Meeting the Anti-Access and Area-Denial Challenge

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by

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EXECUTIVE SUMMARY

During the Cold War, the United States defense posture called for substantial forces to be located overseas as part of a military strategy that emphasized deterrence and forward defense. Large combat formations were based in Europe and Asia. Additional forces—both land-based and maritime—were rotated periodically back to the rear area in the United States. This posture was both effective and possible for a variety of reasons. The United States had a clear understanding of the principal threats to its security, high confidence as to where major acts of aggression were likely to occur, and a belief that forward bases were reasonably secure, even in the event of enemy attack.

These conditions either no longer exist or, where they do, are subject to trends that appear most unfavorable to their long-term survival. Today the US military Services are struggling to adapt to an expeditionary era. This expeditionary era has emerged from two defining developments. First, due to the collapse of the Soviet empire in 1989 and of the Soviet Union, itself, in 1991, increasingly US combat forces have been brought home from the overseas garrisons, bases, and ports they once occupied on the periphery of America's Cold War adversary. Second, there is ample reason to anticipate that future adversaries, having seen Iraq routed twice by US-led coalition forces after they were allowed to deploy unmolested into Southwest Asia, will seek asymmetric ways of opposing the movement of US military forces into their region.

While US power-projection operations are becoming more difficult owing to political, geographic, and resource constraints, there is a growing challenge in the military dimension of power-projection operations as well. This is particularly true with respect to the traditional form of US power-projection operations, which involves deploying and sustaining air and ground forces at or through major ports and airfields. For maritime forces, power projection now implies moving into the littoral to influence operations inland on a far greater scale than was the case only a few decades ago. It also means controlling the littoral in order to sustain US and allied ground and air forces ashore.

Prospective adversaries are developing and fielding, or have ready access to, military capabilities that will place US forces operating from large, fixed forward bases, and in the littoral regions, at increasing risk. Consequently, the Pentagon faces new challenges to the operations of air and land forces from overseas bases, as well as how best to structure its maritime forces to operate in the littoral.

Even more disconcerting is the growing proliferation of national and commercial satellite services and missile technology. Increased access to these satellite services will allow even regional rogue states both to pretarget key fixed facilities and to monitor US deployments into forward bases. Unless one makes heroic assumptions regarding advances in missile defense effectiveness—which this assessment does not—these facilities can be held at risk through the employment of even moderate numbers of ballistic and cruise missiles. This is particularly true if an adversary has and threatens to use missiles with chemical, biological, radiological, nuclear, or enhanced explosives warheads.

Starting in the mid-1990s, senior US military leaders began voicing strong concern over the US military's ability to deal with such a contingencies. General Ronald Fogleman, then Air Force chief of staff, observed in 1996 that

> Saturation ballistic missile attacks against littoral forces, ports, airfields, storage facilities, and staging areas could make it extremely costly to project US forces into a disputed theater, much less carry out operations to defeat a well-armed aggressor. Simply the threat of such enemy missile attacks might deter US and coalition partners from responding to aggression in the first instance.

As Secretary of Defense Donald Rumsfeld noted, "[P]otential adversaries . . . see that our ability to project force into the distant corners of the world where they live depends, in some cases, on vulnerable foreign bases." Deputy Secretary of Defense Paul Wolfowitz, in expanding on Secretary Rumsfeld's observation, stated that

> US forces depend on vulnerable foreign bases to operate—creating incentives for adversaries to develop "access denial" capabilities to keep us out of their neighborhoods. We must, therefore, reduce our dependence on predictable and vulnerable base structure, by exploiting a number of technologies that include longer-range aircraft, unmanned aerial vehicles, and stealthy platforms, as well as reducing the amount of logistical support needed by our ground forces.

If anti-access (A2) strategies aim to prevent US forces entry into a theater of operations, then area-denial (AD) operations aim to prevent their freedom of action in the more narrow confines of the area under an enemy's direct control. AD operations thus include actions by an adversary in the air, on land, and on and under the sea to contest and prevent US joint operations within their defended battlespace.

Aerial AD operations include coordinated operations by an enemy's air forces and integrated air defense forces to maintain a degree of air parity or superiority over their territory and forces. Land AD operations might include short- to medium-range artillery, rocket, or missiles strikes against US maneuver forces at either their littoral penetration points or at air-landing points, before they can disperse and when they are most vulnerable; wide-area mine fields; contamination of large areas by chemical, biological, or radiological agents; and counter-special operations tactics. Long-range maritime AD threats include antiship cruise or even ballistic missiles, and submarines. Closer to shore, sophisticated mines, coastal submarines, and small attack craft could be employed against US forces.

Again, the implications for US power-projection operations are both clear, and disquieting. As the then-chief of naval operations, Admiral Jay Johnson, observed:

> I anticipate that the next century will see those foes striving to target concentrations of troops and materiel ashore and attack our forces at sea and in the air. This is more than a sea-denial threat or a Navy problem. It is an area-denial threat whose defeat or negation will become the single most crucial element in projecting and sustaining US military power where it is needed.

How have the Air Force, Navy, Marine Corps, and Army responded to this emerging challenge? Perhaps the most striking feature of their individual responses to the A2/AD challenge so far is the absence of a truly joint approach. Instead, each Service appears to be pursuing its own solution, for its own institutional purposes, within the boundaries of its traditional warfighting roles and domain. The Air Force's Global Strike Task Force (GSTF) concept focuses on turning the short-range F-22 into an F/A-22 able not only to have a devastating first-look, first-shot advantage over enemy fighters, but also to kick in the door to denied airspace by taking out advanced surface-to-air missiles (SAMs) as well as critical mobile targets such as enemy mobile-missile launchers.

However, unless the GSTF can succeed in suppressing or destroying such systems very quickly—probably within a day or two at the most—the closure of the Army's first few Objective Force brigades on the desired timelines is likely to be delayed. Similarly, whether the sea base is assured or not, V-22 insertion of a Marine combat battalion into enemy battlespace still actively defended by SA-20 class SAMs would also have to wait for the suppression of these AD systems by the GSTF. At the same time, except for Tomahawk land attack cruise missiles (TLAMs), the Navy will have no realistic means of attacking these defenses with manned aircraft until the F-35 Joint Strike Fighter enters service. Indeed, because the SA-10D is believed to have a credible capability against non-stealthy cruise missiles such as the TLAM, the Navy appears to have no capability to attack any critical inland targets in the face of S-300/S-400 class SAMs. Thus, in an A2/AD environment, the ability of the entire joint force to project power promptly ashore may hinge at the outset on the viability of the GSTF to eliminate various A2 and AD systems in a matter of hours to a day or two. And, given the operational risks inherent in the GSTF, doing so appears to be a non-trivial challenge—especially in the absence of long-range, penetrating, staring surveillance.

Operationally, the Army's admirable goals of being able to have a brigade combat team on the ground anywhere in the world within 96 hours, and an entire division with 120 hours, are laudable lines to draw in the sand for an expeditionary era. However, even if the operational risks in the GSTF are set aside, these brigades still appear to require more strategic and in-theater airlift than either the Air Force or Navy are ever likely to field. Beyond simply getting the combat units on the ground within the desired timelines, there is the additional burden of logistical sustainment for light, dispersed ground forces operating deep in enemy territory. As Chapter IV notes, the Army is exploring advanced airlift and sealift options. At best, though, they lie far in the future, and the fiscal pressures on the Army created by the Future Combat System (FCS) alone suggest that, in the end, other Services will have to bear much of the development and procurement burden of such systems if they are to be fielded before 2015. Consequentially, there appears to be a major disconnect between the deployment goals of the Army's Objective Force and the lift capacity of the rest of the joint force.

Turning to the Department of the Navy, the overriding risk to its current approach to the A2/AD challenge is, surely, fiscal. As suggested in Chapter III, the new class of littoral combat ships (LCSs) will probably cost $2-3 billion per year over a period of 15 years just to construct. Manning and operating this new class of ships will create additional costs. Even if one assumes that the Defense Department's 051 topline grows to $483.6 billion in discretionary budget authority by FY 2009, as the Department presently projects, paying for this new class of ships

will probably require the transfer of some total obligation authority (TOA) from the Air Force's or Army's topline to the Navy Department. If, on the other hand, the 051 topline begins leveling off, as history would suggest, before FY 2009, an even larger reallocation of Service budget shares will be needed to pay for the LCS class of ships and the associated growth of the fleet to 375 ships. Thus, even before one contemplates the non-trivial operational risks of trying to operate these vessels close to the shore within the reach of enemy AD capabilities, the fiscal assumption that the DoN can count on an increasing share of TOA at the expense of its sister Services over the next 15-20 years seems to require a major leap of faith about maritime preeminence in the expeditionary era. Unless this leap of faith is borne out, the more likely outcome is that the LCS class will not be fielded in the numbers presently envisioned.

The disconnects between individual Service solutions to the A2/AD challenge, then, are substantial. Furthermore, these disconnects suggest an obvious recommendation. A joint approach to the prospective A2 and AD capabilities of future US adversaries is crucial if the various path, operational, technological, and fiscal risks are to be mitigated or hedged against to any serious degree.

Granted, one could argue or assume that A2/AD threat, as depicted in this report, is overblown and will not emerge within this decade—or the next. Doing so, of course, would be tantamount to judging the risk of encountering serious A2 or AD capabilities before 2020 as unlikely or remote. In other words, foreseeable opponents concerned about United States projecting power into their regions of the world will not really be serious for a long while to come. At the end of the day, however, this viewpoint appears to be a huge gamble and one that neither prudence nor history could recommend with much confidence.

I. New Challenges to Power Projection

Introduction

During the Cold War, the United States defense posture called for substantial forces to be located overseas as part of a military strategy that emphasized deterrence and forward defense. Large combat formations were based in Europe and Asia. Additional forces—both land-based and maritime—were rotated periodically back to the "rear area" in the United States. This posture was both effective and possible for a variety of reasons. The United States had a clear understanding of the principal threats to its security, high confidence as to where major acts of aggression were likely to occur, and a belief that forward bases were reasonably secure, even in the event of enemy attack.

As the following discussion will make clear, these conditions either no longer exist or, where they do, are subject to trends that appear most unfavorable to the continued viability of Cold War approaches to the forward basing of US power-projection forces.

What Has Changed

Despite all the uncertainties the US military must confront in preparing for the future, two trends seem apparent. First, given the United States' current military dominance, the incentive is high for would-be adversaries to present the American military with very different challenges than those which US forces confronted during the Gulf War, or even during more recent operations, such as Operation Allied Force in the Balkans and Operation Enduring Freedom in Afghanistan. Second, the diffusion of military technologies and the rapid progression of military-related technologies may increasingly offer such adversaries the means to achieve this goal. These two trends will play out within the context of three new realities.

Operational Realities

The Cold War was characterized by large numbers of US ground, air, and maritime forces based and deployed around the periphery of the Soviet empire. Since its peaceful conclusion, and as the imminent threat to our allies overseas diminished, the number of US forces based overseas has declined, and the bulk of US combat power was repositioned in the continental United States. As a consequence, the 1990s saw the Services grapple, with varying degrees of difficulty, with the challenge of adapting their "garrison" forces to a new "expeditionary" age. The challenge was particularly acute for the Army and Air Force, which had long maintained large forward garrisons in Europe and northeast Asia, equipped to fight intense battles in relatively small geographic theaters of operations.

With the arrival of the new century, and faced with the new task of fighting a global war on terrorism, US military planners once again might prefer a forward-based posture that would allow them to preempt terrorist activity or to respond rapidly to their attacks. Notwithstanding the force-protection issues such a posture would incur, the United States lacks the resources and the political support abroad to establish a comprehensive network of forward bases so as to

position forces forward to address every plausible threat. Put another way, even if there were no political obstacles to the unrestricted use of overseas bases, the United States cannot afford to maintain a major presence in every corner of the globe. Hence the United States must be prepared to project its forces into distant theaters over inter-continental distances.

Political Realities

Again, the collapse of the Soviet Union led to a substantial reduction in the number of US overseas bases. At the same time, with its attention freed from a dominant focus on air-land operations in Europe, the United States increased both the pace and scope of its worldwide military operations. These changes occurred even as its allies took an increasingly regional focus on security issues, with a corresponding reduction in their willingness to commit to military operations other than those involving local security or those that receive broad sanction from the international community. Consequently, the United States, which has broadened and expanded its global responsibilities and operations, has found it necessary to cobble together ad hoc coalitions, or "coalitions of the willing," to meet threats to its own or international security.

As a result, unlike during the Cold War, US defense officials can no longer assume that allies will automatically provide base access whenever it is needed. Indeed, gaining base access for overseas expeditionary operations is now a central concern of US military planners. However, by their very nature, "coalitions of the willing" imply that political access to forward bases cannot be taken for granted, nor can it be assumed that such bases, even if provided, will be sufficient for the task at hand. For example, during Operation Desert Fox in 1998, both Saudi Arabia and Turkey refused to allow US air strikes on Iraq to originate from bases on their soil. Similarly, in 1999, Greece, America's long-term North Atlantic Treaty Organization (NATO) ally, refused to permit US forces to operate from its bases during Operation Allied Force. In 2001, the United States found unfettered forward base access difficult to come by in the war against al Qaeda terrorist forces and the Taliban regime in Afghanistan.

More recently, the United States literally spent months trying to secure access to overseas bases in order to execute military operations against Iraq. The protracted negotiations undermined the US military's stated goal of being able to bring overwhelming power to bear promptly against an enemy. Moreover, the negotiations were only partially successful, as even long-time allies such as Turkey refused Washington's request to permit the deployment of American ground forces through its territory. In short, US requests for forward base access now typically encounter political resistance, either in the form of refusal to allow access to bases, or the granting of access with severe restrictions on their use, especially in the case of strike operations.

Geographic Realities

Nor can the US military be confident that adequate basing facilities will be available even if political access is unproblematic. During the Cold War, the United States developed modern base facilities to optimize the military's ability to execute the strategy of containment of the Soviet Union. Correspondingly, the US military developed forces that became dependent on these well-developed facilities in Western Europe and Northeast Asia. But the Cold War is over, and the US military has confronted the harsh reality that basing facilities in many other parts of

the world—in places such as Somalia, Albania, and Afghanistan—are austere to the extreme compared to their Cold War–era counterparts. Indeed, the Army's current transformation efforts seem driven, to a significant degree, by its inability to deploy forces rapidly to the Albania-Kosovo border during the 1999 Balkan conflict.[1]

Making matters worse, potential flash points, such as the Asian subcontinent, Spratly Islands, and Taiwan Straits, lie in regions that possess relatively modest local basing facilities to accommodate either the US military's predominately short-range tactical fighter forces or its medium/heavy ground forces. Areas of instability, such as the Persian Gulf, Indonesian archipelago, and Taiwan Straits are characterized by maritime choke points or relatively narrow bodies of water that could make maritime operations difficult.

At the same time, there is increased uncertainty with respect to which state, collection of states, or non-state actors will pose the next major threat to US interests. Since 1989 the US military has conducted operations in Panama, Iraq, Somalia, Haiti, Bosnia, Sudan, Albania, and Afghanistan. While hot spots remain in places like the Persian Gulf and the Korean Peninsula, given America's increasingly muscular approach to foreign affairs, it is more and more difficult to predict with high confidence where its forces will be deployed next, or if there will be adequate base structures once they get there.

THE MILITARY CHALLENGE: ANTI-ACCESS/AREA-DENIAL (A2/AD)

While US power-projection operations are becoming more difficult owing to political, geographic, and resource constraints, there is a growing challenge in the military dimension of power-projection operations. This is particularly true with respect to the traditional form of US power-projection operations, which involves deploying and sustaining air and ground forces at or through major ports and airfields. For maritime forces, power projection now implies moving into the littoral to influence operations inland on a far greater scale than was the case only a few decades ago. It also means controlling the littoral in order to sustain US and allied ground and air forces ashore.

Prospective adversaries are developing and fielding, or have ready access to, military capabilities that will place US forces operating from large, fixed forward bases, and in the littoral regions, at increasing risk. Consequently, the Pentagon faces new challenges to the operations of air and land forces from overseas bases, as well as how best to structure its maritime forces to operate in the littoral.

[1] The principal metric employed by the Army to define its Objective Force brigades concerns their ability to deploy to a forward base within four days. The primary challenge encountered by the Service's Task Force Hawk during Operation Allied Force was its inability to deploy quickly.

Anti-Access (A2)

Even more disconcerting is the growing proliferation of national and commercial satellite services and missile technology. Increased access to these satellite services will allow even regional rogue states both to pretarget key fixed facilities and to monitor US deployments into forward bases.[2] Unless one makes heroic assumptions regarding advances in missile defense effectiveness—which this assessment does not—these facilities can be held at risk through the employment of even moderate numbers of ballistic and cruise missiles. This is particularly true if an adversary has and threatens to use missiles with chemical, biological, radiological, nuclear, or enhanced explosive (CBRNE) warheads.

Starting in the mid-1990s, senior US military leaders began voicing strong concern over the US military's ability to deal with such a contingencies. General Ronald Fogleman, then Air Force chief of staff, observed in 1996 that

> Saturation ballistic missile attacks against littoral forces, ports, airfields, storage facilities, and staging areas could make it extremely costly to project US forces into a disputed theater, much less carry out operations to defeat a well-armed aggressor. Simply the threat of such enemy missile attacks might deter US and coalition partners from responding to aggression in the first instance.[3]

Admiral Jay Johnson, then chief of naval operations, expressed very similar concerns when he declared

> Over the past ten years, it has become evident that proliferating weapon and information technologies will enable our foes to attack the ports and airfields needed for the forward deployment of our land-based forces. [4]

Perhaps most revealing, however, are the comments of a retired Indian brigadier general, who observed that future access to forward bases

> is, by far the trickiest part of the American operational problem. This is the proverbial "Achilles heel." India needs to study the vulnerabilities and create covert bodies to develop plans and execute operations to degrade these facilities in the run up to and after commencement of hostilities. Scope exists for low cost options to significantly reduce the combat potential of forces operating from these facilities.[5]

The National Defense Panel (NDP), formed by Congress in 1997 to review long-term US strategy, concluded that the threat to forward base access was real, and would almost certainly

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[2] The ability of the world's militaries to tap into the commercial satellite architecture for targeting purposes is reflected in the Chinese military's use of US commercial satellite imagery to identify targets in Taiwan for missile attack. Bill Gertz, "China Buys US Satellite Data To Target Taiwan," *Washington Times,* February 7, 2002, p. 1.

[3] Bill Gertz, "The Air Force and Missile Defense," *Air Force Magazine*, February 1996, p. 72.

[4] Admiral Jay Johnson, "Anytime, Anywhere: A Navy for the 21st Century," *Proceedings,* November 1997, p. 49.

[5] Brigadier V. K. Nair, *War in the Gulf: Lessons for the Third World* (New Delhi, India: Lancer International, 1992), p. 230.

grow over time.[6] The NDP therefore concluded that the United States "must radically alter" the way in which its military projects power.[7]

Area-Denial (AD)

If A2 strategies aim to prevent US forces entry into a theater of operations, then AD operations aim to prevent their freedom of action in the more narrow confines of the area under an enemy's direct control. AD operations thus include actions by an adversary in the air, on land, and on and under the sea to contest and prevent US joint operations within their defended battlespace.

Aerial AD operations include coordinated operations by an enemy's air forces and integrated air defenses to maintain a degree of air parity or superiority over their territory and forces. Land AD operations might include short- to medium-range artillery, rocket, or missiles strikes against US maneuver forces at either their littoral penetration points or at air-landing points, before they can disperse and when they are most vulnerable; wide-area mine fields; contamination of wide areas by chemical, biological, or radiological agents; and counter–special operations tactics. Long-range, maritime, AD threats include long-range, antiship cruise, or even ballistic, missiles, and long-range submarines. Closer to shore, sophisticated mines, coastal submarines, and small attack craft could be employed against US forces.[8]

Again, the implications for US power-projection operations are both clear, and disquieting. As Admiral Johnson observed:

> I anticipate that the next century will see those foes striving to target concentrations of troops and materiel ashore and attack our forces at sea and in the air. This is more than a sea-denial threat or a Navy problem. It is an area-denial threat whose defeat or negation will become the single most crucial element in projecting and sustaining US military power where it is needed.[9]

MEETING THE A2/AD CHALLENGE

Would-be adversaries thus have strong incentives to adopt this indirect approach to defeating, or deterring, US power-projection operations. The effort, as noted above, seems well under way. According to a recent Defense Science Board (DSB) study, a regional power's development of this kind of A2/AD capability by 2010 is quite plausible, even given relatively severe resource constraints.[10] A commander-in-chief of US forces in Korea declared that the problem of forward

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[6] National Defense Panel, *Transforming Defense* (Washington, DC: US GPO, December 1997), pp. 12-13.

[7] National Defense Panel, *Transforming Defense*, p. 33.

[8] For a discussion of the maritime AD threat, see VADM Arthur K. Cebrowski and Captain Wayne P. Hughes, US Navy (Ret.), "Rebalancing the Fleet," *Proceedings,* November 1999; and Captain Wayne P. Hughes, US Navy (Ret.), *Fleet Tactics and Coastal Combat* (Annapolis, MD: Naval Institute Press, 2000), pp. 145–68.

[9] Johnson, "Anytime, Anywhere: A Navy for the 21st Century," p. 49.

[10] DSB, *Final Report of the Defense Science Board Task Force on Globalization and Security* (Washington, DC: Office of the Under Secretary of Defense for Acquisition and Technology, December 1999), p. vi.

base access is not a problem for the US military of 2010, but one has existed in embryonic form in Korea for much of the 1990s, and which will only worsen over time.[11]

These concerns have not been lost on the current Defense Department leadership. As Secretary of Defense Rumsfeld noted, "[P]otential adversaries . . . see that our ability to project force into the distant corners of the world where they live depends, in some cases, on vulnerable foreign bases."[12] Deputy Secretary of Defense Paul Wolfowitz, in expanding on Secretary Rumsfeld's observation, stated that

> US forces depend on vulnerable foreign bases to operate—creating incentives for adversaries to develop "access denial" capabilities to keep us out of their neighborhoods. We must, therefore, reduce our dependence on predictable and vulnerable base structure, by exploiting a number of technologies that include longer-range aircraft, unmanned aerial vehicles [UAVs], and stealthy platforms, as well as reducing the amount of logistical support needed by our ground forces.[13]

Defeating the A2/AD threat promises to be a very challenging proposition. States developing A2/AD forces could do so in such as way as to make entry into a theater of operations more problematic, to deny US forces adequate freedom of action once they get there, and to degrade the effectiveness of US counter-A2/AD operations. To this end, enemies might emphasize:

- political access denial (e.g., entering into alliances with, or threatening to attack, neighbors for the express purpose of denying US access);
- geographic access denial (e.g., deploying forces far inland to stress US forces' range and targeting capabilities);
- hardening of fixed targets (e.g., WMD production and storage facilities; command centers; leadership facilities);
- sanctuaries (e.g., positioning military forces in noncombatant neighborhoods, or near cultural landmarks; employing localized global positioning system (GPS) jammers);

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[11] Senior US officials have been concerned about the risk to US forward bases on the Korean Peninsula as far back as the 1994 crisis. At that time, Secretary of Defense William Perry recalled his concerns that

> . . . . North Korea might use some of its large stock of chemical weapons to disrupt the airfields and ports upon which our reinforcement depended. The airfields were critical to our reliance on air superiority to stop the invading force; the ports were critical to our ability to bring in more ground forces to throw back the invading force.

Ashton B. Carter and William J. Perry, *Preventive Defense* (Washington, DC: Brookings Institution Press, 1999), p. 130.

[12] Secretary of Defense Donald Rumsfeld, Speech, The National Defense University, Washington, DC, January 31, 2002.

[13] Paul D. Wolfowitz, Testimony, House Budget Committee, Washington, DC, February 12, 2002.

- mobility and dispersion (e.g., mobile launchers for ballistic and cruise missiles; advanced air defense systems including SA-10, -12, and -20 surface-to-air missiles (SAMs));

- stealth (e.g., diesel submarines; low-observable cruise missiles; advanced antiship mines);

- deception (e.g., coastal combatants masquerading as commercial vessels; terrorists posing as noncombatants);

- information operation attacks against US networks, especially those that support the time phased flow of American forces into a theater; and

- unconventional warfare attacks against transshipment points, and air and sea points of embarkation and debarkation.

To the extent they must operate outside of the enemy's A2/AD envelope, US forces will find their reconnaissance, surveillance, and target acquisition (RSTA) timelines stretched, making destruction of critical enemy mobile A2/AD targets an even more difficult proposition. Indeed, a critical sub-competition of the A2/AD challenge involves enemy efforts to stretch US RSTA and engagement timelines versus US military attempts to compress its engagement cycle timelines.

Of course, such timelines can be compressed, and the opportunities for defeating the A2/AD threat enhanced, by US forces operating within the enemy's A2/AD reach. This will likely require forces that can effect a distributed insertion (i.e., deploy without recourse to large, fixed nodes, such as major ports and air bases), and which can both operate and sustain themselves in a highly distributed, highly networked posture. In addition to, or in lieu of, forces capable of distributed insertion, forces that minimize their risk of detection through various forms of stealth—to include signature reduction and cover, concealment and deception—and which are highly mobile, may be particularly valuable. Finally, forces designed to operate within an enemy's A2/AD network would benefit greatly from effective terminal defenses against enemy missiles.

THE MATTER OF RISK

The US military has been charged by the secretary of defense to develop forces capable of addressing the A2/AD challenge. For their part, each of the Services has developed a concept of operations for accomplishing this mission. The Air Force has developed the Global Strike Task Force concept. The Navy and Marine Corps have advanced the concept of "Assured Access." The Army has centered its efforts around its operational concept for the Objective Force, with an interim force comprised of Stryker Brigades and so-called "legacy forces." There is, as yet, no joint war-fighting concept of operations for addressing the A2/AD threat, although both the Joint Staff and Joint Forces Command (JFCOM) have undertaken efforts to this end.

There is, of course, an element of risk involved in developing new means and methods for dealing with the A2/AD threat. Large-scale innovation—or "transformation"—is never easily accomplished. Transformations are characterized by "winners" and "losers," and perceived losers will oppose change that threatens their own narrow equities. Moreover, transformation

itself is often fraught with uncertainty. While the A2/AD challenge offers a compelling reason for why the Services must "radically alter" the way in which they project power, [14] there are any number of ways "to skin the cat." There is no guarantee that the path less traveled might not be more effective than the path knowingly taken. As a result, there are bound to be risks—some explicit, some implied—in each Service's planned responses to the A2/AD challenge

This paper attempts to illuminate the risks associated with each of the military Department's transformation plans, specifically as they relate to the A2/AD challenge. These risks are categorized into four broad categories. They are summarized next.

Path Risk

Service responses to the A2/AD challenge may proceed down a number of plausible paths. For example, after World War I some tank enthusiasts argued that the tank "could replace the infantry on foot, and the cavalry on horseback."[15] Such single-arms solutions, however, have seldom proven very robust or resilient when confronted with the stresses and frictions of actual combat. The stunningly successful Blitzkrieg campaign that the Germans unleashed on the Western allies in May 1940 was a combined-arms approach that employed Panzer divisions in conjunction with infantry, artillery, and air support. Inherently, this combined-arms solution, though exploiting the tank, was a multi-path solution to both the German strategic problem of two-front wars and the operational problem, encountered in World War I trench warfare, of restoring mobility to the battlefield.

Depending upon the resources available and the level of uncertainty that exists, the US Services might proceed down one path, or multiple paths simultaneously, in their efforts to deal with the A2/AD challenge. The more each Service focuses on a single path solution, the more it will be able to concentrate its resources, and the better prepared it will be to execute a particular war-fighting concept to meet the threat. However, if a Service's particular concept of operations proves to be flawed or beyond DoD resources, the emphasis on a single-path solution for dealing with the A2/AD challenge will leave it with no significant alternatives to fall back on. The Services must take this sort of path risk into account.

Operational Risk

Each of the Services, as part of its transformation strategy, is developing forces, doctrines, and operational concepts to deal with prospective A2/AD challenges. There may be risk, however, that the preferred Service solutions will fare poorly when used in actual combat against intelligent, resourceful, motivated opponents. A ready example can be found in the pre-World War II notion, developed at the Air Corps Tactical School by strategic bombing enthusiasts, that well-flown formations of heavily armed bombers could penetrate to, and accurately bomb, defended targets deep in the enemy's heartland without either fighter escort or suffering

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[14] National Defense Panel, *Transforming Defense*, p. 33.

[15] Charles Messenger, *The Blitzkrieg Story* (NY: Charles Scribner's Sons, 1976), p. 37.

unacceptable attrition.[16] Attractive as this doctrine may have been to pre-war bomber proponents, its various assumptions, each reasonable in isolation, gave rise to a collective risk that led to operational failure against the German Air Force in the fall of 1943. The crucial test came in October when the American 8th Air Force undertook a series of missions against targets in Germany beyond the range of its escort fighters. The culmination of this brash attempt to establish that heavily-armed bombers could fly deep into enemy territory with only the protection of their own defensive fire-power came, of course, on October 14, 1943, when the US 8th Air Force lost 60 B-17s and their 594 crewmen over enemy territory out of the 291 B-17s dispatched to the three ball-bearing plants at Schweinfurt.[17] The loss rate of the B-17s dispatched on this mission, which came to be known as Black Thursday, was nearly 21 percent. In addition, 145 of the B-17s that returned to England on Black Thursday had sustained varying degrees of battle damage, including some that were damaged beyond repair. The returning bombers also carried back 5 dead and 40 wounded. As the 8th Air Force's own report on its wartime tactical development stated after the war in Europe had ended in victory, the Germans had "developed methods of concentration, new armament and improved tactics which made deep daylight bombing penetrations beyond escort too costly to be continued."[18]

Clearly this example is an extreme case. The collective operational risks in the 8th Air Force's concept of operations through mid-October 1943 led to outright tactical defeat. The 8th Air Force did not fully resume large-scale, deep-penetration raids against targets in the German heartland until the following January, and by then enough P-51s were available to provide fighter escort all the way to the targets and back. Yet, as extreme as this example may be, it aptly illustrates the potentially disastrous consequences of doctrines and concepts that harbor significant operational risk.

Technological Risk

The Services also confront technological risk in the sense that they cannot state with absolute confidence that the new capabilities they hope to field for dealing with the A2/AD challenge will actually pan out. Nor can they state with certainty what level of proficiency they can achieve with emerging capabilities, or when these proficiency levels will be achieved. For example, the US military has long sought to develop effective defenses against ballistic missile attack. Yet, despite the expenditure of substantial resources—some $75 billion since President Reagan's

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[16] In the plan (A-WPD/1) prepared by the air staff's Air War Plans Division in the summer of 1941 in response to President Roosevelt's request for an estimate of the munitions requirements to defeat potential American adversaries, pursuit (or fighter) aviation was mentioned. However, the 3,400 fighters the air planners envisioned as necessary to defeat Germany by strategic bombardment of the German war economy were intended simply to protect the air bases from which the bomber force would operate (Air War Plans Division, "Graphic Presentation and a Brief: A-WPD/1, Munitions Requirements of the Army Air Forces To Defeat Our Potential Enemies," August 1941, p. 2). Kenneth L. Walker, who was one of the A-WPD/1 planners, had been a strident advocate at the Air Corps Tactical School of the view that "A well planned and well conducted bombardment attack, once launched, cannot be stopped". Haywood S. Hansell, Jr., *The Air Plan That Defeated Hitler* (Atlanta, GA: Higgins-McArthur/Longino & Porter, 1972), p. 15.

[17] Roger A. Freeman with Alan Crouchman and Vic Maslen, *Mighty Eighth War Diary* (New York: Jane's, 1981), p. 126.

[18] W. E. Kepner, Major General, *Eighth Air Force Tactical Development, August 1942-May 1945* (England: 8th Air Force and the Army Air Forces Evaluation Board, July 9, 1945), p. 116.

"Star Wars" speech—the Pentagon has yet to perfect such a capability. Or take the case of Britain's Royal Navy early in the 20th century. The Admiralty made a strategic decision to fight fleet engagements at extended ranges. This approach presumed the technology existed to enable such long-range strikes against ships moving at relatively high speeds along perhaps irregular paths. Unfortunately, the technology had not yet been perfected to enable highly effective gunnery at the ranges anticipated, and would not be until after World War I.

With respect to the A2/AD challenge, the US military hopes to realize considerable technological gains in its ability to find, track, and engage critical mobile targets; defend against missile attacks; defeat critical deep underground targets; and so forth. But the Services do not know when (or even if) they will achieve the required level of effectiveness in these key capabilities to enable them to operate as called for in their war-fighting concepts. Consequently, the Services may have to find ways to hedge against technical uncertainty, particularly with respect to their war-fighting concepts and modernization strategies.

Resource Risk

There is a risk that the Services will not have sufficient resources to realize their preferred solutions to the A2/AD challenge in the time frame anticipated. To a considerable extent these risks are a function of the Services' budgets. There is concern whether these budgets are adequate to execute the Service programs and maintain the force structure at the levels called for in the Bush Administration's defense posture. The risk here is that key Service transformation initiatives will be starved or crowded out by lower-than-required defense budget estimates, by more immediate demands for military capabilities (e.g., the war on terrorism, homeland defense), or by more traditional modernization initiatives. Alternatively, desired new capabilities may just be too costly to pursue, however promising their potential operational contribution (e.g., the space-based radar). At a deeper level, the Services may also discover that they lack either the human or industrial resources to bring about the kind of changes that are required.

ORGANIZATION

The discussion now turns to an assessment of each military department's approach to addressing the A2/AD threat as part of Service transformation efforts. Chapter 2 assesses the Air Force's concept of Global Strike Task Force. Chapter 3 examines the Navy Department's Assured Access concept. Chapter 4 explores the Army's transformation efforts relative to the A2/AD challenge, with emphasis on its operational concept for its Objective Force. Chapter 5 offers some concluding observations.

II. PROSPECTIVE US AIR FORCE FAILURE POINTS

By Barry Watts

POINT OF DEPARTURE

The Global Strike Task Force (GSTF) is the logical point of departure for identifying potential show-stoppers—areas of significant operational, path, technological, or fiscal risk—in the ability of the US Air Force (USAF) to fulfill its most likely and most demanding wartime mission in future conflicts. While this concept is only one of seven in the USAF's developing family of capabilities-based concepts of operation (CONOPS), it is the one that most directly addresses emerging A2 and area-denial challenges to the projection of American military power overseas.[1] To address these interrelated challenges, Air Force leaders argue that the GSTF will, among other things, provide robust solutions to the full range of time- and mission-critical targets, including the opponent's advanced SAMs, mobile missile launchers, weapons of mass destruction (WMD), and various emerging targets that may be only briefly vulnerable during the course of an operation. The GSTF concept is not only central to current USAF transformation efforts, but its prospective operational failure points are tightly coupled with the path, technological, and fiscal risks built into the Air Force's current force-structure plans, programs, doctrine, and operational thinking about future war.

