The Challenge of Maritime Transformation: Is Bigger Better?

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CSBA CENTER FOR STRATEGIC AND BUDGETARY ASSESSMENTS

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The Center for Strategic and Budgetary Assessments is an independent public policy research institute established to promote innovative thinking about defense planning and investment strategies for the 21st century. CSBA's analytic-based research makes clear the inextricable link between defense strategies and budgets in fostering a more effective and efficient defense, and the need to transform the US military in light of the emerging military revolution.

Robert Work was commissioned by CSBA in Spring of 2001 to write *The Challenge of Maritime Transformation: Is Bigger Better?*. As the reader will discern, Colonel Work offers an expert perspective on this issue. During a distinguished 27-year career, Work held a range of key command, leadership, and management positions. He also holds advanced degrees from the US Naval Postgraduate School, the University of Southern California, and The Johns Hopkins University. This paper offers a well-reasoned, extensively documented case for maritime transformation, one that is worthy of discussion and debate.

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EXECUTIVE SUMMARY

The once mighty U.S. Navy is in precipitous decline. At least, that is what a vocal group of naval officers, defense analysts and Congressional leaders strongly believe. They support their judgment by comparing the number of ships in the Navy's "Total Ship Battle Force" with those of past U.S. fleets. Their most common standard for comparison is the "600-ship" fleet championed by John Lehman, President Ronald Reagan's first, most aggressive and politically savvy, Secretary of the Navy. When compared to that number, the 316 ships of the Fiscal Year 2001 Total Ship Battle Force seem at first glance to provide alarming evidence in support of the "large fleet" faction's dire conclusion.

Totally lost in a narrow focus on fleet ship counts is an appreciation for the fleet's dramatically improved combat capabilities. Consider a comparison between the surface combatant fleet that existed at the end of the Cold War with that of the 316-ship fleet in service on September 30, 2001. On December 31, 1989, the fleet counted 104 large surface combatants, 15 deployable carriers, and four battleships, for an escort-to-capital ship ratio of 5.5:1. In 2001, there were 80 combatants and 11 carriers, for a 7.27:1 escort-to-capital ship ratio. Moreover, the 24 *fewer* combatants carried 784 *more* missiles than their 1989 counterparts. The smaller fleet is thus much more efficient in delivering combat power. Since 1989 the average displacement (in tons) and average number of Sailors per missile carried in fleet missile magazines have fallen by 19 percent and 38 percent, respectively.

More tellingly, of the 123 capital ships and large surface combatants in the 1989 fleet, only 48 (39 percent) were capable of delivering either long-range air or missile strikes against targets ashore. In operational terms, this meant the strike power of the 1989 fleet was heavily concentrated in its carrier force. Of the 108 non-carrier platforms, only 33 battleships and surface combatants could contribute to long-range fleet strike power, for a non-carrier strike platform-to-carrier ratio of 2.2:1.

Compare these figures with the 2001 fleet. Of its 91 capital ships and large surface combatants, 86 (95 percent) are strike capable, and the non-carrier strike platform to carrier ratio is over three times higher, at 6.8:1. Vice Admiral Dennis McGinn, the current Deputy Chief of Naval Operations for Navy Warfare Requirements and Programs, has rightly concluded that "The 600-ship Navy of the 1980s cannot compare with the combat capability of the present fleet."

The debate between those who judge the fleet primarily by the number of its ships and those who focus on its capabilities is an important one. Its outcome will determine, in no small way, how future naval appropriations will be prioritized, as well as the way that the fleet will configure itself for 21st century operations. This paper makes the case that while numbers do count, it is overall fleet capabilities that ultimately matter. And in this regard, the evidence clearly suggests that as a result of a broad, ongoing naval technical revolution, the capabilities found in today's 316-ship fleet make it the most powerful ever put to sea.

Indeed, the following review of the fleet's expanding capabilities suggests that leaders inside and outside the Department of the Navy should worry less about chasing higher fleet numbers that

are unrealistic, unaffordable and undesirable, and more about how they might spark real a real transformation in maritime power-projection operations. This spark could come as the Navy and Fleet Marine Forces, working closely together, begin to better exploit the potential of their new and emerging capabilities and to effect corresponding changes in their operational concepts, operational patterns and organizational structures. By so doing, tomorrow's fleet would be better prepared for mid-term challenges, and funds might be freed up to increase the pace and scope of fleet experimentation, to both hedge against unexpected future threats and to better illuminate the requirements for the "fleet-after-next."

Such a transformational strategy will require both the Navy and the Marine Corps to embrace new ways of thinking about power projection. It will also require both to demonstrate a willingness to adopt less than desired near- and mid-term Service solutions in order to create the battle fleet best capable of confronting likely future operational challenges**.**

What might these challenges be? For nearly a century, and especially for the past five decades, U.S. power-projection operations have relied to a large degree on the ready availability of advanced bases, ports and airfields. The assumption of readily available forward operating hubs appears increasingly problematic over the next several decades. Moreover, even if such hubs are available, they initially may be held at great risk by opponents armed with long-range ballistic or cruise missiles. Future power-projection operations likely will require increasingly complex preliminary theater "break-in" or "forcible-entry" operations against increasingly capable "anti-access" networks.

While the anti-access challenge is a problem for all joint forces, naval forces have traditionally played a major role in preserving U.S. freedom of action when forward bases have been unavailable. They have also made important contributions to theater break-in operations. As a result, the Navy and Marine Corps are likely to play an increasingly important role in power-projection operations in the 21st century, and the challenge of taking on anti-access networks in general, and *naval* anti-access networks in particular, is an especially critical one for fleet planners. For the Navy and Marine Corps to be successful in a high-stakes operational competition against emerging anti-access networks, the 21st century fleet will need enhanced (and thoroughly integrated and networked) defensive, strike, maneuver, mine warfare, and support capabilities.

Toward this end, measuring the operational competency of the Total Ship Battle Force by simply counting its ships against those of the adversary is increasingly irrelevant. Fleet counting metrics made great sense when the operational mission of the fleet was to sink an opposing navy. The fleet must now be compared against potential anti-access networks that may not even include naval vessels. As a result, new measures of relative fleet combat power—with respect to opposing networks, not past U.S. or enemy fleets—must be developed.

Possible metrics for a Littoral Battle Fleet focused on projecting power in the face of an anti-access network might include the density of its defensive fires, measured by the number of surface-to-air missiles carried in fleet magazines, and both pulsed and sustained offensive, precision-firepower potential. Pulse firepower is a measure of the fleet's ability to saturate an enemy's defenses to achieve either network-wide effects or to create local effects that can be

further exploited. It might be measured by the number of fleet strike missiles in a ready-to-fire status or the number of targets a carrier air wing can strike in a single day. Sustained firepower is a measure of the fleet's ability to conduct such massed precision attacks again and again, for the duration of a campaign. It could be measured by the sustained strike power of the carrier air wings, fleet missile magazine capacity, and replenishment capabilities of the combat logistics fleet.

Given the operational circumstances of the early 21st century, the close coordination of battle fleet fire and maneuver capabilities will likely be more critical than it has been in the recent past. Just as Marines seized advanced naval bases in the Second World War to allow the fleet's westward advance across the Pacific, in the future they may seize advanced footholds inside an enemy's anti-access network to help dismantle the enemy's targeting network, thus allowing the fleet to move closer to shore. The fleet must therefore be judged not only on its pulse and sustained firepower potential, but on its ability to project and sustain Marine forces from the sea.

Effective mine countermeasure forces have not been a hallmark of past U.S. fleets, especially during the Cold War. However, because the fleet's primary future operating environment will likely be in the shallower waters of the littorals, and because even sophisticated mines are relatively cheap, the future mine threat likely will be more dangerous than in the past. America's 21st century naval expeditionary forces, therefore, must be judged on the distribution and effectiveness of their organic and supporting mine countermeasure capabilities.

Given the major changes in both the mission profile and the capabilities of U.S. maritime forces, and using metrics like those outlined above, this paper will demonstrate how today's 300-ship fleet defies easy comparison with fleets as recent as a decade ago. Empowered by a naval technical revolution of breath-taking scope, its standardization, connectivity, comparative defensive and offensive combat power, latent maneuver power, and emerging mine warfare capabilities far outstrip any previous fleet to an astonishing degree. Yet, despite this remarkable development, the 300-ship fleet has yet to fully transform, for two primary reasons. First, the ongoing naval technical revolution is still playing out in the surface combatant and submarine fleets, and the operational impact of improved littoral maneuver and mine warfare capabilities are about a decade away. On its current trajectory, then, the true power of the revolution will manifest itself in the second decade of the 21st century. Second, and more importantly, the Navy and the Marine Corps have yet to adopt a common vision for the 21st century, and they lack a mutually agreed upon operational concept for battle fleet operations. As a result, they remain mired in their own Cold War operational patterns and organizational structures. Maintaining Cold War rotational deployment patterns and organizational structures ensures that the ongoing naval technical revolutions in fleet strike, maneuver, and mine warfare will offer nothing more than evolutionary improvements to fleet combat capabilities, rather than the revolutionary improvements promised by bolder transformational change.

Organizing For Combat: The Networked Littoral Battle Fleet

How might the fleet be best organized and equipped to help spur true transformational change? This paper presents the case for a combined 300-ship Networked Littoral Battle Fleet, digitally connected and organized for phased 21st century power-projection operations in the face of

cohesive naval anti-access networks. It is an extremely conservative operational and organizational construct; the fleet could shrink even more and still retain an overpowering combat advantage over near- to mid-term threats. However, the concepts and recommendations included herein are not intended to be prescriptive. Rather, they are intended to help stimulate thought on how the Navy and Marine Corps might change and combine their organizational and operational patterns to create a truly integrated 21st century battle fleet capable of dominating any anti-access network for the foreseeable future.

The 21st century Networked Littoral Battle Fleet would be structured and organized to support the phased deployment of two Littoral Battle Forces, one from each coast, and the deployment of an "economy of force" Littoral Battle Force to a third theater. The basic building blocks for the Littoral Battle Forces would be 11 deployable Littoral Strike Groups, each comprising an aircraft carrier and six supporting littoral battle (i.e., surface) combatants, 11 integrated naval air wings comprising both Navy and Marine Corps tactical air squadrons, and 11 deployable Littoral Maneuver Groups. The Littoral Maneuver Groups would consist of three littoral maneuver combatants (i.e., amphibious assault ships), and an assigned escort of two surface combatants. A twelfth carrier would always be in long-term overhaul, and a twelfth Littoral Maneuver Group, without an assigned escort, would be assigned to the Naval Reserve Force.

The 11 Littoral Strike and 11 Littoral Maneuver Groups, along with the 11 naval air wings, would themselves be combined to form 11 standing Littoral Battle Groups. The Strike and Maneuver Groups and an assigned air wing would form a habitual relationship, ensuring the closest coordination among their staff and in their operations. Nine of the Littoral Battle Groups would form a rotational base to keep two on station along the Asian littoral—one in the Indian Ocean/Persian Gulf and one in the Western Pacific. These Groups would be specifically organized and equipped to conduct advance force operations against an enemy's over-the-horizon targeting and engagement capabilities.

The remaining two Littoral Battle Groups would form the core of two Littoral Battle Forces—LBF Atlantic and LBF Pacific—each with a habitually assigned Littoral Mine Warfare Squadron, composed of dedicated mine countermeasure forces; an Inshore Warfare Squadron, consisting of both manned and unmanned small craft, designed to operate close to shore; and a Theater Support Group, consisting of combat and mobile logistics ships and salvage vessels. A Littoral Battle Force would serve as the network hub for naval power-projection operations, and would assume operational control over on-scene and later-arriving Littoral Battle Groups, linking all into a single, digitally connected, powerful fighting force. They would carry the large staffs, including both joint and allied exchange officers, needed to plan large coalition or independent U.S. naval operations in support of joint campaigns.

The Integrated Fleet Marine Forces would comprise two standing brigades equipped to conduct deep maneuver and other counter-network operations from the littoral maneuver combatants. These two brigades would be complemented and supported by a third standing brigade on Okinawa, and a large Marine Expeditionary Command, which could form either a single large Marine Expeditionary Force for the conduct of major theater wars or major joint campaigns, or two separate Marine Expeditionary Brigades. The primary means of deploying and employing

Marine units from the Marine Expeditionary Command's forces pool would be the Littoral Maneuver Support Force (i.e., the future Maritime Prepositioning Force).

The integrated naval air arm would comprise 11 active naval air wings, including both Navy and Marine fixed-wing squadrons assigned aboard aircraft carriers; a separate Marine aircraft wing assigned to the Marine Expeditionary Command; and a single, combined reserve naval air wing including both Navy and Marine squadrons. Most Marine squadrons would be organized and trained to phase ashore once expeditionary airfields were available. The combined reserve naval air wing would provide the replacement squadrons necessary to keep the flight decks of the carrier fleet filled. This integrated fleet air arm would best exploit the existing carrier fleet, permit the flexible basing of naval air units either afloat or ashore, and free up Departmental dollars to accelerate the integration of unmanned aerial vehicles and unmanned combat air vehicles into fleet aviation operations.

Recommended Changes to Navy and Marine Organizations and Programs

This paper recommends numerous changes to Navy and Marine Corps organizations and programs to support the fleet organization outlined above. Among the most important are to:

- Adopt a 2011 Battle Force planning target of 11 deployable carriers, 96 littoral battle combatants, 24 multi-purpose escorts, 36 littoral maneuver combatants, 28 mine countermeasure ships, and 34 combat logistics force ships. This force would have two additional mine countermeasures ships and five more combat logistics force ships, but no more combatants, than now planned.

- Decommission the first five *Ticonderoga*-class guided missile cruisers and increase the number of planned *Arleigh Burke*-class guided missile destroyers by one, to 63, to achieve a standardized, single-class destroyer force;

- Redesignate the new DD(X) program as the CG(X) program, with a goal of replacing the 22 vertical launch system-equipped *Ticonderoga*-class guided missile cruisers in the next decade. At the same time, scale back the planned $6 billion cruiser conversion program and postpone plans for a follow-on destroyer until approximately 2030.

- Start a FFG(X)/Littoral Combat Ship program in conjunction with the U.S. Coast Guard's Deepwater Program. This combined program would seek to introduce a single, large class of small, multi-purpose combatants modularly designed and equipped to perform Coast Guard maritime defense zone, fleet escort, and littoral combat duties.

- Introduce 11 Interim Littoral Maneuver Group Escorts to provide a dedicated escort for littoral maneuver combatants steaming independently, and to increase the firepower available to advance force Littoral Battle Groups. The interim escort would be a modernized *Spruance*-class destroyer, modified for local air defense, long-range missile and gun fire support, and countermine warfare. These interim escorts would be replaced by CG(X)s late in the next decade.

- Form a four-boat Covert Littoral Battle Cruiser Squadron equipped with *Trident* ballistic missile submarines modified for covert intelligence, surveillance, and reconnaissance; long-range, precision strike; and special operations support. This squadron would keep two Covert Littoral Battle Cruisers deployed at all times.

- Form specialized Deep Operation Brigades as part of the Integrated Fleet Marine Forces. These brigades would have in their ground combat element Deep Maneuver Battalions, integrated amphibious tractor and infantry units, equipped with the new Advanced Amphibious Assault Vehicle; and Raider Battalions, organized and trained for dispersed, small unit, fleet reconnaissance/strike operations as well as raids on high-value enemy network targets. The AAAV programmed buy would be reduced to support three Marine brigades and a pre-positioned war reserve.

- Refocus Littoral Maneuver Support Force (LMSF) operations away from mid- to high-intensity mechanized operations toward operations other than war, crisis response, and military operations in urbanized terrain. The 18 ships of the Littoral Maneuver Support Force and the fleet's planned 36 littoral maneuver combatants would form a combined 54-ship littoral maneuver fleet. All ships would contribute to the Total Ship Battle Force count.

- Contingent on the approval and support of the Government of Japan, redesignate the Marine Expeditionary Force on Okinawa as a Marine Expeditionary Brigade and reposition a LMSF Squadron from the Mediterranean to Okinawa to support it. At the same time, convert the facilities on Okinawa to support the refurbishment of LMSF equipment, and increase the size of the squadron to allow it to carry the equivalent of two Marine Expeditionary Brigades.

