawk, E-3A AWACS, RC-135 Rivet Joint, and E-8 Joint STARS, and the Navy's E-2C Hawkeye and ES-3A Shadow). It will also require the Air Force to develop viable concepts for deploying a small number of tactical aircraft into and/or operating them within an anti-access environment. Several basing concepts in development collectively suggest that operating a small number of fighters in such an environment should be feasible.[22] It is also important to remember that, since the theater enabler would be facilitating strikes against enemy anti-access capabilities, the enemy's window of opportunity for using his anti-access capabilities to neutralize the theater enabling force would begin closing almost as quickly as it opened.

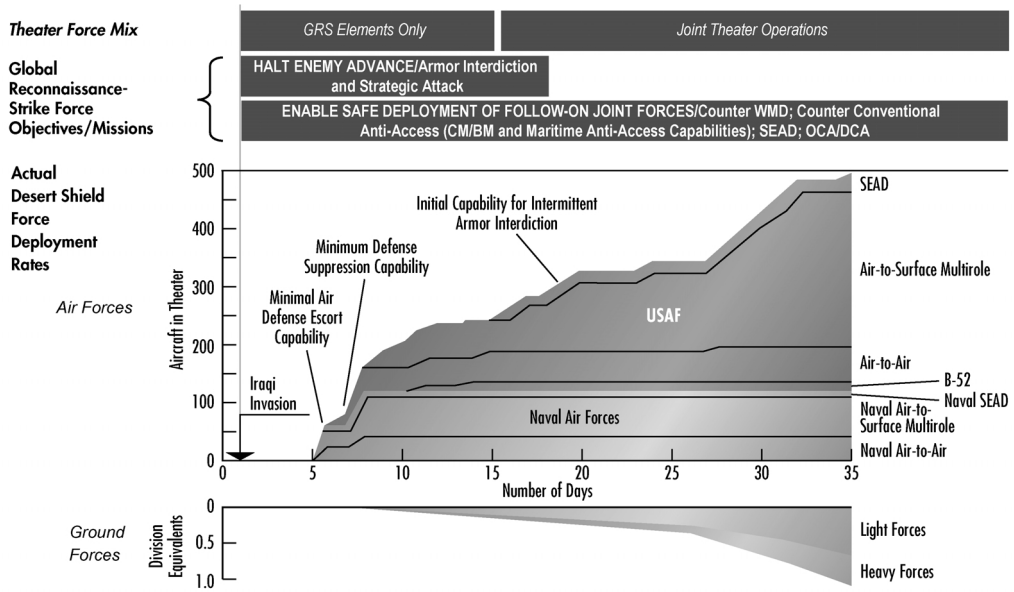
Together, the Global Reconnaissance-Strike concept's three main combat airpower elements—global strike, sea-based strike, and the theater-based enabler—would have two primary responsibilities: 1) rapidly *halting* the enemy's initial advance by attacking his armored invasion forces and his overall warmaking capacity, and 2) *enabling* the safe deployment of follow-on ground, sea and tactical air reinforcements by neutralizing the adversary's anti-access capabilities (to include his WMD production, storage, and delivery capability; his cruise and ballistic missile forces; and his maritime anti-access forces). The concept is illustrated in Figure 4; for real-world perspective on operational timelines, it is cast against the actual Desert Shield force buildup.

Though the focus of this paper is on the airpower elements of the Global Reconnaissance-Strike concept, light and lethal early-entry ground forces—such as those described in both the Army and Marine Corps' future visions—would likely play a critical, complementary role. Key tasks for the ground component might include interdicting enemy land forces shielded from air attack (e.g., naturally by ground clutter or deliberately via concealment, cover and deception), locating and designating time-critical (e.g., WMD) targets, protecting theater enabler operating bases (e.g., from commando/terrorist raids), and conducting/facilitating theater missile defense operations.[23] The responsiveness of such early-entry land forces would likely improve substantially under the GRS concept. Under the current approach to power projection, land forces would be competing early on with tactical air forces for the strategic lift assets required to move forces and their weapons and support to the theater. In the GRS concept, however, the strike burden is shifted from land-based tactical aircraft with heavy lift requirements to global range and sea-based strike assets that require little if any strategic lift support. As a result, a much higher percentage of the strategic sea and airlift fleets would be available in the early phases to transport land forces.

[22] Such concepts include constructing hardened shelters and living facilities at likely deployment bases and/or forward bases; acquiring and prepositioning deployable shelters capable of withstanding missile submunition impact; intra-base dispersal of aircraft over a wider area to increase the number of weapons required for the enemy to achieve the desired damage; abandoning large, fixed theater bases in favor of distributing the aircraft over a larger number of smaller bases (e.g., 10 aircraft each); and setting up a few "full-service" main operating bases (MOB) outside missile range from which aircraft could launch before temporarily recovering to one of many austere forward operating base (FOB) to re-arm and re-fuel in "touch and go" fashion.

[23] For a more complete discussion of the types and roles of early-entry ground forces, see Gritton, Eugene C.; Davis, Paul K.; Steeb, Randall; and Matsumura, John, *Ground Forces for a Rapidly Employable Joint Task Force: First-Week Capabilities for Short-Warning Conflicts* (Santa Monica, CA: RAND, 2000).