THE GLOBAL STRIKE TASK FORCE

General John Jumper, whose tenure as Air Force chief of staff began in September 2001, started publicly advocating the Global Strike Task Force in his prior assignment as head of Air Combat Command (ACC).[2] Jumper's account of the GSTF at the Air Force Association symposium in mid-February 2001 portrayed the concept as the "next step" in Air Force transformation, the previous step having been the conversion of the Cold War USAF, which had emphasized forward basing overseas, into a home-based, expeditionary force during General Michael Ryan's tenure as chief of staff.

The GSTF concept sought to deal not only with potential A2/AD challenges but, also, to incorporate lessons the USAF had gleaned from its operational experiences during the 1990s.[3]

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[1] The other six task-force concepts under development are homeland security, global mobility, global response, air-and-space expeditionary forces, nuclear response, and air-and-space C2ISR (command, control, intelligence, surveillance, and reconnaissance).

[2] The forerunner to the GSTF concept was first briefed to four-star leaders of the USAF at the fall 2000 Corona conference by retired General Richard Hawley, who had previously been the ACC commander. Hawley's presentation used the term 'Global Reconnaissance Strike' (GRS) to refer to a joint approach to no-notice power projection in an anti-access environment. GRS had three main operational goals: to establish air dominance and a clear ISR (intelligence, surveillance, and reconnaissance) picture; to halt enemy aggression; and to permit safe deployment of follow-on joint forces by degrading enemy anti-access and air-defense capabilities. GRS operations focused on the "B-2/F-22" team.

[3] The anti-access challenge, once again, focuses on the availability and viability of in-theater bases and ports. It involves the complex mix of political, geographic, and military factors that could prevent or delay US forces from

One of those lessons was the realization that prospective US adversaries, having witnessed the rapid defeat of Iraqi forces in Kuwait and southern Iraq after the United States and its coalition allies were allowed five months to build up their forces in the region, would be strongly motivated in the future to find ways to deny similarly unopposed and leisurely regional access. Another lesson, driven home during NATO's 78-day campaign aimed at persuading Slobodan Milosevic to abandon ethnic cleansing in Kosovo, was that a continuous presence over the battlefield is needed to find, validate, and release weapons on time-critical and rapidly emerging targets within less than ten minutes (as opposed to hours or days).[4]

In light of these emerging challenges and perceived lessons, USAF leaders have advanced the GSTF as their Service's "contribution to the nation's kick-down-the-door force" when confronted by no-notice contingencies in which the enemy possesses A2 and area-denial capabilities.[5] By leveraging current and near-future USAF capabilities, the GSTF will employ joint power-projection capabilities—including stealth, standoff, precision, space, and information systems—to establish air dominance by rapidly gaining access to denied battlespace, engaging adversary A2 systems and high-value targets, and subsequently maintaining access for all required joint or coalition follow-on forces.[6] Prior to conflict, the GSTF will deploy directly from the continental United States to forward-based "home stations" and begin developing comprehensive awareness of enemy targets, capabilities, and likely courses of action.[7] At the start of a conflict, the GSTF will then kick down the door into denied battlespace by rapidly degrading, and thereafter defeating, the adversary's C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance), A2 weapons, CBRNE delivery systems, and threats to friendly ground or naval forces.

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deploying into an overseas theater, as well as the enemy's ability to attack US forces at or flowing through in-theater bases and ports. By contrast, in current Pentagon usage AD threats involve systems and capabilities—such as advanced SAMs, mines, or diesel submarines—that could be used to deny American forces access to, or limit their freedom of action within, the battlespace of an overseas theater.

[4] David A. Fulghum, "USAF Plan Rapid, All-Stealth Task Force," *Aviation Week & Space Technology*, February 26, 2001, available online at http://www.aviationnow.com/content/ncof/ncfn08.htm.

[5] General John P. Jumper, "Global Strike Task Force: A Transforming Concept, Forged by Experience," *Aerospace Power Journal*, Spring 2002, p. 29.

[6] Headquarters USAF/XPXT, Transformation Division, *The USAF Transformation Flight Plan: FY03-07*, undated, p. 14; also, Posture Statement of the Honorable James G. Roche and General John P. Jumper Before the 108th Congress, House Armed Services Committee (HASC), February 27, 2003, available online at http://www.house.gov/hasc/openingstatementsandpressreleases/108congress/03-02-27airforce.html. p. 15.

[7] The current USAF transformation plan actually goes so far as to assert that, by leveraging information technologies, it will be not only be possible to develop "a complete, accurate, clear, coherent, persistent, real-time" picture of the battlespace, but "predictive battlespace awareness" (PBA) as well (*The USAF Transformation Flight Plan: FY03-07*, pp. x-xi). How literally these goals should be taken is hard to say. Even USAF officials usually concede that technology will never completely overcome the Clausewitzian "fog of war" (Ibid., p. 18). Perhaps, therefore, all USAF officials mean when discussing PBA is that they hope to exploit information technology to improve, as much as possible, the picture of the battlespace on which commanders and operators will base their wartime decisions. On the other hand, one can find USAF statements that go further, asserting for instance that PBA "provides decision-makers the ability to predict what actions the enemy is most likely to make" ("New Strike Force to Debut in Air Force Experiment," Air Force Press Release, July 19, 2002).

The F-22 Raptor, which was redesignated the F/A-22 in September 2002, plays an especially pivotal role in the GSTF CONOPS.[8] Over the last decade or so, the main challenge for the USAF in gaining rapid access to, and control of, enemy airspace has not stemmed from enemy air-to-air fighters. Since 1979 Israeli and American F-15 pilots, plus one Saudi F-15 pilot who scored two kills during the 1991 Persian Gulf War, have downed some 96 enemy fighters—including French-built F-1s as well as Russian-built MiG-29s and MiG-25s—without a single loss.[9] While this box score almost certainly owes much more to the superior training and situational awareness of the F-15 pilots involved than it does to the technological superiority of the F-15 per se, the plane's combat record in US, Israeli, and Saudi hands has been one of crushing dominance over Syrian, Iraqi, and Serbian fighters.[10] Presumably the F/A-22's low observability and capacity to cruise at speeds over Mach 1.5 without engaging afterburners ("supercruise") reflect the USAF's willingness to pay a premium price—almost certainly over $210 million each (including both development and production)—to sustain an overwhelming technological margin of advantage in air-to-air combat.[11]

What, then, is likely to be the more pressing air-dominance challenge the USAF will to face in the foreseeable future? While it would be foolhardy to dismiss the potential threat posed by advanced fighters such as the Russian Su-37 Super Flanker, the more worrisome challenge lies in so-called double-digit SAMs such as the Russian S-300PMU-2 Favorit (the export version of the SAM NATO codenamed the SA-10) and S-400 Triumph (codenamed the SA-20).[12] To give a sense of the area-denial potential of these systems, the S-300PMU-2 (or SA-10D) is credited

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[8] A. J. Bosker, "F-22 Redesignation Reflects Combat Role," September 17, 2002, available online at http://www.af.mil/news/Sep2002/91702361.shtml.

[9] Gulf War Air Power Survey (GWAPS), Vol. V, *A Statistical Compendium and Chronology*, Pt. 1, *A Statistical Compendium* (Washington, DC: US Government Printing Office, 1993), Table 206, pp. 653-54; Lon O. Nordeen, *Air Warfare in the Missile Age* (Washington, DC: Smithsonian Institutions Press, 2002 2nd ed.), pp. 161-63, 251 and 256; and Shlomo Aloni, "The Fighting Baz," *Air Forces Monthly*, October 1999, p. 40. The USAF and Boeing currently put the F-15's box score to date at 101-to-0, but this score includes at least five kills against helicopters and fixed-wing support aircraft.

[10] An important element in the superior situational awareness of American and Israeli F-15 pilots has been the uses of airborne surveillance aircraft such as the E-3 Airborne Warning and Control System (AWACS) and the E-2C.

[11] The estimate of $210 million each (acquisition unit cost) assumes that the Air Force produces 331 F/A-22s for a total program cost of $70.4 billion. The program cost of $70.4 billion is based on increasing the program total of $69.7 billion (current dollars) in the November 1, 2002, Selected Acquisition Report by $690 million for the RDT&E (Research, Development, Testing and Evaluation) overrun that the Air Force acknowledged in December 2002 and dividing by 331 (see Department of Defense, OUSD(AT&L) AR&A/AM, "Selected Acquisition Report (SAR) Summary Tables," November 1, 2002; and, "Raptor Program on Track Despite Challenges," December 3, 2002), available online at http://www.af.mil/news/Dec2002/12030249.shtml.

[12] Jumper, in response to questions from Duncan Hunter during a February 2003 hearing, testified that the Flanker is the "equal" of the F-15 and F-16; House Armed Services Committee, Hearing on the Air Force FY 2004 Budget, February 27, 2003, p. 58 (using the electronic LexisNexis™ file in Word™). This assessment, however, ignores American advantages in pilot skill and proficiency, as well as surveillance and command-and-control, which have consistently combined since 1991 to give American fighter forces an enormous edge in situational awareness. To give some idea of how crucial an edge in situational awareness is in air-to-air combat, reconstructions of the 112 decisive engagements that occurred in Southeast Asia from 18 December 1971 to 12 January 1973 revealed that 81 percent of all 112 aircrews downed—American and North Vietnamese—either were unaware of the attack (67 of 112 decisive engagements), or else did not become aware in time to take effective defensive action (24 of 112); *Project Red Baron III: Air-to-Air Encounters in Southeast Asia*, Vol. 1, *Executive Summary* (Nellis AFB, NV: US Air Force Tactical Fighter Weapons Center, June 1974), p. 24.

with a maximum range of some 109 nautical miles (nm) (200 kilometers) using the 48N6E2 missile, and the Russians have advertised that, with a new missile, the S-400 will have a reach approaching 400 kilometers.[13] It has also been reported that these SAMs will have capabilities against stealthy aircraft such as the F-117.[14] Granted, the S-300 and S-400 are expensive systems. A single S-400 battalion, including eight launchers and 32 ready-to-fire missiles, is estimated to cost over $160 million, and the SA-10B, which entered Soviet service in the 1980s, is thought to run $60 million a system.[15] These prices go far to explain why even the older S-300 has not proliferated outside of Russia as rapidly as Western air forces have feared.[16] Still, the Russians are eager to sell such systems abroad, and even stealthy platforms may have difficulty operating in the immediate vicinity of such systems—especially if they are deployed in numbers and networked. Consequently, as General Jumper observed in September 2002, the F/A-22's "most significant contributions over the next 30 years will be [in] its attack role, particularly against the most lethal next two generations of [enemy] surface-to-air missiles."[17]

Air Force leaders have gone on to emphasize that, because the F-117 and B-2 cannot protect themselves from enemy fighters or visually guided SAMs, they have heretofore operated exclusively at night. The F/A-22, in their view, overcomes this limitation. Not only can the Raptor take out advanced SAMs but, by protecting the F-117 and B-2 against enemy fighters, it opens the door to 24-hour, seven-days-a-week (24/7) operations by all the USAF's stealthy aircraft from the outset.[18] And, once air dominance of enemy airspace is established, the GSTF enables precision-strike operations by non-stealthy aircraft, whether sea- or land-based.[19]

In this context, Air Force officials have also underscored the transformational potential of the F/A-22's advanced sensor suite to provide joint forces with precise location and other information on emerging and time-critical targets. They have argued that Raptor's ability to be its own ISR platform, in conjunction with its supercruise speed, will enable the F/A-22 to locate such targets and, then, close to weapon-release parameters for guided weapons in less time than

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[13] John A. Tirpak, "The Double-Digit SAMs," *Air Force Magazine*, June 2001, p. 49, available online at http://www.afa.org/magazine/June2001/0601sams.html. The SA-20 can fire older SA-10 missiles such as the 9M96E2. The new missile that is advertised to give the SA-20 a range out to 400 kilometers may be derived from SA-12 missiles.

[14] Russian aerospace officials have admitted that they are testing new SAM missiles and other air-defense components against the remains of the F-117A shot down by Serbian air defenses in 1999 (see "S-300PMU (NATO SA-10C Grumble)" at http://www.softwar.net/rfed.html).

[15] Tirpak, "The Double-Digit SAMs" p. 49. A standard US Patriot battalion contains eight launchers, which is the same number usually associated with SA-10 and SA-20 battalions.

[16] Currently the SA-10 is deployed in most of the former Soviet republics, China, Bulgaria, India and Cyprus. Tirpak, "The Double-Digit SAMs" p. 49.

[17] Bosker, "F-22 Redesignation Reflects Combat Role," September 17, 2002.

[18] "The F-22 (Raptor) will bring stealth into the daylight for the first time" (General John Jumper, quoted in A. J. Bosker, "Transformation Allows AF To Leverage Technology"), available online at https://public.afca.scott.af.mil/public/02may/02may.htm).

[19] USAF leaders are adamant that legacy systems, meaning the F-15, "cannot ensure air dominance in future engagements" (Posture Statement of the Honorable James G. Roche and General John P. Jumper Before the 108th Congress, p. 20).

any other platform.[20] Additionally, the Small Diameter Bomb (SDB) will permit a single Raptor to cover 2-3 times as many ground targets on a single sortie as it can with 1,000-pound Joint Direct Attack Munitions (JDAMs) while retaining a mix of short- and medium-range air-to-air missiles.[21]

Indeed, it was to capture this now-planned evolution of the F-22 from a predominately air-to-air fighter into a premier surveillance and precision-strike system that prompted Secretary of the Air Force James Roche and General John Jumper to redesignate the Raptor the F/A-22 in September 2002. The only caveat bearing mention is that this evolution is based on migrating Joint Strike Fighter (JSF) avionics into the F/A-22, which is not scheduled to begin until fiscal year (FY) 2005. As a result, at least the first 65 production F-22s will be built without these air-to-ground upgrades.

FORWARD BASES: DISTANCE TRADEOFFS AND VULNERABILITIES

The first issue to examine vis-à-vis the various risks in the GSTF is how close to enemy targets USAF combat systems generally have to be based to sustain *intense* operations, meaning operations in which theater-based fighter, fighter-bomber, and attack aircraft can sustain at least one sortie per day per aircraft.[22] For purposes of this discussion, short-range systems are those with an unrefueled combat radius of 1,000 nm or less, where combat *radius* refers to the distance combat systems must fly from their bases or launch points to reach their targets or patrol areas. By contrast, long-range systems such as the B-52H are associated with an unrefueled combat radius of at least 3,000 nm. Using these definitions, fighters and fighter-bombers such as the F-15C, F-16C, F-15E, F/A-18C, and F/A-18E are short-range strike platforms. Only heavy bombers such as the B-52 and B-2 qualify as truly long-range systems.

Given the air-refueling resources of the US Air Force, however, the unrefueled combat radius of a given platform no longer answers the question of how close to targets or patrol areas various strike and fighter aircraft need to be based. In the case of heavy bombers, the answer is that, if need be, they can operate over truly global distances but only at reduced sortie rates, which do not qualify as intense. During NATO's 1999 campaign against Yugoslavia (Operation Allied Force), B-2As flew some 45 effective combat sorties against Serbian targets in the Balkans from their home station at Whiteman Air Force Base (AFB), Missouri, a one-way distance (or mission radius) of some 5,470 nm (10,000 kilometers) using the actual routing flown.[23] The typical

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[20] HASC, Hearing on the Air Force Fiscal Year 2004 Budget, pp. 17-19.

[21] The SDB, which is presently in development, will be a 200-250 pound guided munition. A possible munitions load for the F-22 is 4 SDBs in its one center weapon bay, 3 AIM-120 Advanced Medium Range Air-to-Air Missiles (AMRAAMs) in the other, and two AIM-9s in its side bays.

[22] This definition of intense combat operations is borrowed from John Stillion and David T. Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks: Technology, Scenarios, and U.S. Air Force Responses* (Santa Monica, CA: RAND Corporation, 1999), MR-1028-AF, p. 54.

[23] During Operation Allied Force, the 509th Bomb Wing launched 49 B-2 sorties of which 45 were "effective" in the sense of expending munitions against Serbian targets (Colonel Tony Imondi, 509th Bomb Wing briefing on B-2 operations during Allied Force, August 31, 1999, Whiteman AFB, MO). Two sorties were canceled by higher

mission duration exceeded 30 hours—something 509th Bomb Wing crews had prepared for prior to the conflict—and involved four air refuelings.[24] During the opening phase of American operations against al Qaeda and the Taliban in Afghanistan (Operation Enduring Freedom), B-2s flew 44-hour missions from Whiteman, recovering at Diego Garcia in the Indian Ocean.[25] The operational constraint imposed by 30-44 hour mission lengths is, of course, that the number of sorties a given bomber can generate per day is unlikely to exceed 0.2-0.4. From a sortie generation standpoint, therefore, basing bombers closer to their target areas than even their unrefueled combat radii is generally desirable so long as the closer-in bases are not subject to enemy attack.

During the 1991 Persian Gulf War (Operation Desert Storm), for example, B-52Gs flew bombing missions from Fairford in the United Kingdom, Diego Garcia in the Indian Ocean, Moron in Spain, and Jeddah in Saudi Arabia. Using realistic routing, the Fairford, Diego Garcia, and Moron B-52s operated over one-way distances of 2,900-3,390 nm from Baghdad, whereas the 16 at Jeddah were less than 800 nm from Baghdad and even closer to the Kuwait Theater of Operations. Thus, the 16 Jeddah B-52s averaged 1.2-1.3 sorties per day and generated 46 percent of the total B-52 sorties, while the 40-50 B-52s at the other three bases generated less than 0.5 sorties per day and only 54 percent of the total sorties.[26]

Short-range fighters, fighter-bombers, and attack aircraft—collectively "Tacair"—face the same tradeoffs between sortie rates and the distances they are based from the theater of operations. Assuming unlimited air refueling, the main radius-of-action constraint on single-seat aircraft such as the F-15C and the F/A-22 is the amount of time the pilot can remain strapped to an ejection seat and still be able to perform piloting and combat tasks effectively.

During the Vietnam War, 3-4 hour missions from Thailand bases such as Ubon and Korat against targets in the Hanoi-Haiphong region of North Vietnam became routine. On such missions, F-105s and F-4s usually refueled twice from KC-135s. On occasion, mission duration approaching nine hours were reported.[27] In April 1986, F-111Fs based at Lakenheath, England, flew a 14-hour mission against targets in Libya, some 2,200 nm distant given the actual routing.[28] In Desert

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headquarters short of the combat area, one did not drop because the targets "fell out" when the B-2 was en route to the theater, and one sortie was aborted early due to a cabin pressurization problem (Ibid.).

[24] Rebecca Grant, *The B-2 Goes To War* (Arlington, VA: IRIS Press, 2001), pp. 27 and 57-71.

[25] Christopher J. Bowie, Robert P. Haffa, Jr., and Robert E. Mullins, *Future War: What Trends in America's Post-Cold War Military Conflicts Tell Us about Early 21st Century Warfare* (Arlington, VA: Northrop Grumman Analysis Center, January 2003), p. 42.

[26] GWAPS, Vol. V, Pt. 1, *A Statistical Compendium*, Tables 108 and 192, pp. 346 and 556-597; Captain Michael D. Madzuma and 1st Lieutenant Michael A. Buoniconti, "Men of the Stratofortress," *From the Line in the Sand: Accounts of USAF Company Grade Officers in Support of Desert Shield/Desert Storm*, ed. Captain Michael P. Vriesenga (Washington, DC: US Government Printing Office, March 1994), p. 8.

[27] Colonel Robert E. Venkus, *Raid on Qaddafi* (New York: St. Martin's Paperbacks, 1993), p. 42. Venkus logged an 8.9-hour mission in the F-105 during the Vietnam conflict.

[28] Venkus, *Raid on Qaddafi*, pp. 47 and 110. Among other routing problems, France refused permission for the F-111Fs and their accompanying tankers to utilize French airspace. The F-111F crews were offered sleeping pills and amphetamines ("go" pills) to prepare for and fly this long-duration mission (Ibid., p. 23).

Storm, efforts to prevent Iraqi fighters from escaping to Iran by maintaining barrier patrols between Iraqi air bases and the Iranian border led to recurring mission durations of eight hours or more, with multiple refuelings for the F-15C pilots involved.[29] In the spring of 2001, during the run-up to the second Quadrennial Defense Review (QDR), USAF officials argued that the F-22 could sustain mission durations of up to 10 hours over combat radii up to 2,500 nm—with, of course, heavy tanker support (one KC-135 per F-22 at 2,500 nm).[30]

RAND analysts John Stillion and David Orletsky had examined this issue a couple years earlier and concluded that "current USAF combat aircraft probably could not sustain *intense combat operations* . . . over a distance of more than 2,000 nmi [nautical miles]; such missions simply take too long."[31] Christopher Bowie reached a slightly more conservative conclusion in 2002. Recognizing that land-based Tacair would need to provide air cover and strike targets several hundred nm beyond the adversary's borders, he argued that USAF Tacair would have to be based within 1,000-1,500 nm of enemy territory.[32] Assuming the F/A-22's maximum unrefueled combat radius is "in excess of 600" nm, and because little (if any) of the 1,200 nm an F/A-22 would fly on an unrefueled, maximum-range combat mission would be at supercruise speeds (above Mach 1.5), the Raptor's performance characteristics offer no obvious reason for altering these conclusions as to how close to enemy airspace short-range Tacair needs to be based to sustain intense combat operations.[33]

In the best of all worlds, therefore, the USAF would prefer to locate F/A-22 units deploying to an overseas theater as part of a GSTF within 500-1,000 nm of the enemy targets and airspace. However, in extremis, operations could be initiated from bases as distant as 1,500-2,000 nm from the borders of enemy airspace, although doing so would maximize refueling requirements and impose the stresses of extremely long mission durations on the pilots. Long-range systems such as the B-2 could operate from greater distances—including as far away as home bases in the United States—but basing within 1,500-3,000 nm would increase sortie rates and minimize tanker requirements. In the end, such choices will be determined by the political and geographic availability of forward bases in conjunction with their vulnerability to enemy attacks, including by ballistic and cruise missiles.

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[29] The use of sleeping pills and amphetamines became widespread among USAF F-15C pilots during the Gulf War.

[30] USAF QDR Office, "Extended-Range F-22 Operations," PowerPoint slides, April 2001. The thrust of these slides was to argue that the USAF faced no shortage of airfields for its land-based, short-range fighters in the West Pacific. Assuming an operating radius of 2,500 nm for the F-22, and excluding China and North Korea, the first of these two slides insisted that the USAF would potentially have available over 650 "unsinkable" airfields. At this point in time, the USAF's institutional attitude toward the anti-access challenge seemed to be one of denial, despite the fact that General Ron Fogleman had called attention to it back in 1996, while Air Force chief of staff.

[31] Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, p. 54.

[32] Christopher J. Bowie, *The Anti-Access Threat and Theater Air Bases* (Washington, DC: Center for Strategic and Budgetary Assessments, 2002), p. 14.

[33] HASC, Hearing on the Air Force Fiscal Year 2004 Budget, p. 62. Lockheed-Martin slides from April 2002 comparing the F-22 to a notional "bomber" variant, the FB-22, indicate that with 100 nm of supercruise above Mach 1.5 (50 nm inbound and 50 nm outbound), the combat radius of the F-22 is only 475 nm. The same charts cite a 630 nm combat radius for the F-22 on a *subsonic* mission.

Stillion and Orletsky examined the vulnerabilities of air bases to enemy cruise and ballistic missiles in 1999. Their analysis was predicated on three premises. First, GPS has "tremendous potential" for not only reducing cruise-missile en route navigation errors, but for overcoming such errors simply and cheaply, thereby making it likely that cruise missiles with "pinpoint" accuracy will become widely available at relatively affordable prices ($300,000 or less per round if mass produced).[34] Second, modern ballistic missiles such as the Chinese M-9 (CSS-6 or DF-11)—and its longer-range, two-stage variant, the M-18—incorporate detachable warheads with steering jets, thus enabling circular error probables (CEPs) of 150-200 meters or less (depending on the accuracy of the GPS signal utilized) regardless of range.[35] Third, if such weapons are combined with submunitions optimized for area coverage against soft targets such as aircraft parked in the open, tent cities at forward bases or air-defense radars, they can be quite lethal.[36] Based on these assumptions, Stillion and Orletsky calculated that,

> for about $1 billion, an adversary could attack four missile-defense radars [for example, US Patriot radars] once, four tent cities [as large as 1-square kilometer] once, and all [aircraft] parking ramps [at four forward bases] between 6 and 12 times each. These attacks have the potential to be so destructive to equipment and disruptive to sortie-generation operations that, unless steps are taken to diminish the effectiveness of these systems, they could force the USAF to abandon bases within reach of enemy missiles.[37]

In the case of unsheltered aircraft at the four forward air bases, assuming parking patterns similar to those used by US F-15Es at Shaikh Isa, Bahrain, during the 1991 Gulf War, and assuming a 20-foot lethal radius for 1-pound submunitions against soft targets, Stillion and Orletsky estimated that an opponent could achieve a 0.9 probability of kill against all aircraft parked in the open on the four bases "with 30 GPS-guided M-9 and 30 M-18 ballistic missiles, and 38 small GPS-guided cruise missiles, at an estimated cost of $101 million."[38] Their implication is clear. Continued heavy dependence on being able to operate short-range platforms from overseas bases even at distances of as much as 1,500-2,000 nm from enemy territory may not be viable in the

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[34] Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, pp. 10-11 and 25. To complicate the problem for the USAF, Stillion and Orletsky postulated very slow cruises whose low speeds would cause them to be rejected by computer-controlled, low-down radars (Ibid., p. 16).

[35] Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, pp. 9-10, 13, and 79. CEP is the radius of a circle within which 50 percent of the missiles are expected to hit. A range of 600 nm is sufficient to reach Kadena AFB, Okinawa, from the Chinese mainland. The M-9, like the modified Scuds used by Iraq in 1988 and 1991, can be fired from mobile launchers, making them very difficult to destroy before they have fired at least one missile.

[36] Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, pp. 22-27. They assume a lethal radius of 15-25 feet for a 1-pound submunition against aircraft in the open, Patriot radars, or elements of a USAF tent city at a bare forward air base (Ibid., pp. 24 and 80).

[37] Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, p. 27. Stillion and Orletsky's basic solution to the vulnerability of forward-based Tacair was to rely, instead, "on a fleet of long-range aircraft operating from permanent bases" beyond the reach of affordable adversary ballistic and cruise missiles with modern submunitions, (Ibid., p. 60).

[38] Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, p. xiv. For a picture of the ramp at Shaikh Isa in early 1991, see p. 6.

long term against smart, determined adversaries—even ones with modest military defense budgets and resources compared to those of the United States.

Three final points should round out discussion of the vulnerabilities inherent in overseas basing. First, ballistic and cruises missiles armed with specialized submunitions are by no means the only conceivable way of exploiting US dependence on forward bases and ports to project US military power overseas. In reflecting on opportunities that the Iraqis failed to exploit in 1991, it is puzzling that Saddam Hussein's regime was "unable to organize or hire special operations forces or terrorists to attack USAF aircraft" on their forward bases around the Persian Gulf, as the North Vietnamese had done to American bases in South Vietnam over two decades earlier.[39]

Second, the potentially devastating cruise and ballistic missile threat to forward-based USAF Tacair described by Stillion and Orletsky was predicated strictly on the use of non-nuclear or conventional munitions. However, ballistic missiles such as the Chinese M-9 and M-18 could also carry nuclear, chemical, or biological warheads. The M-9 (DF-15), for instance, has been credited with being able to deliver a range of munitions, including a 90-kiloton nuclear or a 500-kilogram conventional warhead.[40] The implications of WMD being used against Air Force in-theater air bases argue that the potential vulnerabilities of basing within range of enemy A2 systems are greater than even Stillion and Orletsky's sobering analysis indicates.

Third, as Bowie pointed out in 2002, the vulnerabilities of forward bases and ports are much more than an Air Force issue. Insofar as "Army, Navy, and Marine forces are dependent upon forward ports, airfields, and bases in the theater to conduct combat operations," continued reliance on large, fixed facilities within the theater of operations has "broader strategic implications for the US military as a whole.[41] Thus, "over the long run, the combined uncertainties raised by political factors, logistics, and emerging military threats mean that the combat power of the land-based fighter force may be significantly constrained in supporting US power-projection operations in an A2 environment."[42] USAF difficulties coping with A2/AD challenges could undermine the operations of its sister Services during joint expeditionary operations overseas.

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[39] Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, p. 6.

[40] See, for example, the Center for Defence and International Security Studies, "The Chinese Missile Threat: A Photo Essay for Special Reports," available online at http://www.cdiss.org/China_Essay.htm.

[41] Bowie, *The Anti-Access Threat and Theater Air Bases*, p. i.

[42] Bowie, *The Anti-Access Threat and Theater Air Bases*, p. i. "To project power, US reliance on forward bases requires success in four areas: an adequate base infrastructure, responsive logistical support, political approval from host nations, and effective counters to enemy threats. If one of these factors is missing, US power-projection capabilities will be compromised. The problem facing the United States is that even a high probability of success in each factor results in an overall low probability of success. For example, if the United States had a 90 percent chance of succeeding in each area, only a 65 percent overall probability of success results (90 percent X 90 percent X 90 percent X 90 percent = 65 percent). In short, these combined uncertainties suggest that over the long term, the land-based fighter forces could be significantly constrained in supporting US power-projection operations." (Ibid., p. 65). The probability Bowie cites is actually 0.6561, which rounds to 0.66. If one of the four probabilities is only 0.5 while the other three remain 0.9, then the overall probability of successful power projection against an anti-access threat falls to 0.3645—slightly better than one chance in three. Moreover, these notional calculations omit the AD challenges posed by, for example, double-digit SAMs.

PATH RISKS IN THE GSTF CONCEPT

On the one hand, the Global Strike Task Force is a sensible response to prospective A2/AD challenges to the expeditionary power-projection capabilities of the US Air Force in particular, and to the American military in general. The GSTF CONOPS takes current USAF capabilities (for example, the B-2A, JDAM, and advanced surveillance assets such as Global Hawk) and future capabilities (notably the F/A-22 and the SDB) and integrates them into an operational concept that endeavors to defeat foreseeable A2/AD capabilities. In this sense, the GSTF is a prudent reaction to the likely emergence of asymmetric responses to the wide margins of advantage currently enjoyed by the US military in most areas of high-intensity, conventional operations.

On the other hand, the GSTF concept is critically dependent on the presumption that, for at least the next three decades, the Air Force will be able to deploy short-range fighters into theater bases located, at most, 1,500-2,000 nm from enemy airspace, if not closer. The USAF's path remains that of betting that forward bases, which are almost certain to fall increasingly within the reach of enemy ballistic missiles, cruise missiles and other A2 capabilities, can nonetheless be utilized by its expeditionary air units. The alternative path of developing long-range strike systems that could provide some capability to "kick down the door" from bases beyond the reach of most enemy A2 systems is not being pursued.

The stated intention of USAF leaders to depend predominately on short-range platforms to cope with A2/AD threats for some three decades is borne out by the following observations. First, in March 1999 the Air Force, in response to congressional language directing the preparation of "a comprehensive plan for the future of the long-range bomber force," produced a white paper that deferred initial operational capability (IOC) for a follow-on to the B-2 until 2037.[43] In the meantime, the vast majority of USAF investment in combat platforms—procurement plus RDT&E—is programmed to go to short-range platforms, mainly to the F/A-22 and the F-35 JSF.

Second, since the appearance of the 1999 white paper, senior Air Force leaders have shown no inclination to change their minds about the wisdom of delaying substantial investment in long-range strike systems until the 2030s. Indeed, their position seems, if anything, to have hardened. Whereas the 1999 bomber roadmap suggested that, in the future, the residual bomber force of B-52s, B-1s, and B-2 would "play a greater role in achieving time-critical effects for the JFACC [Joint Force Air Component Commander]," Air Force Secretary Roche and Chief of Staff General Jumper have argued since that the F/A-22 is the only aircraft with real potential to deal with relocatable or moving targets deep in enemy territory.[44]

Third, the pivotal assumption underlying their judgment that only the F/A-22 can deal with deep, moving targets seems to be that the legacy bomber fleet, during the kick-down-the-door phase of

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[43] Department of the Air Force, *U.S. Air Force White Paper on Long Range Bombers* (Washington, DC: March 1, 1999), pp. 1 and 21-22.

[44] *U.S. Air Force White Paper on Long Range Bombers*, p. 19; HASC, Hearing on the Air Force Fiscal Year 2004 Budget, pp. 17-18.

operations against an A2/AD threat, is only suitable for striking "fixed target sets."[45] On this line of reasoning, time-critical, emergent, moving, and relocatable targets become the exclusive purview of Tacair platforms such as the supercruising F/A-22—despite the fact that the B-2 had success in 1999 over Serbia against relocatable targets such as SAMs, and despite the lesson that General Jumper drew in 2001 from this same conflict regarding the need for persistence in the target area to deal with emerging targets. Indeed, it was General Jumper who, during Allied Force in 1999, instigated B-2 "flex targeting," an innovation that led to successful B-2 attacks against at least a couple Serbian SA-3 sites when all other available strike systems proved unable to cope with the Serb tactic of regularly moving SAMs small distances to preclude precise targeting.[46]

Finally, while Air Force opposition to buying additional B-2s has been evident for at least a decade, less well known is the growing resistance of Air Force leaders to long-range solutions of any sort. Recently senior Air Force officials have gone so far as to argue that, because both long-range and short-range strike aircraft will generally require some air refueling, it is irrelevant to talk at all about long-range versus short-range systems at all.[47] This argument, however, highlights yet another single-path dependency in the Air Force's present trajectory. Insofar as USAF dependence on short-range systems such as the F/A-22 grows in coming years, dependence on an aging tanker fleet will also increase. In fact, air refueling sorties grew to 25 percent of the total sorties flown during the first year of Enduring Freedom, as compared with 20 percent during Allied Force in 1999 and only 12 percent during Desert Storm in 1991.[48] Yet, the last of the KC-135s, which constitute 90 percent of the Air Force's inventory of just over 600 air-refueling aircraft, was delivered in 1965, and the only current USAF proposal for addressing the aging of its tanker fleet is a controversial plan to retire 68 KC-135Es and lease 100 modified Boeing 767s for a period of ten years with an option to buy.[49] Thus, the GSTF's heavy dependence on short-range platforms has not prompted the Air Force to earmark the funding needed to recapitalize the tanker fleet on which this CONOPS will increasingly depend.

One could argue, of course, that Air Force leaders are right in betting so heavily on the F/A-22's potential to cope with the A2/AD challenges likely to appear over the next three decades. After all, the opening months Operation Enduring Freedom showed that with enough air-refueling

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[45] HASC, Hearing on the Air Force Fiscal Year 2004 Budget, p. 50.

[46] Grant, *The B-2 Goes To War*, pp. 81-82.

[47] HASC, Hearing on the Air Force Fiscal Year 2004 Budget, p. 50.

[48] Bowie, Haffa, and Mullins, *Future War*, p. 42.