- Cease development of the MV-22 tilt-rotor in its present configuration and adopt the Sikorsky CH-92 for the Marines' assault support mission. Development of tilt-rotor technology would be refocused to produce a logistics variant of the MV-22, designed to pick up a single 8x8x20 International Organization for Standardization container from cargo ships at sea, speed them directly to a requesting unit, set them down in any type of terrain, and pick up empty containers for their return to a resupply ship. Simultaneously, a expeditionary logistics container program would be started to develop containers purpose-built to store, transport, and dispense fuel, water or other liquids, supplies, food, ammunition, people and vehicles.

Time for a Change

As stated earlier, the concepts and recommendations developed in this paper, while detailed, are intended to be illustrative, not prescriptive. The outlines of the fleet-after-next have yet to fully form. Quick decisions about the character of the fleet-after-next are not yet necessary. The right strategy now is to reject the calls for a larger fleet, and to focus on exploiting the fleet's formidable combat power and capabilities to set the pace of the emerging network-versus-network competition, and to work to better understand the requirements for future network-versus-network combat. However, as is clear from the recommendations above, by simply changing the fleet's organization and operational patterns to better exploit its new capabilities,

tomorrow’s fleet will be more thoroughly transformed. By simultaneously embarking on a wide-ranging, decade-long, experimentation program, so too will be the fleet-after-next.

The time is both right, and ripe, for a change. By pursuing a transformational strategy that combines new operational concepts, organizations, and experimentation, the Navy and Marine Corps will be able to create a revolutionary future—a future characterized by continued maritime dominance.

I. NUMBERS COUNT, BUT CAPABILITIES MATTER: RETHINKING THE CONVENTIONAL WISDOM

A DWINDLING FLEET—A NATION AT RISK?

Throughout the 1980s, the United States pursued a substantial fleet expansion to thwart a global maritime challenge by the Soviet Navy. The expansion actually started before the general defense build-up initiated by President Ronald Reagan. In fiscal year (FY) 1978, the fleet numbered 468 ships, down from its FY 1967 Vietnam War high of 960 vessels. By FY 1983, the fleet had grown to 514 ships as ships approved during the Carter and previous Administrations were commissioned.[1] Without a doubt, however, the expansion was greatly accelerated by Reagan's call for "naval superiority" over the Soviet Union, and the shrewd political salesmanship of his first, and most powerful, Secretary of the Navy, John Lehman.[2] Lehman's celebrated "600-ship" Navy defined the target for the widespread fleet buildup, and today it remains the standard by which many judge the state of the U.S. fleet.[3]

In the event, the high water mark for the fleet expansion was in FY 1987, when the total number of ships in the fleet reached 568 vessels.[4] Soon thereafter, however, the requirement and political support for a 600-ship battle fleet collapsed along with the Soviet Union. With the Cold War won, the Navy and the Marine Corps, along with the Army and Air Force, struggled to defend their residual force structure during a series of defense budget reviews conducted throughout the 1990s. The final review of the decade, the 1997 Quadrennial Defense Review (QDR), called for a U.S. fleet large enough to accomplish two key operational tasks. First, it had to have enough ships, Sailors and Marines to help shape the international environment by keeping a survivable nuclear deterrent force continuously deployed at sea, and by providing U.S. Combatant Commanders with appropriate levels of combat-capable, forward-deployed naval forces. Second, it had to be able to respond to two nearly simultaneous major theater wars with naval expeditionary forces capable of both strike and maneuver, and with the sea-based logistics forces capable of sustaining them.[5]

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[1] A fiscal year starts on October 1 in the year preceding the same calendar year and ends on September 30 of the same calendar year. FY ship counts reflect the number of vessels in the fleet on the *last* day of the fiscal year, September 30. So FY 1983 numbers reflect the number of ships in active service on September 30, 1983. All past fleet ship counts are drawn from *Ship Forces of the U.S. Navy: Historical Force Levels FY62 through FY93*, (Washington, D.C.: Office of the Chief of Naval Operations (N802K), May 1994), pp. A1–2.

[2] Norman Polmar, *Ships and Aircraft of the U.S. Fleet*, 13th edition, (Annapolis, MD: Naval Institute Press, 1984), p. 1.

[3] See for example, John R. Fisher, "Challenge and Opportunity," *Sea Power*, (September 2000), p. 7.

[4] *Ship Forces of the U.S. Navy: Historical Force Levels FY62 through FY93*, pp. A1–2.

[5] *The Report of the Quadrennial Defense Review*, (Washington, D.C.: Office of the Secretary of Defense (OSD), May 1977). A complete copy of the report can be found online at the QDR homepage [http://www.comw.org/qdr//].

At the same time, to better prepare itself for future operational challenges, the fleet had to be affordable (i.e., small) enough to free up additional resources within expected budget ceilings for increased research and development (R&D) of new capabilities. The final report of the QDR endorsed a fleet that included 14–18 strategic ballistic missile submarines, 50 nuclear-powered attack submarines, 11 active and one reserve aircraft carriers, 10 active and one reserve carrier air wings, 116 surface combatants, 36–39 amphibious warfare ships, 16 mine warfare vessels, 29–34 combat logistics force ships, and 25 support vessels. The amphibious component of the fleet could embark and deploy the equivalent of 2.5 Marine Expeditionary Brigades (MEBs), from an active Marine Corps force structure of three larger Marine Expeditionary Forces (MEFs). The QDR concluded that this combined fleet of 298–310 ships and three MEFs would allow the Navy and Marine Corps to meet both current and future tasks within expected resource constraints.[6]

By the end of FY 2001, the fleet had shrunk to 316 ships—a number slightly larger than that envisioned in the QDR (Figure 1).[7] Long before that that time, a growing number of naval officers had concluded that the 300-ship fleet was no longer up to its world-wide responsibilities, and that its small size was placing the nation at grave risk. Submariners were by far the most vocal, publicly campaigning for a fleet of 68–76 attack boats.[8] However, aviators and surface warriors, prodded by a sympathetic shipbuilding lobby in Congress—and perhaps by the demonstrable success enjoyed by the submariners in publicly selling their case[9]—became less reticent in expressing their desire for more ships.[10] Meanwhile, the Marine Corps, while satisfied with 3 MEFs, publicly campaigned for increased end strength and an amphibious fleet capable of embarking three full MEBs.[11]

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[6] Ibid.

[7] All numbers for the FY 2001 and future fleet are drawn from the December 10, 2001 version of *The Department of the Navy Ships and Aircraft Supplemental Data Tables*, (Washington, D.C.: Office of the Chief of Naval Operations, (N801L2)).

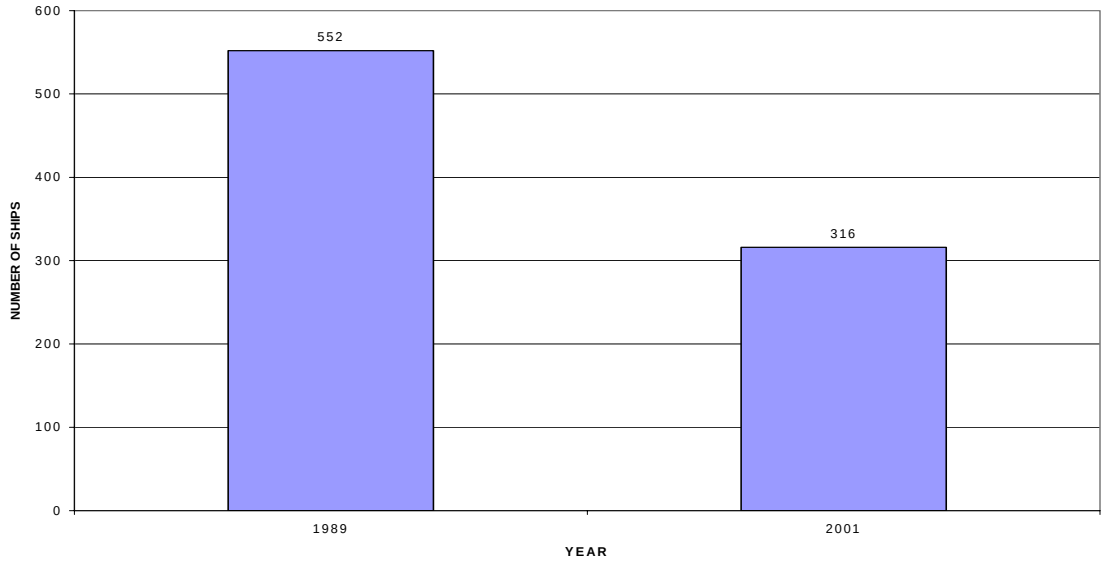
[8] See for example Commanders Mark Gorenflo and Michel T. Poirier, USN, "The Case for More Submarines," *Undersea Warfare*, (Winter 1999), pp. 2–5.

[9] After an analysis based on the number of required mission days on station for intelligence collection duties, a 1999 Joint Chiefs of Staff (JCS) Study concluded a fleet of 68 attack submarines would be required through 2015 and a fleet of 76 boats would be required by 2025. As a result, the FY02 program budget was adjusted to provide for an attack boat fleet of at least 55 boats—an increase of five over the 1997 QDR force. See "Commentary: The Submarine Gap," in *Defense News*, (July 3, 2000).

[10] See for example the comments made by Vice Admiral Daniel Murphy, USN, then-Sixth Fleet Commander, cited by Hunter Keeter in "Murphy: Street Fighter Unsound," *Defense Daily*, (October 15, 1999), p. 5. Murphy argued for a fleet of "at least" 450 ships.

[11] End strength defines the number of Marines authorized and on active service on the last day of a fiscal year. While the QDR endorsed a Marine Corps of 172,000 Marines, the Marines argued for an end strength of 177,000 Marines. See comments made by General Charles Krulak in *Marine: A Guided Tour of a Marine Expeditionary Unit*, (New York: Berkley Books, 1996), pp. 31–32.

Figure 1: The Dwindling Fleet



The cumulative wish list of fleet warfighting communities, known as the "reduced risk force," was outlined in a mid-2000 report to Congress. This fleet would include a submarine force of 14 strategic ballistic missile submarines, 68 nuclear-powered, attack submarines and four ballistic missile submarines converted into conventional, land-attack, cruise-missile carriers. The surface fleet would consist of no less than 15 aircraft carriers, 134 surface combatants, 44 amphibious ships, 40 combat logistics force ships, 16 mine warfare vessels, and 25 support ships, for a total of 360 ships. The additional amphibious ships would enable the embarkation of three full Marine brigades.[12]

Many in the press sympathized with the calls for a larger fleet. For example, Christopher Lehman (younger brother of former Secretary of the Navy John Lehman), in the January 24, 2000, issue of *Defense News*, wrote that "For U.S. Navy, Bigger Not Just Better, It Is a Necessity." On February 11, 2000, New Hampshire State Representative Griffen Dalianis warned readers of the *Manchester Union Leader* that the "Drastic Erosion of U.S. Naval Fleet Has Gone Almost Unnoticed." In the April 15, 2000, edition of *Congressional Quarterly Weekly*, Chuck McCutcheon wrote an article called: "The Shrinking Navy: Build-Down to Breakdown?" And on September 19, 2000, in the *San Diego Union Tribune*, J.F. Kelly, Jr., declared the U.S. Navy "A Mighty Fleet in Decline." As implied by their titles, the underlying premise of all of these articles (and many more like them) was that the best metric for determining fleet capability is the number of ships in the fleet. By this simple calculus, the smaller the fleet, the less capable it is of defending the nation.

[12] *Report on Naval Vessel Force Structure Requirements*, (Washington, D.C.: DoN, Office of the Secretary, February 29, 2000), p. 4.

The addition of 50–62 ships would undoubtedly strengthen the U.S. fleet. However, despite the increasingly urgent calls for a larger fleet by both naval officers and the press, it has been clear from the outset that the cost of such an expansion was well beyond the reach of the Department of the Navy (DoN). Knowledgeable naval analysts estimated that the Navy's shipbuilding program understated the actual money needed to sustain the 1997 QDR force level by $10–25 billion dollars over the Future Years Defense Program (FYDP).[13] By the Department's own calculations, building the 360-ship reduced risk fleet would require an additional $4–5 *billion* in ship construction dollars per year—on top of the $13 billion per year already planned. Moreover, this hefty increase would not cover the costs for the additional required carrier air wings (which would add another $15–20 billion dollars in procurement costs, depending on whether or not the Department bought three or four additional air wings), the additional ordnance needed to fill the fleet's larger magazine capacity, or the associated increases in personnel and support costs.[14]

Even if the Bush tax cut or the tragic events of September 11, 2001, had not occurred, it is improbable that Congress, faced with simultaneous and equally compelling budget demands from both the Army and Air Force, would or could seriously consider such a drastic increase.[15] The Clinton Administration certainly did not. In releasing the report outlining the reduced risk fleet to Congress, then-Secretary of Defense William Cohen described the greatly expanded fleet as "one possible option" to be considered in the next QDR, and he declined to offer a funding path to get to the 360-ship level.[16] As then-Undersecretary of the Navy Jerry Hultin put it soon after the reduced risk fleet was made public, "It's just beyond our ability to afford it.[17]

As the Bush Administration considers the force structure required to execute the strategic tenets and force planning guidance outlined in its recently released QDR, must it accept the notion that the current fleet is incapable of protecting the nation's interests?[18] Only if administration officials accept the premise that the number of ships in the fleet is the key metric of naval power. In this regard, there are at least two reasons why a narrow focus on ship counts increasingly obscures the true power of the contemporary U.S. fleet.

First, the arcane rules of ship accounting are arbitrary, frequently misunderstood and can change with administrations. As a result, judging the fleet by ship counts can be downright misleading.[19] Today's basic ship counting protocols were introduced by Secretary Lehman in 1982. For both accounting and political purposes, he directed that the Navy's total operating forces be divided into six smaller components. These six components were: Strategic Forces, Battle Forces,

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[13] Ron O'Rourke, "Transformation and the Navy's Tough Choices Ahead," *Naval War College Review*, (Winter 2001), pp. 90–106.

[14] *Report on Naval Vessel Force Structure Requirements*, p. 4.

[15] Pat Towell, "With Much of Surplus Off Table, Defense Hawks Are Hard-Pressed to Pump Up Pentagon Budget," *Congressional Quarterly Weekly*, (March 11, 2000), p. 554.

[16] As required by law, and as implied by its name, a QDR is held every four years at the start of every new administration.

[17]David Lerman, "Navy's 'Ideal Fleet' Draws Criticism," *Newport News Daily Press*, (June 28, 2000).

[18] *Quadrennial Defense Review Report*, (Washington, D.C.: OSD, September 30, 2001).

[19] Polmar, *Ships and Aircraft of the U.S. Fleet*, 13th edition, p. 1.

Support Forces, Mobilization Category A (MobCat A) Forces, MobCat B Forces, and Auxiliaries and Sealift. Strategic submarines and their special purpose support ships constituted the Navy's Strategic Forces. The "sharp edge" of the fleet—that is, the ships manned by active duty crews and most likely to go into harm's way in the event of conventional combat operations—made up the Battle Forces. Battle Forces included attack submarines, carriers, surface and patrol combatants, amphibious warfare and mine warfare vessels, and the special purpose ships designed to replenish them at sea (combat logistics force ships). Support Forces included mobile logistics and repair ships, tugs and salvage vessels, and other auxiliaries providing direct support to the fleet (such as ocean surveillance ships). Mobilization Category (MobCat) A Forces included those combatants and amphibious and mine warfare ships manned by the Naval Reserve Force that were immediately available for wartime tasking. Auxiliaries and Sealift Forces included special mission support ships such as oceanographic surveying vessels, mobility enhancement forces like maritime pre-positioning ships, and inactive sealift forces such as the Ready Reserve Fleet. Finally, MobCat B forces included additional mine warfare, amphibious and other fleet support ships manned by reserve crews, but at lower states of readiness and availability than those in a MobCat A status. Importantly, however, Secretary Lehman further directed that only the first four categories would count toward the official Total Ship Battle Force (TSBF) goal of 600 ships; Auxiliary and Sealift Forces and MobCat B Forces would make no contribution to the public fleet count. As a result, Lehman's 600-ship fleet actually would have numbered well over 700 ships![20]

Even within this basic accounting structure, however, there is room for interpretation and accommodation. Take the 552-ship fleet in service on the last day of the 1980s, the decade that saw the substantial fleet build-*up* driven by Secretary Lehman's aggressively marketed and highly publicized goal of 600 TSBF ships.[21] Given that the TSBF stood at only 468 ships in FY 1978, this goal represented an ambitious fleet expansion of nearly 30 percent. As a result, throughout the 1980s, DoN leadership generally tried to retain many ships in fleet service to the end of, or even beyond, their expected service lives (ESLs), and to include *any* plausibly capable hull in the fleet ship count. For example, on December 31, 1989, the TSBF included six small Patrol Hydrofoils that were conducting counter-drug operations in the Caribbean.[22]

In contrast, the FY 2001 TSBF reflected the result of a twelve-year build-*down*, from 552 ships to the QDR-mandated target of approximately 300 ships. This amounted to a fleet reduction of 43 percent. Throughout the 1990s, given the magnitude of the cuts to their active force structure, the DoN's leadership naturally tried to retain and count only the most modern and capable ships in the fleet. As a result, they retired earlier generation ships—sometimes far before the end of their useful service lives—and excluded from the TSBF count other ships with useful combat

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[20] Norman Polmar, *Ships and Aircraft of the U.S. Fleet*, 14th edition, (Annapolis, MD: Naval Institute Press, 1987), pp. 5–7. See also *Ship Forces of the U.S. Navy: Historical Force Levels FY62 through FY93*.