Figure 4 – Global Reconnaissance-Strike CONOPS/Actual Desert Shield Force Build-Up



The "design objective" of the CONOPS described above is not necessarily war-winning, though one could imagine conflict scenarios in which the military capability it represents might alone prove sufficient for achieving U.S. military objectives. Rather, it is to give the U.S. the much-needed capability to deal with an enemy who attacks without warning and who is armed with and willing to employ the full range of conventional and mass-destructive anti-access capabilities.

Moreover, while the concept is designed to improve U.S. theater warfighting capabilities, its utility is not limited to the theater warfare end of the conflict spectrum. Indeed, this concept would have high utility in all contingencies requiring the threat or application of U.S. military force—even those in which the U.S. has ample time to get to the theater and/or unobstructed access to theater bases. In such instances, two principal benefits of the GRS concept would be a more rapid achievement of military objectives and the placement of the fewest number of Americans in harm's way. Strategic agility is another advantage that would be realized across the conflict spectrum. Because the concept relies heavily on global range strike aircraft and is enabled by a small number of tactical aircraft forward-deployed in (or rapidly deployable to) key regions throughout the world, it would allow the U.S. to respond rapidly and effectively to crises in a greater number of different regions. It would also allow the U.S. to swing more effectively between theaters if conflict erupted in two theaters simultaneously, decreasing the strategic exposure the U.S. currently faces when committing significant numbers of forces to a particular theater.

Implications for U.S. Airpower Modernization

One of the more attractive features of the CONOPS described above is that it can be realized with existing programs. Supporting it thus requires only modest adjustments to the current airpower modernization plan. This allows the U.S. to begin transforming its power projection capabilities sooner than is commonly believed possible, and to do so without having to sacrifice near-term capability to fund the transformation. Below, we examine the ability of the current airpower plan to support the concept's essential components.

Theater Enabler. Of the three main airpower components in the Global Reconnaissance-Strike force, the theater enabler is perhaps best supported by the existing airpower modernization plan. The Air Force plans to field a total force of 339 F-22 stealth fighters, enough for

roughly 10 squadrons or just over three wings' worth of operational aircraft. The GRS concept postulates the forward deployment of 2-4 squadrons of theater enablers in each of the three most likely major warfighting theaters: Southwest Asia, where Iraq and Iran are considered the most likely competitors, Northeast Asia (Korea) and East Asia (China). Accordingly, the planned F-22 force represents what is likely the approximate number of *combat ready* aircraft required to support the GRS concept. Typically, however, an additional 20-30 percent must be added to the total aircraft inventory to account for aircraft lost at any given time to maintenance, training, or attrition. Thus, it is conceivable that *total* F-22 force requirements for supporting the GRS concept could exceed the number planned.

Among current and planned U.S. tactical aircraft, the F-22 appears to be uniquely capable of handling the theater enabler role. As mentioned above, the U.S. must concentrate its theater enabling capability into a force small enough to be either forward deployed in peacetime or so rapidly deployable in crises as to be virtually forward-deployed. For the U.S. to get the requisite theater enabling capability under this access "bar," the enabling platform must be capable of handling *both* the air-to-air (counter-air *and* counter-cruise missile) and air-to-ground (SEAD and counter-anti-access) missions *autonomously*. This requires the combination of dominant air-to-air capability, substantial air-to-ground capability, and stealth that only the F-22 will possess.

To fully outfit the F-22 for the theater enabler role, the Air Force may need to improve its air to ground capabilities (e.g., by giving it a more comprehensive suite of weapons) and pursue other enhancements (e.g., sensor and related avionics improvements) that would allow it to perform lethal SEAD and other air-to-ground missions more effectively. Nevertheless, if the F-22 program is not carried forward, the prospect of conducting sustained, high-volume precision strike operations from outside the theater will remain a distant one, dependent on the development of a whole new generation of autonomously survivable global strike and long-range (likely space-based or unmanned) C4ISR capabilities.

Existing Air Force fighters do not appear capable of assuming the theater enabler role. Current air-to-air (F-15C) and lethal SEAD (F-16CJ) assets are single-mission platforms, meaning that larger numbers of aircraft would be required in-theater to handle both the SEAD and air-to-air roles. Moreover, neither aircraft is stealthy; both could require a protective support "package" of its own to accomplish its mission. Thus, use of these aircraft in the theater enabling role would push the required in-theater platform levels above what the U.S. can expect to keep forward deployed during peacetime, or to rapidly deploy and sustain in the face of a serious anti-access threat.

Some may argue that the JSF—expected to be stealthy and programmed to carry two air-to-air missiles—might be capable of performing the theater enabler role, and thus argue for a deferment of F-22 production or a reduction in the planned buy. There are at least three reasons why this does not seem prudent.

First, it is much too early in the JSF program to determine the aircraft's ultimate capability to assume the theater enabler role. The F-22 is well into its developmental test program and just four years from full-rate production. By contrast, the JSF is in just the third year of a 12-year development program.