[49] USAF Fact Sheet, "KC-135 Stratotanker," July 2001, available online at http://www.af.mil/news/factsheets/KC_135_Stratotanker.html; HASC, Hearing on the Air Force Fiscal Year 2004 Budget, p. 10; and, Boeing, "The U.S. Air Force 767 Tanker Program," March 17, 2003, slides 5 and 6. The USAF's fleet of some 540 KC-135 Stratotankers was produced during the late 1950s and early 1960s. The Stratotanker was based on the Boeing model 367-80, which was also the basis for the Boeing 707. The current fleet contains 411 R models, which have been modified with new CFM-56 engines, and 134 Es, which were re-engined with TF-33-PW-102 engines. The other 10 percent of the USAF's tanker inventory consists of 59 KC-10s. These planes, which were modifications of the DC-10, entered USAF service in 1981. Estimates of the cost of the 767-lease agreements have varied widely. In May 2002, the Congressional Budget Office estimated that the cost of lease-purchase agreement (with changes in current law) would be $37 billion; by November 2002 Boeing was offering $21 billion for a 10-year lease followed by purchase at the end of ten years.

support, short-range combat aircraft could operate over long distances and their aircrews could cope with long-duration missions (albeit against an opponent with almost non-existent A2/AD capabilities). Nonetheless, the extreme path dependency underlying the GSTF concept seems impossible to deny. The fact is that Air Force leaders show no inclination whatsoever to hedge against this critical dependency by investing seriously, between now and the 2030s, in long-range systems that could offer the benefits of persistence, large and varied payloads, and, most importantly, greater ability to operate from bases beyond the reach of an opponent's A2/AD systems.

OPERATIONAL RISKS

The vulnerabilities and uncertainties inherent in basing short-range systems—particularly the F/A-22—within reach of adversary AD capabilities have already been covered. The only point bearing reiteration is the obvious one concerning the potential war-stopping ramifications of attacks on USAF forward bases sufficiently destructive or disruptive to force abandonment of bases within reach of enemy missiles and other AD capabilities. In such an event, the deployment of ground forces scheduled for early arrival in theater would have to be delayed, or, if they had already begun arriving, would be vulnerable to heavy losses should the opponent attack US airlift assets, in-theater ports, troop concentrations, or logistics bottlenecks. Indeed, US ground forces might be denied theater access or subjected to attack even if the forward bases were retained should Tacair sortie generation be greatly reduced. Again, the degree of success the GSTF achieves in A2/AD contingencies will directly affect the success of joint-force power projection.

Turning to other operational risks in the GSTF concept, a key claim is that the F/A-22, once its potential for ground-attack has been developed, will be able to take out double-digit SAMs early in an AD contingency. As General Jumper noted in early 2000:

> If Mr. Milosevic had had an SA-10 or an SA-12—and he well could have—or the latest generation of fighter—which he could well have—[Lieutenant General] Mike [Short, the JFACC for Operation Allied Force] would have faced a profoundly more difficult situation than he did, and we would have been having a debate over why we didn't have the F-22 five years ago instead of several years from now. The F-22 will bring us not only the air superiority that we traditionally think of in the air-to-air role, but that total air superiority of a first-in capability that takes out the airplanes and those most potent surface-to-air defenses that would otherwise limit our access to targets. That is why we need the F-22.[50]

Without question, Jumper's position was—and staunchly remains—that *only* the F/A-22 can ensure the early air dominance against both enemy fighters and SAMs that is a sine qua non for the joint force in AD scenarios.

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[50] General John P. Jumper, Air Force Association Air Warfare Symposium Proceedings, February 24-25, 2000, available online at http://www.aef.org/symposia/jump200.htm. The SA-12 is part of the S-300 family of Russian SAMs. The SA-12, however, has a faster missile and is optimized against incoming tactical ballistic missiles (Tirpak, "The Double-Digit SAMs," p. 48).

One way to assess this contention is to consider the following question: How much does air dominance in this inclusive sense hinge on the F/A-22 itself as opposed to its weapons and timely, precise targeting information? In the case of air-to-air threats, two points appear relevant. First, while much is made of the vulnerability of US bombers to enemy fighters, there is no good reason why the B-2 (or any other long-range strike platform) cannot be equipped with air-to-air armament such as the AIM-120 AMRAAM. If the B-2 remains in the inventory until the late 2030s, its avionics—particularly its radar—will be upgraded at least once. When that upgrade occurs, the new radar will surely be an electronically scanned array, and, as in the case of the existing JSF radar, it would be simply a matter of software to provide air-to-air modes along with air-to-ground capabilities. Second, regarding fighter-versus-fighter comparisons, the F/A-22's low observability will give it a first-look, first-shot advantage over aircraft such as the Su-37 that the F-15C will never be able to match. One could suggest that this technology-based edge will not be all that decisive in the real world given the training, proficiency, surveillance, and command-and-control advantages of US pilots. Nonetheless, from the perspective of being an effective competitor over the long haul, the F/A-22 will undoubtedly discourage prospective opponents from even attempting to compete head-to-head with American forces in traditional air-to-air combat.

Of course, the very likelihood of this outcome will inevitably encourage serious adversaries to invest in asymmetric responses, starting with advanced air defenses such as the SA-10 or SA-20. Because these systems employ very powerful radars, they will probably prove difficult to take out even for platforms with the low observability of F/A-22—particularly in the absence of any electronic-warfare support. Low observability does not confer invisibility in any portion of the electromagnetic spectrum. In the case of radar, if a so-called stealthy platform gets close enough, burn-through will occur, which was most likely how an F-117 was downed by a Serbian SA-3 on the night of March 27, 1999, about 35 nm north of Belgrade.[51] Consequently, another operational risk embedded in the GSTF concept is whether the F/A-22 can safely get close enough to double-digit SAMs to release air-to-surface weapons, which in the F/A-22's case means SDBs.

The Air Force's answer to this problem is to put wings on the SDB. Given that the much heavier AGM-154 Joint Stand Off Weapon (JSOW) can glide to targets up to 40 nm away when released from high altitude, SDBs released from an F/A-22 at supercruise speeds can probably reach targets as distant as 50 nm or more.[52] This much stand-off would greatly enhance the survivability of the F/A-22 during attacks against double-digit SAMs. On the other hand, it would also mean that the precise locations of critical SAM elements such as the engagement radars would be needed at even greater distances than 50-60 nm. Hence, off-board surveillance

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[51] General Richard Hawley, who had been the ACC commander when the F-117 was lost, made the revealing observation that "Before that airplane took off from Aviano [Air Base in Italy], there was better than a 50-50 chance it would be shot down" ("U.S. Confirms Yugoslavs Downed Stealth Fighter," *The Washington Post*, November 25, 1999, p. A18). The loss occurred on the fourth night of Operation Allied Force and the Serbs were quick to televise scenes of the wreckage, including the tail number of the F-117 (see "NATO Plane Downed," Online NewsHour, Public Broadcasting System, March 28,1999, available online at http://www.pbs.org/newshour/bb/europe/jan-june99/f117a_3-27.html).

[52] Boeing's SDB candidate uses the MBDA DiamondBack wing and is reported to have "a range greater than 40 nautical miles" "Boeing Successful on First Flight of a Small Diameter Bomb," Boeing press release, February 25, 2003, available online at http://www.boeing.com/news/releases/2003/q1/nr_030225n.html.

for initial target location and the lethality of the SDB appear to be more crucial to kicking open the door into denied airspace than the F/A-22 platform per se. What, for example, would preclude such targeting information and SDBs from being utilized by other low-observable platforms to attack SA-10 or SA-20 sites—assuming the F/A-22s could suppress enemy fighters?

The presumed lethality of the SDB suggests another operational risk in the GSTF concept. The lethal radius of a unitary high-explosive warhead is proportional to the cube root of the weight of its explosive material.[53] The Mark-84 warhead used in 2,000-pound JDAMs, as well as many 2,000-pound laser-guided bombs (LGBs), contains 945 pounds of H-6 or Tritonal. By comparison, the weight of high explosives in the SDB is expected to be some 50 pounds.[54] Simple arithmetic argues, therefore, the lethal radius of an SDB against a given target is nearly 2.7 times smaller than that of a JDAM or LGB using the Mark-84 warhead. LGBs, which are the most accurate US guided bombs, have CEPs of around 3 meters, which is also the CEP objective for the initial version of the SDB. Evidently, then, until a terminal seeker can be developed for the SDB, the weapon may not have the accuracy needed to achieve high probabilities of target destruction with a single round.

Of course, the Air Force's hope is that improvements in high explosives will enable the SDB to be as powerful as a 1,000-pound JDAM, which is the largest air-to-ground munition that can be carried inside the F/A-22's weapons bays.[55] Accomplishing this would require roughly a tenfold increase in the explosive power of the SDB's warhead relative to Tritonal, whereas a 20-30 percent increase is probably the most that is within technological reach. Among other reasons, the explosive material in military munitions has to be stable enough to withstand physical shocks, temperature extremes, rapid temperature cycles, and other harsh treatment unavoidable in military practice even in peacetime. A 30 percent increase in the explosive power of material in the SDB's warhead would, therefore, be a considerable step forward. However, even 30 percent falls well short of offsetting a 3-meter CEP compared to the explosive power and lethal radius of a 1,000-pound LGB.

Aircrews could compensate for the 3-meter CEP by releasing multiple SDBs against a single aim point, but doing so would undermine perhaps the main objective of the SDB development, to provide "increased kills per sortie on current and future aircraft platforms."[56] Another alternative would be to drive the CEP for the basic weapon down close to 1 meter. However, a CEP this small may be difficult to achieve without a terminal seeker. Further, because the seeker envisioned for the second phase of the SDB program aspires to provide automatic-target-recognition (ATR) capabilities suitable for mobile and relocatable targets, it is unlikely to be cheap. Achieving cheap 1-meter CEPs may be pressing the state of technology, and without such

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[53] Stillion and Orletsky, *Airbase Vulnerability to Conventional Cruise-Missile and Ballistic-Missile Attacks*, p. 11.

[54] See, for example, Global Security, "Small Diameter Bomb / Small Smart Bomb," available online at http://www.globalsecurity.org/military/systems/munitions/sdb.htm.

[55] John A. Tirpak, "The F-22 On the Line," *Air Force Magazine,* September 2002, p. 40.

[56] RDT&E Budget Item Justification Sheet (R-2 Exhibit), 0604329F Small Diameter Bomb, February 2002, p. 1.

accuracy the F/A-22/SDB combination could be hard pressed to eliminate advanced SAMs as quickly and thoroughly as hoped.

A related operational risk is that double-digit SAMs such as the SA-20 are designed for rapid relocation. In 1999 the Serbs, drawing on Iraqi experiences in 1991, had considerable success using periodic relocation of their SAMs over short distance to deny precision-targeting information to NATO aircraft. In a full-blown AD contingency involving advanced SAMs, one would expect that the use of such tactics could result in F/A-22 pilots suddenly finding themselves inside the burn-through distances of individual sites that had moved while they were en route to their target areas. Without precise, real-time surveillance of all existing SAM sites, which may well be difficult to achieve, pop-up SA-10s or SA-20s could lead to unexpected attrition, even of F/A-22s.

This prospect raises the broader issue of achieving persistent, wide-area surveillance—especially against deep targets beyond the range of the E-8C Joint Surveillance and Target Attack System (JSTARS). Because JSTARS is hosted on a Boeing 707 airframe, it cannot risk operating inside hostile or denied airspace. Using a standard racetrack pattern located some 90 kilometers inside friendly airspace, JSTARS can track moving targets to maximum depth of less than 100 nm inside enemy territory.[57] There is no reason, however, why mobile launchers for ballistic missiles designed for AD against US power-projection capabilities cannot be located deeper in enemy territory. Further, combat experience in Iraq as well as analytic simulations since 1991 have argued that near-continuous surveillance over large areas is essential to have much chance of targeting mobile-missile launchers after they have fired a missile, much less of destroying them before they have fired at least once. While USAF plans to migrate JSF air-to-ground avionics into the F/A-22 would permit detection and tracking of such targets within the aircraft's field of view when operating in enemy airspace, the Raptor does not offer much capability for around-the-clock surveillance of large areas. For the continuous surveillance needed to locate and track mobile SAMs, mobile missile launchers, and other relocatable or time-urgent targets, a long-dwell platform along the lines of Global Hawk is required. A flight or two of F/A-22s blowing through enemy airspace above Mach 1.5 hardly seem well suited to providing the staring coverage needed for these classes of targets. Nor, in fact, are supercruising F/A-22s likely to provide the persistence in the target area that long-range platforms can provide by loitering in or near areas in which time-critical and moving targets are expected to emerge.[58] Finally, because Global Hawk is being bought in relatively small numbers and is not low-observable, one cannot help but wonder whether the Air Force is buying the kinds or quantities of penetrating, deep-look, persistent sensors that will almost certainly be needed to make the GSTF concept work against smart, resourceful, capable opponents. Indeed, this deep-surveillance shortfall verges on being a true show-stopper for the GSTF concept as a whole.

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[57] Congressional Budget Office, "Options for Enhancing the Department of Defense's Unmanned Vehicle Programs," September 1998, Chapter III, p. 16.

[58] The view implicit in Air Force arguments for the F/A-22 and the GSTF that the high supercruise speeds of the Raptor is the only way to deal with time-critical, relocatable, moving, or emergent targets illustrates another way in which the USAF has selected a single-path solution to a difficult problem. Surely a long-range platform able to provide long loiter times in or near likely target areas offers an alternative.

Taken together, these observations suggest that the aggregate or collective operational risk in the GSTF is substantial. As sensible and prudent as the GSTF may be as an Air Force response to A2/AD challenges, the concept involves non-trivial operational risks. The vulnerability of forward bases, the difficulties of eliminating advanced SAMs quickly, and the shortfalls in the staring surveillance needed to detect and track emerging, time-critical, relocatable, and moving targets are the most obvious areas. While such a comparison cannot be precise, it does not seem unreasonable to suggest that the collective operational risk in the GSTF is at least as great as that which confronted the 8th Air Force's concept of daylight, strategic bombing in mid-1943.

TECHNOLOGICAL AND FISCAL RISKS

The technological risks in the GSTF concept are, to a large extent, those of the F/A-22 program, and the Raptor's technological risks are tightly coupled with fiscal risks facing the F/A-22 program in particular and the Department of Defense's (DoD's) topline in general. The preceding discussion of operational risk implicitly assumed that JSF-class air-to-ground capabilities can be readily migrated to the F/A-22. The present Air Force plan is to begin doing so with Spiral 2 modernization enhancement, starting with substituting the JSF antenna array for the current F/A-22 array. This newer, active electronically scanned antenna array will be substantially cheaper, but in itself it will not provide anything approaching JSF air-to-ground capabilities. Migrating the bulk of those capabilities to the F/A-22 will demand the much greater signal-processing and computational power provided, in the F-35's case, by its open avionics architecture, which is currently based on Motorola G4 microprocessors running at 1 gigahertz or higher.[59] Thus, the migration of JSF-like, air-to-ground capabilities to the F/A-22 is almost certain to increase overall program costs. Among other things, this migration will require large amounts of new software.

The additional cost of this added program content could perhaps be absorbed—at least in part—within the F/A-22 program if the program was on schedule and under cost. Unfortunately, the F/A-22's current IOC is may well slip a year, program costs have grown some $6-7 billion since mid-2001, and the production portion of the program probably exceeds the existing congressional cost cap ($37.6 billion according to DoD) by at least that much.[60]

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[59] By comparison with the microprocessors in the JSF Common Integrated Processors (CIPs), the production representative test vehicle (PRTV) versions of the F-22 built for initial flight testing utilized Intel i960MX microprocessors—roughly comparable to the Intel 386—running at speeds around 25 megahertz. The hope of the JSF's open architecture is that when G5 chips become available, it will be possible to insert new cards with those microprocessors into the CIP slots and have the aircraft's software run without modification. While the validity of this hope has yet to be demonstrated, the aim of making the JSF's computer hardware able to cope with successive generations of improved microprocessors is clearly a step forward compared to the relatively closed computer architectures in the B-2 and F/A-22.

[60] The FY 1998 defense authorization act imposed a cost cap of $36.4 billion on F-22 production. Subsequent decisions to fund the first two PTRVs and long-lead for next six using production money increased this cap to $37.6 billion, and, in December 1999, Pentagon officials put the "adjusted" cost caps for the F-22 as $18.9 billion for engineering and manufacturing development and $39.759 billion for production ("F-22 Program on Track," Air Force News Service, December 22, 1999). Just before the August 14, 2001, Defense Acquisition Board (DAB) on low-rate initial production for the F-22, the Air Force conceded that it needed an additional $5.4 billion in production money, although the Cost Analysis Improvement Group (CAIG) believed that production was $9 billion short. The August 2001 DAB added $5.4 billion to production, $600 million to RDT&E, and mediated the

If Congress does not relent on the existing production cost cap, the Raptor buy could fall to as few as 200 aircraft, well short of the 381 Air Force officials believe they need to equip each of the USAF's ten Air and Space Expeditionary Forces (AEFs) with one 24-aircraft squadron of F/A-22s (while providing enough additional Raptors for training, attrition reserves, ongoing operational testing, and so forth).[61] Even if Congress ultimately accedes to $43-44 billion for production, this higher cap will probably buy only 275-300 Raptors, and achieving full Spiral 5 capabilities now appears to require funding over and above $43-44 billion. If so, then the Air Force may be unable to bring all F/A-22s to the Spiral 5 level. Deciding what portion of the F/A-22 fleet to leave with only basic air-to-air capabilities would be a difficult choice given how much the GSTF depends on the ground-attack capabilities of the plane. The resulting risk may be more fiscal than technological, but the bottom line seems to be that the planned migration of something approaching JSF ground-attack capabilities to the F/A-22 faces substantial risk.

The underlying technological risk lies in the challenge of getting so much software to work reliably. By all reports, the air-to-air software in the PRTV F-22s currently being flown in flight test has had recurring stability problems. Adding all the additional code needed to migrate JSF ground-attack functionality to the F/A-22 suggests that some of the Raptor's technology may not yet be entirely in hand.

The broader fiscal risk that could affect the F/A-22 and the GSTF stems from the sustained real growth now envisioned through FY 2009 in the DoD's topline. If the military (051) topline grows, as the Department now projects, to $483.6 billion in discretionary budget authority by FY 2009, then the 051 topline will have grown in real terms for eleven consecutive years.[62] Since the Vietnam War, there has been no historical precedent for sustained real growth spanning eleven years in a row. Five or six years constitutes the maximum duration of steady topline real growth in the historical record. Given the current state of the US economy, the nation-wide shortfalls in many state and local budgets, the likely costs of the second Gulf War (Operation Iraqi Freedom), and the ongoing effort against global terrorism, it is not unreasonable to think that the 051 topline might level off as early as FY 2005 or 2006, rather than continuing to grow at the projected rate through 2009. In that event, there would be additional fiscal pressure on all large service programs, including with the F/A-22 and the Army's Future Combat System (FCS).

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remaining difference between the USAF and the CAIG cost positions on production by reducing the quantity to 295 (with the proviso that up to 331 could be procured if costs could be reduced). Under Secretary of Defense E.C. "Pete" Aldridge, Jr. then asked Congress to raise the production cap, Congress has not done so, and the Air Force has been left arguing that cost-reduction initiatives would enable the program to produce 295-331 F-22s within the congressional limit on procurement (E. C. Aldridge, Jr., letter to John H. Tierney, October 3, 2001). It now appears increasingly doubtful that the USAF will be able to do so (General Accounting Office, "Tactical Aircraft: DoD Needs to Better Inform Congress about Implications of Continuing F/A-22 Cost Growth," February 2003, GAO-03-280). In fact, since the August 2001 DAB, the program has experienced at least one further cost overrun of $690 million to as much as $1 billion in RDT&E and the decision to begin migrating JSF-like air-to-ground capabilities to the plane starting with Lot (spiral) 5 appears to eliminate much hope of reducing production costs, "Air Force Jet Overruns May Reach $1 Billion," *The Washington Post*, December 7, 2002, p. A6.

[61] Tirpak, "The F-22 On the Line," p. 39. The Air Force believes that each AEF should have 2.5 Raptor squadrons numbering a total of 60 aircraft. This would require a total buy of over 950 F/A-22s, (Ibid., p. 40).

[62] DoD, "Fiscal 2003 Department of Defense Budget Release," No. 044-03, February 03, 2003, available online at http://www.defenselink.mil/news/Feb2003/b02032003_bt044-03.html.

The one other technological risk of significance stems from the GSTF's clear need for staring or persistent surveillance of targets deep inside enemy territory. The Pentagon has begun investing RDT&E funds into spaced-based radar (SBR) as a long-term solution. However, radar physics, orbital mechanics, and the continuing high costs of putting a pound of payload in low-earth orbit suggest that an affordable SBR constellation able to provide 24/7 targeting-quality data throughout areas as large as the entire Korean peninsula is unlikely to come on line before 2020. In the meantime, the only alternative appears to be air-breathing, long-duration, survivable platforms operating at high altitudes. Global Hawk satisfies the first two requirements, but lacks the low observability to be survivable in the presence of advanced SAMs. Dark Star, a stealthy competitor to Global Hawk, was cancelled. Hence, there appears to be a need to offset the technical risk of SBR by investing in a successor to the Dark Star UAV for persistent, penetrating surveillance.

Assessment

The GSTF appears to face some serious fiscal and technological risks on top of the concept's path and operational risks. The most worrisome risks confronting this USAF CONOPS, though, appear to be operational. Moreover, the collective operational risk is, in turn, tied to the path risk inherent in the Air Force's insistence on depending so heavily on short-range systems between now and the late 2030s. If the aggregate operational risk in this preferred path is at least as great as that faced by the 8th Air Force in mid-1943, then some hedging in the direction of greater investment in long-range systems would seem to be prudent at the very least. Against opponents with A2/AD capabilities, betting mainly on short-range systems to find, fix, track, and attack the deepest and most difficult target classes seems tantamount to embracing the riskiest of all paths available. Unfortunately, the fiscal and related technological risks facing the F/A-22 and, after that, the JSF, make even modest rebalancing in favor of long-range systems both bureaucratically and programmatically difficult for the US Air Force.

In the final analysis, USAF and DoD leaders could judge the total risk tolerable on the grounds that American forces are unlikely to be confronted by an opponent as determined and militarily capable as was Nazi Germany in World War II. Judging by Iraqi prowess in two Gulf Wars, this bet may be a safe one in the short term. If history is any guide, however, it is much riskier over the long term, and there can be no doubt that the wager the Air Force is making is a long-term bet. Taking the long view, therefore, prudence would counsel some rebalancing of Air Force modernization investments more in favor of long-range platforms—for strike as well as persistent surveillance of deep targets.

III. The Department of the Navy and Assured Access: A Critical Risk Assessment

By Robert Work

Assured Access

The Department of the Navy (DoN)—comprised of the two sea Services, the US Navy and the US Marine Corps—has a straightforward, declaratory approach to theater access:

> *We assure access*. Assuring sea-based access worldwide for military operations, diplomatic interaction, and humanitarian relief efforts. Our nation counts on us to do this.[1]

Assured access is a relatively new DoN promise. In 1999, the DoN emphasized four strategic concepts for naval forces: forward presence; deterrence; sea and area control; and power projection. The 2000 Program Guide to the US Navy lists forward presence, knowledge superiority, and dominating the battlespace as the key tenets of maritime operations in the Information Age. The promise of assured access was first made during the 2001 QDR. During that review, the Navy outlined the four returns on investment in a strong Navy: command of the seas; US sovereign power overseas; *assured access*; and enabling the transformation of the joint force. The claim of assured access is now a staple of Navy and Marine Corps publications, and it has been elevated to the first of three pillars in the DoN's new strategic vision, *Naval Power 21*.[2]

The confidence this claim implies derives from the unique maneuver space the Navy and Marine Corps operate on and exploit: the broad oceans of the world, which cover over 70 percent of the earth's surface. By international law and convention, naval vessels and aircraft can operate over, on, and under the sea as close as 12 miles off any coast in the world at any time, with no need to seek permission from any international body or national government.[3] As a result, Vice Admiral Art Cebrowski, Director of the Office of Force Transformation, refers to the oceans as the "global commons." By assembling, moving, and concentrating naval forces on the global commons, the United States can literally establish a sovereign sea base—and thereby assure joint

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[1] Gordon England, Admiral Vernon Clark, General James L. Jones, *Naval Power 21* (Washington, DC: Department of the Navy, October 2002), p. 1.

[2] See Richard J. Danzig, Admiral J.L. Johnson, General C.C. Krulak, *Department of the Navy 1999 Posture Statement: America's 21st Century Force* (Washington, DC: Department of the Navy, 1999), pp. 6-8; Admiral J.L. Johnson, *Vision…Presence…Power: A Program Guide to the U.S. Navy, 2000 edition* (Washington, DC: Department of the Navy, 2000), pp. 6-9; *A 21st Century Navy* (Washington, DC: Department of the Navy, 2001), a small pamphlet published by the Navy's 2001 QDR Support Team; and Edmund P. Giambastiani, Jr., "An Investment Portfolio…For the Navy After Next," *Sea Power,* April 2001, pp. 9-19.

[3] In December 1982, the US accepted the provisions of the Convention on the Law of the Sea, which established 12 miles as the limits of the territorial sea, and which gave naval and merchant vessels the right of "innocent passage through those seas. For an overview of the convention, see www.un.org/Depts/los/convention_agreements.

force access—in virtually any theater of operation. A naval officer perhaps best summarized the DoN's approach to access when he wrote:

> With the right Navy, we do not require permanent overseas presence, host-country infrastructure, or other country's permission to assert our national desires. Naval force will take us anywhere in the world to touch someone, whether with diplomatic initiatives or high explosives.[4]

Of course, geographic limitations also apply to sea bases. In some cases, access to an ocean operating area is physically prevented by ice or very shallow water. In other instances, access is complicated, but not denied, by narrow chokepoints such as the Strait of Hormuz, and restricted waters, like the Persian Gulf. In both cases, lack of sea room limits the potential size of the sea base, and hinders the free maneuver of its constituent parts.[5] However, all of the "critical regions" identified in Defense Planning Guidance—Europe; Southwest Asia and the Persian Gulf; the Indian Ocean and Central Asia; the East Asia Littoral; and Northeast Asia—have long, accessible coastlines. Indeed, as Navy and Marines planners like to point out, 80 percent of the world's population and capitals are located within 200 nm of a coastline.[6]

In addition to its political and geographic attractions, sea basing has two key military advantages. First, a sea base is mobile; not only can the ships that constitute the base sail from theater to theater, but once in an operating area, they remain constantly on the move—either over-the-horizon or close to shore—depending on the threat. This attribute has important tactical implications. In an era of precision guided munitions, in which accuracy is independent of range, target location error is one of the biggest operational determinants of a successful engagement. Moving targets are inherently harder to hit than stationary targets, and both the difficulty and expense of developing over-the-horizon targeting capabilities against ships trying to evade detection and engagement are non-trivial challenges. Second, the base generally carries its own defenses with it wherever it goes. Local air defenses are provided by tactical aircraft operating off the decks of its large aircraft carriers and "big deck" amphibious ships; organic missile defenses are netted and dense to protect the base from missile and air attack; and aircraft, surface combatants, and submarines screen the base from submarine and surface ship threats.[7]

Access During the Cold War

During the Cold War, the Navy capitalized on these two military advantages by forming free-ranging, independent strike bases consisting of groups of one or two carriers surrounded by six to 12 surface escorts, and one or two attack submarines in direct support.[8] Given the potential threat

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[4] Captain John Byron, US Navy (Ret.), "A New Navy for a New World," *Proceedings,* March 2003, p.86.

[5] Note, however, that for Operation Iraqi Freedom, the Navy operated *three* aircraft carrier battle groups inside the Persian Gulf. See Robert Wall, "Waging War," *Aviation Week and Space Technology,* March 17, 2003.

[6] Edward Lundquist, "The Future Family of US Naval Ships," *Marine Corps Gazette,* March 2003, p. 28.

[7] See for example Richard Kugler, "Naval Overseas Presence," in *Globalization and Maritime Power,* ed. Sam J. Tangredi (Washington, DC: National Defense University Press, 2002), pp. 302-03.

[8] A Carrier Battle Group, or CVBG, is built around a single carrier, nominally defended by six combatants and one or two submarines; a Carrier Battle Force, or CVBF, has two or more carriers, each contributing their close escort of six combatants and submarines.

posed by long-range Soviet naval aviation, submarine, and surface units, these strike bases were rarely, if ever, stationary. They planned rapid penetrations of Soviet naval defenses to "unmask their batteries" of aircraft (and later, land attack cruise missiles), launch a strike from extended range, and then either retire or reposition for further strikes. The ready availability of allied forward bases meant that the Cold War carrier-centric "strike Navy" worried less about seizing bases from which to operate, repair battle damage, or refit, and more about ensuring reliable underway replenishment from their special purpose combat logistics forces (CLFs).

The Marines also benefited from the extensive worldwide availability of bases in the Cold War—so much so that they gradually came to emphasize rapid *land-based* assembly of large Marine units rather than major amphibious assaults or operations from the sea. It is true that the Navy strove to maintain enough purpose-built amphibious ships to embark 2.5 Marine Expeditionary Brigades (MEBs), or "brigade equivalents."[9] However, with the Marines' enthusiastic support, they organized and operated them in such a way as to keep several reinforced battalion crisis response units forward deployed in peacetime, which were themselves best suited for independent, limited missions. This brigade equivalent of forward sea-based Marines was backed by an additional brigade that could fall in on equipment hidden and protected in deep caves in Norway, and three more that could fly to an airfield ashore to marry up with equipment delivered by special purpose maritime pre-positioning ships to a nearby port. In other words, by the end of the Cold War, the ratio of land-based to sea-based Marine brigade equivalents in crisis response operations was 4:1. As a result, the art of mounting even a single cohesive brigade-sized amphibious operation (as opposed to the assembly of three independent sea-based battalions) was an increasingly lost one.

Assured Access in the New Expeditionary Era

The end of the Cold War ushered in a new expeditionary era that forced both the Navy and Marines to confront new operational realities. With the collapse of the Soviet Navy and no plausible naval opponent on the near- to mid-term horizon, the Navy had to recast its attention toward joint power-projection operations and support of joint land and air forces ashore. And with the ready availability of land bases, ports, and airfields no longer certain, the Marines had to rethink their reliance on land bases for the rapid projection of most of their forces.[10]

In the process of confronting these new operational realities, the DoN recognized an important bureaucratic opportunity. Because it was the only Department with its own navy, tactical air

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[9] Amphibious lift is measured in several ways, such as total personnel spaces, square footage dedicated to cargo, square footage dedicated to vehicle storage, helicopter spots, etc. The active amphibious fleet exceeds all measurements for 2.5 MEB equivalents except in "vehicle square." This shortfall will be alleviated with the introduction of the new LPD-17; in the interim, a reserve Amphibious Lift Enhancement Program covers the shortfall. Major General D.T. Krupp, *Naval Amphibious Warfare Plan* (Washington, DC: Department of the Navy, undated), pp. 32-33.

[10] In 1992, the DoN published *From the Sea,* its first articulation of the rationale for the post Cold War Navy-Marine Corps Team. This was followed two years later by *Forward…From the Sea.* Together, they outlined the vision for a more concerted Departmental shift toward supporting joint power-projection operations in the world's littoral seas. See both of these vision statements in the Official Posture Statement section of the Defense Strategy Review at www.comw.org.

force, and ground maneuver element, it could argue that its ability to assemble *sovereign* forward sea bases[11]—capable of providing assured access and of projecting both fire *and* maneuver—was ideally suited to a new strategic era in which theater access was no longer guaranteed.

> As enemy access to weapons of mass destruction grows, and the availability of overseas bases declines, *it is compelling both militarily and politically* to reduce the vulnerability of US forces through the expanded use of secure, mobile, networked sea basing (emphasis added).[12]

Unstated, but strongly implied, was that this circumstance might warrant a reapportionment of DoD resources in favor of the sea Services.

> Sea basing is also a catalyst for coalition building, because it is politically and logistically easier for nations to contribute to a sea-based effort *than to commit land forces* (emphasis added).[13]

This bureaucratic opportunity gradually helped to convince both Navy and Marine Corps officers that they needed to change their acquired Cold War habits. For assured sea-based access and sea-based fire and maneuver to translate into a meaningful wartime advantage, the Navy had to once again think of Marines as part of the battle fleet's main battery, and about reallocating assets to support them. For their part, the Marines had to rediscover the art of conducting large, sea-based operations not reliant on land-based ports and airfields, thereby increasing their operational reliance on the Navy. Together, then, both the Navy and the Marine Corps had to re-energize an operational partnership with one another than had lapsed since the end of the Korean War. In large measure, the 1990s can be seen as a period of operational reappraisal and debate among and within the two sea Services on the extent and ramifications of this renewed operational partnership.

While the growing ties between Navy and Marine planners has been a positive development within the DoN, both of the sea Services are now starting to confront the operational challenge of promising assured access in the green-water littoral regions of the world. The term "littoral region" includes both a seaward *and* landward dimension in naval operations. The seaward dimension is generally defined "as the area shoreward from the continental shelf."[14] While the definition of the landward extension is less clear, so as not to cede any advantage to the Air Force and Army in the immediate post-Cold War roles and missions debates the DoN chose an expansive one: "…those areas adjacent to the oceans and the seas that are within direct control of and vulnerable to the striking power of sea-based forces."[15] In joint power-projection operations

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[11] The emphasis on sovereignty with respect to sea bases was also a development during the 2001 QDR. See *A 21st Century Navy,* Giambastiani, Jr., "An Investment Portfolio…For the Navy After Next."

[12] Admiral Vern Clark, US Navy, "Sea Power 21: Projecting Decisive Joint Capabilities," *Proceedings,* October 2002, pp. 36-37.

[13] Vice Admiral Charles W. Moore, Jr., US Navy, and Lieutenant General Edward Hanlon, Jr., US Marine Corps, "Sea Basing: Operational Independence for a New Century," *Proceedings,* January 2003, p. 83.

[14] Vice Admiral Hank Giffin, US Navy (Ret.), and Rear Admiral John Tozzi, US Coast Guard (Ret.), "'C' in LCS Stands for Combat," *Proceedings,* January 2003, p. 89.

[15] *Forward From the Sea* (Washington, DC: Department of the Navy, 19 September 1994), preface.

along an enemy coast, naval planners rightly emphasize the latter definition, since the aim of their forces is to threaten as much of the enemy's homeland as possible with fire and maneuver. But therein lies the challenge, because offsetting the sea base's advantages of mobility and organic multi-dimensional defenses is the relatively limited operational reach of its strike and maneuver forces.

With the retirement of A-6 attack aircraft and the abortive development of the A-12, the Navy and Marines began to rely on relatively short-range F/A-18 Hornet and AV-8 Harrier fighter-bombers for naval aviation strike. Indeed, to try to make up for its lack of operational reach, naval aviation converted the F-14 Tomcat, a comparatively long-ranged fighter-interceptor, into a fighter-bomber.[16] In any event, although aerial refueling can extend the reach of its aircraft, carrier strike wings are currently optimized to conduct strikes between 200-500 nm from the carrier deck.[17] Tactical air strikes can be augmented by Tomahawk land attack cruise missile attacks, currently to ranges of approximately 1,000 nm. However, for every mile a carrier or missile shooter operates offshore, the amount of land threatened by its air wings or missiles is reduced. As a result, to optimize the inland reach of its strike assets, naval planners prefer for carriers and surface combatants to operate no more than 50-100 nm from an enemy coastline, adjusted as necessary to deal with tactical threats.