[21] For the purposes of this paper, the author chose to use the fleet in service on December 31, 1989, for comparison rather than that in service on September 30, 1989. A fundamental goal of the 600-ship fleet was to have 15 deployable carriers. With the commissioning of the *Abraham Lincoln* on November 11, 1989, the goal was finally reached. This was the high-water mark for the carrier force; within six months the carrier *Coral Sea* was decommissioned, and the number of deployable carriers dropped to 14.

[22] *Ship Forces of the U.S. Navy: Historical Force Levels FY62 through FY93*, pp. B2–4.

capabilities. For example, the Navy now operates 13 patrol combatants larger than the Patrol Hydrofoils found in the 1989 fleet. They are manned by active-duty, Navy crews, are sent on routine deployments, and, like the 1989 Patrol Hydrofoils, make important contributions to fleet counter-drug operations. However, these patrol combatants are now counted as coastal defense ships, and no longer contribute to the TSBF.[23]

Because of these rules and interpretations, the contemporary U.S. fleet is considerably larger than generally acknowledged. While the official TSBF count for FY 2001 stood at 316 ships, the Navy actually maintained 469 vessels of all types divided among its active fleet, the Military Sealift Command (MSC), and the Naval Ready Reserve Force (RRF).[24] Among the excluded vessels from the official fleet count of 316 vessels are the aforementioned Patrol Combatants, as well as nine Naval Reserve mine countermeasure ships in MobCat B status. While these nine ships are every bit as capable as those in the TSBF and would make important wartime contributions to fleet operations, because of their assigned category, they do not contribute to the fleet count. Also excluded are the 18 ships of the Enhanced Maritime Pre-positioning Force (MPF(E)), which give the Navy-Marine Corps team the operational capability to deploy three mechanized MEBs virtually anywhere in the world and to sustain them for 30 days. This is a warfighting capability unmatched by any other nation. Excluding the patrol combatants, reserve mine warfare vessels, and the ships of the Maritime Pre-positioning Force may not sound like much, but they arbitrarily understate the size of the FY 2001 fleet by 40 ships. Indeed, their inclusion would put the FY 2001 TSBF count at 356 vessels—only four shy of the number (but not the specific *types)* of ships called for in the reduced risk force.

Also among the ships excluded from the fleet count are the 130 ships in the U.S. sealift fleet that contribute so much to our superpower status. One prominent naval analyst estimates the U.S. Navy currently operates *95 percent* of the world's militarily useful sealift. This unchallenged and vital naval competency, which underwrites our current ability to project power around the globe, is totally lost by a narrow focus on the TSBF number.[25]

Even if one understands the mysteries of ship counting methodologies, there is a second, more fundamental problem with judging today's fleet by comparing the number of hulls with past fleets. Such comparisons are extremely misleading since they are made without reference to the comparative world situations, or to fleet missions, or to actual or potential adversaries. For example, some analysts and naval officers bemoan the fact that the current fleet is now smaller

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[23] *The Department of the Navy Ships and Aircraft Supplemental Data Tables*, December 10, 2001.

[24] The MSC operates numerous ships in support of the U.S. Navy and joint forces. MSC ships are manned by government civilians or contractors, although some ships may have active Navy communications and/or technical personnel onboard. The RRF consists of government-owned ships that are maintained in a low status of readiness and which can be activated for service in four to 20 days. Once activated, RRF ships operate as part of the MSC. Norman Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, (Annapolis, MD: Naval Institute Press, 2001), pp. 48–51.

[25] A.D. Baker III, "Sea Power 1999; Costly Fleets: Capability versus Affordability," *The Year In Defense 2000*, (Tampa, FL: Government Services Group), p. 108.

than at any time since before World War II. Presumably, this is a bad thing.[26] But why? If the U.S. fleet goes to war, it will fight neither itself nor ghosts of U.S. fleets past—it will fight a real enemy with real combat capabilities. And as compared to its potential *naval* opponents, the contemporary 300-ship fleet stacks up rather well. Consider the words of A.D. Baker, III, author of *Combat Fleets of the World*, and respected naval authority:

> The U.S. Navy remains by a vast gap the world's most powerful, and with the retreat of the Russian Navy, has been steadily increasing its margin of power over any possible protagonist—or even groups of protagonists…*The enhanced capabilities being introduced in most respects offset the losses through premature retirement of submarines [and] surface combatants…The smaller U.S. Navy, relative to the threat it faces, has not in any way diminished its relative power*. (Emphasis added.)[27]

Even this judgment misses the point, however. The post-Cold War mission of the U.S. fleet is no longer focused on sinking an opposing navy. It is instead focused on projecting power ashore and influencing events on land. Comparing ship counts for a fleet designed for power projection with ship counts for a fleet designed to sink an opposing Navy is bound to give a distorted picture, since their respective capabilities, while perhaps similar, are used in significantly different ways and for fundamentally different missions.

In other words: numbers count, but capabilities matter. And when the dramatic changes to Navy and Marine Corps combat capabilities that have occurred over the course of the past two decades are reviewed in context, it is clear that the current fleet, despite its smaller size, is more than up to its power-projection mission and, in fact, is the most powerful fleet ever put to sea by this, or any other, nation. Indeed, it is also clear that the fleet could be even more powerful if its leaders consciously moved to better exploit its dramatic new capabilities—if they embraced a goal of thoroughly transforming the fleet—by pursuing new operational concepts, operational patterns and fighting organizations.

OF REVOLUTIONS AND TRANSFORMATIONS

The term "transformation" is a staple of modern military jargon. What exactly does it mean? In the early 1980s, Soviet military theorists introduced the term "Military Technical Revolution," or "MTR," to describe a major, discontinuous shift in the conduct of warfare. The defining characteristic of an MTR was not so much the *rapidity* of change in military effectiveness with respect to an opponent (although rapidity of change may be associated with a specific MTR), but rather the *magnitude* of the change compared with preexisting military capabilities.[28]

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[26] See for example Admiral Robert J. Natter, USN, "Help Keep This Greatest Navy," *Naval Institute Proceedings*, (December 2000), p. 2; and Christopher Lehman, "For U.S. Navy, Bigger Not Just Better, It Is a Necessity," *Defense News*, (January 24, 2000), p. 21.

[27] A.D. Baker III, *Combat Fleets of the World 1998–1999*, (Annapolis, MD: Naval Institute Press, 1998), p. xiv.

[28] James R. Fitzsimonds and Jan van Tol, "Revolutions in Military Affairs," *Joint Forces Quarterly*, (Spring 1994), p. 25.

In the early 1990s, the U.S. Office of Net Assessment, under the leadership of Andrew Marshall, advanced the phrase "Revolution in Military Affairs," or "RMA," as a more suitable description for radical changes in the conduct of warfare. The term "RMA" removed the overt association of "technology" with "military revolution," as its definition advanced the notion that *technological innovation* was only one of three necessary preconditions for an RMA. Mr. Marshall noted, for example, that the systems the Germans used to such effect on the Western Front during World War II—the tank, airplane and radio—were common to all major armies at the time. Blitzkrieg owed much to these technological advancements, but it owed more to the uniquely German *doctrinal innovations* that led to new operational concepts for high tempo, combined arms warfare, and the *organizational adaptations* to exploit those concepts, such as the Panzer Division.[29]

By the year 2001, "Revolution in Military Affairs" had largely replaced "Military Technical Revolution" in the American military lexicon, as more and more military officers and analysts accepted Marshall's notion that most military revolutions occur only after the type of doctrinal innovation and wrenching organizational adaptation seen during the interwar years in the German Army. As in similar circumstances throughout history, such change is characterized by an institutional willingness to conceptualize the technological tools of war in new ways and to develop new operational formations, restructured organizations and operational patterns to better exploit them. The result is often marked by a lasting change to the dominant warfighting platform or system or to the primary combat formations that employ them.

While Mr. Marshall's work contributed greatly to the rich defense debates of the 1990s, as service and Congressional proponents now fight to best position their programs in the annual budget battles, it seems that every new technological advance or system and every new proposed operational concept is considered to be "revolutionary." Alternatively, pundits wage endless debates over whether a given change in warfare really reflects a discontinuous revolution or a more gradual evolution in military affairs. As a result, a new term has emerged. "Transformation" describes the process by which changes in the structure of command, control, training, readiness, doctrine, technology, and organization for combat can result in a dramatic metamorphosis in the way military organizations operate and fight.[30] While clearly related to the concept of Revolutions in Military Affairs, the term is more neutral as to whether transformational changes need be considered revolutionary or evolutionary in nature. In any event, it is a process the Services must embrace: "transforming" the U.S. armed forces is now a key objective of the Bush Administration.[31]

THE 300-SHIP FLEET: POISED FOR TRANSFORMATION

This paper rests on two fundamental premises. First, despite increasingly strident calls for a larger U.S. fleet, future defense appropriations will be insufficient to allow a large fleet

[29] Ibid., pp. 24–31.

[30] Douglas A. MacGregor, *Resurrecting Transformation for the Post Industrial Era*, (Washington, D.C.: National Defense University, September 2001), p. 2.

[31] *Quadrennial Defense Review Report*, September 30, 2001, p. 37.

expansion—unless the Department *prematurely* embraces a vision of a larger fleet composed of smaller, less costly, and less capable vessels.[32]

Second, and more importantly, even if future procurement budgets increase to the point that the DoN could dramatically expand the fleet, it would be imprudent to do so. The Navy and Fleet Marine Forces (FMF)[33] are in the midst of a remarkable naval technical revolution that promises to fundamentally alter the way they wage war. However, partly because the revolution began to play out during the 1990s—a period when naval leaders were distracted both by incessant strategic and budget reviews and the pressing challenge of managing a substantial fleet contraction—a coherent story about the nature of the revolution, the dramatic new capabilities it has given the fleet, or how these capabilities might be exploited to transform fleet organizations and operations in the 21st century, has never been told.[34]

The time has come for the DoN's leadership to worry less about chasing fleet numbers and end strengths that are unrealistic, unaffordable and undesirable, and more about how they might spark real transformational change. This spark might come as the Navy and FMF—operating as full partners in a newly conceptualized *Networked Littoral Battle Fleet*—begin to rationalize their capabilities in new ways and start to change their operational concepts, operational patterns and organizational structures to better exploit them.

Accordingly, this paper argues for a more focused *Departmental* (i.e., DoN) response to the challenges of the new century and a new *integrated* approach to future naval expeditionary operations. As will be outlined in Chapter II, a review of past strategic environments suggests that the U.S. military is in the early stages of a Second Expeditionary Era, in which the Navy and Marine Corps will rely upon each other in ways not seen for nearly five decades. This mutual reliance will be especially critical in light of a likely operational challenge U.S. forces will face over the next several decades: confronting strategies and networks specifically designed to deny their access into an operating theater.

For nearly a century, and especially for the past five decades, U.S. power-projection operations have relied to a large degree on the ready availability of advanced bases, ports and airfields. The assumption of readily available forward operating hubs appears increasingly problematic over the next several decades. Moreover, even if such hubs are available, they initially may be held at great risk by opponents armed with long-range ballistic or cruise missiles. Future power-projection operations likely will require increasingly complex preliminary theater "break-in" or

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[32] See for example Robert Holzer, "US Navy Studies Pros, Cons of Streetfighter Combat Concept, *Defense News*, (October 23, 2000), p. 78.

[33] In this age of joint warfare and "componentcy," the term "Fleet Marine Forces" has fallen out of favor, and been largely replaced by the phrases "Operating Forces of the Marine Corps" and "Marine (Operating) Forces." In the spirit of an integrated fleet, the term Fleet Marine Forces is deliberately reintroduced.

[34] Robert Holzer, "Experts Warn U.S. Lacks Strategy for Change," *Defense News*, (August 28, 2000).

"forcible entry" operations against increasingly capable "anti-access networks" designed to deter, prevent or disrupt U.S. movement into a theater.[35]

While the anti-access challenge is a problem for all joint forces, naval forces have traditionally played a major role in preserving U.S. freedom of action when forward bases are unavailable. They have also made important contributions to theater break-in operations. As a result, the Navy and Marine Corps are likely to play an increasingly important role in power-projection operations in the 21st century, and the challenge of taking on anti-access networks in general, and *naval* anti-access networks in particular, is an especially critical one for fleet planners to consider and respond to. For the Navy and Marine Corps to be successful in a high-stakes operational competition against emerging anti-access networks, the 21st century fleet will need more thoroughly integrated and networked defensive, strike, maneuver, mine warfare, and support capabilities than have been required in the immediate past.[36]

Chapters III and IV will argue that the fleet's emerging defensive and offensive capabilities well position the fleet for an operational competition against opposing battle networks. Tightly networked sensors and weapons promise to provide defensive capabilities unseen in any recent U.S. fleet. Moreover, contemporary carrier, surface combatant and submarine forces are all contributing to a striking advance in naval combat power, an advance that would seem to merit the term "revolutionary." Meanwhile, as will be evident in Chapter V, the Marines have developed the concepts and doctrine for equally revolutionary naval maneuver capabilities and will have the technical means to implement them in the not too distant future. The same appears true of the Navy's mine warfare forces, which will be reviewed in Chapter VI. Only in supporting elements, to be reviewed in Chapter VII, are the Navy's current and planned capabilities seemingly not up to the challenges of the future.

Taken together, Chapters III through VII suggest the *combined* capabilities of the Navy and Marine Corps are quite unlike any of those found in past U.S. fleets. These capabilities may seem revolutionary to some. For others, they may seem to be only the early manifestation of things to come. Still others may see them only as evolutionary advancements to legacy capabilities. All should agree, however, that they represent significant enhancements to naval power-projection capabilities. Indeed, these capabilities seem so different than those of past fleets, and so relevant to the Second Expeditionary Era, that to best exploit them the fleet should begin to adopt new operational concepts, fighting organizations and operational patterns. Chapter VIII offers some recommendations on how the Navy and Marine Corps might begin to do just that. These recommendations, while specific, are not intended to be prescriptive. Instead, they are offered to demonstrate that a 300-ship fleet is more than adequate for near- to mid-term challenges and to highlight the potential payoff of developing new organizing principles and operating patterns specifically designed to transform fleet operations.

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[35] Steven Kosiak, Andrew Krepinevich, and Michael Vickers, *A Strategy For a Long Peace*, (Washington, D.C.: CSBA, January 2001), pp. 5–6.

[36] Ibid., p. 6.

GROUND RULES

This paper does not address the vitally important role that naval forces play in anchoring our nuclear deterrent. Moreover, the paper accepts as a premise the relevance of naval expeditionary forces for all joint operations short of war. As a result, there is little discussion about the many fleet contributions to peacekeeping and peacemaking operations or to the multitude of other operations to which forward-deployed naval forces routinely contribute during peacetime. Instead, this paper considers the fleet's current and future ability to project power in the face of possible naval anti-access networks over the next two decades.