Second, the JSF will not be available in numbers until well after the anti-access threat is expected to blossom (~2010) and thus when the theater enabler is required—some 10-15 years after the F-22.[24] Deferring or canceling the F-22 in favor of the JSF would, at best, delay unnecessarily America's ability to take full advantage of its latent global strike capabil-

[24] It is worth noting here that many analysts believe that the DoD-scheduled gap between F-22 and JSF fielding is actually much shorter than recent history with fighter development would suggest. According to the a recent CBO report, the scheduled JSF developmental phase is 40% shorter than that of the F-22. The CBO report noted that many experts question whether DoD will actually be able to keep to such a tight schedule in a program that is supposed to produce three versions of the aircraft for three services. While DoD envisions the first JSFs reaching initial operational capability in 2008, many consider schedule delays inevitable and view 2013 or later to be a more likely IOC date.

ities and, thus, address the anti-access challenge.

Third, the JSF program appears to be in a prohibitively tight cost/configuration "box", particularly on Capitol Hill. With affordability the JSF's hallmark, Congress has told DoD that it would not tolerate any meaningful increase in programmed JSF unit flyaway costs ($43 million in $FY2000 for the Air Force variant) or any major changes in the three planned configurations (Air Force conventional take-off, Navy carrier-capable, and Marines vertical takeoff).[25]

These severe programmatic constraints could limit DoD's ability to reconfigure the JSF, which would likely be required for it to handle effectively the enabler role. As currently planned, the JSF will not likely have the capabilities needed to be dominant when deployed autonomously and in small numbers as envisioned for the theater enabler in the GRS concept. Unlike the F-22, it will not have the ability to cruise at high supersonic speeds, operate efficiently at altitudes which negate many otherwise dangerous surface-to-air threats, or carry a large air-to-air payload concurrently with a meaningful air-to-ground payload. Many believe it will also have a larger radar signature than the F-22. All of this means that the JSF will be less survivable if employed autonomously than it would be if employed in tandem with a true air superiority fighter. Indeed, as planned, the JSF will rely on the F-22 to enhance its survivability.

Sea-based strike. The sea-based strike component of the GRS force is also well supported by the current airpower plan. Under current plans, the Navy will fill its carriers' decks soon with multirole F/A-18E/Fs and F/A-18"G" lethal/non-lethal SEAD aircraft, and later with JSFs. The Navy also plans to field over 3,000 Block III and IV Tomahawk Land-Attack Missiles, or TLAMs, which offer highly survivable, long-range precision punch.

Looking to the future, increasing the range and survivability of the composite (aircraft/missile) sea-based strike force seems highly desirable. To this end, two steps appear worthy of consideration. The first would be to strive for the highest ratio of JSFs to F/A-18E/Fs as possible, as soon as possible. The JSF's stealth—which would reduce substantially the need for organic air-to-air and SEAD support and thus increase the number of actual bomb-droppers on deck—would be a significant force "multiplier." The greater the percentage of stealthy aircraft, the greater the effective striking power of the airwing. The Navy has had a long-standing requirement for a stealthy attack aircraft that simply will not be met with the Super Hornet. The JSF provides the Navy with an opportunity to regain the momentum toward this important goal it lost a decade ago with the cancellation of the A-12 program. In the interim, it seems prudent to continue with the planned F/A-18E/F procurement until the JSF program has matured to the extent that delivery of sufficiently stealthy Navy JSFs is a foregone conclusion.

The second potential step would be a longer-term shift in strike emphasis from manned aircraft to surface- and undersea-based long-range missile platforms. With the maritime anti-access threat growing (both in lethality and range), and thus the range at which carriers must stand off from the littoral increasing, the Navy's ability to strike targets deep inland with manned tactical aircraft will increasingly erode. Generally speaking, long-range missiles offer much greater potential striking range from their launch platform than do manned tactical aircraft. Moreover, sea-based standoff weapon platforms can be deployed separately from the carrier battlegroup (or dedicated permanently to the missile-launch role), allowing the Navy to keep a greater number of them on-station in theaters of interest and thus improve its overall presence and its strike forces' responsiveness. Because the focus of this analysis is on combat aircraft, a detailed discussion of future Navy standoff options is beyond our scope. However, it is clear that preparations for such a shift in strike emphasis might involve accelerated exploration of the

[25] The programmed JSF unit flyaway cost cited here is a DoD estimate. The Congressional Budget Office estimates Air Force JSF unit flyaway cost at $65 billion in FY2000 dollars—higher than Congress has suggested it would tolerate. CBO's estimate is based on historical patterns among price, weight, and performance.

next generation of missiles (to include cruise, ballistic and hypersonic) and missile platforms (both surface- and undersea-based, manned and un- or sparsely-manned).

The Navy might be able to greatly expand its sea-launched missile capability over the near-term simply by filling a large fraction (e.g., 50%) of its roughly 10,000 existing vertical launch system (VLS) tubes with low-cost surface-to-surface missiles, as recommended by the Naval Studies Board (NSB) in 1997. The NSB also suggested the Navy consider modifying its VLS tubes to accommodate "layers" of multiple weapons versus a single round. This would allow the Navy to effectively multiply the number of launchers and, at the same time, extend the length of time each platform can sustain its supporting fire before withdrawing from the theater to re-arm (at present VLS tubes cannot be reloaded at sea).