Sea-based maneuver reach is even more limited than strike reach. Because aircraft carriers or amphibious ships cannot operate large tactical lift aircraft such as the C-130 from their decks, sea-based maneuver operations rely upon rotary wing aircraft (e.g., helicopters and, in the future, tiltrotors) to support the ship-to-shore movement. However, rotary wing aircraft have both less comparative lift capability and range than large, fixed-wing airlifters. For example, Army planning factors call for the insertion of future Objective Force *brigades* by C-130 aircraft to landing zones 500 miles from an intermediate staging base. In contrast, Marine planners envision the air insertion of a combat *battalion* 200 miles from a sea base, using a mixture of tiltrotor MV-22s and helicopters.[18] However, due to the lift constraints of these aircraft, the majority of heavier combat units and equipment will continue to be delivered to the beach by surface craft, and will then drive inland to link up with lighter, air-delivered forces. As a practical matter, therefore, the operational exploitation of sea-based maneuver forces requires that the sea base be

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[16] See for example "Swing-role Tomcats Crucial to First Days of 'Enduring Freedom' Air Campaign," *Jane's International Defense Review,* November 2001, p. 2.

[17] The un-refueled combat radius of a naval strike fighter is subject to many variables. In certain profiles, the F/A-18C, the current workhorse of carrier air wings, is 500 nm—see Vice Admiral Charles W. Moore, Jr., US Navy, and Lieutenant General Edward Hanlon, Jr., US Marine Corps, "Sea Basing: Operational Independence for a New Century," p. 81. However, when highlighting the air wing's maximum daily sortie rates and aimpoints attacked, it assumes ranges to targets on the order of 200 miles. See Lieutenant Commander Ed Langford, *CVW Strike Sortie/Aimpoint Improvement,* unclassified point paper (Washington, DC: DoN (N8QDR), January 18, 2001).

[18] Of course, the use of tiltrotors and helicopters for troop and equipment insertions allows a sea-based maneuver force far more flexibility in selecting landing sites, since aircraft capable of vertical landing require only flat landing zones instead of airfields, whether improved or not, like the C-130.

very close to shore. Indeed, Marine maneuver and supporting naval gunfire planning factors call for the forward edge of the sea base to be located no more than 25 miles from the shoreline.[19]

Even if a potential adversary decides not to contest sea-based operations this close to a coastline, limited operational reach can still complicate or limit the contributions of sea-based forces. For example, during recent operations in Afghanistan—a land-locked country with no navy and located a minimum of 400 nm from the sea (Kabul was over 900 nm)—high sortie rates by carrier strike aircraft were difficult to sustain, even when supported by land-based Air Force tankers, and the Marines had to stage most of their maneuver forces and equipment through bases in Pakistan.[20] Operational reach would also be an issue for combat operations against an exceptionally large country with a coastline (e.g., China); even if the country does not contest the establishment of a sea base close to its shore, the expanse of the country may mean targets are simply out of reach of US weapons, aircraft, and forces. For the remainder of this discussion, however, the focus will be on efforts by US sea-based forces to assure access and to maximize their operational reach by operating close to a contested shoreline and concerted efforts by an enemy to prevent or deny this from happening.

MARITIME AD

Given its declaratory promise of assured access from sea bases established on the global commons, the DoN's position is that the Navy and Marines no longer require forward bases ashore. In this sense, the DoN does not face an A2 challenge; instead, its main problem is to ensure that enemy forces cannot deny its use of the littoral battlespace through concerted maritime AD operations.

To understand the Navy and Marine approach to the maritime AD challenge, one must appreciate the nature of the threats that confront them in *wartime* and, perhaps counter-intuitively, their preferred *peacetime* deployment pattern. Demonstrated or available maritime AD systems include over-the-horizon targeting systems; long-range strike aircraft; antiship cruise missiles (ASCMs) and possibly ballistic missiles; submarines and missile-firing surface combatants; swarming fast attack craft; mines; and coastal defense artillery. Finally, integrated air defenses seek to prevent naval strike aircraft, aerial delivery platforms, and land attack cruise

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[19] The forward edge of the sea base would see purpose-built amphibious assault ships and naval gunfire platforms such as the DD(X) land attack destroyer. The Marines' new Advanced Amphibious Assault Vehicle is designed to commence its run-in to shore from approximately 25 miles over-the-horizon, and the range requirements for future naval gunfire systems assume that the firing ship is located 25 miles offshore. Unarmed and built-to-commercial-standard maritime pre-positioning, ships might operate as far from shore as 100-200 miles, depending on the threat. See George V. Galdosi, "Expeditionary and Amphibious Warfare," in *Globalization and Maritime Power,* p. 419. For a concise overview of Marine Corps future plans, see Marty Kauchak, "The Marine Corps in 2025: Evolving Doctrine and New Weapons Platforms Will Position Corps to Meet Diverse, Future Threats," *Armed Forces Journal International,* April 2002.

[20] In Afghanistan, with the help of US Air Force tankers, three carrier air wings were able to maintain a continuous combat air patrol over US forces over 700 miles away from their carrier decks. See statement of Vice Admiral Kevin P. Green, Deputy Chief of Naval Operations for Plans, Policies, and Operations, before the Subcommittee on Military Readiness and Management Support of the Senate Armed Services Committee on April 9, 2003, found in the Today's Navy section at www.navy.mil.

missiles from penetrating their airspace. Potential adversaries might emphasize none of these systems, some of them, or all of them; prudently, the Navy and Marine Corps plan to face and overcome them all.

When considering the challenge of maritime AD operations, it is therefore helpful to adopt the Israeli Navy's threat-based definition of the littoral, which is "[t]he area of the sea adjacent to an enemy coast, protected by detection and weapon systems based on land, ships, and aircraft within the area." From the Israeli perspective, this definition focuses on what an opponent can do to the naval force, not how or deep the naval force exploits and extends its operational reach. Note that in this construct "littoral" is not defined as a generalized geographic location (i.e., "shoreward from the continental shelf"), but as an "increase in threat level as you near the shore and become more affected by elements operating under its wing." Intuitively, this definition is far more aligned with potential counter-maritime denial operations since, as the Israelis point out, *the nearer a force operates to shore, the better and more reliable an enemy's targeting, the more diverse the threats, and the higher the risk to friendly naval forces*.[21]

This is where the DoN's peacetime deployment pattern looms large. Since the end of World War II, both of the sea Services have emphasized rotational fleet operations that maintain combat credible forward presence. That is, the Navy-Marine Corps team strives to keep balanced battle fleets forward deployed to show the flag and to quickly respond to brewing or emerging crises. An important additional mission for these forward deployed forces is to assert the Navy's continued right to operate on the global commons within 12 miles from any accessible coast on the planet. These freedom-of-navigation exercises are continually conducted. Indeed, some naval officers insist that, as a matter of policy, US naval task groups will always operate in restricted bodies of water and close to shore—even, indeed especially, near potential adversaries—to demonstrate the Navy will not be deterred from using any of the world's accessible water space.[22] The practical result of both its peacetime deployment patterns and its religious insistence of the right of passage on the open seas means that, as a matter of course, the Navy-Marine Corps team *routinely operates in the heart of potential maritime AD networks and within easy range of their component weapon systems.*

This operational reality has a profound impact on the way the sea Services approach the combined A2/AD problem. In power-projection operations into distant theaters, the Air Force and the Army think first of fighting for and establishing theater base access (counter-A2) and then penetrating and defeating AD threats to gain operational freedom of action (counter-AD). In sharp contrast, the Navy/Marine Corps team thinks first about maintaining and sustaining operations within range of even short-range maritime denial systems so as to assure *continual* access for sea-based forces (simultaneous A2/AD). As one Navy officer puts it, "This potential

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[21] Captain Opher Doron, Israeli Navy (Ret.), "The Israelis Know Littoral Warfare," *Proceedings,* March 2003, pp. 66-69.

[22] See for example "A Global Strategy Demands a Global Naval Presence," a section in the *Department of the Navy's 1999 Posture Statement: America's 21st Century Force,* which describes the importance of freedom of navigation exercises.

condition is unique to the sea Services because of the vast areas of responsibility and broad diversity of assigned missions."[23]

This unique DoN approach to the A2/AD challenge has had two far-reaching consequences. Operationally, it has convinced both Navy and Marine Corps planners to organize and train their forces to operate from "enhanced network sea bases" that will "assure access" and provide "the nation's 21st century asymmetric military advantage."[24] Tactically, it means the Navy worries incessantly about surprise first salvos—preemptive enemy strikes against friendly naval vessels and sea bases from enemy maritime AD systems that operate alongside them in the cluttered littoral environment:

> …the short operating distances (close to the coast) means that US naval forces themselves could be subject to greater detection and repeated attacks from land-based missiles and aircraft.
>
> This is a particular danger for *unalerted* surface platforms performing a forward presence mission. To be an effective deterrent, forward-deployed forces must maintain access to the theater and provide essential services to the joint and combined force commanders. These functions require the ability to rapidly assert maritime battlespace dominance in the open ocean approaches to the theater and the littoral regions of the theater. But they also expose a forward-deployed force to a "battle for the first salvo" in a no-warning engagement. (emphasis in the original)[25]

This understandable obsession over mitigating the effects of a surprise first salvo translates into a requirement to build "combat ready forces that are prepared to 'climb into the ring' to achieve and sustain access *before* and during crisis" (emphasis added).[26]

THE DON TRANSFORMATION PLAN: EXPLOITING ASSURED ACCESS

The operational and tactical consequences of the DoN approach to the A2/AD challenge are readily evident in recently published Navy and Marine Corps transformation plans. Although primarily a Navy-developed vision, *Sea Power 21* is unquestionably the primary conceptual driver behind the *Department's* transformation roadmap.[27] In it, the naval Services identify three key concepts that will drive their transformation efforts:

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[23] Giffin and Tozzi, "'C' in LCS Stands for Combat," p. 89.

[24] Moore, Jr. and Hanlon, Jr., US Marine Corps, "Sea Basing: Operational Independence for a New Century," p. 85.

[25] Norman Friedman, James S. O'Braskey, and Sam J. Tangredi, "Globalization and Surface Warfare," in *Globalization and Maritime Power*, pp. 378-379.

[26] *Sea Power 21*, p. 36. Although understandable, the obsession over a surprise naval attack—a "Pearl Harbor in the littorals"—is not necessarily logical based on empirical evidence or recent operational history. Bolt-from-the-blue attacks are rare, and naval bolt-from-the-blue attacks are rarer still. See H.H. Gaffney, *Warning time for US Forces' Responses to Situations* (Alexandria, VA: Center for Naval Analysis, June 2002), pp. 11-16.

[27] *Sea Power 21* is the Navy's strategic vision, developed in coordination with the Marine Corps. *Marine Corps Strategy 21* and the capstone concept of *Expeditionary Maneuver Warfare* outline the Marine Corps strategic vision,

- *Sea Basing* "projects the sovereignty of the United States globally while providing Joint Force Commanders with vital command and control, fire support, and logistics from the sea, thereby minimizing vulnerable assets ashore."[28] Sea basing is the means for assuring access globally.

- *Sea Shield* "develops naval capabilities related to homeland defense, sea control, assured access, and projecting defense overland." Sea shield thus includes both those capabilities needed to fight for and maintain access and those that provide protection for the homeland and joint forces.

- *Sea Strike* is "a broadened concept for naval power projection that leverages enhanced C4ISR, precision, stealth, and endurance to increase operational tempo, reach, and effectiveness."

These three fundamental concepts are enabled by a fourth, called *FORCENet,* "the operational construct and architectural framework for naval warfare in the information age, integrating warriors, sensors, command and control, platforms, and weapons into a networked, distributed combat force."[29]

Deconstructing the transformation plans that devolve from these concepts, five general objectives and goals emerge for DoN transformation efforts. The implied priority of these goals helps to illuminate the DoN's concerns over both A2 and AD threats.

Expand the Navy

The first and overriding goal of the DoN's transformation plan is to expand the size of the fleet. In 1890, Alfred Thayer Mahan argued that the proper role of the Navy was to build a battle fleet and to wield it as a decisive instrument of national power. Since then, the Navy has judged its health primarily by the number of ships in its "Total Ship Battle Force" (TSBF).[30] As a result, a defense analyst once dubbed the Navy the "hypochondriac" of the Services because it continually measured itself against perceived threats, and more often than not found the size of its fleet wanting.[31] For most naval officers a bigger fleet is, by definition, better than a smaller fleet, and "transformation" plans are thus often judged first and foremost by their success in building one.

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developed in conjunction in the Navy. See *Naval Power 21,* pp. 4-5. However, even a cursory reading of the DoN's overall transformation plan makes clear the driving impetus of *Sea Power 21.* Gordon England, Admiral Vern Clark, General James L. Jones, *Naval Transformation Roadmap: Power and Access…From the Sea* (Washington, DC: Department of the Navy, 2002).

[28] *Naval Power 21,* pp. 5-6.

[29] Clark, *Sea Power 21*, p. 36.

[30] For a more thorough discussion of TSBF counting procedures, see Colonel Robert O. Work, US Marine Corps (Ret.), *The Challenge of Maritime Transformation: Is Bigger Better?* (Washington, DC: Center for Strategic and Budgetary Assessments, 2002), pp. 4-7.

[31] Carl H. Builder, *The Masks of War: American Military Styles in Strategy and Analysis* (Baltimore & London: Johns Hopkins U. Press, 1989), p. 21.

In the early 1980s, at the height of the Cold War, the Navy developed a Maritime Strategy that provided the logic and justification behind a 600-ship Navy, and it enjoyed unprecedented political support in driving toward that goal. In the process, 600 ships became the gold standard of measurement for future fleets. Not surprisingly, then, since 1997 the Navy has chafed under the force structure guidelines outlined in the Clinton Administration's QDR. That review called for a fleet of "only" 298-310 ships. Immediately after the review, supporters of a larger fleet began attacking the 300-ship Navy and lobbying for a larger fleet, implying that the smaller fleet placed the nation at great risk.[32] By 2000, when pressed by the Congress to outline the 30-year shipbuilding plan to support the QDR fleet, the DoN included an unasked for section that outlined a reduced risk fleet of 360 ships, including 15 carriers, 68 attack submarines, 134 surface combatants, and 44 amphibious ships.[33] Moreover, some Navy officers made it clear that even this enlarged fleet provided only the minimum level of risk reduction; one active senior officer proclaimed, on the record, that the Navy needed "at least" 450 ships.[34]

Despite the Navy's best efforts, the idea of a major fleet expansion was supported by no one except serving and retired naval officers and the US shipbuilding industry. The Clinton Administration never wavered from its view that a 300-ship Navy was sufficient for the nation's national security needs. Moreover, the incoming Bush Administration refused to buy into the idea of a major fleet expansion either. In a September 2001 letter to the Secretary of the Navy, the Under Secretary of Defense for Acquisition, Technology and Logistics outlined three options for the fleet of 2025: a 260-ship fleet, a 316-ship fleet, and a 340-ship fleet. And even the largest of the three fleets, while only 20 ships short of the Navy's 360-ship reduced risk fleet, was much different in kind. For example, it had only 12 carriers instead of the Navy's desired 15.[35]

Then came the Bush Administration's own QDR followed soon thereafter by new Defense Planning Guidance. Since the end of the Cold War, US national military strategy had called for armed forces capable of waging nearly simultaneous or overlapping major theater wars in two distant theaters. The Navy and the Marine Corps met this requirement in part, by keeping two or three CVBGs and two or three Amphibious Readiness Groups (ARGs) with embarked special operations-capable Marine Expeditionary Units (MEU(SOC)s), ARG/MEU(SOC)s, forward deployed. The post-9/11 defense planning guidance introduced a new 1-4-2-1 planning construct that tasked the Services to defend the homeland, deter adversaries in four critical regions, defeat

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[32] See for example, Hunter Keeter, "30-year Ship Plan Reflects Stress on Current Fleet," *Defense Daily,* March 20, 2000; Christopher Lehman, "For US Navy, Bigger Not Just Better, It is a Necessity," *Defense News,* January 24, 2000; State Representative Griffen Dalianis, New Hampshire, "Drastic Erosion of US Naval Fleet Has Gone Almost Unnoticed," *Manchester Union Leader,* February 11, 2000; J.F. Kelly, "A Mighty Fleet in Decline," *San Diego Union Tribune,* September 19, 2000, and remarks by CNO Admiral Jay L. Johnson cited by Ronald O'Rourke, Congressional Research Service, at the Forum on American Sea Power in the 21st Century, June 24, 1999.

[33] *Report on Naval Vessel Force Structure Requirements* (Washington, DC: DoN, Office of the Secretary, February 29, 2000).

[34] Remarks of Vice Admiral Daniel Murphy, US Navy, then-Commander of the Navy's Sixth Fleet, as cited by Hunter Keeter, in "Murphy: Street Fighter Unsound," *Defense Daily,* October 15, 1999, p. 5. For a more recent articulation on the need for more ships, see Scott C. Truver, "Sea Change for the US Navy," *Jane's International Defense Review,* April 2003, p. 25.

[35] Norman Polmar, "Transformation, Terrorism, and the QDR," *Proceedings,* November 2001, p. 102.

enemy attacks *with minimal reinforcements* in two of the four, and win decisively (i.e., conduct a regime change) in one of the two.[36]

Whether intended or not, this new 1-4-2-1 construct helped to provide the rationale for a new Global Concept of Operations and a much larger 375-ship Navy to implement it. Navy officers appear increasingly confident that, in *Sea Power 21* and the Global CONOPS, they now have the argument to support and foster the "transformation" from a smaller fleet to a larger one.[37] Interestingly, however, there is no explicit tie between the larger Global CONOPS fleet and assertions of growing A2/AD threats.

Restructure the Navy and Marine Corps for Sustained Operations on and from the Sea

The next priority of DoN transformation plans is the development of enhanced, networked sea basing, which "serves as the foundation from which offensive and defensive fires are projected—making Sea Strike and Sea Shield realities."[38] One Marine general put it this way:

> If we get this concept right, it might well be one of the most transformational things the Department of Defense, and our naval forces, will ever do. We will, most importantly, offer our nation a truly quantum leap over what we have today.[39]

Such a statement might be mistaken for simply an overly-optimistic Marine interpretation of fleet priorities, but it evidently represents the view of the highest Navy leadership as well. The current Chief of Naval Operations (CNO), Admiral Vern Clark, recently wrote that:

> Beyond its operational impact, the Sea Basing concept provides a *valuable tool for prioritizing naval programs*. This means transforming shore-based capabilities to sea-based systems whenever practical, and improving the reach, persistence, and sustainability of systems that are already afloat" (emphasis added).[40]

Physically, the Navy and Marines describe the sea base as being made up of nuclear-powered aircraft carriers, multi-mission surface combatants, amphibious warfare ships, submarines, combat logistics force (CLF) ships, and maritime prepositioning force (MPF) ships.[41] The latter is significant. In the past, the MPF ships that delivered Marine equipment to ports to enable the

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[36] Vice Admiral Mike Mullen, US Navy, "Global Concept of Operations," *Proceedings,* April 2003, p. 66.

[37] Two analysts recently wrote "…the 21st–century Navy that evolves from *Sea Power 21* may become the new global military model for the United States." See Robbin Laird and Scott C. Truver, "Sea-Based Forces and Transformation," *Sea Power,* December 2002, pp. 37-40.

[38] Clark, *Sea Power 21,* p. 36. For the definitive articulation of sea basing, see Moore, Jr. and Hanlon, Jr., US Marine Corps, "Sea Basing: Operational Independence for a New Century."

[39] Lieutenant General E.H. Hanlon, US Marine Corps, as cited by Colonels Art Corbett and Vince Goulding, US Marine Corps (Ret.), in "Sea Basing: What's New?" *Proceedings,* November 2002, p. 34.

[40] Clark, *Sea Power 21,* p. 37.

[41] Clark, *Sea Power 21,* p. 37.

land-based assembly of their forces were not counted in the official TSBF count—they were instead counted in a separate sealift category. The planned 375-ship fleet includes six new Maritime Prepositioning Force (Future) ships[42] that "do not have to enter port to offload."[43] Their inclusion in the TSBF and in new Maritime Prepositioning Groups, which also include CLF ships and high-speed logistical support vessels and craft, means that Navy planners now see these new ships as operational fleet assets.[44] Interestingly, however, while the CLF ships and new prepositioning ships count toward the 375-ship fleet goal, new high speed support vessels (HSVs) do not.[45]

In any event, the enhanced networked sea base defines the DoN's sustained access fleet that aims to achieve three important DoN transformational sub-goals:

- to "eliminate the requirement for ports and airfields within the Joint Operating Area (JOA) that traditionally are the key ingredients of reception, staging, onward movement, and integration, but in the future will be vulnerable to being exploited by adaptive enemies;"[46]

- to accelerate expeditionary deployment and employment timelines by pre-positioning heavy equipment forward in theaters, and by conducting *at sea* arrival and assembly of Marine forces, selective offload of units and equipment, as well as their post-operation reconstitution at sea;[47] and

- to increase joint force security and operational agility.[48]

In other words, the DoN implicitly asserts that the A2 threat is more pressing for land bases than sea bases.

Reorganize the Fleet to Provide Increased Global Strike Coverage

The next stated priority in DoN transformation plans is embodied in Sea Strike, emerging Marine Corps concepts about deep maneuver from a sea base and the Global CONOPS. The goal of Sea Strike is to amplify effects-based striking power by increasing the number of independent naval strike groups forward deployed at any given time and by giving these groups the ability to employ fires, maneuver, and special operations forces in high tempo, 24/7 operations with greatly extended reach. As the CNO put it:

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[42] Briefing slide in "Sea Power 21: Projecting Decisive Joint Capabilities," a PowerPoint briefing provided by the Navy Staff.

[43]Clark, *Sea Power 21,* p. 37.

[44] Truver, "Sea Change for US Navy," p. 27.

[45] For a discussion on HSVs, see Admiral Robert J. Natter, US Navy, "Meeting the Need for Speed," *Proceedings,* June 2002, pp. 65-67.

[46] Corbett and Goulding, "Sea Basing: What's New?" p. 34.

[47] Clark, *Sea Power 21,* p. 37; Corbett and Goulding, "Sea Basing: What's New?" p. 34-36.

[48]Clark, *Sea Power 21,* p. 36.

> Sea Strike is what we are all about. It is first and most importantly about being on the offense. It is the ultimate reason we remain forward deployed: to impose the will of our nation on our enemies when all else has failed.[49]

The Navy of today has 19 independent strike groups, including 12 CVBGs—consisting nominally of one nuclear-powered aircraft carrier, six large multi-mission surface combatants (each capable of firing Tomahawk land attack cruise missiles), and two attack submarines—and seven Surface Action Groups (SAGs), consisting nominally of three multi-mission surface combatants with heavy batteries of Tomahawk missiles. In addition, the fleet employs 12 ARGs, consisting of a big deck amphibious ship capable of carrying a large mixed air wing of rotary wing and vertical/short take-off fighters, and two additional amphibious ships. Together, these three amphibious ships can carry a MEU(SOC). The Navy and Marines operate a fleet rotational pattern so that two to three CVBGs and two to three ARG/MEU(SOC)s are forward deployed at any given moment. Importantly, in the past the CVBGs and ARG/MEU(SOC)s traditionally operated independently, except when concentrating during time of crisis. ARG/MEU(SOC)s thus routinely sailed unescorted.[50]

As outlined in *Sea Power 21*'s new Global CONOPS, the Navy intends to increase the number of available strike groups primarily through a more efficient allocation of fleet capabilities, made possible by the diminution of global naval threats. Faced with the prospect of global operations against the capable Soviet Navy, Cold War naval planners called for each carrier to be escorted by six multi-mission surface combatants, (four with the AEGIS combat system) and two submarines in "direct support.[51] With the disappearance of the Soviet Navy, and with no open-ocean threats to carriers evident on the horizon, naval planners concluded that they could reduce the number of carrier escorts to three combatants (all with AEGIS) and one submarine without appreciably raising the risk to the carriers. By assigning the "extra" three surface combatants and submarine to operate with the heretofore unescorted ARG/MEU, the Navy created two new task groups for the price of one: a "strike-heavy" Carrier Strike Group (CSG), consisting of one carrier, three multi-mission combatants, and an attack submarine; and a "maneuver-heavy" Expeditionary Strike Group (ESG), consisting of three amphibious ships carrying a MEU(SOC), three combatants, and an attack submarine.[52] Since the multi-mission combatants and submarine assigned to the new ESG can carry land attack missiles and, in the case of the combatants, long-range naval guns, both of the new task groups will be strike capable.[53] Without changing its

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[49] Vice Admiral Cutler Dawson, US Navy, and Vice Admiral John Nathman, US Navy, "Sea Strike: Projecting Persistent, Responsive, and Precise Power," *Proceedings,* December 2002, p. 55.

[50]Clark, *Sea Power 21,* pp. 38-39; Mullen, "Global Concept of Operations," p. 66; Truver, "Sea Change for the Navy," pp. 26-27.

[51] Norman Polmar, *Ships and Aircraft of the US Fleet,* 14th edition (Annapolis, MD: Naval Institute Press, 1987), pp. 46, 110.

[52] Captain Kendall King and Commander Tom Holmes, US Navy (Ret.), "Expeditionary Strike Group!" *Proceedings,* March 2003, pp. 90-93.

[53] The distinction between "strike-heavy" and "maneuver heavy" task groups mirrors the difference between armored and mechanized combat teams. Armored combat teams have two tank units and one mechanized infantry unit while mechanized combat teams have two mechanized and one armored unit; both are capable of fire and maneuver.

preferred fleet peacetime rotational deployment pattern, the *Sea Power 21* Navy will thus be able to keep four to six independent strike groups with organic air capabilities forward deployed, increasing immediately available theater strike coverage by 100 percent, with *no increase in size to the sustained access fleet.*[54]

In addition, the *Sea Power 21* Navy seeks to increase the number of SAGs from seven to nine. Although these SAGs would retain some residual strike capability and would continue to be counted as a strike group, over time they would be focused primarily on the anti-tactical ballistic missile threat (to be discussed below). Today the SAGs are generally used to cover gaps in Persian Gulf carrier strike coverage, meaning only one is normally forward deployed at any given time. In the future, the Navy evidently would aim to keep two independent SAGs forward to augment CSG and ESG strike coverage. Finally, the Navy will introduce four covert/special operations strike groups, each built around a modified Trident guided missile submarine (SSGN) capable of carrying up to 154 Tomahawk land attack missiles and 102 special operations personnel. Supported by dual crews, two of the four-boat SSGN force will be able to be forward deployed at any given time. In other words, for the modest increase of approximately 10 vessels—six combatants (two SAGs) and four SSGNs— the sustained access fleet would gain three additional *forward deployed* strike groups.[55]

In total, the *Sea Power 21* sustained access fleet will nearly double the pool of strike groups (37 as compared to 19), and increase the number of forward deployed and readily available strike groups from 3-4 to 8-10.[56] In addition to expanding global strike coverage by dispersing strike assets among more critical regions at a time, Sea Strike also seeks to expand the Navy's operational reach and speed of strike response. New long-range, unmanned ISR assets will enable the groups to find and prosecute targets independently;[57] weapons with increasingly longer range such as the 800-mile range JSF and the 1,350-mile range Tactical Tomahawk will expand inland reach; and new means of non-kinetic attack (e.g., information operations) will extend the range of effects further still.[58] Moreover, the strike power of the fleet will be fully integrated into a larger Joint Fires Network that aims to compress the target engagement cycle from hours to minutes, thus improving performance against time-sensitive or time-critical targets.[59]

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[54] See Mullen, "Global Concept of Operations," p. 67; Truver, "Sea Change for the Navy," pp. 26-27. As this document is being published, there are indications that the Navy is contemplating a change to its rotational deployment pattern, emphasizing fleet operations designed to facilitate the surge of six CSGs and ESGs to a crisis point. Vice Admiral Kevin P. Green spoke to such a change in his April 9, 2003 testimony before the Subcommittee on Military Readiness and Management Support of the Senate Armed Services Committee. It is not yet clear how this will affect the number of forward deployed naval strike groups.

[55] Ibid., p. 67.

[56] Mullen, "Global Concept of Operations," p. 67.

[57] Robert Wall, "Navy Sets Course for Endurance UAV," *Aviation Week &Space Technology,* December 23, 2002. "NG: UCAV-N Design Could Fulfill USAF Requirements," *Aerospace Daily,* April 17, 2003.

[58] See Dawson and Nathman, "Sea Strike: Projecting Persistent, Responsive, and Precise Power," pp. 54-58, and Moore, Jr., and Hanlon, Jr., "Sea Basing: Operational Independence for a New Century," pp. 81 and 83-84.

[59] Sandra I. Erwin, "Navy. Air Force Team Up in 'Joint Fires Network'," *National Defense,* March 2003, pp. 22-23.

For their part, the Marines plan to conduct inland combined arms maneuvers from the sea base directly against operational (campaign-level) targets to ranges of approximately 200 miles, and raids to distances far beyond. As outlined in their concepts of Operational Maneuver From the Sea (OMFTS) and Ship-to-Objective Maneuver (STOM), and as embodied in such systems as the V-22 tiltrotor aircraft, Advanced Amphibious Assault Vehicle, and the Landing Craft, Air Cushion (LCAC), the Marines seek to extend their operational reach in the same matter as Navy strike planners, by conducting high tempo, 24/7 maneuver operations deep in an enemy's rear, logistically supported from the sea base. The Marines also seek to fully sea-base their tactical air forces, both through integrating more squadrons into carrier air wings, and by adding additional sea-based aviation platforms to the sustained access fleet.[60]

In summary, the Global CONOPS is better seen as articulating a global, naval-strike network based on assumed (assured) access rather than a reaction to growing naval A2 threats.

Embrace an Expanded Theater Air and Missile Defense Mission

The "most dramatic advancement"[61] promised by Sea Shield is fully netted, long-range theater air and missile defense, which "for the first time [has] the potential to extend naval defensive firepower beyond the task force."[62]

Naval planners hope that updated versions of the AEGIS combat system, the new Volume Search Radar (VSR) and Multi-function Radar (MFR), the E-2C Hawkeye Radar Modernization Program (RMP), and the new Active Electronically Scanned Array (AESA) radar for the F/A-18 E/F and, later, JSF—all netted by means of the new cooperative engagement capability (CEC) and Link-16—will allow the formulation of a single integrated air picture (SIAP), itself enhanced by data collected by interoperable joint sensors, when available. Moreover, planners expect these new netted systems will form an integrated cohesive fire control network now called the Navy Integrated Fire Control-Counter-Air (NIFC-CA). If the hopes of the planners are met, the SIAP will greatly extend a naval task group's sensor reach, both at sea and over land. When combined with high fidelity NIFC-CA tracking and engagement data, and new defensive weapons such as updated models of the AMRAAM and extended range SAMs, future naval task groups thus might be able to conduct multiple engagements against attacking air and cruise missile, beginning at long range, to minimize the number of leakers that the task force terminal defenses must deal with.[63]

In this regard, the Navy recently introduced a new SAM program called the Extended Range Active Missile (ERAM). ERAM is to combine the active seeker from the AMRAAM with a

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[60] Moore, Jr., and Hanlon, Jr., "Sea Basing: Operational Independence for a New Century," p. 81; Corbett and Goulding, "Sea Basing: What's New?" p. 35; and Galdosi, "Expeditionary and Amphibious Warfare," in *Globalization and Maritime Power.*

[61] Clark, *Sea Power 21,* p. 36.

[62] Vice Admiral Mike Bucchi, US Navy, and Vice Admiral Mike Mullen, US Navy, "Sea Shield: Projecting Global Defensive Assurance," *Proceedings,* November 2002, p. 56.

[63] Bucchi and Mullen, "Sea Shield: Projecting Global Defensive Assurance," pp. 57-58.

long-range version of the ubiquitous Standard SAM, to allow interceptions of air and missile threats at ranges to 200 nm.[64] Being able to conduct such extended-range air and missile intercepts would serve two important purposes. First, it would improve the sustained access fleet's ability to defend itself from over-the-horizon air and ASCM attacks as it approached a hostile shore. More importantly, however, as the sea base established its presence in its preferred operating area in the open waters 25 miles from the coastline and seaward, extended-range air and missile intercepts would allow the base to protect itself—as well as joint land bases and littoral penetration points—from air and missile attacks launched from deep in the enemy's territory.[65]

Sea Shield also includes new naval defenses against ballistic missiles. The Navy is pursuing a "family of boost phase, mid-course, and terminal defense as part of an overall joint force ballistic missile defense system." These new sea-based, anti-ballistic missile capabilities would not only protect the sustained access force from future ballistic missile attack, but allied forces and joint bases in a JOA and possibly the US homeland as well. As was said, the Navy plans to increase the number of deployable SAGs from seven to nine, and to gradually focus these SAGs and the multi-mission combatants in them on the ballistic missile defense mission.[66]

Together, extended theater air and cruise and ballistic missile defenses are expected to "protect the deployment of US forces into forward theaters" and "enhance crisis control, protect allies and joint forces ashore, and set the stage for combat victory." [67] The fact that DoN officials cite the projection of defensive power from the sea base as "the most dramatic" contribution of Sea Shield indicates that the DoN's concern over emerging AD threats is relatively low.

Create a New Special Purpose Counter-Maritime AD Force

The final goal of the DoN transformation plans is to create a special purpose counter-AD force "…capable of defeating the conventional and asymmetric access-denial threat in the littoral."[68] The means to do this will be new expeditionary sensor grids, including subsea arrays such as the advanced deployable system (ADS), which will be used to locate and track enemy AD threats during periods of rising tension, and a large class of new focused-mission combatants called the Littoral Combat Ship (LCS) designed to prosecute the threats.[69]

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[64] From an article by Andrew Koch, "US Navy Proceeds with Defense Missile Initiative," in an unknown 2003 edition of *Jane's Defense Weekly.*

[65] Ibid., pp. 57-58.

[66] Ibid., p. 58. See also Norman Polmar and Stephen Keller, "A Credible and Cost-Effective Contribution: Theater Ballistic Missile Defense '…From the Sea,'" *Sea Power,* September 2000, pp. 32- 35. For potential Navy contributions to national missile defense, see John G. Morgan, Jr., "A Triangle of Persuasion," *Sea Power,* April 2001.

[67] Clark, *Sea Power 21,* p. 36.

[68] *Littoral Combat Ship Flight 0: Preliminary Design Interim Requirements Document (PD-IRD),* Serial Number N763F-S03-026, February 10, 2003, p. 2.