Why limit the time horizon of the paper to two decades? The DoN deals simultaneously with three fleets. The fleet of today is the fleet in service over the near term. It is comprised of the ships already in commission and those that will be placed in commission over the course of the FYDP out to seven years. The fleet of tomorrow is the fleet that will exist eight to 20 years hence. New technologies will undoubtedly be introduced over this timeframe. However, because ships have service lives that can extend 50 years or more, tomorrow's fleet will change most fundamentally—be transformed—if the ships found in today's fleet are used in new and innovative ways. The "fleet-after-next" is the fleet that will exist in the far future. Depending on technology, emerging threats and changes in joint operational doctrine, among a host of other things, the fleet-after-next could look much different than the fleet of today.[37]

The focus of this paper is on tomorrow's fleet. At the beginning of the 21st century, the Navy and Marine Corps find themselves in the very early stages of an operational competition against emerging naval anti-access networks. The character of this *network-versus-network* operational competition is likely to determine the primary attributes and organization of the fleet-after-next. Because the nature and scope of the competition is not yet clear, this paper argues that the proper strategy is to start to organize, operate and fight today's fleet in a different manner than in the past, while simultaneously increasing the pace and scope of experimentation until future threats are better understood. By doing so, tomorrow's fleet will be that much more powerful and the proper path to the fleet-after-next will be better illuminated.

This paper accepts the notion that while capable of independent action, future Networked Littoral Battle Forces will most often operate as a component of a larger, joint, power-projection network. While reference to the larger, joint network is frequently made, the paper concentrates on the fleet's emerging combat capabilities and on ways these capabilities might be better utilized to transform fleet network-versus-network combat operations against naval anti-access/area-denial networks.

The paper focuses on conventional combat operations. It largely avoids discussing operations in the face of an anti-access network expressly designed to employ weapons of mass destruction (WMD). It also avoids discussing the political implications of asymmetrical WMD anti-access strategies, such as an opponent declaring a naval exclusion zone and threatening to attack an American city using covertly delivered chemical or biological weapons if U.S. naval forces enter

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[37] Captain David Schubert, USN, "Naval Research Invests in Future Warfighting," *Undersea Warfare*, (Summer 2001), p. 3.

it. Although both WMD threats and asymmetrical strategies are real possibilities, they seem unlikely to become the primary *force structure* drivers for the 21st century fleet. Fleet tactics and operations in a WMD environment obviously would be different, and the political control and restrictions on operations in a WMD environment would be much tighter than in conventional operations. However, this paper assumes that any special fleet capabilities required to mount counter-WMD operations would be *additive* to the fleet's basic conventional warfighting force structure and would not be the dominant driver of overall fleet organization and design.

Because one of this paper's fundamental premises is that future DoN desires and plans most often will be constrained by future defense budgets, its recommendations first seek to optimize *Departmental* capabilities and resources and only second to optimize *service* capabilities. In other words, the paper's recommendations are always made with the goal of saving Departmental dollars—dollars that then can be diverted to experimentation or other fleet priorities. Compelling arguments for specific service programs can always be made, but in keeping with the spirit of the Second Expeditionary Era, solutions for the 21st century Networked Littoral Battle Fleet must include service tradeoffs not previously considered.

II. THE STRATEGIC AND OPERATIONAL OUTLOOK FOR 21ST CENTURY NAVAL OPERATIONS

PAST AS PROLOGUE: WHAT PREVIOUS STRATEGIC ERAS MIGHT TELL US ABOUT THE FUTURE

In the broadest sense, the armed forces of the United States have evolved through three strategic eras, and, for the past decade, have been trying to define the fourth. The Continental Era spanned the country's first century and a quarter, during which the nation fought a world power to win its freedom, fought a Civil War to preserve its unity, and expanded to the limits of its continental borders. While not unknown to venture beyond the confines of the Western Hemisphere, the Continental Navy focused primarily on coastal defense. The Marine Corps formed a tiny part of the Department, providing ships' complements and small expeditionary forces.[38]

The Expeditionary Era started with the Spanish American War, which gave the nation an empire to protect and police, and ended with the Korean War, which convinced the nation that it would have to shoulder the primary burden of protecting the free world. From a military perspective, the First World War was the era's most striking anomaly. The American Expeditionary Force went to battle in one theater, along a static front beside larger allied armies and was supported by a well-developed and efficient logistics network. In every other campaign or war, even if they did not have to fight their way into the operating theater, U.S. joint forces could count on little developed infrastructure once they arrived there. They brought with them whatever they could, outsourced what they could not, and did whatever was necessary to accomplish the assigned mission, be it pacifying the Philippines, keeping order in the Caribbean basin, protecting U.S. interests in China, or fighting worldwide, high-intensity joint and coalition combat operations against the Axis Powers in World War II. In all cases, Marine and Army forces rode to distant theaters on ships and relied on supplies delivered over long sea lines of communications (SLOCs), which the U.S. Navy protected.

During the early years of the Expeditionary Era, leaders of the "two-ocean Navy" protected joint SLOCs and supported deployed expeditionary forces more out of necessity than desire. Decidedly Mahanian in their outlook, Navy officers continually longed to advance the Battle Fleet across the broad oceans and fight decisive battles against any fleet that stood in its way. Their appetite whetted by successful fleet engagements against the Spanish Navy at the start of the era, Navy officers spent most of the era's remaining years planning and experimenting to repeat their successes—preferably in the Pacific. The Marines, equally aggressive, and looking for a more substantial Departmental role beyond that of being "State Department Troops," gradually focused on seizing and defending advance naval bases to support the (westward) advance of the battle fleet and other joint forces.

[38] The strategic eras described over the next several pages were inspired by Samuel P. Huntington in "National Policy and the Trans-oceanic Navy," *Naval Institute Proceedings*, (May 1954), pp. 483–493.

The Second World War amply justified the long years of experimentation and planning for high-intensity fleet combat operations in distant theaters. The Navy-Army-Army Air Force expeditionary team fought its way into Africa and Europe and mounted operations in India and Southeast Asia. At the same time, the Navy-Marine Corps-Army-Army Air Force expeditionary team rolled back the Japanese Empire's vast anti-access network in the Central and Southwest Pacific. The end of the war in the Pacific theater saw the entire Pacific Fleet, reinforced by the Royal Navy and the U.S. Army Air Corps, prepared to land 1.3 million men (including six Marine Divisions) on mainland Japan and to support them with 5,000 combat aircraft.[39] During the long Central Pacific drive, while their relationship was at times rocky, Navy and Marine Corps cooperative action reached its post-Revolutionary War pinnacle of combat excellence and success.

The long Cold War defined the Garrison Era. From a military perspective, the Cold War began in 1950 with the commitment of four Army divisions to the NATO alliance, and was firmly established by the end of the war in Korea. More than anything, the long, bitter struggle on that rugged peninsula firmly convinced U.S. leaders that America must lead a worldwide coalition of like-minded nations against an implacably hostile Communist alliance. With large standing Communist forces capable of conducting decisive offensive operations with little strategic warning in both Europe and Asia, mounting reactive expeditions from the United States would be far less effective than manning the ramparts overseas, shoulder-to-shoulder with allied forces. For the first time in its peacetime history, then, America stationed large, standing, joint, military forces in both Europe and Asia and kept powerful naval strike and amphibious forces constantly deployed, to conduct restless rotational patrols along the perimeter of the vast Eurasian landmass. These permanent land and naval "garrisons" benefited from the gradual but persistent construction of a vast worldwide combat support infrastructure of American and allied bases, ports and airfields.

During the Garrison Era, the Navy and the Marine Corps, whose Departmental bonds had been forged by over 150 years of cooperative action and had been tempered by the fires of the Central Pacific, drifted slowly apart. The Marine Corps, designated by congressional language as the nation's "force in readiness" during the Korean War, and later accorded the stature of having its Commandant become a voting member of the Joint Chiefs of Staff, moved to establish its own niche.[40] This niche was defined, most fundamentally, by the Marines' refusal to move away from their expeditionary roots. Throughout the Cold War, they viewed themselves as the nation's 911 force, focused less on fighting the Communist alliance, and more on responding quickly to lesser crises around the world. As a result, even as they adopted equipment better suited for fighting the Soviet Union than for prompt crisis response (such as heavy, self-propelled howitzers), the Marines never mentally embraced the precepts of the Garrison Era; when they manned

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[39] Williamson Murray and Allan R. Millet, *A War to Be Won*, (Cambridge, MA: The Belknap Press of Harvard University Press, 2000), p. 520.

[40] "Marine Corps," *Sea Power*, (2001 Almanac Issue), p. 188.

permanent, forward deployed garrisons—like on Okinawa—they did so, by and large, by rotating expeditionary units for periods of months, not years.[41]

Meanwhile, the Navy, the most independent of the Services, gradually adopted the most independent of wartime visions. Through much of Garrison Era, the Navy's wartime strategy was to bottle up Soviet surface ships and submarines north of the Greenland-Iceland-United Kingdom (GIUK) gap and to escort convoys carrying vital equipment from the United States to Europe. By 1977, however, this defensive, passive barrier and escort strategy was challenged by Navy leaders who wanted to carry the fight to the Soviet Navy and to contribute in a more direct way to the decisive battles expected on Europe's Central Front. Their vision was expressed most vividly in the Maritime Strategy, which was developed in the 1980s to provide the strategic rationale for the 600-ship fleet.[42]

While the fleet would continue to protect the convoys moving between the United States and Europe, the Maritime Strategy outlined a vision of independent, offensive naval operations against the Soviet Union north of the GIUK gap, in the Mediterranean and in the Pacific. This vision included both aggressive carrier-strike and offensive anti-submarine operations. Such unrelenting naval pressure would force the Soviets to fight a multi-front war and divert resources away from the decisive Central Front, thereby contributing directly to victory in the European theater. While Amphibious Task Forces (ATFs) were mentioned in the Maritime Strategy, the strategy's emphasis on strike and anti-submarine operations, coupled with the large number of forward, Garrison Era logistic hubs, greatly reduced fleet requirements to seize advance naval bases. In any event, the Central European theater was ill-suited for large-scale amphibious attacks, and operations to keep the ocean bridge open from the United States to Europe in case of all-out war required modest Marine participation. As a result, the Navy's interest in conducting amphibious operations waned.[43]

Upon reflection, then, the gradual decline in fleet amphibious capabilities evident throughout the Garrison Era was less the result of concerns over whether they were obsolete and more the result of the era's particular circumstances.[44] In any event, the reduced fleet emphasis on large-scale amphibious assaults suited the Marines just fine. Befitting their new vision as the nation's 911 Force, by the end of the Era they willingly changed the name of Marine *Amphibious* Forces, Brigades, and Units to Marine *Expeditionary* Forces, Brigades, and Units. At the same time, they pursued a variety of new means to deploy quickly to potential operating theaters, including

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[41] See comments made by General Krulak in *Marine: A Guided Tour of a Marine Expeditionary Unit*, pp. 31–32.

[42] Robert W. Love, Jr., *History of the U.S. Navy, 1942–1991*, (Harrisburg, PA: Stackpole Books, 1992), pp. 702–728.

[43] Ibid. For a fascinating "insider's view" about the origins of the Maritime Strategy, see Gregory L. Vistica, *Fall from Glory: The Men Who Sank the U.S. Navy*, (New York: Touchstone Books, 1995), pp. 69–77.

[44] In the early years of the Garrison Era, many defense experts posited that the advent of nuclear weapons made amphibious assaults obsolete. The Marines never accepted this argument. Instead, they sought ways to fight on potential nuclear battlefields. For example, one Marine Corps response was to emphasize vertical envelopment with helicopters, which would allow for the dispersal of both amphibious ships and Marine assault waves. Matthew McCarton, *Amphibious Warfare and the Evolution of the Helicopter Carrier*, (Arlington, VA: Naval Sea Systems Command, March 1998), p. 18.

amphibious shipping, the pre-positioning of heavy equipment on both land and sea, and airlift. As a result of the natural separation of Navy and Marine visions during the Cold War, by the early 1990s, except for the routine combining of their votes in inter-Departmental budget battles with the Army and Air Force, mutual cooperation between the Navy and Marine Corps had reached a 200-year low.

The demise of the Soviet Union marked the end of the third strategic era, and the start of an as yet unnamed fourth. From a Departmental perspective, it began with the promising adoption of a common vision as outlined first in *From the Sea*, and later in *Forward…From the Sea*.[45] Yet, for the past ten years, burdened by the operational patterns and organizational structures built up during the Garrison Era, and distracted by the need to defend their service equities in a series of interminable defense budget reviews, the Navy and Marine Corps have yet to really define a new, mutually agreeable *Departmental* vision for the 21st century. At best, they have formed a distinctly uneasy and at times untrusting alliance, less out of earnest desire and more out of the need to respond to mounting service and Departmental budget pressures.

It is time for a change. The 21st century promises great rewards to the nation if both the Navy and the Marine Corps can forge a common operational vision and implement it. Both Navy and Marine leaders need to reconsider their long mutual history and to acknowledge—in action instead of word—that an *integrated* naval team can meet the challenges of the fourth strategic era better and more efficiently than can either of its two individual service parts.

STRATEGIC OUTLOOK: A SECOND EXPEDITIONARY ERA

What do we or can we know about this fourth strategic era, and what are its implications for U.S. naval forces and joint operations?

In the future strategic environment, the word "long" will be an inherent part of the term "sea lines of communication." With the demise of the Soviet Union and the disintegration of the Russian Navy, the DoN's primary focus will gradually shift away from the North Atlantic and Mediterranean Sea towards the east. This shift in strategic gaze will likely accelerate throughout the first decade of the 21st century, for two key reasons. First, security conditions in Europe seem likely to improve over time as Eastern European nations continue their conversion to democracy and European international institutions, including the military, develop and grow in strength. For example, by the year 2015, assuming current plans come to fruition, the European powers may count among them four large aircraft carriers (two British and two French), augmented by several smaller carriers from Spain and Italy capable of employing short take off and vertical landing (STOVL) aircraft.[46] In addition, the European powers will be capable of deploying and employing a multinational brigade from a modern amphibious fleet.[47] As a result,

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[45] *…From the Sea: Preparing the Naval Service for the 21st Century*, (Washington, D.C.: Department of the Navy, September 1992); *Forward…from the Sea*, (Washington, D.C.: Department of the Navy, 1995).

[46]See Richard Scott, "Keeping CVF on a steady course," *Jane's Navy International*, (May 2001), p. 40, and "Afghan Campaign Prompts France to Eye Second Aircraft Carrier, Official Says," *Phillips Publishing International, Inc*, (17 December 2001).

[47]A.D. Baker III, "World Navies in Review," *Naval Institute Proceedings*, (March 2001), pp. 33–49.

the long standing U.S. planning goal of keeping a Carrier Battle Group (CVBG) and a Amphibious Ready Group/Marine Expeditionary Unit (ARG/MEU)[48]*continuously* deployed in the Mediterranean is likely to recede over time, as standing European naval forces gradually develop and replace them, and as budget pressures force more focused operational prioritization of U.S. naval forces.

Second, and as facilitated by the expansion of European naval power, the eyes of Navy and Marine officers likely will be continually pulled to the arc drawn from oil-rich Southwest Asia and the Persian Gulf; through the fractious Caucasus and Central Asia; past the bitter nuclear rivalry on the Indian sub-continent; around the straits of Malacca; past a tense confrontation across straits separating Taiwan and a rising, nuclear-armed, China; and ending in Korea and Japan, vital U.S. allies since the beginning of the Cold War. Less willingly, if only because of their drain on scarce naval resources, attention also will be drawn to incessant humanitarian crises in Africa, whether famine, disease, natural disaster, or war trigger them.[49]

Over the next several decades, both Africa and Asia will see explosive population growth, especially in urban areas along their littorals. Burgeoning population growth and urbanization will put immense strains on local and logistic infrastructures. These strains will be aggravated by intense competition for oil and natural gas between the greater and lesser developed powers in Central and Eastern Asia, and the developing nations throughout Asia and Africa. Resource competitions in the area will not be confined to energy supplies, however. There is likely to be increased competition for water as well, especially in Southwest Asia. Strains will also be exacerbated by nagging health problems, such as the spread of AIDS throughout Africa. All in all, the population, resource and health pressures on both continents' fragile political systems seem likely to be enormous, and the likelihood of internal instability and regional strife seems concomitantly high.[50]

Given these circumstances, for the next two decades and perhaps beyond, U.S. joint and naval forces most likely will be called upon to respond to complex contingencies far from home and support. The jungles of the Philippines and the Caribbean, in which American forces slogged through and fought in during the Expeditionary Era, will likely be replaced in the future by urban jungles along the African and Asian littoral. Precision-strike capabilities will be important throughout the conflict spectrum, but no more so than highly trained maneuver forces that can work with joint, interagency, non-governmental, and coalition forces in a variety of chaotic and ambiguous circumstances, and which are self-reliant and able to operate without large footprints

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[48]A CVBG is a naval task force consisting of a single aircraft carrier and 3–6 escorts. An ARG/MEU is a small task group of 3–5 Navy amphibious ships carrying a Marine Expeditionary Unit (MEU)—a reinforced battalion of some 2,000 Marines and Sailors.