Global strike. In contrast to the sea-based strike and theater enabler components of the GRS force, the global strike component is not well-supported by the existing airpower modernization plan. The Air Force's long-term (i.e., through 2020) strike investment focuses exclusively on the theater-range Joint Strike Fighter; the Air Force does not plan to field a follow-on global strike system before 2037. Such an extreme skewing of strike resources toward short-range platforms is cause for deep concern. The JSF will not be significantly more rapidly deployable or meaningfully less dependent on theater basing than the aircraft it is slated to replace. By placing all of its strike "eggs" in the JSF "basket" the Air Force is reinforcing U.S. dependence on warning time and theater base access for the projection of military power. To the extent that the Air Force's large investment in JSFs crowds out investment in global strike capability over the near- to medium-term, the JSF-dominated Air Force strike modernization plan represents a major strategic opportunity cost.

In the GRS concept, the global strike force moves to center stage—it goes from being an auxiliary firepower source to carrying the bulk of the firepower burden during the initial phase of a theater campaign. The current and planned global strike force, however, is ill-configured to handle such an expanded role. Key global strike force objectives would include interdicting advancing enemy armored forces before they could achieve their initial military objectives; quickly degrading the enemy's overall warmaking capacity with "strategic" attacks against such targets as political and military command and control centers, defense-related industries, communications networks, and transportation system; and rapidly neutralizing the enemy's WMD and conventional anti-access capabilities. These target sets—which represent the enemy's most highly valued assets—would likely be heavily defended. In addition, the majority of the targets would likely be either mobile (e.g., advancing armor), relocatable (e.g., ballistic/cruise missile launchers), or hardened and/or deeply-buried (e.g., military command and control), and thus largely resistant to current generation cruise missiles, which have limited capability against targets with these characteristics.

This highly demanding target set presents serious problems for the planned global strike force, which is composed primarily of aircraft designed for operating in low- to medium-threat air defense environments. According to the Air Force's concept of operations for global strike aircraft, the B-52H would be limited to delivering long-range cruise missiles (the ~1,300 nautical mile-range CALCM) from outside enemy air defenses until the U.S. has achieved air "supremacy"—i.e., until the enemy's integrated surface-to-air defenses have been fully suppressed and the air threat neutralized. Although more survivable than the B-52H, the B-1B is nonetheless similarly constrained, limited to long-range cruise missile delivery until surface-to-air defenses have been at least partially suppressed, and medium-range cruise missile delivery (e.g., of the 200-250 nautical mile-range JASSM) until defenses have been mostly suppressed.[26] Only the

[26] It should be noted that the B-1B is prohibited under the START treaty from carrying the AGM-86C CALCM, the only long-range cruise missile in the Air Force inventory. As such, the B-1B would likely be sidelined altogether until enemy air defenses have been degraded to the point where it is safe for the B-1B to operate with only a medium-range cruise missile such as the JASSM.

B-2A is considered capable of safely penetrating unsuppressed air defenses.

Accordingly, a full 88 percent of the operational global strike force would be prohibited from executing the most time-critical missions until air defenses have been largely or, in the B-52H's case, totally neutralized. As we learned in ALLIED FORCE, such comprehensive shutdowns of enemy air defense systems are likely to become an increasingly difficult and time-consuming venture. After watching U.S. and allied aircraft quickly neutralize the highly centralized Iraqi air defense system during the Gulf War, Serbia adopted a much more decentralized approach, allowing SAM operators to keep their systems "turned off" unless directly engaging allied aircraft. Their intent was to preserve, to the extent possible, their air defense system and thus deny the U.S. the operational freedom that comes with knowing the SAM threat has been neutralized. Future adversaries can be expected to adopt similar tactics.

The existing requirement to neutralize enemy air defenses in order to facilitate B-1B and B-52H direct-attack operations is problematic because it would significantly slow the pace at which the U.S. could potentially achieve its core objectives. With the carrier-based lethal air-defense-suppression assets responsible for protecting the carrier-based strike forces, and the necessarily small F-22 force splitting its time between lethal air defense suppression and combat air patrol, the U.S. would likely need to devote the 16 available B-2As to lethal SEAD full-time until the air defense threat is degraded enough to permit B-1B and B-52H direct attack operations.[27] This would leave the U.S. with little, if any, residual firepower available for achieving such core, time-critical objectives as rapidly halting the enemy and degrading his anti-access capabilities to permit timely deployment of joint theater reinforcements. Failure to achieve these objectives in the war's opening days would greatly expand the enemy's window of opportunity for achieving his military aims and raise considerably the ultimate cost of redressing the aggression.

The central challenge, then, for the global strike force is to decrease substantially its dependence upon air defense suppression for effective operations in the early days of conflict. This would accelerate the pace at which heavily defended, time-critical targets of all kinds can be destroyed and increase the likelihood that U.S. military objectives could be achieved within an acceptable timeframe. To "decouple" global strike force effectiveness from the air defense suppression requirement, the force must receive an infusion of highly survivable attack capability. There are three principal options for doing so over the near- to medium-term (e.g., the 2010-2015 timeframe): 1) developing a new long-range cruise missile for the B-52H and B-1B,[28] 2) enhancing and expanding the B-2A fleet, and 3) building a new penetrating global strike aircraft.