[69] Bucchi and Mullen, "Sea Shield: Projecting Global Defensive Assurance," p. 36; and Friedman, O'Braskey, and Tangredi, "Globalization and Surface Warfare," in *Globalization and Maritime Power,* p. 378. See also

The LCS is part of the Navy's new family of next-generation combatants and a key program in its counter-AD strategy and plans. The ship is designed to confront three long-standing maritime AD threats—submarines operating close to the coast, small fast attack craft armed with missiles, and mines. In the words of one senior Navy official, "[w]e want to serve that niche market with a specific class of ships to respond to those threats."[70] Importantly, however, the LCS will only be able to confront one threat at a time. That is, every LCS will be able to re-configure itself in port or perhaps at the sea base to carry one of three special-purpose mission modules designed to combat one of the three threats. As a result, for counter-AD operations against a highly capable opponent, the LCS is specifically designed to work as part of a larger networked force—in close proximity to larger multi-mission combatants, and as part of LCS "divisions" made up of 3-5 ships with complementary mission modules.[71]

While the LCS will be smaller than the 9,000 to 10,000-ton multi-mission destroyers along side of which it will operate, it likely will be a bigger vessel than many expect. Indeed, naval planners are less concerned with the ship's final displacement—the typical metric used to compare size of ships—than with its navigational draft, speed, crew size, and capability. As befits a ship designed to operate close to shore, the requirements document for the LCS specifies the desired and maximum draft to be 10 and 20 feet, respectively (as compared to a modern multi-mission destroyer that has a draft of 31 feet). The ship is required to achieve high speeds—between 40 and 50 knots (as compared to 30 knot speeds of larger combatants). Maximum crew accommodations, including core crew members and mission module detachments, are not to exceed 75 personnel (as compared to crews of 350-400 on existing guided missile destroyers and cruisers). Capability-wise, each LCS must be able to embark and hanger one medium MH-60R/S helicopter, and its mission modules are to emphasize unmanned systems, including UAVs for surveillance, unmanned surface vehicles for anti-boat defense and surveillance, and unmanned mine countermeasure systems. They will carry no land attack missiles or guns, thereby adding no combat punch ashore.[72]

In a networked battle fleet, the LCS will complement the multi-mission surface combatants that make up the sustained access or sea-based force in three ways:

- First, they will be designed to operate in the dead zone of adversary AD networks that extends from the shoreline to a distance of some 25-50 miles to sea—a sea space characterized by shallow water. "Speed, shallow draft and maneuverability will allow the

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"Expeditionary Pervasive Sensing," in the concepts section on the Naval Warfare Development Command website; www.nwdc.navy.mil.

[70] "Focused Mission Ship Studies to Help Chart Course for Future Navy," story number NNS021206-14 on Navy Newsstand, at www.news.navy.mil., released December 6, 2002.

[71] *Littoral Combat Ship Flight 0: Preliminary Design Interim Requirements Document (PD-IRD),* and Littoral Combat Ship Concept of Operations, PowerPoint briefing prepared by Navy Staff, 2003.

[72] *Littoral Combat Ship Flight 0: Preliminary Design Interim Requirements Document (PD-IRD),* p. 4. Although often compared to guided missile destroyers, the LCS should more properly be seen as a replacement for the guided missile frigate (FFG) force. The current FFG, the *Oliver Hazard Perry*-class frigate, has a navigational draft of 25 feet, a speed of up to 36 knots, and a crew of approximately 215. It carries two MH-60 class helicopters. Norman Polmar, *Ships and Aircraft of the US Fleet, 16th edition* (Annapolis, MD: Naval Institute Press, 1997), pp. 139-41.

agile LCS freedom of action to operate near the shore, where larger, deeper draft ships would be constrained severely."[73]

- Second, the ships will shoulder the burden of in-shore counter-AD tasks and screen the sustained access fleet from maritime threats, thereby allowing the larger multi-mission combatants to concentrate on Sea Strike and Sea Shield tasks: "As a focused mission ship, the LCS will enable unimpeded accomplishment of other missions such as ballistic missile defense or precision strike by multi-mission surface combatants."[74]

- Third, their small size, small crew, and modest mission capabilities will allow the Navy to establish a low-risk naval presence in high-risk areas. While one noted naval analyst conceded that a LCS would be vulnerable in the coastal zone, he asked: "Would you rather have a destroyer or cruiser in there with 300-plus crew members and a billion-dollar price tag?"[75]

Given the DoN's preferred deployment pattern of continuous operations within range of potential adversary maritime AD systems, this third factor is especially important. In essence, the LCS is a small crewed combatant designed to conduct immediate *suppression of enemy littoral defenses*, while operating inside the very teeth of an enemy's maritime AD network, at ranges certain to increase the likelihood of their detection and engagement, and under circumstances that cede to the enemy the advantage of firing first. Since the chances are poor that a small combatant like the LCS would survive any type of direct hit, "crew survivability" is one of its priority design objectives, and its mission life will depend in part on "speed, agility, signature management, and a core self-defense weapon suite."[76] However, "the LCS—more than any other Navy surface combatant—will require dominant battlespace awareness (DBA)" to survive; in other words, "full knowledge" of the location of enemy threats, so that they can be avoided.[77]

Although the LCS is a focused-mission ship, its initial requirements document and CONOPS makes clear that the Navy will employ it as a multi-mission platform. Although first designed to confront the maritime AD threat, the LCS will also accompany CSGs and ESGs to provide "vanguard scouting, pouncing support" or execute other direct-support task force tasks; operate independently in low threat areas to support special operations, supply forces, provide medical assistance and evacuate civilians; or conduct division-size maritime intercept operations or intelligence collection during periods of heightened tension.[78]

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[73] Rear Admiral Don Loren, US Navy, "Littoral Combat Ships Will Help US Forces Gain Access," *National Defense,* December 2002, p. 21.

[74] *Littoral Combat Ship Flight 0: Preliminary Design Interim Requirements Document (PD-IRD),* p. 3.

[75] Otto Kreisher, "New Small Navy Ships Debated," *San Diego Union-Tribune,* February 12, 2003.

[76] *Littoral Combat Ship Flight 0: Preliminary Design Interim Requirements Document (PD-IRD),* pp. 9-10.

[77] Giffin and Tozzi, "'C' in LCS Stands for Combat," p. 89.

[78] *Littoral Combat Ship Concept of Operations*, PowerPoint briefing prepared by Navy Staff, 2003.

These additional missions help make clear that the driving force behind the proposed ship is less a concern over the maritime AD threat *per se*, and more to support the DoN's first transformation objective: to increase the size of the fleet. As naval analyst Norman Friedman put it:

> …before the 4-2-1 there had been barely enough [surface combatants] for the existing carrier battle groups. There was, however, a new surface combatant program at an embryonic stage: LCS. The new strategy converted LCS from a proposal for perhaps a squadron of ships into a desperate requirement for about 50-60 new surface combatants. It also completely changed the nature of the LCS, because for some purposes it would have very little in common with the earlier LCS formulation.[79]

Given a choice, it seems apparent that the Navy would prefer additional multi-mission ships. Congressman Gene Taylor (D-MS), whose district includes the Northrop-Grumman shipyard in Pascagoula, probably accurately portrayed the Navy's view when he said, "In an ideal world, I'd like a bunch of destroyers. But this isn't an ideal world." Taylor, who agrees with naval planners that the 300-ship Navy is too small for its worldwide responsibilities, thinks the smaller and less expensive LCS is the only way to expand the fleet from its current size to 375 ships.[80] This sentiment is echoed by Ron O'Rourke, naval analyst for the Congressional Research Service, who said "I think it's fair to say…the LCS represents the most important program to move the Navy from 310 to 375 ships."[81]

To drive the Navy toward its TSBF goal of 375 ships, the LCS class will be a large one, numbering between 30-60 ships; the actual class planning number for the *Sea Power 21* Navy is for 56 vessels. This would make the LCS the largest class of ships in the fleet and fully 15 percent of the TSBF. This makes the cost of the ships an important design factor. As a result, the maximum allowable costs for the core hull and mission packages are $220 and $180 million, respectively. The intent is to be able to purchase three of the ships for the same cost as a single multi-mission, guided missile destroyer.[82] Of course, low cost is also attractive given the high risk mission of the vessel.

Recently, a new argument in support of the LCS has emerged: that this small combatant program will "save" the US shipbuilding industry:

> There is more at stake for the Navy than just the specific characteristics of the LCS. Unless the Navy can get its shipbuilding act together fast, it will lose control of shipbuilding to outside agencies.

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[79] Norman Friedman, "New Roles for Littoral Combat Ships," *Proceedings,* January 2003, p. 5.

[80] Pat Towell, CQ Staff, "Design for Agile Combat Ships Reflects New Face of Sea War," *Congressional Quarterly Weekly,* March 1, 2003.

[81] Kreisher, "New Small Navy Ships Debated."

[82] Freidman, "New Roles for Littoral Combat Ships," and Towell, "Design for Agile Combat Ships Reflects New Face of Sea War." Planning number for the 375-ship Navy was provided to the author by N81, the staff section on the CNO's staff responsible for the Global CONOPS.

> The problem starts with the Navy's rigid approach to shipbuilding. The recent debacles of the Arsenal Ship and DD-21 programs highlighted the Navy's inability to bring in a new start in surface combatants…The result is a shipbuilding account that is unstable, unrealistic, and, from an industry standpoint, frustratingly unpredictable. All of this has been to the detriment of the nation's highly skilled shipbuilding industrial base. Simply stated, the law of evolution applies: use it or lose it. Unless the Navy builds more combatants, those who build them will go out of business.[83]

Note that this argument thus both supports and reinforces the first goal of DoN transformation plans—to build more combatants to get a larger fleet.

PATH RISK

What is not to like about the DoN's new transformation path? Together, the transformation vision and its associated concepts and detailed plans outline organizational, technological, and operational innovations. And the associated Global CONOPS and the 375-ship *Sea Power 21* Navy make the most compelling and comprehensive story since the Maritime Strategy and its 600-ship Navy. However, the explicit and implicit goals outlined in the DoN's transformation plans make clear that the DoN worries less about A2 and AD threats—it clearly sees these threats as more pressing for land-based ground and air forces—and more about crafting far-reaching plans that exploit assured access from the global commons. DoN transformation plans might thus be seen as a bid to assert Departmental preeminence in this new joint expeditionary era.[84]

By so doing, DoN transformation plans are revealed as a politically unconstrained solution. First, the DoN seeks to maintain the same general sustained access fleet called for in the 1997 QDR. Look at it this way: one year before *Sea Power 21* was unveiled, the sustained access fleet included four command ships, 12 carriers, 55 attack submarines, 84 guided missile cruisers and destroyers, 32 land attack destroyers, and 36 amphibious ships, and 29 CLF ships for a total of 248 ships, all types. The "transformed" sustained access fleet includes 12 carriers, 55 attack submarines, four SSGNs, 88 guided missile cruisers and destroyers, 24 land attack destroyers, 37 amphibious ships, six new maritime pre-positioning ships designed to support sea-based operations (including command elements), and 42 CLF ships for a total of 268 ships, all types. Moreover, as will be discussed in the section on technological and fiscal risk, all of the next-generation sustained access force ships are more capable—and expensive—than the ones they

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[83] Vice Admiral Henry C. Mustin, US Navy (Ret.), and Vice Admiral Douglas J. Katz, US Navy (Ret.), "All Ahead Flank for LCS," *Proceedings,* February 2003, p. 31.

[84] Indeed the subtitle of *Sea Power 21 is "Projecting Decisive Joint Capabilities"* (emphasis added). This pointed emphasis on joint contributions represents a real sea change for Navy, traditionally the most independent of the services.

will replace. Just achieving and maintaining the "improved" 268-ship sustained access force would be a significant challenge.[85]

On top of the improved sustained access fleet, and unchanged mine countermeasures and fleet support forces, the DoN plan adds the new counter-maritime AD force of 56 LCSs, employing an unknown number of special purpose mission modules.[86] This new transformation element is thus "above the line" in relation to previous budget plans. Moreover, LCS combat capabilities are strictly additive to the sustained access fleet's improving combat capabilities, not a replacement in kind. For example, the new land attack, multi-mission destroyer, DD(X), will itself carry new radars and an integrated undersea combat system specifically designed for littoral operations. Presumably the follow-on CG(X), built on the same hull, will carry similar systems. Although the Navy is loath to use the word "expendable" in an operational sense, its ship-building plans make clear that the loss of the LCS force would not, in and of itself, threaten the viability of the fleet's capability to project power. [87]

When combining all the desired new platforms, the DoN's chosen transformation path requires a 17-25 percent fleet expansion, depending on the base fleet number used for comparison.[88] Proportionately, this represents an expansion equivalent to the major fleet build up in the 1980s in the face of a global naval challenge by the Soviet Navy—in a world devoid of any traditional naval opponents, and with only embryonic maritime AD networks. Of the three military Departments, only the DoN is arguing for such a large increase in its fighting strength. Given the amount of time it takes to develop and build ships, and even though the planned increase to 375 ships is largely driven by "relatively" inexpensive $400 million combatants and CLF ships, such an ambitious fleet expansion will only be possible with stable support over many succeeding administrations. This appears unlikely, since it is by no means apparent that DoN leaders have won support from even this one; Bush Administration officials have yet to explicitly endorse the idea of a major fleet expansion.[89] And as will be discussed shortly, even if this and future administrations generally endorse the idea of a larger fleet, it is by no means apparent that they will be able to afford the fleet proposed in the current DoN transformation plans.

The political (and fiscal) support for the plan therefore appears anything but solid, threatening the entire chosen path. What is the DoN's hedging strategy if its bid for a larger fleet fails? What component will be the first to go if support from the secretary of defense and the White House is less than forthcoming? How will the DoN adjust the Global CONOPS to account for a 325-ship

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[85] Comparisons between the fleet outlined in the Navy's 30-year shipbuilding plan outlined in the previously cited *Report on Naval Vessel Force Structure Requirements* and the 375-ship fleet outlined in the Navy Staff's *Sea Power 21* PowerPoint slide briefing.

[86] The Navy has not yet made clear how many or what type of mission modules will be procured to support the Navy. Presumably there will be more than 56, but less than 168 (three for every LCS).

[87] See remarks attributed to Vice Admiral Timothy LaFleur in Kreisher, "New Small Navy Ships Debated."

[88] The Secretary of the Navy uses the upper end of the range—25 percent. See *Naval Power 21,* p. 3.

[89] Ronald O'Rourke, *Navy DD(X) Future Surface Combatant Program: Background and Issues for Congress* (Washington, DC: Congressional Research Service, updated January 27th, 2003), p. CRS-2.

Navy? Because the plan is so closely tied to a fleet expansion, and makes no clear prioritization of fleet combat capabilities, the answers to these questions are unclear.

One reason why this is so is that the primary measures of merit that naval officers use to judge the capability of the fleet are the number of ships in the TSBF and the level of combat credible forward presence that it can sustain. With regard to the former, traditional fleet counting criteria means that a combat support ship with useful combat capabilities would not contribute to an expansion in fleet size; as was noted, HSVs do not count toward the Navy's 375-ship goal, even though they are clearly capable of supporting both helicopter and unmanned vehicle operations.[90] Nuclear-powered carriers and submarines are extraordinarily expensive (costs of over $6 billion and $2 billion, respectively). Modern multi-mission combatants now cost over $1 billion dollars; indeed, modern amphibious ships, like the LPD-17, approach those costs.[91] Therefore, barring a change to fleet counting conventions or a new way to judge the capability of the fleet beyond simply counting ship hulls, the only way to pursue a 375-ship Navy is to build large numbers of relatively inexpensive, small crewed *combatants*.

It is not yet clear that a 375-ship Navy with 56 small crewed LCSs is the transformation path best taken. As will be discussed in the next section, the exact character of the future naval competition or emerging maritime AD threats is not yet clear. At the same time, the current 305-ship Navy is the best fleet ever put to sea by this, or any other navy. Indeed, Navy officers acknowledge that the capabilities of the current 300-ship fleet are far superior to those of the 600-ship Navy that sailed little over a decade ago.[92] Such sentiments suggest two things. First, that simply counting fleet hulls is no longer the best means to determine the health or combat power of the battle fleet. And second, that newer, different, and more applicable fleet combat metrics need to be developed that better illuminate the Navy's proper transformation pathway.

For example, imagine one new metric called "undersea battlespace characterization," defined as the time required to search and characterize the underwater battlespace in littoral waters (defined by a certain volume of water). It seems likely that unmanned underwater systems would do well against this metric—and probably better than manned combatants.[93] If this presumption was validated, then a debate could occur over the best way to employ the unmanned systems: Autonomously, from long range? Directed, from elements of the sustained access fleet? Or operated from small, manned combatants at short range? This simple example helps demonstrate why the lack of such expanded metrics makes it difficult to determine if the DoN's chosen

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[90] See for example Admiral Robert J. Natter, US Navy, "Meeting the Need for Speed," *Proceedings,* June 2002, pp. 65-67.

[91] Ms. Gaye Evans, "FY 2004 President's Budget Overview," PowerPoint briefing by the Director, Investment and Development Division, Office of the Assistant Secretary of the Navy (Financial Management and Comptroller), March 7, 2003.

[92] For example, see Vice Admiral Dennis McGinn, in testimony before the House Armed Services Committee, from transcript prepared by the Department of the Navy, Office of Legislative Affairs, February, 2001.

[93] See for example Mark Hewish and Joris Jannssen Lok, "Silent Sentinels Patrol the Depths," *Jane's International Defense Review,* April 2003, pp. 49-54.

pathway is the best alternative because, in many ways, the primary measure of merit now used to judge it—the TSBF count—is increasingly irrelevant.[94]

This point is driven home when considering the second long-standing metric for determining fleet combat capability: the level of combat credible global presence the TSBF can sustain. By simply reorganizing fleet assets into new naval task groupings like the CSG and ESG, increasing missile defense SAGs from seven to nine, and adding just four covert SSGN special operations/strike forces, the total number of available strike groups is doubled, and the number of forward task groups tripled, with only a ten-ship increase to the size of the sustained access fleet. This is an innovative and cost-effective solution to meeting the basic requirements of the new 1-4-2-1 Defense Planning Guidance. Each of four critical regions can be covered by the strike platforms found in either a CSG, ESG, SAG, or SSGN; using just forward deployed assets, the Navy-Marine Corps team would be able to bring to bear the gold standard of naval expeditionary power projection, a full Expeditionary Strike Force (the combination of a CSG and an ESG)—reinforced by a missile defense SAG and a covert SSGN strike group—in two of the four theaters.[95] And to win decisively in one of the theaters, these powerful combat credible forward presence forces could be quickly reinforced from fleet surge assets.

Moreover, it seems likely that these new task groupings and capabilities will lead to even more dramatic improvements to naval combat contributions in joint power-projection operations, and that they will spur even further operational refinements. For example, although sea-based maneuver is included in the definition of Sea Strike, the Global CONOPS expands only naval air and missile coverage. The transfer of a new LPD-17 from the ESG to the CSG, along with a specially configured company-size Marine maneuver unit, would provide expanded fire *and* maneuver coverage around the globe. Perhaps the Marines will be prompted to organize a special purpose raiding/fleet strike company, organized for deployment and employment from an SSGN, and trained to provide target location and terminal precision guidance for fleet tactical air and missile strikes. Or, perhaps the Navy and Marine Corps would explore different ways of surging and concentrating CSGs and ESGs. The point here is that as Navy and Marine officers experiment with these new organizations in operational settings, they will identify additional improvements and enhancements. And, importantly, they will be divorced from increases to the TSBF count.

Interestingly, the DoN refuses to explicitly emphasize either its efficient restructuring of fleet striking power, or its potential to spark further transformational change. Instead, it chooses to use the doubling of strike groups as a means to justify the fleet's expansion to 375 ships:

> To meet our defense goals to deter forward in critical areas, and decisively defeat threats to our nation, we see the need to reorganize the fleet to provide a large number of strike groups. We believe we could

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[94] For a more complete discussion of possible future fleet metrics, see Work, *The Challenge of Maritime Transformation: Is Bigger Better?"* pp. 35-37.

[95] Truver, "Sea Change for the Navy," p. 27.

> double the number of strike groups today with a 25% increase in the size of the fleet.[96]

However, as has been discussed, the increase in the number of strike groups is obtained through a nearly neutral restructuring of the sustained access fleet, while the bulk of the fleet expansion—driven by the LCS force—adds nothing to fleet striking power. This incongruous argument simply provides more evidence that the overriding goal of expanding the TSBF count is distorting the entire DoN transformation pathway.

OPERATIONAL RISK

In expanding the fleet with the ships now envisioned, the Navy and Marine Corps transformation plan is based on four key judgments about future enemy threats and friendly capabilities. The following section outlines these key judgments, and the operational risks associated with them.

Threats to land bases—including political impediments, ballistic and cruise missile attacks, and unconventional warfare threats—are increasing at a much faster rate than threats to sea bases. As discussed, the key long-range threat to the sustained access fleet is over-the-horizon targeting systems directing long-range air and ASCM and ballistic missile strikes. Open-ocean submarine attacks pose a real, but lesser threat, especially in the near term. Threats to the components of the sea base when operating close to shore include air, ASCM, and ballistic missiles attacks, as well as diesel submarines and mines. Swarming attack boats represent a final but less pressing threat. Naval planners appear confident that the envisioned capabilities for the sustained access fleet and counter-maritime AD forces will sufficiently overmatch emerging enemy maritime AD systems, allowing the assured continuous operation of future sea bases. This confidence is based on a key judgment: that ballistic and cruise missile attacks against land bases will continue to mature more rapidly than missile, and other, threats to sea bases.[97]

This judgment warrants further debate. It is indeed difficult to locate, track, and engage ships operating over the horizon. It is also true that risks to a sea base decrease as range from the shore increases. However, those on both sides of the sea base vulnerability argument probably spend too much time debating whether or not a sea base might be successfully engaged at *extended range* with ballistic and cruise missiles. It is largely a moot argument. As has been discussed, for a sea base to make an operational contribution beyond land attack missile strikes, it must operate close to the coastline. Therefore, in the future, most adversaries will have no real incentive to mount extended-range, over-the-horizon attacks, since being able to locate a large, sea-based force operating within 25-150 miles from the coast would appear to be a relatively certain proposition—and more easily attainable technologically, financially, and operationally. If this judgment is correct, the survivability of the sea base will likely hinge first on the outcome of accurately directed enemy barrage missile attacks against its organic missile defenses. This is

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[96] *Naval Power 21,* p. 3.

[97] See for example Adam B. Siegel, "Scuds Against Al Jubayl?" *Proceedings,* December 2002, pp. 34-36.

true for both surprise attacks against forward deployed vessels, as well as those deliberately closing on the theater.[98]

The Navy's approach to ASCM defense during combat operations depends on "killing the archers"—destroying ASCM missile launchers from long-range—and on networked organic defenses including long-range SAMs, horizon-range Enhanced Sea Sparrow Missiles (ESSMs), and terminal defenses including decoys and missile and gun systems (e.g., the Nulka decoy system, the Rolling Airframe Missile, and the Close-in Weapon System). The Navy is quite confident in the ability of these systems to defeat the emerging cruise missile threat.[99] There are those who believe the Navy's confidence is misplaced, however. For example, a 2000 Government Accounting Office report concluded that the Navy was both underestimating the potential threat, and over optimistic on its projected defensive capabilities.[100]

Whether or not task group cruise missile defenses are as good as the Navy believes they are hopefully will never be tested. If they are, however, and even if the defenses prove highly effective, an Achilles heel of a sea base may be exposed: namely, that for *conventional* attacks, the sea base is much more susceptible to catastrophic damage from individual missile leakers than a land base. Although the ships that make up the sea base are dispersed, each node represents a very highly concentrated and vulnerable target. A single SS-N-22 ASCM would likely disable, or sink outright, anything smaller than an aircraft carrier,[101] whereas the damage to a land base caused by one or two 2000-pound high explosive warheads delivered by missiles is likely to be much less, especially if the defending force has taken even the modest precautions of dispersing and hardening its combat assets.

A stark example of the vulnerability of sea bases to missile leakers occurred during the Falklands War. On May 25, 1982, two Argentinean Super Etendards attacked the British sea base operating off the Falkland Islands. In the subsequent engagement, British warships were able to successfully decoy the missiles away from themselves, but in the process one of the missiles veered and hit a large container ship. It quickly went to the bottom, taking ten Wessex and four Chinook helicopters—not to mention the tentage for the entire landing force—with her. The loss of the helicopters "was a crippling blow to British strategic plans for the campaign."[102]

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[98] Lieutenant Commander Douglas E. Eurom, US Naval Reserve, and Lieutenant Mark Hughes, US Navy, "Don't Forget the Anti-ship Missile," *Proceedings,* July 2002, pp. 56-59.

[99] See for example Rear Admiral Phil Balisle and Captain Tom Bush, US Navy, "CEC Provides Theater Air Dominance," *Proceedings,* May 2002, pp. 60-62; George K. Hamilton, "Defense in Depth: Protecting Naval Forces," *Surface Warfare,* March/April 1999, pp. 2-15; and M.S. Frick, "RAM and Phalanx: System of Systems Testing," *Sea Power,* September 2000, pp. 46-48.

[100] See *Comprehensive Strategy Needed to Improve Ship Cruise Missile Defense* (Washington, DC: Congressional Budget Office, July 11, 2000).

[101] Ibid., p. 57.

[102] Max Hastings and Simon Jenkins, *The Battle for the Falklands* (New York: W.W. Norton & Company, 1983), pp. 227-228.

This type of disaster can be mitigated by spread loading equipment among elements of the sea base, but the fact remains that equipment on a stricken ship cannot be salvaged quickly, if ever. Therefore, the advantages of operating at sea are offset, to a great degree, by the increased risk that missile (or, as will soon be discussed, torpedo) leakers pose to the sea base. Said another way, when faced with conventional ASCM attacks, task force defenses *must* be nearly perfect to minimize the potential for catastrophic damage to key components of the sea base. This will be an especially challenging task given the ranges at which the sea base is expected to operate offshore, and the short reaction time sea base defenses may have to react.

Moreover, a case can be made that a sea base may actually be *more* susceptible to CBRNE attacks than a land base, especially nuclear attacks. During the Cold War, there was some thought that the probability of nuclear weapons being used at sea was higher than on land, for three reasons. First, because nuclear explosions at sea would be less damaging than on land, nuclear war at sea could be limited. Second, nuclear weapons provided an attractive tactical option for attacking certain targets, such as deep-diving nuclear submarines or US aircraft carriers. And third, physical controls over nuclear weapons at sea could be less than those on land. Indeed, in 1979, the Atlantic Council Working Group on Securing the Seas stated that "[i]t can be argued that the restricted use of nuclear weapons at sea carries neither the degree of moral stigma nor the threat of further escalation that applies to their use against land targets."[103]

All of the Cold War reasons that argued for a potentially lower nuclear threshold for sea warfare remain in effect. Since US forces now plan to concentrate sea bases close to shore, a nuclear explosion in the general vicinity of the sea base might be an attractive tactical attack option for any adversary seeking to deny US naval forces freedom of action in a littoral. Moreover, it has the added advantage of possibly being conducted covertly, underwater, providing the adversary with "plausible deniability" of such an attack. For this reason, and when considering the added potential threats of torpedo attacks (nuclear or conventional), mines (nuclear or conventional), or future underwater threats (to be discussed shortly), it is by no means axiomatic that threats to future sea bases will be significantly less than those to land bases.

The vulnerabilities to land bases and the advantages to sea basing outweigh the operational and logistical penalties of designing the entire naval maneuver force for sea-based operations. The vulnerability of the sea base aside, a maneuver force designed to conduct most of its operations from a sea base—including its assembly, employment, and reconstitution of forces—requires the maritime maneuver commander to accept some real operational and logistical penalties. For example, it is not yet clear that at sea arrival and assembly of forces will appreciably compress the deployment and employment timeline, a key goal of sea basing. Assembly of a 15,000-Marine sea-based brigade on newly designed maritime pre-positioning ships using just V-22s and helicopters would take quite some time. HSVs might cut the at sea assembly time, depending on whether or not they could be quickly staged at an intermediate transfer point, and whether or not ship-to-ship transfer of personnel could be accomplished promptly and safely in mid-ocean from their decks. An alternative would be to fly Marines directly to an intermediate port and to embark them onboard ships there. The preparation of their

[103] William M. Arkin, *The Nuclear Arms Race at Sea* (Neptune Papers No. 1, October 1987), p. 25.

equipment could then be accomplished onboard on the way to a joint operating area, but the offloading of the ships operating 25-100 miles at sea would likely be much slower than a rapid disgorgement of forces across a pier or near a beach.[104]

Marine planners tend either not to accept or advertise the operational and logistical penalties associated with sea-based operational maneuver. Instead, they argue that enhanced-network sea basing is more of an operational concept for providing assured access, exploiting the sea as both a sanctuary and operational maneuver space, generating a higher operational tempo, and maintaining the initiative.[105] However, the fact remains that for the foreseeable future, maneuver of units above battalion size directly against a deep operational target is generally not being contemplated. As has been previously discussed, Marine planning metrics now seek to deploy a single Marine infantry battalion 200 miles from the sea base; larger units could be inserted at shorter ranges. In any case, Marine heavy equipment will generally be delivered to the beach via high-speed surface craft and then be driven inland. Of course, Marines will strive to land this surface component where the enemy is not and have it push quickly inland, rather than assaulting a defended shoreline. However, for the foreseeable future, STOM will have both an air-delivered and a prominent ship-to-shore-to-objective maneuver component, both of which will consume supplies as they move ever deeper into enemy territory or operate far from their sea base.

OMFTS and STOM are thus properly seen, above all, as requiring revolutionary logistical improvements. OMFTS and STOM will be transformational when Marines and their organic heavy equipment and means of tactical mobility can be lifted deep inland *at the same time*, and when fast-moving Marine units can be sustained logistically from the sea base at extended tactical ranges. This would seem to argue for a maneuver force transformation strategy that emphasizes a higher proportion of *heavy lift* rotary-wing and tiltrotor aircraft than in the past.[106] However, the priority for Marine vertical lift plans is the high speed V-22, which is optimized for insertion of troops, and not equipment. Indeed, its cargo box is so narrow (68 inches on the floor) that it can carry only light strike vehicles, if them. This means that the majority of their loads in support of air maneuvers are likely to be carried beneath the aircraft on slings, slowing them down appreciably, and, given their high relative costs (nearly $70 million a plane), making them a less attractive addition to the force structure.[107] Meanwhile, the service life extension program for the Marines' heavy lift CH-53E helicopter is a much lower priority in Marine aviation modernization plans. Until there is more operational data from which to make more informed

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[104] Major John M. Curatola, US Marine Corps, and Lieutenant Commander Robert Bovey, Jr., "The Future Maritime Pre-positioning Force," *Proceedings,* November 2001, pp. 87-89; Also Christopher J. Castelli, "DoD Panel Mulls Seabasing Ideas, Including Mobile Offshore Base," *Inside the Navy,* November 18, 2002, p.1.

[105] Corbett and Goulding, "Sea Basing: What's New?" p. 37.

[106] For a good synopsis of Marine heavy-lift support, see Major David J. Dowling, "The Future of Heavy Lift in Support of Expeditionary Maneuver Warfare," *Marine Corps Gazette,* May 2002, pp. 76- 82. For a discussion on the contribution that heavy-lift tiltrotors would make to STOM, see Major General Richard L. Phillips and Lieutenant Colonel Mark J. Gibson, US Marine Corps (Ret.), "The Missing Piece of the OMFTS Puzzle," *Proceedings,* November 2000, pp. 70-72.

[107] This price, which includes the recurring flyaway costs plus nonrecurring expenses, ancillary equipment, training support equipment, contractor support and initial spares, likely understates the cost, as they were costs before the major restructuring of the V-22 that occurred in 2000 after two crashes of early production aircraft. *V22 Resource Book* (Washington, DC: Headquarters, US Marine Corps), p. 93.

judgments, then, the assertions that sea-based forces will be able to generate greater operational tempo, or be able to maintain the initiative better than land-based forces, are based on facts not yet in evidence.

It also bears noting that the logic behind *Sea Power 21* contains an apparent contradiction. One of the key promises of Sea Shield is that extended naval theater air and missile defense will provide "global defensive assurance" by projecting "a defensive umbrella over coalition partners and joint forces ashore."[108] Two obvious questions jump out: if these capabilities enable and protect joint forced entry, why wouldn't they enable continued land-based assembly of Marine forces or rapid ship-to-shore-to-objective maneuver? Restated, given defensive assurance, why accept the operational and logistical penalties associated with designing the entire maneuver force for sea-based operations?

Having already locked in to a future path demanding sea-based maneuver forces, Marines are attempting to preempt this line of thinking:

> Even when secure ports and airfields are available, the greatly enhanced operational tempo Sea-Based forces will be able to achieve through ship-to-objective maneuver will make Sea Basing the preferred means of engagement.[109]

Given the potential costs to convert the entire future MPF and the Marine Corps for sea-based operations and recent operational history—including Marine operations in Operation Iraqi Freedom—this is a surprising conclusion. In the first place, there will be many instances in the future where land-based access *is* available. Indeed, one analyst at the Center for Naval Analysis, after looking at US military operations since 1989, concluded the United States has been remarkably successful in getting access to land bases.[110] Moreover, the uncertainties over whether threats to the sea base will mature more or less rapidly than those to land bases, and the operational and fiscal penalties associated with true STOM operations, are both high. It would pay dividends to sort out these uncertainties and penalties before committing to a complete force transition to sea basing.

Perhaps a better hedging strategy would be to modernize just one maritime pre-positioning ship squadron (the one located on Diego Garcia) to enable one Marine brigade to conduct at sea assembly of forces, selective offload, STOM, and reconstitution of forces. The Marines could then experiment with this STOM brigade in operational settings. Such a path would fly in the face of Marine preferences for standard force deployment packages. But if threats to the sea base materialize quicker than expected, or if naval air and missile defenses prove as effective as claimed in Sea Shield, optimizing the other maritime pre-positioning squadrons for improved ship-to-shore-to-objective maneuver may prove to be just as operationally attractive as STOM, at

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[108] Bucchi and Mullen, "Sea Shield: Projecting Global Defensive Assurance," pp. 56-59.

[109] Corbett and Goulding, "Sea Basing: What's New?" p. 35.

[110] Hank Gaffney, "The American Way of War as it Emerged in Combat Experience After the Cold War," Briefing paper, Center for Naval Analysis, undated.

a much lower price. Moreover, a period of experimentation would allow a more measured examination of the apparent steep logistical burden associated with concepts like OMFTS and STOM, and whether or not accepting them is operationally warranted.

Surface penetrations into the dead zone from the leading edge of the sea base to the shoreline, and the sea base itself, must be screened from three key threats: diesel subs lurking close to shore, mines, and swarming boats. Although none of these three threats are new, naval and civilian leaders have concluded that their previous efforts to deal with them have been ineffective.[111] This judgment has led the Navy to conclude that the best way to counter them is with a special-purpose counter maritime AD force based on crewed combatants. Moreover, given their desire not to change peacetime operational patterns, and to mitigate the dangers of surprise first salvos, these vessels must be low cost, and their loss cannot threaten the viability of the sea base.

All of these judgments and conclusions are also open to debate. Indeed, the Navy may be preparing to fight the last maritime AD network, and with the wrong tools. As Norman Friedman has noted after a careful review of global naval arms transfers and purchases, coherent maritime AD networks comprised of submarines, mines, and boats—and even ASCMs—are not materializing.[112] This suggests one of three things: potential adversaries have decided not to develop maritime AD networks; they are attracted to the maritime AD capabilities that currently occupy US naval planners, but have elected not to pursue them in the near term for other political or military reasons; or they are pursuing new capabilities to outflank DoN transformation plans.