[49] The strategic shift from Europe to Asia has been a consistent theme of recent strategic papers. For a good overview of recent writings, see Captain Sam Tangredi, USN, *All Possible Wars? Towards a Consensus View of the Future Security Environment, 2001–2025,* [http://www.ndu.edu/inss/macnair/mcnair63/63tents.html].

[50] Paul Mann, "Sleuthing Defense Threats More Uncertain Than Ever," *Aviation Week & Space Technology,* (March 19, 2001), pp. 118–119, and *Global Trends 2015*: *A Dialogue About the Future with Non-Government Experts*, [http://www.cia.gov/cia/publications/globaltrends2015]. For a discussion of future energy competition, see CSIS *Energy Outlook to 2020,* at [http://www.csis.org/sei/geopoliticsexecsum].

ashore.[51] The ability to operate without large footprints ashore will be especially critical since, in stark contrast to the Garrison Era, theater infrastructures are likely to be rudimentary and the number of available forward bases from which U.S. forces will be able to readily respond will be much smaller.[52]

Accordingly, the decade since the end of the Cold War is best thought of as the first decade of the nation's Second Expeditionary Era. How long this new era will last is open to conjecture. However, barring the rapid resurgence of a hostile Russia or the emergence of an expansionist China, it seems a safe bet that it will last at least another two decades. Over that time, given the reduction in the severity of the threats facing the United States and its allies, U.S. forces forward based overseas are likely either to quit the garrisons established during the Cold War and return slowly to the United States or to be dramatically reduced in number. Therefore, future U.S. military responses most likely will be joint in nature and be mounted primarily from bases located in the United States and its territories—enabled, whenever possible, by forward deployed forces.[53]

During the Second Expeditionary Era, the Department of the Navy will continue to do what it did during the Garrison Era: to organize, train and equip naval expeditionary forces for day-to-day presence and crisis response operations, and to provide combat ready forces to joint warfighting commanders. However, given the return to the same general circumstances of the First Expeditionary Era, Departmental (and joint) planners should once again consider ready access to bases to be a luxury. They should be prepared to operate without them for long periods of time; be prepared to take whatever they need to operate in a theater; and be prepared to seize and protect new bases if necessary. In other words, the 21st century battle fleet is likely to rely on its Marines and on its sea-based combat logistics forces much more than has been the case in the immediate past.

To the continual irritation of Marines, the strategic circumstances of the Second Expeditionary Era will compel both the Army and the Air Force to experiment with and introduce operational concepts that emphasize rapid-reaction, expeditionary operations. Indeed, the Army has adopted a goal of being able to deploy a brigade combat team anywhere in the world in 96 hours, a full division within 120 hours, and five divisions within 30 days.[54] With such ambitious deployment timelines, it seems likely that the Army will be drawn to its own World War II amphibious experiences and will begin to consider and experiment with sea-based delivery means. Meanwhile, the Air Force—an institution raised during the Garrison Era and designed to

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[51] Major General Julian Thompson, Royal Marines, "Planning the Unplannable," *Defense Systems International* (Spring 2001), p. 7.

[52] For example, in the early 1990s, the United States had ready access to 45 airbases overseas. By 2001, the number had shrunk to 13, of which seven were in the Pacific and six were in Europe. See "GAO: Overseas Airfields Wouldn't Support Two Wars," *Air Force Times*, (July 2, 2001), p. 28.

[53] "Forward deployed" refers to forces that are based in the United States and that are on routine, scheduled and time-fixed overseas deployments. "Forward based" refers to forces permanently stationed on bases located in foreign countries.

[54] See Dennis Steele, *The Army Magazine Hooah Guide to Army Transformation,* (Washington, D.C.: Association of the U.S. Army, 2001).

generate high sortie rates from established overseas air bases—will struggle to forge a completely new, and somewhat alien, expeditionary culture. Indeed, the Air Force is in the process of introducing ten Aerospace Expeditionary Forces that will mimic, to a large degree, the rotational deployment patterns long practiced by U.S. naval forces.[55]

Although the circumstances of the Second Expeditionary Era will compel joint and naval expeditionary forces to operate routinely at the end of long SLOCs, the Navy is blessed by the notable absence of a strategic naval competitor that can interdict those lines on the open oceans. The U.S. fleet-in-being dwarfs that of any potential opponent, or even group of opponents, in terms of both modern units and fighting capabilities. When factoring in allied and friendly navies, most notably the European powers, Canada, Japan, Korea, Australia, and Taiwan, the gap between the high seas fleets of definite good guys and potential bad guys is arguably wider than at any point since the end of the Korean War.[56]

If anything, the huge gap between the U.S. Navy and the world's navies, especially those of its potential adversaries, appears to be growing wider and at an accelerating rate. The number of yards producing complex surface combatants and submarines outside of the United States is dwindling, and most are in allied countries. As a result, U.S. and allied naval ships generally outmatch those of their plausible opponents in terms of capabilities as well as numbers. Moreover, the combined shipbuilding capabilities of the U.S. and allied powers would give their navies a crushing advantage in any time-based, strategic naval competition.[57]

Given these happy circumstances, the likelihood of any serious challenge to U.S. open-ocean supremacy seems so remote that U.S. naval planners have the luxury of presuming command of the seas for the foreseeable future.[58] Even in the unlikely event that an opponent initiates a serious attempt to interdict world SLOCs, either by dramatically increasing submarine or surface combatant construction or by creating long-range, naval-aviation, strike forces, it would be some time before that opponent could seriously challenge U.S. command of the seas. Moreover, given the United States' proven ability to collect technical intelligence around the world, it seems likely that U.S. naval planners would have ample warning of any such challenge. Given early and unambiguous warning, one might presume a forceful counter action and concomitant U.S. fleet expansion, both to dissuade the continuation of the competition and to ensure continued U.S. open-ocean superiority.

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[55] Aerospace Expedition Forces are part of an overall effort by the Air Force to reorganize itself as an "Expeditionary Aerospace Force," or EAF. See John A Tirpak, "Perspectives of the Expeditionary Aerospace Force: The EAF Turns One," *Air Force Magazine*, (August 2000).

[56] See for example Robert Holzer, "World's Navies to Cut Back, Study Shows," *The Navy Times*, (September 4, 2000), p. 26, and A.D. Baker III, "Shrinking Fleets, Expanding Technology," *The Year in Defense 1999*," (Tampa, FL: Government Service Group), p. 189.

[57] A.D. Baker, III, "Naval Technology at the Beginning of the 21st Century," *The Year in Defense 2001*, (Tampa, FL: Government Service Group), p. 172.

[58] A.D. Baker, III, sees no other possible challenger for at least two to three decades. "Shrinking Fleets, Expanding Technology," p. 189.

As a result of U.S. global maritime superiority, U.S. naval forces most likely will be employed primarily as instruments of national power projection for next several decades: they will be focused on, and increasingly organized for, influencing events *on land* while operating at the end of long, albeit secure, SLOCs.[59] Regional powers seeking to confront the U.S. fleet, denied an opportunity to successfully challenge it on the high seas, will likely focus on opposing U.S. naval expeditionary forces operating in the littoral regions of their own theaters of operations. Like the Japanese during the latter half of World War II, and the Soviets during the latter half of the Cold War, they will *be forced* by overwhelming U.S. naval superiority to focus their resources and efforts on area-denial strategies and anti-access networks.[60] This is a circumstance that we should relish: the choice between a strategic competition with a global maritime peer and an operational competition against regional anti-access networks is an easy one to make.

OPERATIONAL OUTLOOK: A TIME-BASED NETWORK-VERSUS-NETWORK COMPETITION

If a potential adversary builds a regional naval anti-access network it will be but one component in a larger, theater anti-access network. This network would be designed to deny or hinder the movement of U.S. and coalition forces moving into a theater, to deny them freedom of action if and when they arrive, and to prevent them from either establishing lodgments or influencing actions ashore. Therefore, the operational outlook over the next several decades likely will be highly influenced by an intense operational competition between U.S. joint theater power-projection networks and the opposing networks specifically designed to thwart them.[61]

U.S. joint forces in general, and the U.S. Navy in particular, find themselves in a strong position for this time-based operational competition. U.S. naval leaders have been thinking about networked-fleet operations since at least 1988,[62] when retired Vice Admiral Joseph Metcalf, writing in the January issue of *U.S. Institute Proceedings*, argued that naval warfare was becoming "network-centric."[63] By 1996, the ideas of network centric warfare (NCW) first espoused by the Navy had been adopted as a tenet of joint warfare in *Joint Vision 2010*, a document outlining the Chairman of the Joint Chief's vision of future warfare.[64]

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[59] Steven Kosiak, et al., *A Strategy for a Long Peace*, pp. 5–6.

[60] Thomas G. Mahnken, "A Corps for Tomorrow," *Marine Corps Gazette*, (November 2000), pp. 38–39.

[61] The proliferation of naval area-denial and anti-access networks has been a key part of war games sponsored by the Office of Net Assessment, OSD, since the mid-1990s. For an analysis of foreign writings on anti-access strategies, see George Kraus, et al., *Components of a Maritime Concept of Operations: A Foundation for Experimentation,"* (Strategic Assessment Center: Science Applications International Corporation, May 30, 2001).

[62] One naval office believes the Navy has been pursuing networked fleet operations since the Battle of Midway in World War II. See Commander Paul Nagy, USNR, "Network Centric Warfare Isn't New," *Naval Institute Proceedings*, (September 2001), p. 44.

[63] See VADM Joseph Metcalf, USN (ret), "A Revolution at Sea Initiative," *Naval Institute Proceedings*, (January 1988).

[64] *JV2010* can be viewed at [http://www.dtic.mil/jv2010/].

Network centric warfare is a conceptual framework for conducting joint (and naval, and air, and ground) military operations in the information age.[65] It involves the networking of sensors and communication nets to fuse intelligence and operational and logistics data into a coherent battlefield picture faster than an opponent, and exploiting this picture with networked precision fire and maneuver. Although one aim of NCW is to improve offensive and defensive fires to achieve greater lethality and increased survivability, its primary aim is to gain "dominant battlespace awareness" and to use this greatly enhanced awareness to outmaneuver the enemy in the fourth dimension—time.[66] Faster operations in time are used to disrupt, disorient, demoralize, and defeat opponents at both the operational and tactical levels of war. As NCW has permeated more and more joint operational doctrine, all Services have been thinking about, experimenting with and discussing networked operations to varying degrees.[67] Moreover, related concepts of nodal analysis of enemy networks and effects-based targeting have shown great promise in actual combat operations.[68]

A strong case can be made that the four Services have yet to fully embrace NCW. Their intelligence, surveillance and reconnaissance (ISR) accounts have not yet seen the major increases one might expect in information-enabled networked operations, and joint networks continue to be hampered by problems of interoperability and communications. However, these problems should in no way detract from the huge *relative* advantage the United States now has in global, theater and tactical sensor systems and technologies; modern command and control systems; precision-guided weaponry; variety of delivery systems; and in systems integration. While a joint, power-projection network is still in its infancy, its components are sound, and it will benefit from continued attention from leaders at all levels of command. Recent and on-going operations in Afghanistan have again demonstrated the combat-multiplying effect of long dwell and persistent ISR, and the Services are starting to shift more resources to improve their capabilities.[69] Furthermore, joint networked operations received a ringing endorsement in the 2001 QDR. In a June 22, 2000 briefing, the leader of the QDR's conventional forces panel, RAND Analyst David Gompert, told reporters that all future joint units must be "ready, rapidly deployable and employable, tailored for a range of operations; *easily integrated and networked*; [and] supportable despite distance and dispersion." (Emphasis added.)[70]

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[65] For a thorough discussion about NCW, see *Measuring the Effects of Network-Centric Warfare,* (McLean, VA: Booz-Allen & Hamilton, Inc., 28 April 1998).

[66] Outmaneuvering an enemy in the time dimension is often referred to as "speed of command" or "getting inside an enemy's decision cycle." Simply put, these terms mean making better decisions faster than an enemy.

[67] John G. Roos, "An All-Encompassing Grid," *Armed Forces Journal International,* (January 2001), p. 26. Also Joseph R. Cipriano, "A Fundamental Shift in the Business of War," *Sea Power*, (March 1999), pp. 39–42. For a description of effects-based operations, see Kraus, et al., *Components of a Maritime Concept of Operations: A Foundation for Experimentation,* p.23.

[68] John B. Nathman, "A Revolution in Strike Warfare," *Sea Power*, (October 1999), p. 30.

[69] Marc Strass, "Navy Outlines Future UAX Strategy, First Focus is on Long Dwell ISR," *Defense Daily,* (February 22, 2002).

[70] Nicholas Lemann, "Letter from Washington: Dreaming about War," *The New Yorker*, (July 16, 2001), p. 32.

Given the U.S. lead in conventional, networked, power-projection operations, perhaps the most effective enemy response would be to build a theater anti-access network designed to employ nuclear weapons. And in this regard, the trends—especially in Asia—are not encouraging. China, India, Israel, and Pakistan are already members of the nuclear club; North Korea, Iraq, and Iran seek to join them. Given assumed overwhelming U.S. nuclear superiority, it seems most likely that the nations possessing or pursuing nuclear arms would use them more for regional deterrence, dissuasion and coercion rather than as a means to attack the U.S. homeland. However, U.S. political and military leaders can ill-afford to ignore the possibility that a nuclear-armed, regional power might use its nuclear weapons against deployed joint combat forces, especially if regime survival is in question.[71]

The presence of nuclear weapons obviously would alter U.S. political calculations in any regional confrontation, and they would change the way fleet and joint power-projection networks are armed and employed. For example, their presence would put a great premium on fleet tactical ballistic and anti-air defenses, especially those that could be extended over allied territory and joint and coalition forces. They would also cause fleet operations to be more dispersed and would prolong joint advance force operations as long-range strike, special operations and maneuver forces sought to destroy enemy nuclear command and control and delivery systems. However, it seems premature for naval planners to design the 21st century fleet first to fight regional nuclear wars, or for Army planners to consider introducing an updated version of the "Pentomic Division."[72] Absent clear direction from the Secretary of Defense or Chairman of the JCS to organize to fight regional nuclear wars, a more prudent course would be for service planners to design joint and fleet networks first to overcome conventionally armed anti-access networks and then to develop the additional special capabilities, tactics and techniques needed to engage a foe threatening the use of nuclear or other weapons of mass destruction.[73]

Even absent nuclear weapons, a naval area-denial or anti-access network armed with modern conventional weapons could pose a formidable obstacle to fleet power-projection operations, especially in restricted littoral waters. Imagine a naval anti-access network with good over-the-horizon surveillance and targeting capabilities, large numbers of long-range stealthy anti-ship missiles, integrated minefields covered by long-range, shore-based artillery and missile fire, and quiet diesel or nuclear submarines lying in ambush along likely naval approaches (chokepoints). If approached carelessly, such a network could inflict great damage to U.S. and allied naval units and could seriously disrupt joint power-projection operations.

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[71] Eliot Cohen, Aaron L. Friedberg and Stephen Peter Rosen, *The Future Security Environment 2000–2025 and American Defense Planning*, (unpublished manuscript, 2001), p. 14.

[72] In the late 1950's, the Army sought to redesign its forces for the nuclear battlefield. The result was the Pentomic Division—a division composed of five small "battle groups" designed for dispersed operations under nuclear threat. However, the Army discarded the Pentomic Division and chose to retain divisions optimized for conventional operations, but trained to employ different tactics while operating under the threat of nuclear weapons.