The principal argument for a new long-range cruise missile (LRCM) is that it would allow both the B-52H and B-1B to strike targets from outside the lethal range of enemy air defenses during the earliest phases of conflict. However, there are problems with relying heavily on cruise missiles in leading-edge operations or as the primary option for shoring up the deficiencies of the planned global strike force. First, even if a new cruise missile program were started next year, the history of complex weapon system acquisition suggests new weapons might not enter service in numbers for another 10-15 years.[29] By this time, the strategic

[27] If the B-2As were operating from a regional forward base 3,000-4,000 nm from the theater, the force would likely generate an aggregate daily sortie rate of about 0.5, or about 8 sorties per day. Given the potentially large number of air defense targets, it is reasonable to assume that the U.S. would need virtually all of these daily sorties to apply sufficient firepower to the SEAD mission.

[28] For the purposes of this analysis, we define a long-range cruise missile as one with range sufficient to keep the launching aircraft out of hostile airspace while still enabling it to strike targets throughout a theater of operations. The B-52H's current cruise missile, the AGM-86C CALCM (conventional air-launched cruise missile), with a range of ~1,300 nautical miles, is generally thought to meet this definition. The CALCM, however, is at best an interim solution to the LRCM requirement. As mentioned above, the B-1B is prohibited from carrying CALCMs. Moreover, the CALCM supply is very limited and, more problematically, finite. CALCMs are converted nuclear ALCMs (AGM-86A/Bs), the production of which ended in 1986 at roughly 1,700 missiles. Considering the need to keep a certain percentage of the ALCMs in the nuclear force, the most that could be converted would range from a few to several hundred.

[29] It may be possible to develop in a much shorter timeframe an air-launched variant of the Navy TLAM. However, the range of the existing TLAM (~700 nm) would need to be improved significantly, and it would likely still suffer cost and capability disadvantages relative to direct-attack precision weapons deliverable via stealthy aircraft.

challenges necessitating a robust global strike capability will likely have been in full bloom for an extended period, and both the B-1B and B-52H will have reached the end of or, in the latter's case, far exceeded their originally planned service lives.

Second, even armed with a new LRCM, B-1B and B-52H participation in leading-edge operations might still be limited by such missiles' marginal effectiveness against many of the targets global strike aircraft would be required to destroy. Current-generation cruise missiles are effective against fixed, relatively soft, aboveground targets, but not so against hardened, buried and mobile/relocatable targets. Major advances in the state of the cruise missile art are necessary, then, to make cruise missiles viable attack options against the full spectrum of leading edge targets. Such advances are possible, but their timing is not predictable, and there are no obvious breakthroughs on the horizon.

Finally, there is the all-important question of cost. It is difficult to imagine a cruise missile possessing the required capabilities (e.g., very long range, hard-target penetration, mobile- and relocatable-target capable) with a unit cost much under $1 million, and certainly no less than $500,000 (for perspective, the unit cost of the medium-range JASSM is projected at $400,000). Even at $500,000, such a weapon would still be some 40-50 times more expensive than a direct-attack weapon (e.g., a 2000-lb JDAM; unit cost: $15,000), which has very high utility across the target spectrum.

The second option for rapidly infusing the global strike force with highly survivable attack capability is to strengthen the small fleet of stealthy B-2As, through both technological enhancements to the existing 21-aircraft force and through the procurement of additional aircraft. (It should be noted here that restarting B-2 production is a major undertaking that cannot be flatly advocated without careful consideration of many critical, as-yet unresolved issues. The high initial, non-recurring cost of restarting a cold production line, the timeframe in which new aircraft would enter service, and the production cost and capabilities [relative to the B-2A] of a new B-2 variant are three that come to mind. Nevertheless, as the following paragraphs suggest, the option of expanding the B-2 force appears sufficiently advantageous for improving U.S. global strike capabilities over the near-term that it should not be ruled out.)

Strengthening the B-2A force has a number of advantages over building a new cruise missile for substantially improving the global strike force over the near-term. First, it could yield significant additional capability very soon. Enhancements to the current B-2A fleet's survivability, maintainability (particularly of its external low-observable features), lethality (weapons suite and offensive avionics), connectivity (to the broader command and control and ISR infrastructures), forward deployability (to non-U.S. bases closer to, but still far outside, potential conflict theaters), mission planning system, and operational support infrastructure could be fielded progressively over the next two to five years. Such enhancements would effectively multiply the capability of the existing force by increasing its wartime sortie rate and allowing it to locate and destroy the full range of targets.