This last circumstance would seem not only plausible, but highly probable. For any adversary contemplating a long-term competition with the US battle fleet, building a maritime AD network that US naval expeditionary forces are being specifically designed to defeat would not appear to be an attractive transformation path. From an adversary's perspective, crewed submarine operations are an extremely expensive pathway, and the prospect of taking on the US attack submarine fleet is not an attractive one. The United States is expending an enormous amount of resources and effort, however belatedly, to sweep *stationary* mines and to effect rapid but relatively narrow penetrations of *static* minefields. For an adversary to embark now on a major procurement program to buy these types of weapons would appear to be huge gamble. And except for surprise attacks, no serious naval opponent is going to emphasize swarming boats (except perhaps in special cases like the Persian Gulf, where sea room for US naval forces is limited). As was conclusively demonstrated at the Battle of Bubiyan Channel, a naval engagement during the first Gulf War, fast attack craft attacking a prepared naval force that enjoys air superiority is not a survivable tactic.[113]

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[111] Mustin and Katz, "All Ahead Flank for LCS," p. 31.

[112] Norman Friedman, "Globalization of Antiaccess Strategies?" *Globalization and Maritime Power,* pp. 487-501.

[113] *Navies in the Nuclear Age: Warships Since 1945,* ed. Robert Gardiner (Edison, NJ: Chartwell Books, 1993), pp. 105-106.

An alternative approach might be to pursue new underwater attack systems combining the technology of torpedoes, mobile mines, and new autonomous underwater vehicles (AUVs). Pursuing new types of stealthy uncrewed attack submarines, or long-range autonomous torpedoes, or mobile mines that constantly shift their position or patrol an engagement area would appear to be a far more attractive competitive strategy for maritime AD, in that it would side-step most, if not all, of US counter-AD plans. Moreover, such a strategy would allow attacks beyond the littoral dead zone to threaten the very viability of the sea base. AUV technology available today could easily allow an adversary to conduct wake-homing attacks on surface vessels at ranges out to 250 miles.[114] In the future, even longer-range attacks will be possible, perhaps extending to ocean basin ranges. In addition, unlike in the past when the military sector dominated the development of underwater systems, today's revolution in remotely operated underwater vehicles and AUVs is being driven by the commercial and scientific communities. Since most of the research and development (R&D) for long-range AUVs is being borne by them, the costs for weaponizing AUVs are likely to be reasonable, meaning that AUV-based weapons might be built in numbers, and quickly, opening the possibility of springing either an operational or tactical surprise. Moreover, once built, weaponized AUVs would require little infrastructure overhead, and they could operate largely autonomously after the start of a war.[115]

Even if future adversaries do not attempt to outflank DoN transformation plans and decide to construct the maritime AD networks that US naval planners expect, it is not yet clear that building crewed combatants with crews of up to 75 officers and sailors is the best way to tackle the "dead zone" threats of submarines, mines, and swarming boats. For the near to mid-term, helicopters would appear to be the dominant weapon system in the dead zone. From a submariner's perspective, "no [anti-submarine warfare] platform is more feared than the helicopter."[116] The Navy's mine countermeasures plan relies on a variety of systems to be employed by the MH-60S medium helicopter.[117] Additionally, missile and gun-firing helicopters are the scourge of small boats.[118] In the mid- to long term, unmanned systems may vie for primacy as the dominant warfighting platforms in shallow littoral waters. Indeed, the threat of mines and small boats can already be mitigated, to a large degree, by networked unmanned systems, and "track and trail" of enemy submarines in littoral waters by unmanned underwater vehicles is expected to be demonstrated by FY 2007. [119] It is therefore unsurprising that the LCS

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[114] STN Atlas Elektronik is developing a 2,000-kilogram AUV, called DeepC, that can carry a 200-kilogram payload, dive to 4,000 meters, has a 60-hour endurance period, and a range of 250 miles at 6 knots. See Hewish and Janssen Lok, "Silent Sentinels Patrol the Depths," p.51.

[115] For a more thorough discussion on the potential for these types of threats, see *Maritime Futures: The Undersea Environment* (Washington, DC: Center for Strategic and Budgetary Assessments, 2003).

[116] Rear Admiral W.J. Holland, US Navy (Ret.), "Battling Battery Boats," *Proceedings,* June 1997, p. 32.

[117] See US Naval Mine Warfare Plan (Washington, DC: Department of the Navy, undated), and Admiral Robert J. Natter, US Navy, "Access is Not Assured," *Proceedings,* January 2003, pp. 39-41.

[118] *Navies in the Nuclear Age: Warships Since 1945,* ed. Robert Gardiner., pp. 105-106.

[119] See for example "Future Undersea Battlespace: Unmanned, Undersea," *Jane's Defense Weekly,* June 12, 2002; Richard Scott, "New Roles Studied for RMS Unmanned Vehicle," *Jane's Defense Weekly,* July 24, 2002, pp. 76-77; Norman Friedman, "Mine Clearance Progresses," *Proceedings,* March 2003, pp. 6-7; Robert L. Wernli, "Low-cost UUVs for Military Applications," *Sea Technology,* December 2002.

will rely on both helicopters and unmanned systems to accomplish its missions. What is not clear, however, is why a small, focused-mission combatant is required to employ them.

Helicopters and unmanned surface and air systems, employed by large multi-mission combatants or sea base support ships operating within the protected confines of the sea base, and augmented by submarines and unmanned underwater vehicles, would appear to be a viable, lower risk option than those outlined in DoN plans. Such an option might forego a littoral *combat* ship, and instead pursue a vessel along the lines of the littoral *support* craft (LSC) studied by the Office of Naval Research since 1997, or HSVs like the HSV-X1, a high-speed wave-piercing catamaran leased by the Navy in 2001. Like the LCS, the LSC and HSV are both designed to operate at high speeds, but they both trade stealth for larger deck areas and more storage volume. Both would be able to employ helicopter detachments and unmanned vehicle detachments, or both, in a maritime AD environment—and in larger numbers than could be carried by an LCS. These detachments would operate from roll-on, roll-off container vans. In lower threat environments, or once maritime AD threats had been rolled back, they could then perform important logistics functions in support of the sea base, serving as high speed ship-to-shore delivery craft, thereby helping to offset or mitigate some of the aforementioned penalties for sea-based maneuver operations.[120]

Even if LCS is conceived as a true small *combatant,* it is not yet clear that a focused-mission approach (larger numbers of single-mission ships) is the right answer for the deployment patterns preferred by the Navy. Given the fact that the LCS may be the target of a wide variety of surprise attacks, a more attractive approach might be the multi-mission approach preferred by the Israelis (fewer numbers of multi-purpose ships).[121] Indeed, given the wide array of missions now contemplated for the LCS, perhaps an multi-mission corvette or frigate would be the better answer. It would appear that operational experimentation would be the best means by which to determine the merits of these different design approaches. Perhaps one option might be to build two experimental LCS divisions, one designed to operate in the Persian Gulf, and one designed to operate in the East Asian Littoral—both areas of restricted waters that complicate operations for larger combatants and elements of a sea base.[122] Perhaps the division in the Persian Gulf could be comprised of small multi-purpose combatants, while the division in the East Asia Littoral could be comprised of small focused-mission combatants. Both squadrons would experiment, *in an operational setting,* primarily in support of CSGs and ESGs. At the same time,

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[120] See Natter, "Meeting the Need for Speed," pp. 65-67; Rear Admiral George R. Worthington, US Navy (Ret.), "We Have the Craft for Littoral Warfare," *Proceedings,* October 2002, p. 128.; Rear Admiral George R. Worthington, US Navy (Ret.), "Littoral Warfare Needs a Specific Ship," *Proceedings,* January 2003, pp. 90-91; David Foxwell and Richard Scott, "X-Craft Catamaran Will Test New Technologies," *Jane's Defense Weekly,* 12 March 2003; and the concept for High Speed Vessels in the concepts section of the Naval Warfare Development Command website at www.nwdc.navy.mil.

[121] Doron, "The Israelis Know Littoral Warfare;" see also Freidman, O'Braskey, and Tangredi in "Surface Warfare," in *Globalization and Maritime Power,* pp. 382-384.

[122] The Persian Gulf is accessible only through the narrow straights of Hormuz, has restricted maneuver room, and is characterized by relatively shallow water (74 percent of the Gulf is less than 30 fathoms (55 meters) deep. Hewish and Janssen Lok, "Silent Sentinels Patrol the Depths," p. 54. In fact, one naval analyst believes that the original impulse for the LCS originated from US naval operations in these waters. See H.H. Gaffney, *Globalization and the US Navy: An Annotated Briefing* (Alexandria, VA: Center for Naval Analysis, July 2002), p. 49.

the Navy would monitor the development of actual, as opposed to projected, maritime AD threats. Final decisions on the size and character of the smallest member of the Navy's future family of ships would be made based on these experiments and observations.[123]

Under any circumstances, however, the DoN's inside-out approach to the A2/AD threat—that is, continuously operating crewed combatants inside the heart of potential maritime AD networks, even in times of heightened tension—should be re-examined and debated. Although naval planners now assert that maritime AD networks built around coastal submarines, mines, and swarming boats are increasingly dangerous and pose higher risks to US naval forces, they refuse to change their operational approach to fighting for access and organizing the fleet for an outside-in roll back of maritime AD networks.[124] Instead, the DoN continues to pursue its traditional peacetime deployment pattern, and has concluded that the best way to handle increasingly dangerous A2/AD threats is to create a new manned combatant designed to operate in the areas of highest risk so as to assure continued access.

This type of thinking is eerily reminiscent of pre-World War II Army Air Corps thinking that "the bomber will always get through." It rests on shaky operational assumptions such as the LCS will always have the dominant battlespace awareness to avoid threats, or that its signature reduction will make it virtually invisible, or that its speed and maneuverability will allow it to generate misses. However, a strong counter-argument can be made that at the ranges from the shore that these ships will operate, their location and targeting in a future sensor rich environment is virtually assured, and the likelihood that they will be engaged is very high.

Proponents of the LCS would counter that their smaller crew and lower costs make these risks acceptable. However, this assertion rests on a key, unproven assertion: that the loss of several small $400 million crewed combatants with 75-person crews in surprise first salvos would be more politically and operationally palatable than the loss of a $1 billion crewed combatant with a 350-person crew. On the surface, this assumption appears attractive, especially on the basis of a cost-benefit analysis. However, what of the inherent political risks? It is by no means certain that a political or even an operational war leader would consider the employment of three smaller, less well-protected ships, each with crews of 75 officers and sailors, to be less risky than employing a larger, better-protected ship with a crew of 350. After all, a larger ship is more difficult to sink than a smaller vessel;[125] the hits sustained by the *Stark* (two Exocet missiles), the *Samuel B. Roberts, Princeton,* and *Tripoli* (mine explosions), and the USS *Cole* (waterline suicide boat explosion) would all likely have destroyed or sunk a LCS outright. Moreover, what

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[123] US Navy experimentation will be conducted under the new Sea Trial construct, *Sea Power 21*'s fleet-led concept development and experimentation process. See Clark, *Sea Power 21.*

[124] An outside-in approach to maritime AD networks has many advantages. Covert mining clearing using unmanned systems from standoff ranges would be far less risky than surface clearing operations within enemy sensing and engagement ranges. As for battling diesel boats in the littoral, shallow water is not a haven naturally sought by submariners. Diesel boats have tactical vulnerabilities that become crippling when patiently exploited by penetrating anti-submarine warfare forces; see Holland, "Battling Battery Boats." Of note, the LCS portrays an outside-in approach to an attack through the Straits of Hormuz.

[125] See Friedman, O'Braskey, and Tangredi, "Surface Warfare," *Globalization and Maritime Power,* p. 383.

would a terrorist or potential adversary prefer: putting one multi-mission combatant out of action temporarily, or sinking three $400 million combatants outright? The psychological impact of being able to claim the first sinking of a US combatant in battle since the Korean War would likely be significant on both enemy and US populations. Moreover, any subsequent order to withdraw LCSs from a littoral joint operating area to assess their operations and tactics would likely be viewed as serious reversal for the US Navy and the Joint Force.

Even if one ignores these political and operational risks, further problems remain. For example, advocates of the LCS emphasize that their combat systems will rely to a great degree on unmanned systems. But much of the fleet value of pursuing unmanned naval systems will be obviated by creating *new* crewed combatants to employ them. Moreover, introducing a large class of new crewed combatants to employ unmanned systems, rather than exploiting unmanned systems to reduce the number of crewed combatants, or to improve the performance of a similar number of combatants, is fraught with its own risk. If the LCS turns out to be either an ineffective or non-survivable combat platform, much of the potential combat contribution of unmanned naval systems will be lost to the sustained access fleet.

In sum, the LCS component of the DoN transformation plan appears to be its weakest operational link, and one that needs to be more fully considered before embarking on a 56-ship class production run.

There is no viable threat to the sea lines of communication to the sea base. That is, there will be no need for open ocean escorts or convoys in the future.

This judgment is already having important impacts on fleet design and operations. For example, all of the Navy's CLF ships—those ships that provide the lifeline for forward deployed naval task forces and that would guarantee the sea base's operational independence from forward bases ashore—are being transferred to the Military Sealift Command. Their weapons are being removed and their crews are to be made up primarily of civilian mariners. As this is happening, the Navy's relatively large (35-ship) residual guided missile frigate force is losing its local area air defense armament. Indeed, one new proposal calls for the frigates' conversion into LCS test beds by converting one of their two helicopter hangers into an unmanned vehicle storage and handling facility.[126] These latter two developments will rob these frigates of much of their open-ocean escort capability—a capability no longer considered necessary since all CLF ships are to operate alone and unescorted from forward fleet bases. The same would go for the maritime pre-positioning ships, as well as the surge sealift ships bringing joint forces to theater.

Both these changes can be readily defended based on *observable* trends in foreign naval developments. However, they present an attractive opportunity for an enemy that views maritime AD through a strategic rather than tactical lens. Sinking civilian crewed pre-positioning ships in their unprotected anchorages, or attacking CLF ships on the high seas with armed merchantmen

[126] Norman Polmar, "Getting the LCS to Sea, Quickly," *Proceedings,* April 2003, pp. 106-107.

or container vessels (a modern variation of the "Q-ship"),[127] or stalking both with long-range ocean interdiction versions of AUVs would be just as effective in denying US naval access as taking on and sinking heavily armed combatants operating close to shore. In fact, these operational approaches might be easier to achieve, especially if an adversary planned them as part of a surprise, coordinated global first salvo.

The point here is that while the risks associated to sea base lines of communication may appear to be low now, the Navy should retain the flexibility to respond to and overcome unexpected challenges against them. Should an adversary pursue this tack, the only way to respond with the *Sea Power 21* Navy as now envisioned would be to divert multi-mission combatants away from the sea base, thereby robbing the base of both striking and defensive power. All the more reason to question the pursuit of a large class of special purpose, focused-mission LCSs with 20-30 year expected service lives suitable only for operations in the littoral. And all the more reason to enter a period of operational experimentation and to determine if future threats to naval operations emerge in expected or unexpected ways.

TECHNOLOGICAL AND FISCAL RISK

The new DoN transformation plan is packed with technological promise. In the near to mid-term the Department plans to introduce new hull forms; a new electric propulsion system for its large multi-mission combatants; high bandwidth sensor and fire control systems that allow the sharing of data among many different network nodes; new deployable sensors; new long-range radars conformally mounted in ship hulls; new integrated undersea warfare suites; new long-range land attack and air defense missiles; new ballistic missile defenses; new aircraft such as the JSF, E/A-18G Growler, V-22 tiltrotor, and multi-mission, maritime aircraft; unmanned systems designed to operate in the air, on the sea, and under the sea; new long-range naval guns; new precision weapons of all types; a new high-speed amphibious assault vehicle; and other high-speed support vessels and landing craft.[128] All of these advances appear to be technologically feasible, although ballistic missile defense will continue to be especially challenging. Indeed, technological risk, to the extent that it is present, appears more associated with integrating all of the new technologies together rather than in developing them. As is evident by the past problems with introducing the AEGIS combat system and the CEC, integration is not a trivial challenge. However, given time and operational experience, the integration challenges appear to be manageable.[129]

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[127] A "Q-ship" was man-of-war disguised as an unarmed merchantman, used to lure enemy submarines or merchant raiders close aboard where they could be destroyed by gunfire. Originally a class of ships built in England during World War I, and given the classification "Q" by the British Navy. John Quick, *Dictionary of Weapons and Military Terms* (New York: McGraw-Hill Book Company, 1973), p. 361.

[128] See the *Naval Transformation Roadmap* for a complete recount of the DoN's planned technology insertion program. See also the statements of the Honorable John J. Young, Jr., Assistant Secretary of the Navy (Research, Development, and Acquisition) and Vice Admiral John Nathman, US Navy, Deputy Chief of Naval Operations (Warfare Requirements and Programs) before the Subcommittee on Projection Forces concerning Navy Transformation and Future Naval Capabilities of the House Armed Services Committee on April 3, 2003, found in the Today's Navy section at www.navy.mil.

[129] Polmar, "Transformation, Terrorism, and the QDR," p. 103.

In the farther term, the Navy is pursuing more esoteric and perhaps more revolutionary systems such as electromagnetic rail guns and directed-energy weapons.[130] The technological risks associated with these weapons are higher, but the stakes are lower. The near- to mid-term weapons appear more than capable of holding their own against known near- to mid-term operational challenges. Moreover, US armed forces are far outspending all other potential adversaries in R&D, thereby providing a big hedge against an opponent beating them to any technological knockout punch. Should any of these weapons prove technologically feasible, they will simply widen the technological edge that the Navy and Marine Corps now enjoy.

The real risk associated with the technological plan is that, like the fleet expansion plan, it pursues an unconstrained vision of future naval capabilities. Together, both plans require large steady state increases in ship and aircraft procurement, sea-basing costs, weapons procurements, and operations and support costs, sustained over many years. The Navy is trying to mitigate the risks as best it can by canceling programs and by aggressively seeking "business efficiencies," in a process known as *Sea Enterprise.*[131] DoD is also trying to help; it diverted an additional $1.3 billion to help the Navy cover its FY 2004 bills, and an additional $6.6 billion to cover costs within the five year defense plan.[132] Despite these promising developments, the fiscal risk to the overall DoN transformation plan is perhaps the most daunting, and the most likely to result in its eventual abandonment or modification.

Throughout the 1990s and up through 2001, the number of aircraft carriers in the active fleet was a continual target for those who argued for a more aggressive transformation of US combat forces. Some argued that carriers were increasingly vulnerable; others argued that they took too great a share of available resources.[133] These arguments have been largely muted since the Afghanistan campaign, where access problems initially prevented the introduction of short-range, land-based fighters into theater, and carrier air accounted for nearly 75 percent of all strike sorties. These naval strike sorties, flown over extended ranges, dropped approximately 25 percent of the total tonnage, approximately 90 percent of which was delivered via precision guidance.[134] This performance was followed up by the assembly of five aircraft carriers for Operation Iraqi Freedom, and where two carriers in the eastern Mediterranean helped to overcome the tactical shortcomings caused by Turkey's refusal to allow land-based tactical

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[130] See for example Lieutenant Commander David Allan Adams, US Navy, "Naval Rail Guns are Revolutionary," *Proceedings,* February 2003, pp. 34-37, and Christopher J. Castelli, "Navy Envisions Surface Combatants with Powerful Laser Guns," *Inside the Navy,* December 9, 2002, p. 1; and Andrew Koch, "US Navy Sees the Light," *Jane's Defense Weekly,* December 18, 2002.

[131] *Sea Enterprise* is a new process for identifying cost-cutting solutions to help the Navy recapitalize the fleet. See Clark, *Sea Power 21*, and Admiral Clark's 2003 Fleet Guidance at www.chinfo.navy.mil/navpalib/cno/clark-guidance2003. See Hunter Keeter, "Mullen: Navy To Back Further Program Cuts, More Business Efficiencies," *Defense Daily,* January 17, 2003, p. 1.

[132] Christopher J. Castelli and Amy Butler, "At Last Minute, OSD Gives Navy $1.3 billion To Cover Bills in FY-04," *Inside the Navy,* January 13, 2003, p. 1.

[133] See for example Dave Moniz. "Biggest US Ships called Vulnerable," *USA Today*, May 21, 2001, and Loren Thompson, "What It Takes to Kill an Aircraft Carrier," *Defense Week,* June 11, 2001.

[134] Eric Schmitt, "Improved US Accuracy Claimed in Afghan Air War," New York Times, April 9, 2002, and William Arkin, "Weapons Total for Afghanistan includes Large Amounts of Cannon Fire," Defense Daily, March 5, 2002.

aircraft to be launched from its soil.[135] The Navy appears to have thus successfully made the case for a 12-carrier force structure, [136] and to have won approval for the first major redesign of its aircraft carriers since the 1960s.[137]

The US carrier fleet offers unequaled capabilities, but it does incur high costs. Assuming an expected service life of 50 years, a new carrier has to be built every 4 or 5 years. Between 1990 and 2002, aircraft carrier annual average construction costs, including refueling overhauls, was $1.4 billion a year. That will jump to $2.0 billion plus between 2003 and 2020.[138] The *planned* cost for the next replacement carrier—the new CVN-21 design—will be $12.35 billion through FY 2009 including R&D.[139] Costs for subsequent carriers are expected to range between $6-7 billion—and these costs do *not* include the costs of their organic air wings. Even if the shipbuilding cost targets are achieved, in constant FY 2004 dollars they will be 23-35 percent higher than for carriers delivered during the 1980s.[140]

Spending on amphibious ships and support ships between now and 2020 is expected to average $1 billion a year, which is well within historical averages. Surface combatant spending is another story. Between 1990 and 2002, the surface combatant force cost an average of $3.6 billion a year in constant FY 2003 dollars to sustain a force structure of 116 ships. The expansion of the combatant fleet to 168 vessels (including the LCS) would cost over $5 billion a year between now and 2010, and average at least $6.2 billion per year from 2010-2020—nearly a 100 percent increase in funding. By itself, the planned level of spending for surface combatant construction is three quarters of the average construction costs for the *entire* fleet between 1990 and 2002.[141] Moreover, the new weapon systems that go aboard the new combatants themselves carry high costs. For example, depending on the number of ships converted for the anti-ballistic missile defense mission and the numbers of special-purpose missiles bought, costs for putting these new capabilities to sea could be as high at $17 billion.[142]

Planned increases in attack submarine procurement are even more dramatic. As the submarine fleet contracted from its Cold War high of nearly 100 boats to the current level of approximately 55 boats, average fleet construction costs averaged $1.3 billion between 1990 and 2002. To

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[135] David Brown, "Battle Groups Prepare to Do More With Less Hardware," *Navy Times,* February 24, 2003, p. 18.

[136] The case for the carrier was aided immeasurably by the favorable endorsement given these vessels by the Defense Science Board. See *Defense Science Task Force on the Future of the Aircraft Carrier* (Washington, DC: Office of the Secretary of Defense, Under Secretary of Defense for Acquisition, Technology, and Logistics, October 2002). Public commentary on the carrier is also far more supportive. See for example Victor Davis Hanson, "Our Islands in the Storm: Carriers as the new phalanxes," *National Review Online,* December 13, 2002.

[137] See David Lerman, "Pentagon OKs 2007 Start for CVN Carrier," *Newport News Daily Press,* December 20, 2002, and Jason Sherman, "US Navy Nears Decision," *Defense News,* March 24, 2003, p. 16.

[138] *Transforming the Navy's Surface Combatant Force* (Washington, DC: Congressional Budget Office, March 2003), p. 21.

[139] Ms. Gaye Evans, "FY 2004 President's Budget Overview."

[140] *Transforming the Navy's Surface Combatant Force,* p. 21.

[141] Ibid., pp. 17-21.

[142] Tony Capaccio, "US Defense Spending Heading to Reagan-Era Levels," *Bloomberg.com*, January 8, 2003.

sustain a 55-boat fleet, average construction costs between 2003 and 2010 are expected to jump to a minimum of $4.2 billion a year, and jump again to $6.2 billion a year between 2011 and 2020.[143] Moreover, these planned costs are likely optimistic. Procurement costs on the new Virginia-class attack submarines have not yet been contained. Recently, higher-than-expected costs in material, labor, health care, pensions and infrastructure contributed to industry bids for the next block of five boats to be 20 percent higher than expected. Maintaining the attack submarine force at 55 boats thus appears to pose a significant long-term challenge.[144]

Taken together, the increased shipbuilding costs associated with DoN transformation plans are quite striking. The average annual ship construction costs necessary to drive the fleet expansion between 2003 and 2010 would be nearly 60 percent higher than the average between 1990 and 2002. To help put these numbers in perspective, between 1980 and 1989, during the build up to the 600-ship Navy, the DoN built an average of 20 ships per year, at an average cost of $14 billion. Between 2010 and 2020, the decade that would see the most dramatic increase in fleet units, the DoN would need to build over 14 ships per year, at an average cost of nearly $17 billion.[145]

Enhanced sea-basing costs are not yet clear, primarily because many of the new platforms associated with the base, such as future maritime pre-positioning ships, have not yet been designed. Also, a large percentage of the costs will likely be paid for by National Defense Sealift Funds. However, the costs promise to be substantial. Given the new operational capabilities required by future maritime pre-positioning ships (such as enhanced command and control capabilities), they are sure to be much more expensive than past ships. New big deck amphibious ships designed to support JSFs and V-22s will be far more expensive than previous ships. Costs for new HSVs, replacements for aging landing craft, and service life extensions of air cushion landing craft will also likely be higher.[146]

The outlook for Navy and Marine aviation costs is somewhat brighter due to the $19 billion cost savings associated with the recently announced Navy and Marine Corps Tactical Aviation Integration plan.[147] But these savings merely made a woefully out-of-balance plan more manageable. Over the course of the next decade the Navy and Marine Corps will complete the F/A-18 E/F buy and introduce the new E/A-18G electronic attack aircraft, more advanced E-2C early warning aircraft, the JSF, the V-22, nearly 500 MH-60 S/R helicopters, more KC-130J airlifters, upgraded UH-1 and AH-1 helicopters, a new maritime multi-mission aircraft to replace

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[143] Ibid., pp. 17-21.

[144] Jason Sherman, "US Navy Sub Costs Mount," *Defense News,* March 10, 2003, p. 1. For the prospects of maintaining the submarine fleet at 55 boats, see remarks made by Ronald O'Rourke, Congressional Research Service, at the Forum on American Sea Power in the 21st Century, June 24, 1999.

[145] *Long-Term Implications of Current Defense Plans* (Washington, DC: Congressional Budget Office, January 2003), pp. 59-61, and *Transforming the Navy's Surface Combatant Force,* pp. 17-21.

[146] For an overview of systems required to support OMFTS and STOM, see Mark Hewish, "Solving the Amphibious Puzzle," *Jane's International Defense Review,* November 2001, pp. 52-57.

[147] Ms. Gaye Evans, "FY 2004 President's Budget Overview." See also "US Scales Back JSF, Super Hornet Buys," *National Defense,* March 2003, p. 21.

its aging P-3 fleet, and unmanned aerial and unmanned combat aerial vehicles. The final aggregate cost for these programs is not known. However, the Congressional Budget Office (CBO) estimates that annual spending on DoN fighter-attack aircraft will jump from approximately $3.5 billion in FY 2003 to over $8 billion in FY 2009, then fall to a steady state of approximately $6 billion a year from 2010 through 2020. Spending on Marine helicopters will see similar dramatic increases, from approximately $1 billion in FY 2003 to $2.5 billion a year from FY 2007 through 2012.[148]

Weapons procurement costs appear also to be formidable. The aggregate missile capacity for the surface combatant fleet at the end of FY 2001 was approximately 7,100 (13-inch and larger diameter) surface-to-air, anti-ship, anti-submarine, and land attack missiles. The aggregate magazine capacity for the planned sustained access fleet will be over 12,000 missiles—a 70 percent increase in potential combat power. Comparable numbers for the submarine fleet are approximately 1,800 21-inch diameter weapons in 2001, and 2,500 21-inch diameter weapons in 2011—a 40 percent increase. The weapon procurement costs required to fill the substantially enlarged fleet magazine, even if individual weapon costs drop, will certainly be much higher.[149]

Naval planners often point out that they expect higher construction costs to be offset by lower operations and support (O&S) costs, due primarily to smaller crew sizes on the next generation of combatants. Given the aggressive technology insertion program associated with the new vessels, however, that expectation may not prove valid. For example, the current fleet is largely standardized. For example, all surface combatants are powered by the same basic gas turbine propulsion plant, and all guided missile cruisers and destroyers have the same anti-air and anti-submarine combat systems. The next two decades will see new propulsion systems, new radars, new combat systems, new weapons, and new LCS mission modules. Training costs will invariably rise during the transition, as will support costs due to the multitude of new systems. Moreover, the fleet expansion will require more, not less sailors—at least for the next two decades. Compared to the pre-transformation plans of 84 AEGIS combatants and 32 DD-21s, the post-transformation fleet of 88 AEGIS combatants, 24 DD(X) destroyers, and 56 LCSs will likely require at least 3,000 more sailors. Significant O&S savings will thus not be realized until the AEGIS combatants with crews over 350 start to retire, and are replaced by combatants with smaller crews, in 2025.[150]

As can be seen, then, the DoN's aggressive technology insertion plan, when coupled with the types of ships that they are building and their associated costs, will require sustained budgets that even under the best circumstances (all costs contained, ship construction timelines met, technology integration 100 percent successful) will be far larger than history suggests can be

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[148] *Long-Term Implications of Current Defense Plans,* pp. 64-65.

[149] The Navy's SAMs, anti-submarine rockets, Harpoon anti-ship missiles were all originally 13 inches in diameter to fit inside the pre-vertical launch system rotary magazines. Submarine weapons are designed to be fired through 21-inch diameter torpedo tubes. Aggregate weapons capacities in Work, *The Challenge of Maritime Transformation: Is Bigger Better?,* and calculations of vertical launch cruise cells, deck launchers, and torpedo room spaces for the projected 2011 fleet.

[150] CBO projects rising aggregate O&S costs at higher rates than expected by DoN. See *Long-Term Implications of Current Defense Plans,* pp. 15-22.

supported. The DoN's transformation plan is thus incredibly fiscally risky—and one unlikely to be consummated.

Overall Assessment

DoN transformation plans largely discount future access threats and outline a new naval striking network in order to justify a large fleet expansion. These plans are based on several key assumptions, conclusions and programs that warrant further discussion and debate. In particular, the DoN's approach toward countering maritime AD networks—operating small crewed combatants in the area of maximum danger—raises as many questions as it answers. It thus appears that the overall plan has path, operational, and technological and fiscal risks that are formidable, if not insurmountable.

The plan has many attractions. The technological insertion plan promises a future fleet far more capable than the one that rules the seas today. Sea Strike (including OMFTS and STOM), Sea Shield, and Sea Basing are exciting concepts, even if they have yet to be fully developed. The new Global CONOPS has innovative and cost-effective new naval task groupings that promise to spark further change and improvements to fleet operations. However, given the crushing dominance that the Navy and Marine Corps now enjoy over potential naval adversaries, as well as the embryonic state of developing maritime AD and other naval threats, a period of experimentation and observation would appear to be an appropriate strategy to help mitigate the risks associated with the current plan.

IV. THE ARMY AND THE OBJECTIVE FORCE

By Andrew Krepinevich

POINT OF DEPARTURE

The Army's transformation effort is the logical point of departure in assessing how the Service intends to accomplish its missions in an A2/AD warfighting environment. The Army presents a clear and sobering picture of the challenges it confronts in future power-projection operations against an enemy possessing A2/AD capabilities. For the Army, the A2/AD threat comprises "theater ballistic missiles, cruise missiles, long-range rockets and artillery, weapons of mass destruction and other unconventional means, and information operations."[1] It is believed the enemy will employ these capabilities in an attempt to either deny deploying Army units access to major forward aerial and sea ports of debarkation (APODs and SPODs, respectively).

Moreover, in its wargames, the Army has found repeatedly that the longer an enemy can delay effective US response, the greater his chances for success.[2] Since an "enemy could seek to accomplish its initial objectives quickly by an aggressive, territorial move with conventional forces against a neighbor, leaving sufficient time to prepare for and deny external intervention," the Army believes its forces must be capable of deploying rapidly, along much shorter time lines than at present.[3] The Army's leadership also recognizes that the deployed ground force must not only be capable of addressing the A2/AD threat, but must also be capable of carrying out its mission upon arrival in the threatened theater.

Rapidly deploying expeditionary ground forces in an A2/AD threat environment is not viewed as an end in itself; the forces that arrive must be capable of conducting the full range of combat operations. The Army believes that such combat may involve engagements in open terrain, but that the enemy will more likely "disperse and operate from areas of physical and moral sanctuary often located in complex, urban terrain, shielded by civilians and culturally significant structures" to reduce his exposure to US precision fires, while also creating discrimination problems for US targeting.[4]

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[1] US Army White Paper*, Concepts for the Objective Force* (Washington, DC: Department of the Army, undated), p. 2, available online at *http://www.army.mil/features/WhitePaper/default.htm.* Hereafter cited as US Army, *Objective Force.*

[2] US Army White Paper, *Concepts for the Objective Force* (Washington, DC: US Army, November 2001), p. 1. Hereafter cited as White Paper, *Objective Force*.

[3] US Army, *Objective Force*, p. 2.

[4] As the Army's Objective Force concept paper states, "Operations will occur day and night, in open, close, complex, or urban terrain throughout the battlespace." Ibid., p. 6.

ARMY TRANSFORMATION AND THE A2/AD CHALLENGE

A Lighter Army

The Army has established very ambitious deployment time lines for its forces. The design of its future forces is driven by its goal to deploy a brigade combat team anywhere in the world in 96 hours after liftoff, a division on the ground in 120 hours, and five divisions in theater in 30 days."[5] Unless they are predeployed in advance of a conflict, the Army's current heavy, mechanized divisions are far too heavy to meet these deployment timelines under any plausible contingency. The Service also believes that its light divisions lack the combat capability to conduct the full range of ground force missions.[6]

Consequently, the Army's transformation plan seeks to create an Objective Force that "will possess the lethality, speed and staying power associated with heavy forces and the agility, deployability, versatility, and close combat capability of today's light forces."[7] At present, however, the Objective Force is more concept than reality. To bridge the gap between today's heavy (or legacy) forces and the Objective Force, the Army is beginning to field Stryker Brigade Combat Teams (SBCTs).[8] However, while these brigades are roughly as deployable as the Objective Force units are projected to be, they are nowhere near as lethal as today's heavy formations. Thus the Army's transformation plan is counting heavily on its Objective Force units, which it intends to begin fielding by the end of this decade.

Deploying the Force

The Army's White Paper outlining its concept for its Objective Force states that "[i]n order to overcome an aggressor's A2 capabilities, entry into areas of operations must be enabled without reliance on conventional Aerial Ports of Debarkation (APODS) and Sea Ports of Debarkation (SPODS) where denial efforts will be focused."[9] This approach is necessary because of the anticipated threat of large-scale enemy missile attacks against major transportation hubs, or nodes.

Army Objective Forces will deploy from multiple ports of embarkation, at home or abroad, to multiple points within the theater of operations and fight upon arrival, bypassing chokepoints and

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[5] Ibid., p. 9.