[73] Thomas C. Linn, "Adversarial Use of Weapons of Mass Destruction," *Joint Forces Quarterly*, (Autumn/Winter 1999–2000), pp. 58–64. See also Gunnery Sergeant Darren S. Wheeler, "MAGTFS –Prepared for the Unthinkable?" *Marine Corps Gazette*, (June 2001), pp. 58–61.

Therefore, whether or not they include nuclear weapons, regional anti-access networks define a key operational challenge for which joint expeditionary forces in the Second Expeditionary Era should be designed, and by which current and future fleet capabilities should be ultimately judged. For, despite the high likelihood that the majority of their time and efforts will be consumed by day-to-day presence operations and responding to complex contingencies or other operations short of war, like their predecessors in the (First) Expeditionary and Garrison Eras, fleet operators should concentrate their planning, experimentation and training on worst case scenarios. In the Second Expeditionary Era, the worst-case scenario seems likely to be defined by the requirement for a naval expeditionary force to fight its way into a contested littoral, and to support joint operations or campaigns once it arrives. As then-Chief of Naval Operations Jay Johnson put it in 1997:

> I anticipate that the next century will see those foes striving to target concentrations of troops and materials 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 U.S. military power where it is needed.[74]

Regional, naval, anti-access networks will not just magically appear—they will be conceived, developed, built over time, and be operated by men and women who will require sustained training and useful amounts of operational experience to best employ them. Therefore, the time-based competition that pits the current and future strengths and weaknesses of U.S. joint and naval power-projection networks against those of emerging theater and naval anti-access networks will involve considerable give and take, and reaction and counter-reaction. Such competitions can unfold rapidly, especially when new technologies are introduced. Indeed, a recent Defense Science Studies Board concluded that a regional opponent could develop an area-denial capability by 2010, even under severe resource constraints.[75] However, other operational competitions have taken much longer to unfold, their time horizons being measured in decades. One reason these operational competitions tend to be so long is that their pace and outcome are often defined less by technological systems and more by how people decide to best employ them. In this regard, it takes approximately two decades for a generational shift to occur in one's armed forces, so that the entire organization—from senior leaders to professional non-commissioned officers to fighting men and women—can be thoroughly inculcated in new operational concepts and tactical procedures.[76]

Based on these long competitive timelines, even while recognizing the nature of the emerging operational competition, U.S. joint and naval planners need not make any precipitous final conclusions about its outcome. As the French learned during the interwar years, the biggest danger in the early years of any new strategic era is for an army (or navy or air force) to

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[74] Admiral Jay Johnson, "Anytime, Anywhere: A Navy for the 21st Century," *Naval Institute Proceedings*, (November 1997).

[75] Mahnken, "A Corps for Tomorrow," p. 38.

[76] The German interwar development of mechanized, combined arms warfare and blitzkrieg are good examples of the result of a generation-long, operational competition between maneuver forces and fixed defenses.

confidently sketch a specific picture of the future and to then design forces for that future without regard to subsequent changes in the environment. In its emerging competition with anti-access networks, the Navy and Marine Corps should make some educated guesses about the *early course* of the competition; organize the fleet to take advantage of its strengths and to mask its weaknesses; experiment and think about possible solutions to potential future operational problems; and continually adapt their assumptions based on actual rather than perceived threats.[77]

So, how might the early course of this competition unfold? For a regional power contemplating a future fight against U.S. naval expeditionary forces operating as part of a larger, joint, power-projection force, the conventional components required to assemble an effective area-denial or anti-access network are unremarkable. In stark contrast, melding these components into a cohesive anti-access network is immensely demanding. The levels of joint training and cooperation required to make such a network operationally effective are extremely high, and they demand significant, sustained investments in people, equipment and training. Moreover, the command and control and targeting components for such a network, even given the explosion of commercially available alternatives, are terribly expensive and difficult to effectively integrate.

Another important factor that a potential regional opponent must consider is that there are no armed forces better at conducting counter-network operations than those of the United States. They have only to recall how daunting the Iraqi and Serbian integrated air defense systems appeared *before* Operations Desert Storm and Allied Force to appreciate how adept U.S. joint forces are at disassembling even the strongest anti-access networks. Potential opponents must therefore weigh the expenditures required to build an effective anti-access network against two countervailing concerns. First, they must know that they will have to build their network, piece-by-piece, and train to operate it, under the watchful, anticipatory and predatory gaze of U.S. counter-network planners. Second, they must assume that the opening round of any U.S. campaign will be designed specifically to dismantle, degrade or destroy the network before major U.S. force elements are put at risk. In other words, the network will have to be extremely robust and have the redundancy and hardening required for it to withstand a concerted U.S. counter-network attack and to survive long enough to serve the purpose for which it was designed.

Given the expenditure of time, effort, people, and equipment required to forge a cohesive network, the power of current and future U.S. joint and naval power-projection networks, and demonstrated U.S. skill in conducting counter-network operations, some potential adversaries may be dissuaded from entering the competition in the first place. However, for other nations seeking to pursue interests counter to those of the United States, assembling an anti-access network will still be an attractive operational option. Their leaders might judge that, at best, the prospect of losing people, aircraft and ships during a theater break-in operation would deter the United States from intervening at all; at worst, a functional network might hinder U.S. freedom of action *long enough* for those leaders to accomplish their operational objectives and to pursue a

[77] Mahnken, "A Corps for Tomorrow," p. 38.

favorable regional outcome. The task remains, then, for them to choose the tactical components that will comprise their network.[78]

Considering the conventional options now available, the choices for naval anti-access network components are simpler than one might think. Submarine operations of any kind are difficult and expensive to master; in any event, the prospect of taking on the U.S. nuclear submarine force—even in home waters—is not a happy one. Without the means to counter U.S. nuclear submarines, large surface units are simply helpless targets. Small, stealthy, missile-armed combatants, operating without the benefit of local air superiority, are a questionable gamble; developing an air force capable of challenging U.S. joint and naval air forces for air supremacy is even more of one. By contrast, mines are relatively cheap, and while they possess increasingly sophisticated combat capabilities, they require unsophisticated supporting forces and can be preemptively sown using even the most modest levels of operational expertise and deception. Likewise, developing shore-based surface-to-air missile (SAMs) forces that can challenge U.S. air forces and anti-ship, cruise- and ballistic missile strike forces that can challenge U.S. naval forces is a much cheaper, more reasonable, and operationally attractive alternative. Over the next two decades, then, mines and missiles seem likely to be the two most important conventional components of any opponent's naval anti-access network.[79]

As previously mentioned, U.S. joint and naval air forces have had great success in countering integrated air-defense networks composed of early warning radars, SAMs and interceptors. Perhaps that is why cruise and ballistic strike missiles are the threats that have captivated the attention of many contemporary defense analysts, some of whom believe that these missiles will increasingly hold aircraft carriers and major surface combatants at great risk.[80] However, defending carriers and other fleet units against missile attack is nothing new to the U.S. Navy, and it is a threat they have long taken very seriously. After all, American naval forces have operated under the threat of massed, long-range, cruise-missile attack since 1944, when Japanese kamikazes—the first long-range, precision-guided cruise missiles—hurled themselves against the fleet.[81] Later, during the long Cold War, the Navy developed the equipment, tactics and skills required to fight against a Soviet opponent who emphasized mass attacks of subsonic and supersonic cruise missiles—unmanned kamikazes—in their anti-access operations. In other words, fleet operators have been thinking about and training to defeat the cruise missile threat for nearly six *decades*, and their combat systems reflect a high degree of evolutionary effectiveness. The outcome of the competition between fleet defenses and incoming strike missiles is therefore not as clear-cut as some analysts believe.

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[78] Ibid., p. 39.

[79] Harold Kennedy, "Navy, Marines Prepare for War in Coastal Waters," *National Defense*, (January 2000), p. 22. See also T.D. Kilvert-Jones, "From Showstopper to Speed Bump," *Sea Power*, (February 2000), pp. 33–35.

[80] See for example Dale Eisman, "Longtime Pentagon Adviser Promotes a Less Visible Military," *Norfolk Virginian Pilot*, (February 23, 2001).

[81] Although some lone suicide attacks had occurred before 1944, the Japanese formed their Kamikaze Corps in 1944 to combat the U.S. landing in the Philippines. See Murray and Millet, *A War to be Won*, pp. 493–494.

In stark contrast to U.S. emphasis on and experience in countering SAMs and anti-ship cruise missile attack, effective mine countermeasure forces have not been a hallmark of past U.S. fleets, especially during the Cold War. Mines posed little threat to the wide-ranging, open-ocean, carrier strike and anti-submarine operations envisioned against the Soviet Union. Furthermore, if compelled to operate closer to shore, U.S. forces could rely on the support of large NATO mine countermeasure forces. However, because the fleet's primary future operating environment will be in the shallower waters of the littorals, and because even sophisticated mines are relatively cheap, the future mine threat likely will be more dangerous than in the past. The mere threat of mines will be enough to severely limit a naval task force's freedom of action. Their actual presence guarantees, at the very least, the prolongation of naval counter-network operations; at the very worst, they could wreak havoc on naval expeditionary plans and operations. To ensure their relevance, 21st century naval expeditionary forces therefore must be able to call upon a host of responsive and effective organic and dedicated mine countermeasure capabilities.[82]

Despite the likely lower emphasis potential adversaries will place on operating *large* strike aviation, surface, and submarine forces, U.S. fleet anti-air, anti-surface and anti-submarine warfare skills must not be allowed to atrophy for two compelling reasons. First, retaining these skills is required to hedge against the revival of a serious open-ocean naval threat. Second, and most tactically germane, an anti-access network including even a small number of capable units would greatly complicate naval-expeditionary operations in the littorals, where gaining and maintaining air, surface and undersea situational awareness is a difficult proposition. For friendly naval units operating close to a hostile shore, terrain masking greatly complicates the task of establishing a complete air picture, especially for targets flying nap-of-the-earth profiles over land. High volumes of coastal surface traffic and difficult acoustic conditions in coastal waters work to both the advantage of hostile combatants and submarines seeking to blend into the environment. The littorals therefore imbue even small enemy forces with a lethality above and beyond that suggested by sheer numbers, especially in opening engagements when they will likely have the initiative and the advantage of firing the first salvo.[83]

In sum, an anti-access network consisting of sophisticated, over-the-horizon targeting networks and long-range, anti-ship missiles, dense and sophisticated minefields covered by shorter-range missile and long-range artillery fire, and a very small numbers of submarines capable of firing wake homing torpedoes, supersonic strike aircraft, or missile armed combatants could pose a difficult operational challenge for future naval expeditionary forces. Indeed, some defense futurists seem to believe that the mere existence of anti-access networks, the proliferation of cruise and ballistic missiles and the requirement to fight in restricted littoral waters harkens the end of the surface fleet and maneuver from the sea, and that it will force U.S. forces to fight

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[82] National Research Council, Naval Studies Board, *Naval Mine Warfare: Operational and Technical Challenges for Naval Forces*, (Washington, D.C.: National Academy Press, 2001), pp. 1–3.

[83] Ib S. Hansen, "They Must be Sturdy," *Naval Institute Proceedings*, (October 2000), p. 51. In missile-age combat, research has shown that the side that can "attack effectively first" often has a decisive edge in missile combat. See Captain Wayne P. Hughes, Jr., USN (ret), *Fleet Tactics: Theory and Practice*, (Annapolis, MD: Naval Institute Press, 1986), p. 34.

future regional powers without the benefit of forward bases.[84] As a result, they describe future campaigns as nothing more than prolonged, long-range, artillery duels, conducted between opposing aviation and cruise and ballistic missile forces.

This is a future vision we should not accept, and a future campaign we should not fight. If the United States decides to intervene against a regional power, either unilaterally or as part of an allied coalition, joint, power-projection forces would first commence advance force operations designed to map out *all* existing anti-access networks—both naval and air—and to identify their vulnerabilities. Once this was done, they would mount a host of integrated joint, counter-network attacks as part of a thoroughly planned, phased, theater break-in operation. A long-range air and missile duel may well be part of these advance force operations, but only a part. Naval anti-submarine, mine countermeasure, and joint aerospace, special operations, information warfare, and maneuver forces would all participate in initial counter-network operations. These high-intensity operations would be designed to disassemble or degrade an opponent's command and control and over-the-horizon targeting capabilities and to destroy his long-range strike forces. Once this was accomplished, as in past U.S. expeditionary, power-projection operations, naval forces would support joint ground and air as they phased ashore.

Sea-based offensive and defensive firepower would make important contributions during all phases of a theater campaign. Long-range naval air and missile strikes would target high value enemy network components to cripple his ability to target forces over-the-horizon. Sustained and massed fires would tie down enemy maneuver forces and target important infrastructure and network support targets. Simultaneously, the fleet's defensive fires network would attempt to ward off surprise first salvos and to defend U.S. naval and joint forces from air and missile strikes until fleet and joint counter-fire and joint advance force operations had achieved "network fire superiority" over the enemy's targeting and engagement grids.

To achieve network fire superiority, all units in future naval task forces must be able to do three things. First, they must be able to scan for *all* potential threats in their local operating area and be able to provide their data to other fleet units. Second, they must be able to receive sensor data from friendly units to be aware of potential threats outside of their own sensor envelope and to refine the data collected from their own onboard sensors. Finally, they must be able to carry dense missiles and gun batteries and electronic systems capable of both rapid reaction and of delivering sustained and lethal defensive and offensive fires across all operational dimensions: space, air, surface, sub-surface, and cyberspace.

As should be evident from the foregoing discussion, networked naval sensor and engagement grids, capable of transparent, plug-and-play operations with similar national and joint grids, will be the *sine qua non* for 21st century fleet operations. These grids might be formed by digitally linking either modest numbers of large, multi-mission combatants, large numbers of small, single-mission combatants, or a combination thereof. Despite vocal advocates on both sides of

[84] See for example remarks made by ADM Johnson in "Anytime, Anywhere: A Navy for the 21st Century," and Cohen, Friedberg, and Rosen, *The Future Security Environment 2000–2025 and American Defense Planning*.

this debate, the choice is not as straightforward as either side will admit. More debate and experimentation will be required to determine the attributes of the most effective network.

In high intensity network-versus-network combat, the synergistic relationship between naval fires and maneuver from the sea is unlikely to change in the future; indeed, given the strategic and operational circumstances of the Second Expeditionary Era, the relationship likely will be more critical than in the recent past. Just as Marines seized advanced naval bases in the Second World War to allow the fleet's westward advance across the Pacific, in the future they may seize advanced footholds inside an enemy's anti-access network to help dismantle the enemy's targeting capabilities thus allowing the fleet to move closer to shore. One possible tactic would be to stealthily insert Marines in small, dispersed units that operate as the forward eyes and ears of the networked fleet's sensor and engagement grid and provide fleet units with precision-targeting information on critical enemy network targets.[85] If the tactical situation permitted, another would be for Marine combined-arms units to asymmetrically attack the enemy's fire network. As the Egyptians discovered during the 1973 Yom Kippur War, ground units tasked with rolling back enemy missile forces are a threat with which to be reckoned.[86]

Such early use of maneuver forces would be highly dependent on the enemy threat, but far from impossible. Once ashore, the prospect of operating under an enemy's missile fan would seem far less daunting to ground units than operating under an enemy's artillery and rocket fan, at least in the near to mid-term. Mobile and dispersed ground forces present a much more difficult target for long-range, ground-launched missiles than is generally acknowledged; a missile designed to engage fast-moving ground units requires much more sophisticated (and expensive) targeting, propulsion, seeker, and payload technologies. Indeed, the only surface to surface missile in the world now capable of attacking *maneuvering* ground forces from long range is the Army Tactical Missile System (ATACMS) ballistic missile carrying the Brilliant Anti-Tank (BAT) submunition.[87] More missiles are in development, but they remain expensive and have yet to be proven operationally effective.

Once an enemy's anti-access network has been degraded, maneuver forces arriving from the sea would provide joint planners with the same variety of flexible campaign options that they did in the First Expeditionary Era. Indeed, as was discussed earlier, it seems likely that U.S. Army planners will experiment more and more with new deployment options from the sea. However, what will separate Marines from Soldiers in the Second Expeditionary Era will be that while Soldiers will continue to think of the ships and the sea as a means and avenue of deployment, Marines will think of ships at sea as their main operating and support bases. They will organize

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[85] Colonel Gary W. Anderson, "Infestation Tactics and Operational Maneuver From the Sea," *Marine Corps Gazette,* (September 1997), pp. 70–75.