Meanwhile, new B-2s incorporating these enhancements—and thus superior capability to the current B-2A—could potentially begin entering the force at a rate of up to four per year by as early as 2006 or 2007 (if production were restarted in 2001). Therefore, while a new cruise missile might not enter service in numbers until as late as 2015, by as early as 2010 the U.S. could have in hand an operational fleet of some 41 enhanced B-2s. This is not to suggest that 41 aircraft is the proper force size, but rather to illustrate how quickly the U.S. could expand the fleet if it was determined to be the best course of action.[30]

[30] It is worth noting here that a range of analyses have pegged 30-60 aircraft as the minimum number required to exploit the B-2A's unique capabilities. RAND's Project Air Force, for example, has conducted a series of analyses of B-2A requirements for stopping armored invasions. RAND found that a force of up to 60 B-2As could be required to halt a short-warning invasion of Kuwait by Iraqi forces similar in size and composition to those that invaded Kuwait in 1990. RAND also found that if the B-2As were armed with advanced anti-armor weapons such as the Brilliant Anti-Tank (BAT)

Second, unlike building a new cruise missile, strengthening the B-2A force would yield robust capability against the full spectrum of targets. By virtue of its ability to safely deliver most any type of weapon through most any air defense network, the B-2A (or an equivalently stealthy global strike aircraft) will remain for the foreseeable future the ideal platform for any target considered susceptible to air attack.

Finally, increased reliance on stealthy aircraft capable of delivering low-cost precision direct-attack weapons is significantly more cost-effective than relying heavily on non-stealthy aircraft to deliver high-cost cruise missiles. To put the relative cost-effectiveness of a platform such as the B-2A in perspective, consider the following. A single sortie by a B-2A carrying sixteen 2,000-lb GPS-guided JDAMs delivers the same warhead tonnage as two B-52Hs carrying 32 CALCM-class cruise missiles with standard 1,000-lb warheads at a notional cost of $1 million each.[31] Yet, the total cost of B-2A's weapons is just $240,000, compared with over $32 million for the B-52Hs' weapons. Thus, when used instead of the B-52H/cruise missile combination, each B-2A/JDAM sortie saves *over $31 million*.

Some might question whether additional B-2s would be affordable in the current budget environment. However, funding for additional aircraft may not need to be drawn from other programs. Congress, and the House in particular, has expressed in recent years (1995 and 1997) a strong desire to pay for a B-2 force expansion with budget plus-ups, only to be rebuffed by the White House and the Pentagon. If the funding needed to come from an existing program or set of programs, a recent CBO analysis suggests that additional B-2s could be paid for with the savings generated through select program slowdowns rather than outright force trades. For example, the CBO said that if DoD extended the JSF schedule by only two years, the savings over the 2001-2010 timeframe would exceed $22 billion. Viewed in a cost-benefit sense, it would be hard to argue against waiting just two additional years for the JSF if the deferment would allow the U.S. to augment its global strike capabilities by orders of magnitude. This is particularly true considering the extent to which emerging challenges suggest that the Air Force should be seeking within its strike modernization plan a better balance between short- and global-range assets. Slipping the JSF even two years could, given the advancing age of the F-16 fleet, create a "bathtub" in the USAF's desired fighter force structure if the F-16 is not replaced on the current schedule. However, this could be mitigated if some of the savings from the JSF slip were used to purchase relatively inexpensive new F-16s to replace those that need to be retired first.

A third option for augmenting the global strike force over the near- to medium-term is to develop and field a new manned penetrator. Compared to building additional B-2s, however, this option entails substantial cost and schedule penalties that would need to be balanced by an equally significant increase in capability. According to DoD's 1995 "Heavy Bomber Industrial Capabilities Study," the R&D costs alone for a new aircraft with capabilities equal to the B-2A (i.e., global range, large payload, precision, and stealth) would be between $38 and $45 billion (FY1995 dollars). As for production costs, DoD found that even if the most aggressive acquisition reforms were incorporated, the unit production cost of the new aircraft would be roughly equal to that estimated for additional B-2As. Significant R&D and production cost savings could potentially be realized if the new aircraft were designed for conventional use only and if commercial information technology formed the basis of much of the aircraft's avionics system. Such savings are not, however, unique to a new

munition—as opposed to the currently programmed Sensor-Fuzed Weapon (SFW)—the number of B-2As required for this mission could be cut by up to one-half. This reduction is attributed to the more advanced weapon's larger search "footrprint", which effectively cuts the number of weapons (and thus aircraft) required to target and kill enemy forces within a given area.

[31] For perspective, the Air Force CALCM "fact sheet" lists the weapon's unit cost at $1,160,000, but does not specify dollar year. In its report on the Desert Storm air campaign, the GAO lists the CALCM's unit cost at $1,875,000 in FY99 dollars.

global strike aircraft. It is widely believed that if the Air Force decided to build additional B-2s, to lower production costs they would strip the aircraft of all systems, characteristics, and performance requirements related to nuclear weapon delivery and utilize, to the extent possible, commercial-off-the-shelf (COTS) information technology to modernize its avionics.

With regard to schedule, the aforementioned DoD study estimated that it would take up to 16 years from the start of a new program to deliver the first operational aircraft;[32] it would take an additional five years or so for this first aircraft to reach full operational capability. The first new B-2, on the other hand, could be fully operational within just five or six years—*over 20 years sooner than a new aircraft, even if the new program were started next year*.

Finally, if a new manned penetrator program were started immediately—and thus without the benefit of a sustained global strike technology development program—it is unlikely that the new aircraft would meaningfully exceed the B-2A's performance. Indeed, most of the technological advances on the horizon related to global strike (e.g., in the areas of weapons, avionics, and low-observability and LO maintenance) that could be incorporated into a new aircraft could likely also be added into new B-2s.