[6] Ibid., p. 11. The Army has ten active divisions. The 1st Infantry (Mechanized), 3rd Infantry (Mechanized), 4th Infantry (Mechanized), 1st Cavalry and 1st Armored divisions are considered "heavy" divisions, owing to their preponderance of heavy armored vehicles, such as the 70-ton Abrams main battle tank. Light formations include the 82nd Airborne Division, the 25th Infantry and 10th Mountain divisions. The 101st Airborne Division (Air Assault) is the Service's only helicopter-intensive division, and is not considered light. The 2nd Infantry Division is regarded as a medium-weight division. The Service also has several independent brigades and regiments.

[7] Ibid., p. 11.

[8] The Army has converted two units to Stryker configuration. It also plans to convert the 172nd Infantry Brigade (Forts Richardson and Wainwright, Alaska); the 2nd ACR (Fort Polk, Louisiana); the 2nd Brigade, 25th Infantry Division (Schofield Barracks, HI); and the 56th Brigade of the 28th Division (Mechanized) of the Pennsylvania Army National Guard. (The two brigades now being converted are the 3rd Brigade, 2nd Infantry Division (Medium), and the 1st Brigade, 25th Infantry Division (Light)).

[9] US Army, *Objective Force*, p. 10.

A2 threats as necessary. In order to deploy in this way, the Army will rely on a strategic mobility triad comprising sealift, airlift, and prepositioned stocks. This triad "is critical to protecting and sustaining US forces in distant anti-access and aerial (sic) denial environments."[10]

Strategic Lift and Prepositioned Equipment

With respect to lift, the Army envisions an expansion beyond the US military's current sealift assets, which include eight Fast Sealift Ships (FSS), 11 Large Medium Speed Roll-on Roll-off (ROROs, or LMSRs) vessels, and 31 LMSRs in the surge fleet. Similar expectations exist with respect to the future airlift fleet, which will comprise 126 aging C-5 Galaxy cargo aircraft (including 38 C-5A models) and programmed 180 C-17 Globe Master IIIs. Once in theater, the Army intends to use intermediate staging bases (ISBs) that are C-5/C-17 and LMSR capable, to transload military forces to a range of sealift and airlift assets for deployment into the threatened area.[11]

Recognizing that "[j]oint dependence on mobility platforms such as LMSRs, C-17s and C-5s for this sustainment flow will not decrease dramatically in the near future . . . . " the Army advocates "accelerated exploration of new lift capabilities . . . ."[12] In addition to the limited supply of lift relative to the demand imposed by the Services, the need for new kinds of lift capabilities is also driven by the Army's requirement to deploy with greater speed against an A2/AD threat. Indeed, the Army's 2002 Transformation Wargame led the Service to conclude that "[f]uturistic air and sealift concepts proved essential to strategic and theater force projection and in countering A2 efforts."[13]

Realizing the importance of lift to its future warfighting concept, the Army is exploring a range of possible airlift and sealift solutions. Among them are the Advanced Technology Transport (ATT),[14] the Shallow Draft High Speed Ship (SDHSS),[15] and Theater Support Vessel (TSV).[16]

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[10] Shinseki and White, *Army Roadmap*, p. B-4; The Army's *Objective Force* document states that "Deployment transformation counters our adversaries' strategies of anti-access and AD. The successful transformation of air and sealift platforms, prepositioning, deployment organizations, training, processes, and infrastructure has enabled the Objective Force to meet our deployment objectives." DA, *Objective Force Final Draft*, p. 32 The conclusions of the Army's major transformation wargames "consistently bear out the critical importance of strategic and intra-theater lift enablers for deployment, operational maneuver, and sustainment of the joint Objective Force." Department of the Army (DA), *Army Transformation Wargame 2001*: April 22-27, 2001, (Carlisle Barracks, PA: undated), pp. 13-14. (Hereafter cited as DA, *Army Wargame 2001*.)

[11] Shinseki and White, Army Roadmap, p. B-4; and Ron Laurenzo, "Congress: Air Force Must Fully Fund C-17," *Defense Week*, October 21, 2002, p. 7.

[12] Shinseki and White, *Army Roadmap*, p. B-7.

[13] Department of the Army, *Army Transformation Wargame 2002* (Fort Monroe, VA: Army Training and Doctrine Command, 2002), p. 18. Hereafter cited as DA, *Army Wargame 2002*.

[14] The ATT is envisioned as super short takeoff and landing (SSTOL) airlifter capable of deploying two Future Combat Systems. Ibid., p. 14.

[15] Three SDHSSs would be capable of delivering a SBCT with its initial basic load of supplies.

[16] Michael Fabey, "Army's New Craft is All About Speed," *Newport News Daily Press*, September 6, 2002. The Army is actually testing the TSV HSV-X1, Joint Venture. This catamaran is capable of speeds in excess of 40 knots and can be adapted to haul freight, equipment, or combat forces. The ship, which is Australian built, is made of

These systems are viewed by the Army as providing it with the means "to avoid traditional entry points and deliver . . . combat power along multiple routes to the operational and tactical fronts."[17]

Turning to the third element of the Army's strategic mobility triad, prepositioned equipment, the Army envisions that it "will selectively transform our prepositioned stocks . . . [with] an increased proportion of sustainment stocks and equipment relative to combat equipment." This approach seems to indicate that such stocks will be used primarily to sustain deployed ground forces, rather than be configured in unit sets.[18]

Deploying the Force

Once they are deployed to ISBs, Army units still face the challenge of deploying into an A2/AD threat environment. Army Objective Force and Stryker units are envisioned as transferring their equipment from strategic lift assets (e.g., C-17s, FSSs) to intratheater lift assets such as C-130 and ATT cargo aircraft, and TSVs. Other more advanced forms of lift noted above may also be employed, if they are available. These forms of lift could allow Army units to bypass major port and air base "chokepoints."[19]

There is some evidence that the Army envisions Stryker brigades as part of the first-wave assault into an A2/AD environment. The Army Transformation Roadmap notes that

> . . . [SBCTs] will provide JFCs [Joint Force Commanders] with a robust, lethal, early entry, land force capability to expand control of key areas and receive follow-on forces. For example, an SBCT employing Joint Airfield Construction (JRAC) (sic) Program capabilities provides a unique capability to upgrade the existing airfields rapidly, or to construct contingency airfields in austere or degraded environments.[20]

The Army appears to realize that even operating out of small or remote airfields in an A2/AD environment may prove difficult in the face of enemy missile forces. Consequently, it continues to pursue a number of air and missile defense systems to defend these bases from attack.[21] The

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lightweight aluminum. The Army hopes the Navy, its sister Service in the Joint Venture experiments, will begin building military versions of the vessel within four years, at a cost of $85-100 million per ship.

[17] Even more exotic means of providing lift are being explored—at least in the Army's war games. Among them are a large ground-effect aircraft (Pelican), an Ultra-Large Airlift (ULA) aircraft, and a Precision Extended Glide Airdrop System (PEGASYS) that would provide logistical support from high-altitude and standoff ranges. which "could improve strategic responsiveness significantly." Shinseki and White, *Army Roadmap*, p. B-4.

[18] Equipment configured in unit sets essentially represents a complete set of equipment for a maneuver formation (e.g., a brigade). Configured in this manner, prepositioned equipment can speed the deployment process since in theory all that is required is for the personnel to move from their base of origin to their prepositioned equipment. Of course, procuring an extra set of equipment for a maneuver formation is an expensive proposition. This may have factored in to the Army's apparent decision to emphasize sustainment stocks (e.g., munitions, spare parts).

[19] Shinseki and White, *Army Roadmap*, p. B-4

[20] Ibid., p. B-7.

[21] Ibid., p. B-2.

Army's Patriot system has had limited success in a ballistic missile defense role, although improvements continue to be made on the system. Further down the road the Army envisions deploying its Theater High Altitude Air Defense (THAAD) system along with its Medium Extended Air Defense System (MEADS). Long-term initiatives are focused on the Mobile Tactical High Energy Laser (MTHEL) and the Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS), which offer the potential for new and revolutionary methods of detecting and defeating theater air and missile threats.[22]

Intratheater sealift is also intended to avoid traditional entry points such as major ports. As in the case of arriving at and operating from a distributed cluster of smaller air bases, the use of multiple entry points along the coastline is also intended to complicate the enemy's targeting problem.

Combat Operations: The Objective Force

The Army's transformation goal is not merely to deploy forces in an A2/AD environment, but to prevail decisively across the entire conflict spectrum. The Service therefore has established three main transformation requirements as they pertain to the A2/AD problem: forces that can deploy rapidly; deploy at acceptable cost in an A2/AD threat environment; and accomplish their warfighting mission once they have deployed. In an effort to address the first two challenges, the Army is lightening up the force. At the same time, the Service intends for its Objective Force units to be as lethal and survivable as today's far heavier legacy force. The SBCTs, possessing neither of these characteristics, are clearly a transition force, and the Army accordingly describes the SBCTs as an Interim Force. Hence the focus here will be primarily on the Objective Force.

The Objective Force is very much a product of the Information Age, and its vision of "see first, know first, act first and finish decisively" speaks to a true revolution in land warfare. Simply stated, Objective Force formations will not seek to close with and destroy the enemy as the decisive part of battle, but rather conduct the decisive phase of the engagement at extended range. As the Army's White Paper on the Objective Force notes:

> Operations will be characterized by developing situations out of contact; maneuvering to positions of advantage; engaging enemy forces beyond the range of their weapons; destroying them with precision fires; and, as required, by tactical assault at times and places of our choosing. Commanders will accomplish this by maneuvering dispersed tactical formations of Future Combat Systems units linked by web-centric C4ISR capabilities for common situational dominance.[23]

The Objective Force will also shift from traditional linear to nonlinear operations:

> In contrast to the phased, attrition-based, linear operations of the past, this approach is focused on disrupting the integrity of the enemy's battle plan by exposing the entire enemy force to air/ground attack, rather than

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[22] Ibid.

[23] US Army, *Objective Force*, p. 6.

> rolling his forces up sequentially. Non-contiguous operations will have a dramatic impact on the architecture of the battlefield and in the relationship between combat, combat support and combat service support formations. Superior situational understanding, based on advanced C4ISR capabilities embedded at all levels, enables ground commanders to operate non-linearly . . . . [24]

As the Stryker Interim Armored Vehicle is central to the SBCTs, so too is the Future Combat System at the heart of the Objective Force. The FCS is intended to combine the capabilities of current howitzers, main battle tanks, and infantry fighting vehicles—exceeding their lethality and survivability while coming in at a weight not to exceed 20 tons, or slightly above that of the 19-ton Stryker.[25] More than a platform, however, the FCS is envisioned to comprise a networked, combined-arms team of manned and unmanned ground systems and UAVs. Once the FCS proves itself, it will be adopted by the Legacy and Interim Forces, which will eventually merge into the Objective Force.

The FCS's development is driven by three principal performance metrics. Like the SBCT's Stryker, it must be transportable in a C-130-type aircraft. Unlike the Stryker, however, the FCS must also be as survivable and as lethal as the Army's 70-ton M1A2 Abrams main battle tank.[26] This has led to a fundamental shift in Army thinking with respect to the conduct of operations. Mandating a 70 percent reduction in weight from the Abrams tank and a 50 percent reduction in internal volume (to under 20 tons and between 300-400 cubic feet respectively) to accommodate C-130 cargo capacity limitations runs directly counter to the historical trends of ever-increasing size, weight, and volume in ground combat vehicles.

Projecting such a radical weight loss forces the Army to abandon its long-held belief that survivability is based primarily on armor thickness, and move toward a network-centric view of combat. As Col. Ellis Golson, Director of Combat Development at the Army's Aviation Center in Fort Rucker, Alabama, stated: "[a] lighter force in the future, without a 70-ton tank will depend on information to survive."[27] In fact, the Army does not expect the FCS to survive a direct hit from an anti-tank missile. Rather, the goal is to protect the vehicles against 14.5 mm rounds.[28]

This view is consistent with the Army's concept of "see first, know first and act first;" that is, waging the decisive battle at extended ranges. At extended ranges, Objective Force units will, it is presumed, have the advantage in battlespace awareness (i.e., scouting), ranged fires, and precision munitions. FCS formations will rely primarily on these advantages to achieve first-hit

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[24] Ibid., p. 13.

[25] David Jablonsky, "Army Transformation: A Tale of Two Doctrines," in Conrad C. Crane, *Transforming Defense* (Carlisle Barracks, PA: US Army War College Strategic Studies Institute, December 2001), p. 50.

[26] Briefing, Dr. A. Michael Andrews, "Army S&T and the Objective Force...Accelerating the Transformation," (Washington, DC: AUSA Future Combat System Symposium Briefing, June 27, 2000) p. 7.

[27] Ann Roosevelt, "Army Ponders Its Future In Aviation," *Defense Week*, January 14, 2002, p. 6.

[28] Sandra I. Erwin, "Army's Future Combat System Shakes Up Procurement Culture," *National Defense*, January 1, 2003, p. 24.

kills for survival, instead of on their armor.[29] Key force elements that will enable Objective Force units to achieve an advantage in battle space awareness include, at a minimum, "combat identification systems; organic sensors that are robotic, multi-spectral, and disposable; UAVs; embedded C4ISR; Special Operations Forces (SOF); Long Range Surveillance Detachments (LRSD); and air and ground reconnaissance operations."[30]

The Army sees the Objective Force's mobility as another key enabler of its Future Combat System's ability to survive. A force that can move rapidly and that operates on a nonlinear battlefield in which there are no front lines can make an enemy's scouting job difficult. The Army envisions Objective Force's mobility being facilitated by several intra-theater airlift systems, to include the joint transport rotorcraft (JTR) vertical airlifter, and the ATT SSTOL airlifter.[31]

The Objective Force is to comprise Units of Employment (UEs) and Units of Action (UAs). "The UEs . . . are the basis of [a] combined arms air-ground task force." They are the rough equivalents of today's Army corps and divisions.[32] According to the Objective Force final concept draft

> The UA is the decisive element within the OF [Objective Force] . . . . It is not a fixed organization and has the capability to command and control up to three FCS combined arms battalions, one Aviation Detachment one Artillery Battalion, and one Forward Support Battalion, as well as, employ enablers from higher headquarters.[33]

An FCS basic unit is envisioned to comprise some 2,245 soldiers, 369 ground vehicles and 66 unpiloted aircraft.[34] Although not included in this description, the Army's believes its "Comanche [helicopter] will be a revolutionary cornerstone of the Objective Force and this networked C4ISR systems architecture."[35]

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[29] "Tactical engagement will be characterized by development of the situation out of contact and the integration of standoff fires, skillful maneuver and close combat assault to achieve tactical decision simultaneously at multiple locations across the JOA. Objective force tactical commands will direct the continuous integration of powerful sub-elements, moving along multiple, non-contiguous axes to objective areas, while engaging the adversary with organic, overmatching, and precise fires." US Army, *Objective Force*, pp., 7, 14.

[30] Ibid., p. 7.

[31] DA, *Army Wargame 2002*, p. 15.

[32] DA, *Objective Force Final Draft*, p. 5.

[33] Ibid., p. 6.

[34] Erwin, "Army's Future Combat System Shakes Up Procurement Culture," *National Defense*, p. 24.

[35] General Eric Shinseki, Speech, Dwight D. Eisenhower Luncheon, Association of the United States Army, Washington, DC, October 22, 2002.

OPERATIONAL RISK

Rapid Deployment

Strategic Lift

Assuming the Army can configure its SBCTs and Objective Force units for rapid deployment, it also confronts issues with respect to both their ability to be deployed by strategic lift assets, and the quantity of these assets that would likely be made available to support Army force deployments. Moreover, as the Objective Force operational concept states, "For the Army, the first consideration argues for maximum early reliance on strategic mobility assets capable of delivering forces at unimproved points of entry over the shore or at austere inland aerial ports of debarkation."[36] This adds the A2/AD element to the mix; because it means that the Army requires strategic lift that can avoid being targeted by enemy A2/AD forces—that can avoid large ports and major air bases. The conclusions of the Army's major transformation wargames "consistently bear out the critical importance of strategic and intra-theater lift enablers for deployment, operational maneuver, and sustainment of the joint Objective Force."[37]

Unfortunately, the Army concludes that vessels "capable of delivering forces over the shore are in short supply and travel slowly. Strategic airlifters travel quickly but have limited ability to use unimproved fields, and the larger their size and weight, the fewer sorties any such unimproved arrival site will tolerate."[38] As one senior Army official succinctly put it, "[T]here's not enough lift, period . . . [and we] don't think that's going to change much in the future."[39] Army logisticians were even more blunt in their assessment: "Despite significant improvements in US strategic mobility capabilities since Desert Storm, the Army Vision of moving one Brigade in 96 hours, one Division in 120 hours, and five Divisions in 30 days to a theater of operations remains out of reach."[40] Similarly, a recent study sponsored by the Air Force concluded that a "force with more than 1,000 vehicles [i.e., an SBCT] cannot be deployed by air from CONUS to the far reaches of the globe in four days."[41] GAO also reached the same conclusion, stating "[i]t is questionable whether the Army will be able to deploy its first brigades anywhere in the world in

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[36] US Army Training and Doctrine Command, *The United States Army Objective Force: Operational and Organizational Concept* (TRADOC Pamphlet 525-3-0) (Fort Monroe, VA: TRADOC, December 18, 2001), p. 42. Hereafter cited as TRADOC, *Objective Force*, p. 42.

[37] DA, *Army Wargame 2001*, p. 4.

[38] TRADOC, *Objective Force*, p. 42.

[39] "C-130 Will Provide Airlift For FCS: No Role For Future Transport Rotorcraft," *Aerospace Daily*, March 12, 2002.

[40] US Army Logistics Integration Agency, *Industry's Role In Logistics Transformation: Final Report*, January 16, 2002, p. 8. Hereafter cited as USA LIA, *Logistics Transformation*.

[41] Alan Vick, David Orletsky, Bruce Pirnie and Seth Jones, *The Stryker Brigade Combat Team* (Santa Monica, CA: The Rand Corporation, 2002), p. xvi. The study did note that, with some mobility enhancements, it is possible to achieve deployment timelines on the order of one to two weeks. While impressive, this is far short of the Army's deployment metrics that call for three brigades (or a full division) to be deployed within five days. Moreover, the study finds that "Prepositioning of equipment or overseas basing of forces is the single most effective way to increase the responsiveness of US Army forces for operations in key regions." Yet as noted above, prepositioning entire unit sets of equipment is likely to prove too costly, and perhaps too risky as well. Here the risk pertains to equipment prepositioned ashore, which may be vulnerable to attacks by anti-access forces. If such equipment were

96 hours." GAO further noted that "[w]hile this is now only a goal for the IBCTs, it is a requirement for units entering the force after 2008."[42]

In the process of exploring options, an Army study determined that the closure of a SBCT to Kosovo, at the Pristina airfield from Fort Lewis, Washington, using nearby McChord Air Force Base, would take 12.7 days using current airlift capabilities. If the Pristina airfield were improved to be capable of handling all-weather, round-the-clock operations, and if the throughput capacity of en route air bases was doubled, and if maximum use were made of commercial aircraft, the best deployment time that could be achieved was 7.5 days, almost twice the Army's target deployment time length of four days (96 hours).[43]

According to a study by Boeing, which manufactures the C-17 cargo aircraft, deploying an SBCT within 96 hours would require between 103 to 168 C-17s dedicated solely to this mission, assuming the aircraft were to fly at greater than normal mission completion success rates.[44] Assuming the Boeing figures are correct,[45] it would be impossible even for the entire planned inventory of 180 C-17s to deploy the remaining two SBCTs in the following day (i.e., to meet the goal of three SBCTs deployed in 120 hours). Nor does this analysis take into account the A2/AD threat to major forward operating air bases. Nor does it address the fact that the nation's strategic lift assets may be assigned to other high-priority missions. All this has led Army officials to conclude that "with all the competing demands for these aircraft, the Air Force currently does not possess sufficient numbers of them to meet the 96-hour goal for the [S]BCTs."[46]

The C-130

The Army concept for the Objective Force calls for the deployment of forces to ISBs, where they would transload their equipment and be inserted into a threatened theater of operations employing intra-theater lift assets, with emphasis on the Air Force's C-130 cargo aircraft. However, assuming that ISB access is not an issue, there is the matter of transloading SBCT/Objective Force equipment from "strategic" (i.e., C-17 and C-5 aircraft) to C-130 aircraft, a process that will only further delay the deployment of these forces.

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positioned afloat, the Army would likely want it on ships capable of avoiding traditional SPODs, adding still further to the cost of prepositioning.

[42] General Accounting Office, *Military Transformation: Army Actions Needed to Enhance Formation of Future Interim Brigade Combat Teams* (Washington, DC: General Accounting Office, May 2002), p. 3. The term IBCT refers to Interim Brigade Combat Teams. The IBCTs were renamed Stryker Brigade Combat Teams when the brigades' light armored vehicles were christened with the name Stryker, to honor two Army enlisted Medal of Honor winners. (Hereafter cited as GAO, *Military Transformation*).

[43] Ibid.

[44] Briefing, Leonard Tavernetti, "Deploying a Brigade Combat Team," The Boeing Company, undated, p. 3.

[45] Army transportation planners have determined that it would take 201 C-17s and 51 C-5s to transport all of the SBCT's equipment to a distant theater.

[46] GAO, *Military Transformation*, p. 23

Moreover, the 2,800 mile range of the C-130 implies an ingress and egress route from the intermediate staging base of approximately 1,400 miles each. But it seems quite possible—indeed likely—that during the time frame in which the Army will field the Objective Force even a rogue state enemy could deploy ballistic missile systems with ranges that exceed 1,400 miles.[47] Thus projecting power thorough ISBs may well prove untenable for purely military reasons, in addition to the problems associated with getting political access for such bases in the first instance.

Given its ability to land at fairly austere airfields, the C-130 has been adopted by the Army as its best bet for deploying forces rapidly in an A2/AD environment. However, there are other problems with which to contend, in addition to the ISB issue. Simply put, despite its attempts to prioritize force design around the C-130, the Army may not yet have come to grips with the severe limitations such an approach has imposed on both the SBCTs and the Objective Force.

This leads to a discussion of the C-130 itself. This venerable air lifter has been in the US military's inventory since 1956, although it has undergone a number of modifications over the years. In choosing the C-130, the Army selected a system that is likely to be in service for many years to come, given the apparent absence of a program designed to produce a follow-on aircraft. However, "The number of C-130s that the Air Force can dedicate to Army missions probably will not increase."[48]

The C-130 has a maximum range of 2,800 nm, carrying no payload. The C-130's maximum payload is 45,000 pounds, or 22.5 tons; but this reduces its range dramatically, to 240 nm. These figures, however, do not take into account a range of operational conditions or aircraft structural limitations. For example, once the cargo exceeds 36,500 pounds, the aircraft must land with additional fuel so that the airplane remains within its center-of-gravity limits, further reducing aircraft range. If one accepts the Army's requirement for the Stryker, the C-130 can fly this 19-ton payload up to 1,000 nm onto a 5,000-foot improved runway on a standard day at sea level with no correction for weather (e.g., wind, rain), runway slope, etc. If conditions are less than ideal, then the cargo-carrying capacity is reduced.[49] As of May 2002, the Stryker interim armored vehicle (IAV) infantry carrier variant weighed 39,750 pounds, while the Stryker mobile gun system weighed 45,000 pounds (although designed to weigh 41,300 pounds).[50] It is important to note that unless the C-130s can be refueled upon landing—a prospect that seems problematic given that they are deploying forces into an austere (and perhaps hostile) forward base area—the aircraft's range would be roughly cut in half, as it would need fuel to recover to its base of origin.

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[47] North Korea already has in production a ballistic missile, the Taepo Dong 2 missile, with a range of 3,600 miles.

[48] Joseph F. Cassidy, *C-130 Transportability of Army Vehicles* (Newport News, VA: Military Traffic Management Command, Transportation Engineering Agency, March 15, 2001), p. 6.

[49] Ibid., p. 3.

[50] Frank Tiboni, "New IAV Armor Boosts Protection for Soldiers," *Defense News*, April 8-14, 2002, p. 7. The Army has put the Stryker's mobile gun system on a weight reduction program designed to accommodate C-130 requirements.

Landings on shorter runways are possible, but they also reduce cargo capacity, again for structural reasons. For example, in conducting an assault landing on a runway at least 3,000 feet long would reduce the aircraft payload to 36,500 pounds, or below the weight of either the Stryker IAV or the anticipated weight of the FCS. If range is sacrificed to increase the C-130's cargo capacity, then intermediate fuel stops are necessary. But this assumes the availability of secure airfields in an A2/AD environment and also lengthens deployment times.[51]

The situation does not look any better for the FCS, whose requirements allow the system to weigh up to 40,000 pounds, or 2,000 pounds more than the Stryker. The heaviest current Army C-130 certified armored vehicle is the M9 Armored Combat Earthmover (ACE) which, at 35,500 pounds, is certified for C-130 transport at 38,000 pounds.[52] Recently, however, the Air Mobility Command has granted a permanent waiver to deploy the Infantry Combat Vehicle variant of the Stryker on C-130 aircraft, with a maximum of four crew members. (The vehicle normally carries nine troops, not including the driver.)[53]

Given these factors, the Military Traffic Management Command has concluded that:

- *If one considers maximum transportation flexibility to be of paramount importance, the maximum C-130 air transport weight of future vehicles should be in the 29,000-32,000 pound range. These weights ideally would include the crew, ¾-tank of fuel, and full ammunition, armor, and equipment.*

- *If the vehicle's mission allows the aircraft to be refueled at the payload's destination, then the maximum C-130 assault landing air transport weight could be as high as 36,500 pounds."* [Emphasis in the original][54]

The above discussion leads ineluctably to the conclusion reached in the Army's recent large-scale transformation wargame: "Advanced sealift and airlift capability investments are required now. These include: shallow-draft high-speed ship (vital future capability), advanced theater transport, and joint transport rotorcraft."[55] To accomplish this, according to the Army's logistics community, the Army needs to invest in technology that will enable it to move rapidly through ports of embarkation and debarkation.[56] Toward this end, the Army has found that a number of

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[51] Cassidy, *C-130 Transportability*, pp 3-6. Even assuming tanker aircraft were made available to support C-130 operations, with the exception of some special mission aircraft, the C-130 does not have an aerial refueling capability. The C-130J was designed with the internal piping required to support aerial refueling, but there are no current plans to field such a capability, and the Army is apparently not strongly advocating this be done.

[52] Cassidy, *C-130 Transportability*, p. 7.

[53] Andrea Shalal-Esa, "Arm Sees No Challenge to Stryker Combat Vehicle," *Reuters.com*, August 27, 2002; and Megan Scully, "Permanent Waiver Allows Strykers to Be Deployed by C-130s," *Inside the Army*, p. 7.

[54] Cassidy, *C-130 Transportability*, p. 13.

[55] DA, *Army Wargame 2001*, p. 12.

[56] US Army Logistics Integration Agency, *Industry's Role In Logistics Transformation: Final Report*, January 16, 2002, p. 8. Hereafter cited as USA LIA, *Logistics Transformation.*

strategic lift technologies show promise. They include the lighter-than-air ULA, and high-speed sealift.

Advanced Airlift

The Army is intrigued with the idea of ULAs. These airships are very large, and also have very large cargo capacities.[57] According to the Army, they are "no more vulnerable that any other high value transportation asset" to anti-aircraft fires, and their failure modes are more benign than aircraft, as they tend to settle to ground rather than crash.[58] They are capable of landing on water or on large flat areas ashore. However, there are other issues relating to vulnerability, such as the ULA's radar signature, that need to be explored before the Army can be sanguine about its ability to operate in an A2/AD environment.

ULAs might help solve some of the Army's demand for large lift volumes. However, ULAs move at slower speeds than airlifters, although they do move more quickly than ocean-going ships. Hence their ability to support the rapid deployment of Army forces would appear to be quite limited.

In any event, a substantial investment would be required to support full development of the ULA, and the cost of infrastructure is relatively high. Manufacture and maintenance would require the construction of very large hangars. While there appears to be a commercial market for such craft, it is not clear it will mature along the timelines required to sustain the Army's vision of force transformation. At present the Army appears content to monitor the commercial sector's progress on ULAs rather than commit to the kind of funding necessary to accelerate their development.

The Army's 2001 and 2002 transformation wargames concluded that, intratheater lift assets for combat units and for sustainment are "essential enablers" for the Objective Force.[59] The Army's Future Transport Rotorcraft (FTR) program was intended to provide the Objective Force with much-needed intra-theater lift capability to supplement its reliance on the C-130 cargo aircraft. Until 2002, the system was scheduled for program definition and risk reduction during FYs 2008-2011, followed by engineering and manufacturing development (EMD) from 2012-2017, and then production.[60]

In the spring of 2002, the Army announced it would not fund the development of a heavy-lift FTR to address FCS requirements. Instead, the Service chose to rely on C-130 cargo aircraft for the mission. However, the FTR initiative has now been resurrected in the form of the Advance

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[57] For example, the Advanced Technologies Group's SkyCat 1000 could carry over 700 short tons of cargo, vice 61 short tons for a C-5 cargo aircraft, the largest in the US air fleet.

[58] USA LIA, *Logistics Transformation*, p. 10.

[59] DA, *Army Wargame 2001*, p. 14; and DA, *Army Wargame 2002*, p. 14-15, 18.

[60] "C-130 Will Provide Airlift for FCS; No Role for Future Transport Rotorcraft," *Aerospace Daily*, March 12, 2002.

Maneuver Transport (AMT). If fielded, the aircraft would provide vertical airlift for the heaviest FCS vehicles over a distance of roughly 1,000 miles.[61]

Advanced Sealift

There are two broad areas of development with respect to high-speed sealift, which is a Navy mission. One area is focused on developing an ocean-going vessel that carries similar tonnage to today's LMSR vessels, but which is capable of speeds between 40 and 90 knots. However, the High Speed Sealift Steering Group, chaired by the US Transportation Command (TRANSCOM), estimates the technology required to produce such a craft is "at least 10 years away" and would cost well over a billion dollars to develop.[62]

A potentially more promising approach centers on commercial off-the-shelf technology and involves the TSV. Both the Marine Corps and the Navy have already experimented with such a high-speed vessel—a leased, commercially designed Australian catamaran, which has been christened the WestPac Express. The WestPac Express displaces 10,054 tons and is 331-feet long. Its cargo capacity is the equivalent of roughly nine C-17 aircraft. It can carry 417 tons of equipment and 970 passengers. It can also travel at speeds approaching 50 mph for 48 hours (or some 2,400 miles) before refueling.

The Navy also has been conducting experiments with a high-speed catamaran it calls the Joint Venture. The twin-hulled ship, also made in Australia, was originally designed as a car ferry. Admiral Robert Natter, Commander-in-Chief, Atlantic Fleet, appears excited over the ship's potential, declaring "I think there are all kinds of applications for this kind of high-speed, relatively small craft . . . ."[63]

Army studies exploring the potential of using Australian-designed commercial high-speed catamarans (HSCs) as TSVs are encouraging. The studies conclude that it would take 12.71 days to move an SBCT from Langley AFB in Virginia to an APOD at Tirana-Rinas, Albania using C-17 aircraft. However, if the brigade were airlifted to an APOD at Sigonella, Sicily and then transshipped by 12 TSVs to a SPOD at Durres, Albania, the SBCT deployment could be accomplished in 10.1 days.[64] This represents a significant improvement over current deployment timelines.

Again, however, the fact remains that such vessels would still not enable the Army to meet its deployment metrics. Moreover, as long as these vessels have to operate out of major ports, they would be vulnerable to A2 capabilities. There also is the matter of the enemy's littoral AD forces. Until such time as US forces achieved sea control over the littoral, cargo ships would

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[61] Jefferson Morris, "Army Funding for New Heavy-Lift Helo Will Remain Scarce, Official Says," *Aerospace Daily*, January 9, 2003.

[62] USA LIA, *Logistics Transformation*, p. 10.

[63] Nathan Hodge, "Admiral: Fast Catamaran Shows Mine-Warfare Potential," *Defense Week Daily Updates*, http://www.king-discussion.com.

[64] USA LIA, *Logistics Transformation*, p. 10.

operate in such waters at great peril. The Service estimates that it would take 12 TSVs to deploy a single SBCT.[65]

In the final analysis, it remains unclear how large airlifters and high-speed sealift would fare in an A2/AD environment, given that they are not anticipated to be stealthy, but are intended to deploy early in a conflict. Nor is it clear how either ULAs or fast sealift will resolve the challenge of rapid SBCT or Objective Force deployment. As Army studies show that even with these assets, it remains difficult to deploy one brigade in four days, it will be even more difficult to meet the goal of deploying three brigades in five days, or fifteen (i.e., five divisions) in 30 days. Recall also that these formations are projected to arrive with only three days of supplies. Hence the demand for lift to support these forces' sustainment is likely to be substantial.

In summary, it is easy to sympathize with the dilemma of fielding a more expeditionary Army that can deploy rapidly in an A2/AD threat environment, but which can also maintain the most desirable characteristics of the heavy, forward-deployed mechanized Army forces that characterized the Cold War era. Unfortunately, it may well be that the Army's current approach provides the worst of both worlds. For despite the sacrifices being made with respect to other design parameters (e.g., lethality, survivability, sustainability) at the altar of the Army's deployment metrics, the current and projected airlift force seems unlikely to accommodate Army deployment goals.

Logistics

General Eric Shinseki, the Army's chief of staff, has stated bluntly that "[w]ithout a transformation in logistics, there will be no transformation in the Army." And without transformation, the Army will come under increasing risk from enemies possessing A2/AD capabilities. As the Army works to reduce the weight of its combat systems and maneuver force elements in order to enhance deployability and reduce reliance on large, fixed forward APODs and SPODs, it is also working to reduce sustainment requirements to achieve the same end. As its Objective Force White Paper declares, "[t]he Army will aggressively reduce its logistics footprint and replenishment demand."[66] To accomplish this, the Army has concluded that "[t]he Objective Force operational concept requires new sustainment capabilities, maximizing distribution-based logistics and enhancing strategic responsiveness."[67] This will be critical, as the Army believes its Objective Force units will operate at a significantly higher tempo, or pace, than current formations. This will accentuate the need for "innovative sustainment concepts and capabilities, based on sharp reductions in sustainment demand, significant improvements in reliability, split-based operations, and refined procedures for accelerating throughput, battlefield distribution, and mission staging."[68]

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[65] DA, *Army Wargame 2002*, p. 14.

[66] US Army, *Objective Force*, p. 15.

[67] DA, *Army Wargame 2002*, p. 24

[68] US Army, *Objective Force*, p. 13.