[86] In preparation for the 1973 Yom Kippur War, the Egyptian Army built a dense aviation anti-access network based on the latest Soviet SAMs along the Suez Canal. The goal of the network was to blunt the striking power of the Israeli Air Force. The network initially performed its function against the Israeli Air Force, inflicting grievous losses in the early day of the war. However, the network was subsequently dismantled by Israeli combined arms *ground* units that forced their way across the canal and rolled back the SAM belt.

[87] Norman Polmar, *Ships and Aircraft of the U.S. Fleet,* 16thedition, (Annapolis, MD: Naval Institute Press), p. 44.

and train either to fight from the sea, moving directly against deep-inland objectives from purpose-built amphibious combatants, or to be supported from the sea, operating ashore as an extended part of the fleet battle network. They will also be prepared for sustained operations ashore as part of joint task forces. In all cases, their heavy, general-support artillery and logistics units would remain at sea for as long as possible. This would reduce their reliance on large land-based supply depots and high-capacity transportation networks, and keep their footprint ashore deliberately light. As a result, Marines would provide few lucrative soft targets for an enemy to attack or interdict and add no additional burdens to already overtaxed local infrastructures. In contrast, as in the First Expeditionary Era, even when Army troops are delivered to a theater by ship, they will be trained primarily to phase both their units and logistics networks ashore—and to keep them there—until a campaign ends.[88]

In like fashion, naval aviation will continue to offer an inherent flexibility that cannot be matched by short-range, land-based, tactical aircraft during both early and later phases of a theater break-in operation. Marine and Navy tactical fighter and strike squadrons have distinctly different, but symbiotic, outlooks: one that emphasizes operating on the landward extension of the littoral and one that emphasizes operating on the seaward extension. However, because both can operate from carriers at sea or from bases ashore, Navy and Marine tactical aircraft squadrons provide joint air campaign planners with versatile basing options ideally suited for campaigns at the end of long SLOCs where few air bases will be readily available.

Without question, though, in the campaign's subsequent exploitation phase, forward air and naval bases, troop concentrations and logistical hubs would continue to draw the attention of enemy long-range strike forces. Once again, however, enemy missiles and aircraft would have to penetrate dense and layered naval expeditionary and joint force defensive fires to do damage. Furthermore, every time they reveal themselves, they would be met with prompt, intense and accurate counter-fire. At the same time, ground-based joint forces would pursue a host of operational countermeasures, among them dispersed operations, hardening of fixed sites and just-in-time logistics, that would reduce their footprint and decrease their susceptibility to a crippling missile attack. As a result, while the future threat of cruise and ballistic missile attack is unquestionably formidable, it is not likely to force the abandonment of phased joint operations ashore—at least for *conventional* operations—during the next two decades.

This conclusion does not imply that a theater break-in operation against even a modest anti-access network would be easy or casualty free. During World War II, combat casualties in terms of days of combat and losses of 1,000 soldiers were three times higher in the Pacific than in Europe.[89] While the enemy and tactics in the two theaters were manifestly different, part of the disparity is directly attributable to the difficulty of mounting naval air and ground operations against an effective, multi-dimensional, anti-access network. Therefore, although it is unlikely that any near- to mid-term future anti-access network would be as formidable as the one U.S. forces faced in the Second World War, break-in operations against even moderately effective anti-access networks would undoubtedly be tough. That said, the underlying assumption of many

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[88] Vernon Loeb, "Marines Mission Stirs Army Debate," *The Washington Post*, (December 9, 2000), p. A32.

[89] Williamson and Murray, *A War to Be Won*, p. 520.

anti-access theorists, like those of past and undoubtedly some future opponents, seems to be that a U.S. military response will be deterred or thwarted by the mere prospect of casualties or damaged/sunk ships. This assumption has yet to be proven true, especially for a determined U.S. response. In any event, it is more of a *political* assumption than a *military* one, and one that should not deter naval planners from preparing for the prospect that they might be asked to sail in harm's way.

One way for fleet planners to both prepare the 21st century fleet to sail in harm's way and to prevent casualty avoidance concerns from restricting future fleet operations would be to pursue a wide range of unmanned systems, autonomous vehicles and robots. Even if casualty avoidance worries abate over time, two things seem certain. First, the lethality of weapon systems seems likely to increase; and 21st century manpower will be both enormously expensive to recruit and retain, and difficult to replace. These trends by themselves would argue for increased reliance on unmanned systems in future fleet combat operations. Indeed, President Bush, in a recent speech at the Citadel, remarked "Now it is clear the military does not have enough unmanned vehicles."[90]

Developing the doctrine and skills needed to effectively merge manned and unmanned network operations, and capitalizing on their respective strengths, should therefore be a predominant focus of experimentation in the next two decades. In this regard, the experiments would be analogous to those of the First Expeditionary Era, which sought to determine the best way to merge naval surface and naval aviation operations. However, experiments with unmanned, autonomous and robotic systems will likely affect the future Networked Fleet on a much wider scale, since the results should be applicable across all aspects of naval expeditionary operations: strike, defense, maneuver, mine warfare, and fleet support.[91]

Finally, as the recent attack on the U.S.S. *Cole* amply demonstrates, the sheer power of naval expeditionary forces often will compel adversaries to pursue asymmetrical tactics against U.S. naval units, especially those that are isolated or steaming independently. Force protection should be an implied task during any future naval deployment, and future commanders must be trained to better anticipate asymmetric threats and to recognize asymmetric attacks. Increased emphasis on organic force protection capabilities will be a bedrock requirement in the Second Expeditionary Era.[92]

THE 300-SHIP FLEET: ON COURSE FOR THE 21ST CENTURY?

The 21st century 300-ship fleet will be the physical manifestation of difficult tradeoffs among many competing capabilities. In this, the 21st century fleet will be no different from those of the past. Selecting the fleet's most appropriate capabilities and structuring it to deal with the most

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[90] James Gerstenzang, "Bush Offers New Vision of the Military," *Los Angeles Times,* (December 12, 2001), p. 1.

[91] See for example Geof S. Fein, "Navy Looking to Unmanned Vehicles for New Missions, Including ASW," *Inside the Navy*, (August 14, 2000).

[92] Sydney J. Freedberg, Jr., "Beyond the Cole." *National Journal,* (October 21, 2000).

likely threats is the key dilemma now facing naval planners and has been the subject of intense debate within both the DoN and the Bush Administration.

Based on the foregoing discussion, the relevancy of the 300-ship fleet should rest, first and foremost, on its ability to go wherever needed, especially when not wanted. To be best prepared to support 21st century joint expeditionary operations and joint campaigns, future naval expeditionary forces must be designed to break into any potential operating area and to retain their freedom of action for as long as they choose to remain. Their defenses must be strong enough to thwart enemy attacks, particularly in the early counter-network portion of a campaign when the enemy's anti-access network is still intact. Once established in theater, they must be able to project both fire and maneuver throughout an enemy's operational depths in support of joint campaign objectives. Moreover, they must be able to accomplish these two key operational tasks without the *initial* benefit of forward bases. This operational challenge should define the fleet's "first mission"—the mission that should guide the development of its future doctrine, fighting organizations and capabilities.

There are those who believe that the Navy and Marine Corps are not up to the challenges of littoral combat operations in the 21st century. As discussed in Chapter I, the most vocal critics are those in the "large fleet" faction, who base their judgments on fleet adequacy primarily on the size of today's fleet, and the projected size of tomorrow's fleet.[93] It is worth the time to examine—and dispel—their concerns. Figure 2 compares the overall TSBF and the surface combatant fleet in service on December 31, 1989, with the fleet in service on the last day of FY 2001. Also included in the comparison is the surface combatant fleet that will exist at the end of FY 2011 if current plans are executed. Recall that patrol craft were included in the 600-ship fleet count, while they are now excluded from the current TSBF count. To allow for more accurate fleet comparison, patrol craft are included in all three fleet counts, which increase the official FY 2001 and FY 2011 TSBFs by 13 and zero ships, respectively. The Naval Reserve Force (NRF) ships shown are those in MobCat A, manned by a combination of active duty and reserve crews and immediately available for wartime tasking.[94]

On December 31, 1989, then, as the Cold War was drawing to an end, the vaunted 600-ship Navy numbered 552 vessels in its TSBF. The surface combatant fleet included 15 deployable carriers and 4 battleships, for a total of 19 capital ships.[95] The remainder of the fleet consisted of 104 battle force capable (BFC) combatants and 100 protection of shipping (POS) combatants (including 26 in the NRF). The former consisted of the large, guided-missile cruisers and destroyers and general purpose destroyers that sailed with and protected the 19 high-value capital units; the latter were smaller frigates tasked with escorting amphibious task forces, underway replenishment groups and the convoys necessitated by the open-ocean Soviet submarine threat.

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[93] Fisher, "Challenge and Opportunity," p. 7.

[94] Numbers are derived from *Ship Forces of the U.S. Navy: Historical Force Levels FY62 through FY93*, and the December 10, 2001 versions of *Department of the Navy Ships and Aircraft Supplemental Data Tables.*

[95] There is normally at least one carrier in long-term overhaul or undergoing an extended service life extension program, or SLEP. This carrier is considered to be non-deployable, and therefore not counted in the overall TSBF. The 1989 fleet therefore had 16 total carriers, while the 2001 fleet has 12.

The 1989 fleet was large enough to keep three CVBGs and one Battleship Surface Action Group (BB SAG) forward deployed during peacetime. This level of forward presence provided *continuous* naval, strike-group coverage in each of the Navy's three primary operational hubs: the Mediterranean Sea, the Indian Ocean and Persian Gulf, and the Pacific Ocean.

Figure 2: The 600-Ship v. 300-Ship Navies: A Large Fleet Faction Perspective

	1989	2001	2011
Total Ship Battle Forces	**552**	**329**	**314**
Deployable Capital Ships	**19**	**11**	**11**
Carriers	15	11	11
Battleships	4	0	0
BFC Combatants	**104**	**80**	**90**
POS Combatants	**100**	**35**	**30**
Active	74	27	20
Reserve	26	8	10
Patrol Combatants	**6**	**13**	**0**
Total Combatants	**229**	**139**	**131**
Gaps in Theater Coverage	**No**	**Yes**	**Yes**

By comparison, on September 30, 2001, at the beginning of a new century, the 300-ship Navy numbered 329 ships (316 TSBF ships plus 13 patrol combatants). The capital and surface combatant fleets included 11 deployable carriers, no battleships, 80 BFC combatants and 35 POS combatants (including 8 in the NRF). By considering a Carrier Battle Group stationed in Japan to be constantly forward deployed, the 2001 fleet could keep three CVBGs deployed, albeit with periodic gaps in theater naval task group coverage

At first glance, the arguments of the large fleet faction seem compelling. After all, both the 2001 TSBF and its surface combatant fleet are approximately 40 percent smaller than those found in 1989. However, a more detailed examination of the numbers tells a somewhat different story, and highlights the dangers of comparing fleet numbers without regard to their associated contemporary security environments or required missions.

During the 1980s, Navy planners rationalized the 600-ship Navy's surface combatant requirements with an easy to understand template (Figure 3).[96] This template was elegant in its simplicity: it listed the major fleet formations needed to fight a naval war with the Soviet Union, as well as their component parts. More importantly, it was unburdened by assumptions about ships laid up in maintenance; about ships diverted for drug missions; or about the number of ships off the firing line and being replenished—all assumptions subject to endless question and debate. Instead, it simply listed the required building blocks, implying, quite rightly, that should war actually break out, naval commanders would make do with what was actually available. 1989 combat requirements called for 137 BFC combatants of all types (nuclear powered guided missile cruisers (CGNs), guided missile cruisers (CGs), guided missile destroyers (DDGs), and

[96] Polmar, *Ships and Aircraft of the U.S. Fleet*, 14th edition, p. 110.

general purpose destroyers (DDs)), and 101 POS combatants (frigates (FFs) and guided missile frigates (FFGs)), for a total of 238 surface combatants. The 1989 Navy actually numbered 204 combatants (104 BFC and 100 POS), 34 vessels below its wartime requirement.

Figure 3: 1989 Surface Combatant Force-Level Objectives

	CGN	CG47	DDG51	DDG993	DD963	FF/FFG	Totals
7 CBVFs[97] with 2 carriers	6	21	29	0	28	0	**84**
1 CVBG	0	2	2	0	2	0	**6**
4 SAGs with 1 BB	0	4	12	0	0	0	**16**
2 ATFs	0	0	10	4	0	8	**22**
7 Mil. Convoys	0	0	0	0	7	63	**70**
10 URGs	0	0	10	0	0	30	**40**
Total	**6**	**27**	**63**	**4**	**37**	**101**	**238**

On the day the Soviet Union collapsed, the Cold War requirement for seven destroyers and 63 frigates to escort Atlantic convoys vanished along with the specter of a Soviet-style, open-ocean, anti-SLOC campaign. Moreover, the 2001 combatant fleet had eight fewer capital ships to protect (four carriers and four battleships). Using the 600-ship Navy's own planning metrics, *and assuming no other reductions to the requirements in Figure 3,* 2001 surface combatant fleet requirement would be 90 BFC combatants (1989 BFC requirement of 137 ships minus 16 SAG escorts, 24 carrier escorts, and seven convoy escorts) and 38 frigates (1989 POS requirement of 101 ships minus 63 convoy escorts), for a total requirement of 128 surface combatants. In the event, the 2001 Navy actually numbered 115 combatants, split between 80 BFC combatants and 35 frigates. By comparison, then, the combined 2001 surface combatant fleet could meet 89.8 percent of its comparative mission requirements (115 of 128 total combatants), as opposed to 85.7 percent in the 1989 fleet (204 of 238 total combatants). In terms of *relative* combat requirements, then, the 2001 Navy was in far better shape than a simple hull comparison first suggests.[98]

Of course, the members of the large fleet faction would argue that the loss of eight capital ships and their attendant escorts is a major loss to the fleet and to the nation. However, they are careful not to couch their arguments in terms of lost fleet *fighting power.* As will soon be discussed, this is an argument that simply fails under serious scrutiny. Instead, they argue that the lost ships result in dangerous gaps in continuous, naval-strike coverage in the Mediterranean Sea, Persian Gulf and Pacific Ocean. As a result, in times of crisis, carrier strike groups must be shuttled from one theater to the next, leaving some critical theaters uncovered and vital U.S. interests there vulnerable to further mischief. During the Balkan War, they point out, the carrier *Kitty Hawk* deployed from its homeport in Japan, leaving the Pacific theater devoid of aircraft carrier

[97] "CVBFs" stand for carrier battle forces which are multi-carrier, task groups while single-carrier, task groups are referred to as "carrier battle groups" or "CVBGs."

[98] The comparison between mission requirements is for illustrative purposes only. The 2001 Navy no longer builds its ships to 600-ship fleet requirements.

coverage for a period of 86 days. Furthermore, if risky gaps in naval coverage were not enough, the constant demands on the small fleet mean that 33 percent of the fleet is forward deployed at any given time. At this rate of deployment, the argument goes, both ships and Sailors will soon wear out, and there will not be a Navy to call upon if a future crisis occurs. The smaller fleet therefore puts the nation at grave risk.[99]

This argument is wrong on both counts. It is true that the regional Commanders-in-Chief (CinCs) and the large fleet faction would prefer to have continuous CVBG and ARG/MEU coverage in each of the three main operating theaters. This preferred operational pattern would require a force structure of 15 carrier battle groups and 14 ARGs—the numbers called for in the reduced risk fleet. However, the 1997 QDR adopted a strategy that required the fleet to fight overlapping major theater wars in only two distant theaters. The current 11-ship deployable carrier force is designed to meet the needs of this strategy, and it is large enough to ensure that simultaneous crises in two distant theaters can be covered by forward deployed carrier battle groups without the need to mobilize and surge additional naval forces from the United States. So, while it is true that the deployment of the *Kitty Hawk* during the Balkan War resulted in a gap in carrier coverage in the Pacific, it is also true that this gap occurred while U.S. carriers were engaged in sustained combat operations in two different theaters for the first time since World War II (the War in Kosovo and the contested Air Occupation of Iraq). The 300-ship force structure is therefore performing as designed, and well within the parameters of risk accepted by the 1997 QDR strategy.