While strengthening the B-2A force through enhancements and the low-rate production of additional aircraft would likely provide an adequate global strike capability "bridge" through 2025, preparations should begin now for fielding capabilities to replace the B-1B and B-52H fleets in the 2020-2025 timeframe. By this time, both aircraft will have exceeded their originally planned service lives and will have become, like all aging aircraft, much more expensive to operate and maintain. Thus, while the Air Force currently plans to operate the B-52H and B-1B through 2037, strong incentive exists for accelerating their retirement schedule—and thus the developmental schedule of a replacement capability or set of capabilities—by 15 to 20 years.

A wide range of potential alternatives exists for such a next-generation global strike capability(s).[33] It is not at all clear, for example, that a manned penetrating platform will remain, over the longer-term, the most cost-effective means of rapidly and survivably delivering large payloads of precision firepower over long distances. For example, future advances in such areas as materials, propulsion, sensors, flight controls, navigation, avionics, and explosives might substantially lower the cost of cruise missiles while increasing their capability. This could shift the cost-effectiveness balance from manned penetrators to standoff weapons and favor some sort of commercially-developed "arsenal plane" option. By the same token, unmanned aircraft may emerge as the platform of choice and, in the process, diminish the current casualty-minimization advantages standoff weapons have *vis-a-vis* manned penetrating platforms.

Given the broad warfighting role global strike systems would assume in the Global Reconnaissance-Strike concept, and the potentially wide-ranging impact of future technological advances on major systems such as air and spacecraft, weapons, and their supporting C4ISR, the national interest would probably best be served by the development of a mix of both penetrating and standoff capabilities. The current balance between the two could well shift over time, but given the high premium on broad combat effectiveness, the utility of

[32] Kaminski, Paul, *Under Secretary of Defense for Acquisition and Technology, Final Report of the Heavy Bomber Industrial Capabilities Study* (Washington, DC: Department of Defense, 1995), pp. 55-70.
[33] Potential penetrating alternatives include: a manned subsonic stealth aircraft (likely a variant of the B-2A); a manned subsonic aircraft (likely stealthy); a manned hypersonic aircraft (potentially transatmospheric, potentially stealthy); and an unmanned subsonic, supersonic or hypersonic aircraft. Potential standoff alternatives include: a commercially-developed missile carrier (armed with cruise and/or hypersonic missiles); a hybrid missile carrier/large transport-tanker aircraft (also potentially commercially-developed); conventional intercontinental cruise and/or ballistic missiles (to include a reconfiguration of existing nuclear ICBMs); and space-based strike (using armed and/or unarmed kinetic-energy weapons, directed-energy (e.g., laser) weapons, or both.)

penetrating platforms is likely to endure, if narrowly.

A prudent and flexible approach to the development of future global strike capabilities would be to prepare now to exploit as-yet immature or unforeseen technologies as they emerge to impact the global strike mission area. To this end, DoD (with active Air Force and Navy participation) should consider establishing a global strike technology program, funded at a sustainable level (e.g., $80-100M per year) over the next four to five years, to: 1) track, collect, and assess emerging technologies relevant to future global strike capabilities; 2) focus system-based research and analysis on critical technical, operational, and cost issues; and 3) develop bases for future (e.g., by 2006) decisions to begin specific global strike programs. Analogous to the Joint Advanced Strike Technology, or JAST, program that preceded the JSF, such a program could provide for the systematic review of technologies and concepts necessary to inform future decisions about global strike capability acquisition *without premature commitment to a particular program(s).*

Conclusions

Combat aircraft modernization stands at the center of the defense planning debate. At present, the focus is on tactical aircraft and the big question has been whether the U.S. can afford to spend some $340 billion on over 3,700 new F-22s, F/A-18E/Fs and Joint Strike Fighters. This is the wrong question. The right question is to ask whether it makes strategic sense for America to invest *only* in short-range aircraft over the next 20-30 years. We believe that it does not, and that emerging power projection challenges require not only a rethinking of the current airpower modernization plan, but also a fundamental reassessment of the power projection strategy it is designed to support. Such an approach, we believe, will help set the airpower debate on a new, more strategically productive track. In the process, it will underscore the shortsightedness of the long-standing competition between global strike proponents, land-based fighter advocates and carrier aviation backers that has succeeded only in slowing America's strategic progress.

The success of the current U.S. power projection strategy rests on assumptions about future conflict—namely, that U.S. forces will have time to deploy to the theater before the onset of hostilities, and that they will have ready access to the theater itself—that are becoming increasingly implausible. Consequently, there is growing risk inherent in U.S. strategy. To mitigate this risk over the near-term, the U.S. must act aggressively to lessen its dependence on the critical time and access assumptions. The Kosovo War illustrated that such a strategic transformation is possible over the near-term. Operation ALLIED FORCE effectively validated the concept of "importing" the necessary early firepower to the theater from both the sea and from land bases outside the theater.