Although Objective Force units are expected to have a high operating tempo, they will initially deploy with only three days of supplies before they must be replenished from external sources.[69] This has led to concerns over resupply efforts, particularly since the Army's 2002 Transformation Wargame concluded that heavy demands the Objective Force places on employing precision munitions early in major combat operations can "quickly deplete stockage to dangerously low levels."[70]

One way to assess the risk associated with the logistical dimension of the Army's efforts to meet the A2/AD challenge through transformation is to examine the Service's SBCTs, which are rough surrogates for the Objective Force in terms of their deployment and sustainment metrics. With respect to sustainment, the SBCTs, like the Objective Force units, are designed to carry limited supplies and after 72 hours to "reach" for needed logistical support. Under the Army's transformation concept of "reach" logistics, deployed Stryker Brigades are expected to receive logistics support through an integrated distribution system by a linked communications network that will include a foreign country's commercial systems. However, to date the Army has not yet determined how this approach will enable SBCT replenishment.[71]

The Army is also engaged in an effort to decrease the ratio of combat arms soldiers to support troops to 6:1 from the current ratio of 2.5:1 in the Stryker brigades.[72] The results, thus far, have not been encouraging. As a GAO study noted, "Fort Lewis has had to assume an increased maintenance workload because the IBCT [i.e., SBCT] was designed with fewer maintenance personnel in order to deploy quickly."[73] To facilitate their rapid deployment, the SBCTs have been designed with an austere support battalion that contains fewer mechanics to support and maintain its vehicles. However, even though the number of mechanics has been reduced by two thirds, the number of vehicles to support remains the same.[74]

While the Objective Force is designed to draw upon emerging, advanced technologies to avoid the problems being experienced by the SBCTs, there does appear to be significant risk associated with the Army's approach to deploying and sustaining forces in an A2/AD environment. The message here seems to be that there is no free lunch. Efforts to lighten SBCT and Objective Force units to facilitate rapid deployment tend to push a significant part of the logistics problem, whether it is munitions support for Objective Force units or maintenance support for the SBCTs, into the sustainment phase of the operation.

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[69] The period prior to replenishment may be extended if the operating tempo is reduced. The Army Objective Force White Paper states: "Units will organically sustain themselves for three days of high tempo operations without replenishment from external sources in continuous combat in mid-to-high intensity conflict or be self-sustainable for up to seven days in low-end conflict and peacetime military engagement." Ibid., p. 15.

[70] DA, *Wargame 2002*, p. 23.

[71] GAO, *Military Transformation*, pp. 3, 28.

[72] Army Leadership Gives Green Light to Logistics Transformation Plan," *Inside the Army*, September 9, 2002, p. 1.

[73] GAO, *Military Transformation*, pp. 3.

[74] Ibid., p. 27.

The Army's logistics challenge is also likely to be exacerbated by its warfighting concept. In a non-linear warfare environment against an A2/AD threat, there are serious risks with respect to the Army's ability to sustain its SBCT and Objective Force maneuver formations. Army logistics elements must not only find a way to support the rapid deployment of the Objective Force, but to sustain them as well, as they conduct highly distributed operations on a fluid, nonlinear battlefield; i.e., in an environment where there are no rear areas offering sanctuary for lift and sustainment operations.

In such a battlefield environment, it may be necessary to devote substantial combat resources in support of resupply convoy operations, diverting significant combat and logistics resources away from the main effort of the ground campaign. The situation may be further exacerbated by the Army's efforts to establish a distributed supply network as opposed to a few iron mountains of supplies which could be highly vulnerable to enemy missile attack. While a distributed supply network would assist in addressing the A2/AD challenge, it would require additional combat forces to provide security. The Army appears to have a solution for the convoy problem, in the form of advanced airlift capabilities. However, it is not clear that the Service has the resources to field a fleet of intratheater vertical airlifters on the scale necessary to support a sizeable ground force in the area of operations. In short, the Service appears to have assumed substantial risk with respect to how it will accomplish the various aspects of this mission.

PATH RISK

The Homogenous Objective Force

As noted above, in responding to the need for transformation, the Army is pursuing what might be termed a three-track approach. The first track involves sustaining and modernizing a significant portion of the legacy force. This legacy force is dominated by heavy, mechanized forces that proved their worth in deterring aggression while forward deployed in Europe, and in routing the Iraqi Republican Guard. The second and third tracks are directed at fielding an Expeditionary Army. The second track's centerpiece involves fielding an Interim Force comprising SBCTs—rapidly deployable medium-weight units possessing more punch than light formations, such as the Army's light infantry divisions and airborne division—but not nearly as heavy and logistics intensive as the Service's armored and mechanized infantry divisions.

The Stryker brigades are intended to serve as a bridge to the Objective Force, the third track of Army force development. The Objective Force will comprise units that possess the ability to deploy and sustain as rapidly as the Stryker brigades, as well as their mobility, but which also have the lethality and survivability characteristic of today's heavy formations. Once the Objective Force has been fielded, the Army's legacy formations will be restructured along Objective Force lines. After this phase of the Army's transformation is completed, the SBCTs will be reorganized into Objective Forces.

There are several path risks associated with the Army's approach to transformation. First of all, the Army seems to assume its sister Services are pursuing transformation paths that will support its concept for dealing with the A2/AD threat. It is far from clear, however, that the Army has fully considered the impact the A2/AD threat will have on its operations, or the limitations such

an environment will place on its sister Services. For example, given the Army's relatively low level of investment in vertical lift, and in air and missile defenses, it appears to assume the early destruction of the enemy's ballistic and cruise missile forces, which would permit a more traditional buildup and sustainment of forces through major transportation nodes. But the US military's ability to target and destroy these critical, mobile forces over extended ranges is much more a hope than it is a reality. As noted in Chapter II of this report, the Air Force's modernization program does not offer high confidence that an enemy's mobile ballistic and cruise missile forces can be defeated promptly. In Millennium Challenge 2002 (MC02), a large-scale joint field exercise designed to address the problem of dealing with an A2/AD threat in a small-scale contingency, the Air Force did not address the problem. If forced to operate for a protracted period in an A2/AD environment, early deploying Army units could find themselves at a severe disadvantage for other than logistical reasons. In such an environment, it is unlikely that the Air Force will want to deploy its aircraft to forward bases. This could substantially limit the close air support that US ground forces have come to expect, further reducing their effectiveness.[75]

Moreover, during the exercise, when the Navy moved the fleet into the littoral to open a sea line of communications in order to facilitate the resupply of deployed ground forces, it suffered serious losses to its combatants and was forced to withdraw. Consequently, even if the Army possessed the TSV, this aluminum-hulled craft may find itself operating at extreme risk in its efforts to deploy or resupply the Objective Force ashore. In short, the Army does not seem to have developed a hedge against the possibility that it may have to operate in an A2/AD environment for a protracted period.

Beyond the Open Battle—Urban Warfare

Army forces must not only deploy rapidly and sustain themselves in an A2/AD environment; they must also be able to accomplish their mission. The Objective Force is optimized for conventional theater warfare in general, and maneuver warfare in relatively open terrain in particular. A case can be made that this is appropriate. However, the Army's contention that a single basic force element can be task organized to dominate across the full spectrum of conflict would appear to court significant risk. The urban conflict environment is likely to demand a significantly different force mix than one that is optimized for extended-range, nonlinear ground warfare in open terrain. Enemy forces would likely seek cover in urban terrain in order to avoid having to operate in the open, where they would find themselves at a severe disadvantage against US air power and Army forces optimized for open battle. As the Army White Paper on the

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[75] Sean Naylor, "Stryker Impresses in Its First Real Test," *Army Times*, August 19, 2002, p. 10. The MC02 exercise is revealing in terms of the risks it identified with respect to Army deployments and the reliance of ground forces on air power. In MC 02, a Stryker company with 14 vehicles participated with 800 troops of the 82nd Airborne Division against an opposing force (OPFOR) comprising the Army's 11th Armored Cavalry Regiment at the Army's National Training Center (NTC). The OPFOR was scaled down from the usual T-72 tanks that units typically encounter at the NTC. Moreover, the Stryker unit was not allowed to cross its line of departure before air strikes had destroyed all enemy tanks. Officers on the scene noted that the Opposing Force was not permitted to attack the Blue Force (including the Stryker unit) without permission from the controllers. Similarly, although the Red Force had forces in position to attack the Stryker unit as it landed, it was not allowed to do so. The first comment is substantiated by LTG (Ret.) Paul van Riper, the Red Force Commander in MC02. See Michael Gilbert, "General: Stryker Unit's Performance Not an Issue," *Tacoma News Tribune*, August 22, 2002.

Objective Force notes, "[t]he environment is growing more and more urban—avoiding built-up areas is simply not possible. Future adversaries will exploit urban and complex terrain for sanctuary. Objective Force units must be extensively trained, properly equipped, and psychologically prepared for urban warfare."[76] Moreover, US urban operations seem increasingly likely in the near and far future for another reason. Many demographic experts predict that by 2025, over 85 percent of the world's population will reside in cities. Thus not only will adversaries have more incentive to fight in urban environments, there will also be more urban terrain than ever before in which to seek sanctuary.[77]

This complicates matters for the Objective Force. It is far from clear that units organized, trained and equipped for optimal performance in non-complex terrain will be optimized as well for operations in urban terrain. Urban operations are not only extremely personnel intensive, but forces attempting to evict enemy forces from urban terrain historically suffer much higher casualty rates than forces operating in open terrain.[78] For these reasons, the Army—despite its concept of operations—may not want to put Objective Force units into an urban meat grinder. Indeed, in its major transformation war games, while Red (i.e., enemy) commanders typically concentrate their forces in cities, the Blue (i.e., US/allied) commanders have generally relied on *allied* ground forces to conduct urban eviction operations.[79]

Having said this, it is clear that the Army is making an attempt to structure and train its SBCTs with an eye toward the urban mission in mind. For example, roughly half of SBCT collective training explicitly deals with urban operations. The base unit of employment for both the SBCT—and the Objective Force—is a combined arms mechanized/motorized infantry unit—historically, the type of unit well-positioned for urban terrain, and "heavy" with the numbers of infantry soldiers necessary for the house-to-house fighting so prevalent in urban operations.[80] Furthermore, the Objective Force system-of-systems envisions the integration of robotic ground and aerial vehicles (e.g., UAVs) which will provide both sensor and shooter capabilities to reduce the risk to personnel in the high-threat tactical situations so prevalent in urban terrain.[81]

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[76] US Army, *Objective Force*, p. 14.

[77] General Accounting Office, *Military Capabilities: Focused Attention Needed to Prepare US Forces for Combat in Urban Areas* (Washington, DC: February 2000), p. 6. Furthermore, 95 percent of the population growth over the next 10 years or so will occur in developing countries, with almost all of the increase taking place in urban areas. See Central Intelligence Agency, *Global Trends 2015: A Dialogue About the Future with Non-governmental Experts*, (Washington, DC: NIC 2000-02, December 2000, GPO #041-015-00211-2).

[78] Army and Marine Corps Estimates that urban operations require up to nine times the number of personnel than open terrain operations of a similar scope. GAO, *Military Capabilities*, p. 7.

[79] One war game set in the Persian Gulf region found German ground forces tasked with the urban eviction mission, while another game set in the Caucasus region saw the Turkish Army performing the mission.

[80] Huba Wass de Czege and Jacob Biever, "Maximizing the Army's Competitive Edge: Close Combat Soldiers," *Army Magazine*, July 2001, pp. 9-12. "The Army must remember that its unique contribution to the fight is the assurance of decisive campaign results by closing with the enemy and assuming control of populations and territory . . . . The enemy will avoid open terrain, and will move to complex terrain and an urban environment—therefore, larger numbers of squads and vehicle crews will be necessary. We must maximize their numbers while reducing the amount of overhead as well."

[81] LTG Paul Kern, "Army Transformation," Briefing, Washington, DC, Association of the US Army (AUSA) Conference, October 17, 2000, pp. 29, 37.

These efforts, if successful, may lead to the proliferation of robotic vehicles, to include the use of very small, or micro, aerial vehicles (MAVs) so that almost every unit, down perhaps even to the squad or individual level, would have its own eyes-and-ears.[82]

As currently configured, the 24-man tactical human intelligence (HUMINT) platoons in the SBCT's military intelligence company not only roughly doubles the HUMINT capability of each brigade, but also puts control of these intelligence assets within the brigade itself. While this is hardly a panacea (one doubts, for example, that such units could achieve quick results), it does represent a step in the right direction. Recognizing the importance that snipers have played in urban combat, Stryker Brigades boast a sniper in every infantry squad, a sniper team in every company, and a sniper squad in every battalion.

In terms of equipping the individual soldier, the Army's Objective Warrior program aims to boost the abilities of Army personnel operating in the urban environment. With its focus on increased situational awareness (although not necessarily in urban environments), lethality, and survivability, the Objective Warrior program—assuming its products can be provided in a rugged and lightweight form—will enhance individual effectiveness in urban environments. Unfortunately, the program has been delayed due to a combination of technical and fiscal problems.[83]

In summary, however, it appears that serious questions remain concerning the structure of the SBCTs and the Objective Force for urban warfare. Both are built around the notion of operating under a new operating paradigm: to see first; understand first; act first; and finish decisively. There is a sequential aspect to this approach. To finish decisively, one must act first. To act first, one must understand first. Finally, to understand first, one must see first. However, in urban operations it seems highly likely that the local inhabitants or occupying enemy forces will have a much better picture than Army forces arriving after the fact. Thus the Army will find itself operating from the start in a situation at odds with its new operating doctrine. Furthermore, the battlefield sensors used by Army forces will likely be degraded in urban terrain. Until (and unless) R&D and acquisition efforts produce viable MAVs, wall-penetrating radars, and advanced room-clearing munitions, Army units may find themselves operating at a distinct disadvantage relative to their conduct of operations in open terrain.

Finally, despite its assertion that the SBCTs and Objective Force will be sufficient to achieve dominance in land warfare across the spectrum of conflict, the Army's concept of operation seems to acknowledge the unique requirements of urban operations. Specifically, it states that "wherever possible, urban clearing should be treated as an independent operational task, assigned to forces designated, prepared, and resourced specifically for the clearing mission under separate

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[82] DA, *Objective Force Final Draft*, p. 20.

[83] Erin Q. Winograd, "Army Scraps Plan to Field Objective Force Warrior With FCS Block I," *Inside the Army*, January 27, 2003, p. 1. The Army scrapped its plans to field the advanced soldier system known as Objective Force Warrior with the first block of the Future Combat System in 2008, and is now pursuing a less ambitious variant. Early variants of the capability, known as Land Warrior Initial Capability and Land Warrior Stryker Interoperability, will be deployed with Army Ranger units in FY 2004 and Stryker brigades, respectively. In 2008 the Army now intends to field the "Land Warrior SI+".

command and control."[84] This seems to call for units specially oriented, trained, and equipped for urban operations. From the above discussion, it also seems clear that the Army should at least experiment with such units. This also suggests that the Army may want to maintain its heavy counterattack legacy corps beyond the establishment of the Objective Force. These units might be especially valuable if they can be predeployed, either as part of a peacetime rotation of forces, or during a crisis prior to the initiation of hostilities. Alternatively, the Army may want to explore major variations in force design apart from the Objective Force so as not to progress down too narrow a path.

Indeed, recent history suggests that armies engaged in transformation explore a significant number of alternative force structures. In the late 1930s, for example, the German Army experimented with various mechanized, motorized, airborne and air-landing ground formations. Moreover, within these general categories, they also made major modifications to unit organizations.[85] Given the Army's vision of future warfare, a hedging strategy designed to mitigate operational risk is not only warranted, it is a necessity. Such a strategy could support exploring several different types of Objective Force field formations, in addition to the full-spectrum base formation contemplated by the Army. This might include brigades optimized for the extended reconnaissance/deep-strike mission, the urban eviction and control mission, large-scale consequence management operations, and WMD control operations.

Technical Risk

As in any transformation, the Army is incurring technology risk. The Service must surmount formidable technological challenges on a range of capabilities key to its transformation strategy—from novel forms of strategic lift, to system weight and support reductions, to new forms of munitions, to the integration of a wide array of information systems.[86] Moreover, to create a system-of-systems level of integration requires that a range of systems, intelligence, surveillance and communications components be integrated. This poses two challenges. First, there is the challenge of creating such a systems architecture, which is essential to the Army vision of rapidly deployable forces that rely on an advantage in information (i.e., situational awareness) and mobility rather than heavy armor for their protection. Second, there is the matter of fielding such a capability—even in rudimentary form—in five years. Indeed, the Objective Force concept, as originally envisioned by the Army Science Board in the mid-1990s, had an anticipated fielding date of 2015. However, the Army seeks to field the Objective Force beginning in 2008, even though the FCS's roving network of manned and unmanned ground and aerial combat vehicles, all to be linked into a battle network, is by far the most complex technological challenge ever attempted by the Army.[87]

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[84] TRADOC, *Objective Force*, p. 24.

[85] See Andrew F. Krepinevich, *The German Army's Transformation to Blitzkrieg*, (Unpublished paper), p. 32.

[86] Dan Caterinicchia, "Army Racing the Clock For Objective Force," *Federal Computer Week*, November 4, 2002.

[87] Frank Tiboni, "Future Combat Systems Program Has Its Doubters," *ArmyTimes.com*, October 22, 2002.

Challenges abound. For example, signature management techniques are needed to make the FCS less visible to enemy sensors, an important factor in reducing the system's vulnerability. However, they are too expensive to be incorporated into FCS Block I. Battery performance is another challenge, with the technology lagging the ambitious FCS fielding schedule.[88] The Army also hopes to incorporate hybrid-electric propulsion in the FCS. A hybrid-propulsion engine's components allow for a more flexible (and hence, more efficient) use of the vehicle's volume, thereby making a major contribution to maximizing the internal volume available for various payloads. Thus the FCS infantry carrier with a nine-man squad is anticipated to have 25-35 percent greater internal volume than a Stryker vehicle. This will enable the FCS to carry the fuel, ammunition, spare parts, food, and water necessary for the Objective Force UE to deploy with the requisite three to seven days of supplies. Yet it is not clear that this can be achieved on the timelines established. If the savings in volume are not realized, this could further exacerbate the logistics challenges discussed above.[89]

Not surprisingly, perhaps, the Army Science Board concluded that, of the 32 technologies required to support the fielding of the Objective Force, 16 of them will not be ready by the time the initial units of the force are being fielded.[90] A strong case can be made that the Army may experience a significant lag in its fielding of the Objective Force. This has profound implications for the Army if one accepts General Shinseki's statement that the Army risks becoming irrelevant if it cannot begin the transition to the Objective Force as scheduled.

FISCAL AND HUMAN RESOURCE RISK

The Budget

The Army might be able to reduce the technical risk associated with the Objective Force if it could devote more resources to addressing the problem. Despite its efforts to increase funding for the Objective Force, however, the Army still finds itself coming up short. In fact, despite canceling and restructuring 48 programs, the Army's six-year spending plan contains mismatch of some $35 billion when compared to the Service's program.[91] Many of the Army's key Objective Force programs are inadequately funded and in danger of not being able to meet critical development and fielding time lines. A few highlights indicate the risk this poses to the Army's goal of creating a force that can deploy rapidly and operate effectively in an A2/AD environment:

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[88] Sandra I. Erwin, "Army's Future Combat System Shakes Up Procurement Culture," *National Defense*, January 1, 2003, p. 24.

[89] Mark Hewish, "Technology Transformation for Armored Warfare," *Jane's International Defense Review*, April 200303, p. 38.

[90] Briefing, Office of Program Analysis and Evaluation, *Army Transformation*, July 26, 2001.

[91] *Inside the Army*, "Despite Increased Spending, Army Faces $35 Billion Gap in 2004-09 POM," September 2, 2002. The Army's fiscal risk extends beyond its own budget. For example, the Army states that its "96/120/5-30 deployment timelines were only made possible when they were accepted and stated as Joint requirements. In essence, sister Services [must] program their resources to support Joint deployability and the future Joint Force Commander (JFC)." DA, *Objective Force Final Draft*, p. 32. Yet it is far from clear that the Navy or Air Force intends to buy the kind or amount of lift required by the Objective Force's deployment timelines.

- The FCS organic air defense system (ORAD) is designed to provide organic defense against rotary-wing aircraft, unguided rockets, artillery, UAVs, and mortars, as mandated by the FCS operational requirements. Absent ORAD, FCS units would have little ability to defend against such threats. Yet the program is severely under funded.[92]

- At the same time, the PAC-3 missile defense system, which could be critical to the Army's ability to operate forces from multiple, austere forward bases, is arguably short of missiles, which cost roughly $2 million apiece. The Army hopes to buy over 1,000 PAC-3 missiles through FY 2009.[93]

- The Army does not possess its own means for air transporting its FCS assets within an operational theater. Despite discussing building an FTR, the Army seemed to lose enthusiasm for the project once the Marine Corps pulled out of the enterprise. It is estimated that the Army would have to spend over $1 billion in the current defense plan (FY 2004-2009) to create an option to field an FTR-like aircraft sometime in the next decade.[94] According to the Army, an Objective Force brigade-size formation would require 544 JTRs and 82 ATTs to be airlifted.[95]

- Unmanned systems figure prominently in the Army's Objective Force. However, the Service's Cooperative Enhanced Performance for Unmanned Systems (CEPUS) is not being funded. The program is intended to develop cooperative control behaviors for unmanned systems. Without them the Objective Force's unmanned systems will not achieve their performance requirements in areas such as land navigation, mapping, communications relay and target identification.[96]

- The Army hopes to see 17 Joint Venture–like FSS in service. Procurement costs alone are anticipated at between $1.5-2 billion. Even if the ships are procured, they will not provide sufficient lift to move even two Stryker brigades.[97]

- The Army chief of staff, General Shinseki, maintains that the Comanche helicopter is "a revolutionary cornerstone of the Objective Force . . . ."[98] The Army's plan requires a fleet of 819 Comanches; however, only 650 aircraft are programmed for production.[99]

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[92] Erin Q. Winograd, "Dozens of Key Army Transformational Efforts Inadequately Funded," *Inside the Army*, December 16, 2002, n.p.

[93] Erin Q. Winograd, "With Iraq in Mind, DoD to Boost PAC-3 Missile Purchases," *Inside the Army*, November 25, 2002, n.p.

[94] Wingorad, "Key Army Transformation Efforts," n.p.

[95] DA, *Army Wargame 2002*, p. 16. The JTR has been resurrected as the AMT. An FCS goal, according to the Army's TRADOC operational requirements document, is to be able to vertically lift a significant maneuver element.

[96] Wingorad, "Key Army Transformation Efforts," n.p.

[97] Richard Sisk, "Army Battles the Ax," *New York Daily News*, October 21, 2002, p. 26.

[98] Vernon Loeb, "Top Army General Backs US Capability," *The Washington Post*, February 17, 2003, p. A24.

- The FCS crew is to control both ground robots and aerial drones. Its ground vehicles will carry a small (less than 30-pounds) robot for urban reconnaissance, a robotic mule weighing 1-2 tons and carrying up to 1,200 pounds of cargo, a 5.3-ton armored reconnaissance vehicle to support maneuver forces and a 2.5-ton assault vehicle that will accompany dismounted infantry. Once again, the technological challenges are impressive in this area, and the Army has not received the kind of funding support that it had hoped for in order to maintain its deployment timelines.[100]

There does not appear to be much in the way of fat in the Army budget to redirect to its transformation efforts, following the Service's reductions and/or adjustments to generate over $20 billion in additional funding for transformation.[101] Barring a significant increase in its budget estimates, it seems the Army will incur significant fiscal risk in its efforts to field a transformed ground force.

Personnel and Training

Not surprisingly, military transformations typically lead to substantial shifts in the skill sets required of soldiers. The Army's shift toward more expeditionary forces that can be deployed rapidly and operate as part of a highly distributed, networked force on a nonlinear battlefield will require a highly trained force. This force must be capable of operating along highly compressed timelines, both with respect to deployment and to meet the Army's "see first, understand first, act first and finish decisively" vision. Consequently, the Army's training paradigm "will change from 'Alert-Train-Deploy' to 'Train-Alert-Deploy.'"[102] That is, Army units will need to train more intensively than in the past. Rather than gearing up their training efforts upon being alerted for deployment, units must be highly trained, so that upon being alerted, they are ready to deploy rapidly.

Yet the Army has already encountered problems with soldiers maintaining proficiency in the new digital battle field technologies being introduced into the force, particularly with respect to the SBCTs.[103] Army officials were concerned that normal personnel rotation policies would adversely affect the SBCT's readiness and ability to achieve certification on time. To address the problem, the Army established a formal stabilization policy for the SBCTs in May 2001.[104]

Realizing that this action only addressed the symptoms of the problem, the Army, much to its credit, is considering replacing its individual-replacement system with a unit-manning system.[105]

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[99] John R. Guardiano, "Manning and Unmanning Army Aviation," *Rotor& Wing*, December 2002, p. 8.

[100] Sandra I. Erwin, "Future Combat System," p. 24.

[101] Department of the Army, Deputy Chief of Staff, G-8, *Army Modernization Plan 2003* (Washington, DC: February 2003), p. 2.

[102] DA. *Objective Force Final Draft*, p. 6.

[103] GAO, *Military Transformation*, p. 3.

[104] Ibid., p. 25.

[105] Sean D. Naylor, "Secretary Pushes for Large-Scale Personnel Reform," *Army Times*, September 16, 2002, p. 14.

The intent is to reduce the turbulence that happens when a unit must rotate soldiers in and out one at a time. In the words of Army Secretary Thomas White, the personnel system "for the last 60 years has been focused on an individual rotation basis, which is the antithesis of unit cohesion and expertise."[106] The proposed approach could see units home basing at installations in the United States and deploying overseas for six-month or one-year unaccompanied tours. More importantly, it offers the promise that soldiers will be stabilized in their units, enabling them to achieve the high levels of training proficiency demanded by the Army's new deployment and warfighting concepts.

MEETING THE A2/AD CHALLENGE: AN OVERLY RISKY PROPOSITION?

The discussion above leads ineluctably to the conclusion that the Army's transformation effort, while laudable, is a highly risky proposition. Indeed, the Service's focus on fielding Objective Force units that are capable of deploying rapidly and operating effectively across the entire spectrum of conflict including the A2/AD threat, is a highly risky proposition, is problematic for several reasons.

What is to be done? This issue is beyond the scope of this paper, whose focus is diagnostic rather than prescriptive. A good starting point, however, would involve an assessment of how the Army vision and its associated Objective Force operational concept might be modified to reduce risk, while still enabling the Army to meet the A2/AD threat that helped define the need for transformation in the first place. In areas where risk cannot be reduced to more acceptable levels, the Army might explore opportunities to develop strong hedges against risk failure.

Finally, despite the formidable problems confronting the Army, there is some cause for cautious optimism. The Army leadership clearly sees the need for addressing the A2/AD challenge. The Army has initiated the transformation process before the A2/AD threat has grown to such proportions as to jeopardize the Service's ability to perform its land warfare missions at acceptable costs. The Army still has time to make adjustments to its transformation strategy, so as to enhance the prospects for success and mitigate the consequences of setbacks. How much time, however, will be up to America's adversaries.

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[106] Ibid.

V. CONCLUSIONS AND RECOMMENDATIONS

The preceding chapters paint an overall picture of the US military services struggling to adapt to an expeditionary era. This expeditionary era has emerged from two defining developments. First, due to the collapse of the Soviet empire in 1989 and of the Soviet Union, itself, in 1991, more and more US combat forces have been brought home from the overseas garrisons, bases, and ports they once occupied on the periphery of America's Cold War adversary. Second, there is ample reason to anticipate that future adversaries, having seen Iraq routed twice by US-led coalition forces after they were allowed to deploy unmolested into Southwest Asia, will seek asymmetric ways of opposing the movement of US military forces into their region.

A2 and AD capabilities are, therefore, a natural and logical response to American military preeminence and demonstrated power-projection capabilities. Iraq's Baathist regime may have learned little in this regard from the 1991 Persian Gulf War, but evidence is accumulating that other nations are more adept competitors. For instance, the ongoing People's Republic of China (PRC) deployments of advanced CSS-6 and CSS-7 short-range ballistic missiles (SRBMs), SA-10 SAMs, over-the-horizon targeting systems, and related capabilities opposite Taiwan may be a leading indicator of the kinds of A2/AD capabilities America's expeditionary forces will eventually confront should another Taiwan Straits crisis arise. Moreover, US power-projection capabilities are themselves contributing the problem. It is likely, for example, that the GPS coordinates of most potential fixed targets on Taiwan are already precisely known to PRC SRBM units, and GPS has also made accurate, long-range cruise missiles an option countries with limited defense resources relative to the United States will find increasingly affordable in the future.

But the Pentagon's concerns are not limited to China. A recent commander-in-chief of US forces in Korea declared that the problem of forward base access is not a problem for the US military of 2010, but one that exists in embryonic form in Korea *today*, and which will only worsen over time. Indeed, Secretary of Defense William Perry voiced concerns over this problem during the 1994 crisis on the peninsula. A cursory examination of the situation on the Korean peninsula reveals the reasons for concern.

In the near term, air operations from the two US air bases in South Korea are unlikely to be severely disrupted by North Korean missile attacks as long as North Korea refrains from using nuclear or chemical warheads, and does not improve the accuracy and lethality of its conventional missiles. North Korea's current inventory of Scud-C (Hwasong 5/6) and Scud D/E (No-Dong 1 and 2) ballistic missiles, despite ranges of over 300 and 900 miles respectively, lack sufficient accuracy to target an air base effectively. North Korea has yet to develop warheads for delivering submunitions, either bomblets or runway penetration submunitions, a capability useful for disrupting operations spread over large areas.

However, this relatively favorable situation seems unlikely to endure. North Korea is increasing its inventory of No-dong 1 and 2 ballistic missiles. South Korea and a significant portion of Japan are within range of the No-dong 1. Most of Japan, including the US air bases of Misawa and Yokota, are within range of the No-dong 2. All of Japan, including the US Kadena air base

in Okinawa, is within range of the Taepodong 1 medium-range ballistic missile currently in production. While these missiles are relatively inaccurate, over time improvements in their accuracy appear not only possible, but highly likely. As this comes to pass, forces relying on large, fixed bases will find themselves paying an ever greater (and perhaps prohibitive) price for continuing to operate out of these facilities.

There is also the matter of Iran. The importance of maintaining free maritime passage through the Strait of Hormuz cannot be understated. Yet the strait is perhaps the most likely maritime chokepoint to be threatened by an AD capability. Iran, with military-technical support from China, North Korea, and Russia, seems intent on developing and fielding a range of A2/AD capabilities, to include ballistic and cruise missiles (possibly equipped with WMD warheads), mobile ASCMs (both shore based and sea based), submarines, small high-speed coastal combatants, and advanced anti-ship mines. While the situation appears manageable for US maritime forces over the near term, the prospect that Iran will continue to develop more formidable AD capabilities cannot be ruled out. If anything, such a development would appear likely. Moreover, Iran's AD capabilities could be enhanced by its fielding of A2 forces, which could also be used to hold at risk the oil and natural gas production facilities (to include over land pipelines) of other Gulf states. As noted earlier in this report, a recent US military major joint field exercise, Millennium Challenge 2002, revealed what even a small country's AD forces could do to limit US maritime forces' ability to control key narrow waters.

How have the Air Force, Navy, Marine Corps, and Army responded to this emerging challenge? Perhaps the most striking feature of their individual responses to the A2/AD challenge so far is the absence of a truly joint approach. Instead, each Service appears to be pursuing its own solution, for its own institutional purposes, within the boundaries of its traditional warfighting roles and domain. The Air Force's GSTF concept focuses on turning the short-range F-22 into an F/A-22 able not only to have a devastating first-look, first-shot advantage over enemy fighters, but also to kick in the door to denied airspace by taking out advanced SAMs as well as critical mobile targets such as enemy mobile-missile launchers. However, unless the GSTF can succeed in suppressing or destroying such systems very quickly—probably within a day or two at the most—the closure of the Army's first few Objective Force brigades on the desired timelines is likely to be delayed. Similarly, whether the sea base is assured or not, V-22 insertion of a Marine combat battalion into enemy battlespace still actively defended by SA-20 class SAMs would also have to wait for the suppression of these AD systems by the GSTF. At the same time, except for TLAMs, the Navy will have no realistic means of attacking these defenses with manned aircraft until the JSF enters service. Indeed, because the SA-10D is believed to have a credible capability against non-stealthy cruise missiles such as the TLAM, the Navy appears to have no capability to attack any critical inland targets in the face of S-300/S-400 class SAMs. Thus, in an A2/AD environment, the ability of the entire joint force to project power promptly ashore may hinge at the outset on the viability of the GSTF to eliminate various A2 and AD systems in a matter of hours to a day or two. And, given the operational risks inherent in the GSTF, doing so appears to be a non-trivial challenge—especially in the absence of long-range, penetrating, staring surveillance.

Operationally, the Army's admirable goals of being able have a brigade combat team on the ground anywhere in the world within 96 hours, and an entire division with 120 hours, are

laudable lines to draw in the sand for an expeditionary era. However, even if the operational risks in the GSTF are set aside, these brigades still appear to require more strategic and in-theater airlift than either the Air Force or Navy are ever likely to field. Beyond simply getting the combat units on the ground within the desired timelines, there is the additional burden of logistical sustainment for light, dispersed ground forces operating deep in enemy territory. As Chapter IV noted, the Army is exploring advanced airlift and sealift options. At best, though, they lie far in the future, and the fiscal pressures on the Army created by the FCS alone suggest that, in the end, other Services will have to bear much of the development and procurement burden of such systems if they are to be fielded before 2015. Consequentially, there appears to be a major disconnect between the deployment goals of the Army's Objective Force and the lift capacity of the rest of the joint force.

Turning to the DoN, the overriding risk to its current approach to the A2/AD challenge is, surely, fiscal. As suggested in Chapter III, the new class of littoral combat ships will probably cost $2-3 billion per year over a period of 15 years just to construct. Manning and operating this new class of ships will create additional costs. Even if one assumes that the Defense Department's 051 topline grows to $483.6 billion in discretionary budget authority by FY 2009, as the Department presently projects, paying for this new class of ships will probably require the transfer of some total obligation authority (TOA) from the Air Force's or Army's topline to the Navy Department. If, on the other hand, the 051 topline begins leveling off, as history would suggest, before FY 2009, an even larger reallocation of Service budget shares will be needed to pay for the LCS class of ships and the associated growth of the fleet to 375 ships. Thus, even before one contemplates the non-trivial operational risks of trying to operate these vessels close to the shore within the reach of enemy AD capabilities, the fiscal assumption that the DoN can count on an increasing share of TOA at the expense of its sister Services over the next 15-20 years seems to require a major leap of faith about maritime preeminence in the expeditionary era. Unless this leap of faith is borne out, the more likely outcome is that the LCS class will not be fielded in the numbers presently envisioned.

The disconnects between individual Service solutions to the A2/AD challenge, then, are substantial. Furthermore, these disconnects suggest an obvious recommendation. A joint approach to the prospective A2 and AD capabilities of future US adversaries is crucial if the various path, operational, technological, and fiscal risks are to be mitigated or hedged against to any serious degree.

Granted, one could argue or assume that the A2/AD threat, as depicted in this report, is overblown and will not emerge within this decade—or the next. Doing so, of course, would be tantamount to judging the risk of encountering serious A2 or AD capabilities before 2020 as unlikely or remote. In other words, foreseeable opponents concerned about US power-projection capabilities into their regions will not really be serious for a long while to come. At the end of the day, however, this viewpoint appears to be a huge gamble and one that neither prudence nor history could recommend with much confidence.