By shifting the leading-edge firepower burden to extratheater-based global strike aircraft and sea-based strike forces (aircraft and missile), the U.S. would be capable of rapidly projecting massive destructive power overseas—without having to first deploy large numbers of joint forces to the theater of conflict. All the U.S. would absolutely need in-theater to unlock the full potential of its composite strike force is a small contingent of "enabling" aircraft charged with protecting both the strike force and the command and control and ISR aircraft upon which the global and sea-based strikers depend for targeting and battle management. Together with early-arriving light and lethal land forces, the composite strike force and theater enabling aircraft would have two principal objectives: halting the aggression by attacking the enemy's invasion forces and his warmaking capacity, and enabling the safe deployment of joint theater reinforcements by neutralizing the enemy's anti-access capabilities.

Adoption of this "Global Reconnaissance-Strike" concept is possible over the near-term

because it builds on existing programs. Indeed, the current airpower modernization plan is already well structured to support two of the concept's three main airpower components. The sea-based strike component is well supported by the F/A-18E/F/G, JSF and Navy stand-off weapon programs. And while the Air Force may need to improve the F-22's air-to-ground capabilities—and will certainly need to develop viable concepts for operating it in an anti-access environment—the F-22 appears uniquely capable among all current and planned tactical aircraft of filling the critical theater enabler role.

In casting the F-22 as a vital component of a concept designed specifically to counter the emerging anti-access challenge, this represents a substantial departure from the prevailing strategic rationale for the F-22. However, it is just the kind of light in which the F-22 must be viewed for its long-term strategic utility to be fully appreciated. The current F-22 rationale, which holds that it is needed to restore U.S. air-to-air dominance in the face of emerging foreign air-to-air challenges, is viewed by many as insufficiently compelling to justify its cost. Moreover, many who advocate military transformation cite the anti-access threat as a principal reason not to invest in the F-22. If the F-22 can be shown to be essential to meeting the anti-access challenge, champions of transformation who currently oppose the F-22 could well come to regard the aircraft as a top transformational priority.

Where the current airpower plan falls short is with the global strike force. The Air Force strike modernization plan is devoted exclusively to the short-range JSF. Under current plans, new global strike capability will not enter service until 2037. However, the planned combat-ready force of 16 B-2As, 44 B-52Hs, and 70 B-1Bs is ill-configured to handle the greatly expanded and highly demanding warfighting role it would necessarily assume under the Global Reconnaissance-Strike concept. The primary deficiency is the poor survivability of the B-1B and B-52H in the face of modern air defenses. These aircraft, which comprise nearly 90 percent of the active force, would be prohibited from participating in the most critical global strike aircraft missions until air defenses have been mostly or, in the older B-52H's case, totally suppressed. The F-22 and B-2A together are potentially capable of handling the defense suppression role, but devoting these two assets to defense suppression early in the conflict would leave little, if any, residual offensive capability for achieving core, time-critical military objectives within a favorable timeframe.

To redress this critical global strike capability deficit—and thus make possible the near-term adoption of the Global Reconnaissance-Strike concept—the U.S. would need to give its global strike force a meaningful infusion of highly survivable attack capability. It would appear that the most cost-effective primary option for doing so over the near-term is to strengthen the small B-2A fleet through both enhancements to the existing 21-aircraft force and through the low-rate production of new aircraft incorporating these enhancements.

Cruise missiles will likely remain over the medium-term a supplementary—though potentially very useful—source of survivable global-range firepower. However, they will likely remain too costly and continue to lack the broad effectiveness necessary to form the backbone of a viable global strike force.

Developing a wholly new manned penetrator, as some propose, is difficult to justify on the basis of cost, schedule, and/or capability. Developmental costs alone for a new aircraft program, if begun within the next few years, would likely exceed $40 billion. Yet, global strike aircraft technology does not appear to have advanced appreciably beyond the B-2A to warrant such a high R&D expenditure. In addition, most of the global strike-related technological advances that could be incorporated in a new aircraft could also be incorporated into new B-2s. Lastly, new B-2s would enter the operational force some 15-20 years sooner than would the first new "B-3s." So while any decision to restart B-2 production would necessarily entail careful consideration of many unresolved issues related to cost, schedule, and capability, the arguments for expanding the B-2 force are compelling enough for us to argue

that this option not be foreclosed.

Over the longer-term, the U.S. should consider accelerating by 15-20 years its development of the next generation of global strike capabilities, with the objective of replacing the B-1B and B-52H fleets during the 2020-2025 timeframe. The first phase of development should consist of a five- to six-year global strike technology program designed to identify emerging technologies with potential impact in the global strike area and to develop the foundation for making specific program decisions.

In sum, we conclude that the current airpower modernization plan requires adjustment to support an effective U.S. response to emerging strategic challenges. However, the required adjustment—striking a better balance between short- and global-range land-based strike aircraft—is by any definition modest. This leads us to conclude further that the U.S. can achieve a strategic transformation of meaningful proportions sooner than conventional wisdom holds possible by simply leveraging properly its existing airpower programs. In addition to a better balance among short- and global-range assets, this involves aggressive exploitation of their combined capabilities in the context of advanced operational concepts. Thus, while a wholesale transformation of U.S. *forces* is rightly considered a long-term prospect, a transformation of U.S. *capabilities*—achieved with only a minor adjustment to the airpower modernization plan—should be considered an objective eminently affordable and achievable over the near-term.

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