An analysis of ship steaming days also undermines the claim that the smaller fleet is causing ships to wear out because of increased usage. The Navy budgets 50.5 steaming days per quarter for ships deployed and 28 days per quarter for non-deployed ships. The actual numbers have consistently averaged approximately 55 and 28 days, respectively, since 1986, with a large spike only during the major fleet deployment associated with the Persian Gulf War. More telling, however, is that there was no appreciable increase in the number of ship steaming days per quarter during the twelve years between 1989 and 2001, which saw a 223-ship drop in the TSBF. If the fleet or its Sailors are wearing out, the smaller size of the fleet does not yet appear to be directly attributable.[100]

If anything was wearing out the Sailors and ships during the 1990s, it was most likely the sheer difficulty in managing a substantial 40 percent fleet reduction. Between 1989 and 2001, the Navy decommissioned some 350 ships and submarines of all types—an average of two to three ships *per month.* Over the same time, the Navy commissioned over 125 new ships and completed over 20 major modernizations—an average of just over one per month. It is not hard to imagine the difficulties in determining fleet manpower requirements or juggling fleet maintenance and deployment schedules in the midst of such turmoil. In contrast, as was shown in Figure 2, the size of the fleet is expected to remain relatively flat over the course of the next decade, with new

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[99] See Tom Philpott, "World Events Increase Demand for Naval Forces," *Sea Power,* (January 2000), and Daniel Goure, "US Navy: Stretched Thin," *Defense News,* (June 12, 2000).

[100] *Highlights of the Department of the Navy FY 2002 Budget,* (Washington, D.C.: Office of Budget, DoN, June/July 2001), p. 2–4.

construction ships generally replacing existing ships on either a one-for-one or a one-for-several basis. The resulting fleet stability will likely be translated into more predictable deployment and maintenance schedules.

In any event, operational tempo (OPTEMPO) and personnel tempo (PERSTEMPO) rates would decrease only if presence requirements remained steady as fleet numbers went up. This is not what the large fleet faction proposes, however. They instead would use increased fleet size to cover more demanding fleet presence requirements. As a result, even if the Navy expanded to the 360-ship reduced risk fleet level proposed by advocates of a larger fleet, ships and Sailors would continue to deploy at approximately the same rates that they do today.

Unless and until the large fleet faction can make the case that the 300-ship Navy is unable to meet its *warfighting* requirements, their arguments are less than compelling. However, the arguments of a second group of critics, the "revolutionary" faction, attempt to make that very case. The revolutionary faction is made up of those who foresee an impending revolution in anti-access technologies and systems, and who believe the current and planned capabilities in both the Navy and Marine Corps to be ill-matched for the revolution's challenges.

The revolutionary faction is less homogenous than the large fleet faction, since its members have different views about what best constitutes a future "RMA fleet." Faced with the prospect of taking on an anti-access network armed with tactical ballistic and cruise missiles, for example, some espouse a large, networked fleet of smaller vessels, specifically designed for work inside the littorals. Others see the gradual sunset of surface vessels altogether and a future dominated by submersible and semi-submersible vessels. What forges the people who hold these different views into a coherent faction is that they all advance the argument that the fleets of today and tomorrow are on the wrong course to win a time-based competition with emerging anti-access networks.

This argument seems premature. Naval historians will likely mark the last two decades of the 1990s as having seen one of the most remarkable naval technical revolutions in history—not just U.S. history, but naval history. For some members of the revolutionary faction—and, certainly, most members of the large fleet faction—the full story behind this technical revolution seems either to have been ignored or largely discounted. This is unfortunate, since the revolution has given the fleet combat capabilities quite unlike those found in past U.S. fleets, and these capabilities seem more than up to any time-based network versus network competition. Indeed, one of the problems encountered when examining arguments by either the revolutionary or large fleet factions is that the metrics they use to support their respective cases are, in the case of the former, ill-defined, and in the case of the latter, obsolete.

Developing New Metrics for 21st Naval Power Projection

One consequence of the change in strategic naval circumstance outlined in this chapter is that measuring the operational adequacy of the Total Ship Battle Force by simply counting its ships and comparing them to another fleet is increasingly irrelevant. Of course, comparing current friendly fleet ship counts with past *friendly* fleet counts has never made any sense, as it provides

no credible basis for judging the current fleet's capabilities against its most likely operational challenges. However, when the operational mission of the fleet was to sink an opposing navy, comparing fleet size with those of *opposing* fleets made great sense. Now, given the lack of credible *naval* threats, the fleet's operational mission is to project power from littoral waters, and the two-Navy or three-Navy standards by which past U.S. naval commanders judged the operational capabilities of their fleets are simply no longer germane. Current and future fleet capabilities must now be compared against the emerging capabilities of potential anti-access networks that may or even may not include naval vessels. As a result, new measures of fleet-relative combat power—with respect to opposing networks, not past U.S. or enemy fleets—must be developed.

Possible metrics for 21st century, littoral, power-projection potential in the face of an anti-access network might include defensive firepower potential, measured by the number of fleet defensive missiles carried, and pulse and sustained, offensive, precision-firepower potential. Pulse firepower is a measure of the fleet's ability to saturate an enemy's defenses to achieve either network-wide effects or to create local effects that can be further exploited; it might be measured by the number of fleet strike missiles in a ready-to-fire status or the number of targets a carrier air wing can strike in a single day. Sustained firepower is a measure of the fleet's ability to conduct such massed precision attacks repeatedly for the duration of a campaign; it could be measured both by the sustained strike power of the carrier air wings, fleet missile magazine capacity, and at sea ordnance replenishment capabilities.[101]

In addition to defensive and offensive firepower potential, the ability to project and sustain maneuver forces from the sea and the effectiveness of organic and dedicated mine countermeasure capabilities would be two additional key metrics. A final one, and one most often ignored by the large fleet faction, would be the ability to sustain combat forces at the end of long SLOCs. It could be measured by the ratio of combat logistics ships to combatants.

When using capability metrics such as these—metrics that focus on the fleet's fighting potential rather than the number of hulls in the TSBF—the true impact of the ongoing naval technical revolution is put into sharper focus, and the concerns of both the large fleet and revolutionary factions are put largely to rest. Not only is the smaller fleet more powerful than any of its predecessors, through a combination of technological adaptation, good planning, and favorable strategic circumstances, the 300-ship fleet is in great shape to compete in the early stages of a time-based operational competition with opposing anti-access forces. Indeed, the following review of emerging naval, power-projection capabilities suggests that while the fleet's developing fighting power is much greater than that found in past fleets, it could be even greater

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[101] Andrew Krepinevich, *The Trident "Stealth Battleship:" An Opportunity for Innovation,* (Washington, D.C.: CSBA, February 24, 1999), p. 4.

if the fleet adopted new organizations and operating patterns to better exploit its dramatic new capabilities.

III. THE QUIET (R)EVOLUTION IN THE SURFACE COMBATANT FLEET

THE STRIKING (R)EVOLUTION IN THE CAPITAL FLEET

The 600-ship Cold War fleet was unquestionably carrier-centric. Recall that war plans called for employing its 15 deployable carriers in seven, two-carrier CVBFs, and one, single-carrier CVBG. This wartime force allowed the Navy to keep three CVBGs forward deployed during peacetime with no gaps in theater coverage.

The capital fleet was rounded out by the *Iowa*-class battleships, which lent their names to four BB SAGs. These World War II dreadnoughts were visually impressive ships that boasted unmatched passive protection. However, their long-range firepower of 32 Tomahawk cruise missiles was barely half that of modernized destroyers, and their main battery of 16" cannons, while powerful, ranged only to 23 miles. More critical, however, was their woeful lack of modern anti-air and anti-missile armament. It is ironic that these fast battleships started their careers as anti-air "shotguns" for carriers, armed as they were with vast batteries of anti-aircraft guns. Yet, in the missile age, armed only with 4 rapid-firing gatling guns for self-defense, they were reduced to being escorted by guided-missile frigates and destroyers in the presence of even the most modest air and missile threats.[102]

By 2001, all four of the manpower-intensive battleships had been long-since retired, and their equivalent 16 cruiser crews had been redistributed throughout the fleet. Their passing is mourned only the large fleet faction and those who never had to recruit during the 1990s. Meanwhile, although the carrier force has shrunk to the 11 deployable carriers necessary to support the current warfighting strategy, its "Sunday punch"—delivered by its embarked carrier air wings—is dramatically more powerful than in the past. Since 1989, the average number of strike aircraft in the typical air wing has increased from 36 to 46 (an increase of 28 percent), while at the same time the average number of targets (aimpoints) each plane can hit per sortie has increased from one (for the A7 and A6 bombers in 1989) to four (for the F/A18s today). The result has been an explosive growth in carrier air wing strike power: compared to a typical 1989 wing, the 2001 air wing can generate 28 percent more strike sorties per day (207 versus 162), and strike over four times the total number of aimpoints per day (693 versus 162). *In other words, in 2001, a **single**-carrier battle group can strike over two times the number of aimpoints per day than could a **two**-carrier battle force of just a decade ago.*[103]

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[102] Polmar, *Ships and Aircraft of the U.S. Fleet*, 16th edition, p. 107.

[103] These figures are based on the most optimistic of assumptions. For example, target range is only 200 nautical miles (meaning they require no aerial refueling) and weather is not a factor. However, since the assumptions are consistent between air wings, the comparative measure is still useful. See Lieutenant Commander Ed Langford, *CVW Strike Sortie/Aimpoint Improvement*, unclassified point paper, (Washington, D.C.: DoN, (N8QDR), January 18, 2001).

Viewed another way, the 1989 capital fleet provided the hubs for 12 independent wartime strike forces—seven CVBFs, one CVBG, and four BB SAGs—one-third without the benefit of organic naval air cover. Not counting the short-range targets that could be engaged by the 16" cannons on the battleships, first-day-of-the war pulse firepower potential of the entire capital fleet was 2,558 deep targets, and its sustained firepower potential was 2,430 per day thereafter.[104] In contrast, although multi-carrier task forces remain the preferred method of wartime employment, the current carrier fleet could, if required, provide the hubs for 11 independent strike forces, each with their own organic air cover. Together, they could theoretically attack no less than 7,623 targets a day, indefinitely—amounting to pulse and sustained strike firepower rates three times those of the 1989 fleet.

The dramatic comparative improvements to carrier strike power have been matched by similar impressive advances in carrier command and control capabilities. By virtue of limitations to their communications/data transfer capabilities, the 1989 carrier fleet was configured for independent carrier battle force and battle group operations. Carrier communication suites were incapable of receiving quality targeting imagery in a timely fashion, if at all; interoperability with the Air Force's Air Tasking Order systems, as demonstrated during Desert Storm, was marginal.[105]

In contrast, current carriers are now best described as world-class information hubs. With access to the large bandwidth pipes provided by the Defense Satellite Communications System, the Global Broadcast System, Challenge Athena, Ultra High Frequency (UHF) Medium Data Rate and INMARSAT high-speed data systems, and outfitted with both classified and unclassified local area networks, satellite telephone circuits and video-teleconferencing capabilities, their strike groups have sustained near-real time access to multi-source targeting quality information. Moreover, all of their mission-tasking-and-planning systems are now fully compatible and interoperable with all Air Force campaign planning/strike tools. Because of their formidable command and control capabilities, today's carriers are now Joint Forces Air Component Command (JFACC) capable, meaning they have the onboard capability to control and coordinate *all* theater air operations.[106]

The improvements to carrier information capabilities are as much of a combat multiplier as are improvements to their air wings' strike power. For example, the *Enterprise* Battle Group used these new capabilities to cut operational planning time by one-third during a 1998 deployment to the Persian Gulf. Their Air Intercept Controllers were able to provide near-instantaneous feedback for briefing and debriefing aircrews. Furthermore, an allied maritime interdiction surge operation was conceived, planned and coordinated almost entirely on the Battle Group classified internet. None of these actions would have been remotely possible in 1989.[107]

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[104]Numbers assume the four Battleships expend their entire load of 128 Tomahawk cruise missiles on the first day of the war and that the Tomahawks are not reloaded at sea.

[105] Norman Friedman, "Naval Lessons of the Gulf War," *Desert Shield/Desert Storm: the 10th Anniversary of the Gulf War,* (London, UK: Faircount LLC, 2000), p. 127.

[106] Captain Jacob L. Shuford, USN, "Tomorrow's Sea Power Plays Today," *Naval Institute Proceedings,* (January 2000), p. 32–35.

[107] Ibid.

In summary, the only two areas in which the current capital fleet does not exceed the capabilities of the 1989 force is in total number of hulls and *short-range* naval gunfire. As previously discussed, the former translates into slightly lower levels of *peacetime* carrier presence. Given the nature of expected maneuver operations in the littorals (to be discussed in Chapter V), the latter has no operational impact. In terms of strike power, network connectivity and joint interoperability, the 2001 capital fleet is vastly more capable than any in the past. With new platforms, technologies and, most importantly, new integrated fleet organizations, it will become more so in the future.[108]

Juxtaposed against the undeniable increase in carrier fighting power are arguments made by some in the revolutionary faction that aircraft carriers—indeed, all surface ships—are increasingly vulnerable. Many in the faction believe that the appearance of anti-access architectures with over-the-horizon radars, ocean surveillance satellites, stealthy unmanned aerial vehicles, and means of long-range precision strike will usher in the end of the aircraft carriers dominance in naval operations, much like air power ushered in the end of battleship dominance in the First Expeditionary Era.[109] On balance, however, it seems that aircraft carriers will remain important contributors to anti-access operations for at least the next two decades. This judgment is based on seven interrelated factors.

First, airpower is the increasingly central feature of U.S. joint combat operations. The opening air campaign of the Persian Gulf War, the long air occupation over Iraq, the war in Kosovo, as well as the ongoing campaign in Afghanistan all demonstrate the importance that U.S. military planners place on establishing control of the air and in exploiting it in dramatic ways. Barring a radical change in the nature of integrated air defenses, there seems no reason to believe the emphasis on airpower will decline over the next two decades. If anything, given U.S. aerospace dominance, there is every reason to believe that the role and emphasis on airpower in future joint operations will only increase.[110]

This judgment applies equally to the role of air power in future naval operations. New aircraft and weapons will increase both the range over which naval aviation strike forces can attack, as well as the precision with which they can strike. The F/A18E/Fs now entering service have 15 percent more range in comparable attack missions than the F/A18C/Ds they replace.[111] The Joint Strike Fighter (JSF) now in development will improve attack ranges even further. In fact, with the JSF carrier air wings should be able to deliver more payload on targets 450 miles inland than fighters can today at 250 miles.[112] Equally important, the weapons they drop increasingly will be

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[108] For a good discussion of the planned improvements in the future carrier force, see Richard Scott, "Charting a Course to CVNX," *Jane's Navy International*, (March 2001), pp. 19–24; Harold Kennedy, "New Navy Flattop Heralds Next Carrier Class," *National Defense*, (March 2000), p. 18; and Hunter Keeter, "Lower Cost, More Flexibility Keys to New Carrier Plan," *Defense Daily*, (March 15, 2000), p. 3.

[109] See Dave Moniz, "Biggest U.S. Ships Called Vulnerable," *USA Today*, (May 21, 2001). See also Loren Thompson, "What it Takes to Kill and Aircraft Carrier," *Defense Week*, (June 11, 2001).

[110] Fareed Zakaria, "Face the Facts: Bombing Works," *Newsweek*, (December 3, 2001).

[111] Bill Sweetman, "Boeing F/A-18E/F Super Hornet," *World Airpower Journal*, (Autumn/Fall 2000), p. 50.

[112] David A. Perin, "Are Big Decks Still the Answer?" *Naval Institute Proceedings*, (June 2001), p. 32.

precision weapons that are much more effective than unguided, "dumb" bombs. For example, only about 10 percent of the weapons dropped from aircraft in the Gulf War were precision guided; by Afghanistan, the number had risen to 90 percent.[113] Moreover, the increasing ranges of these weapons allow the launching aircraft to remain outside of an enemy's terminal air defenses. The Joint Direct Attack Munition (JDAM), used to such effect in Kosovo and Afghanistan, has a range up to 25 nautical miles, with accuracies better than 10 feet. In the future, the JDAM should be complemented by the Joint Stand-off Weapon (JSOW) and Standoff Land Attack Missile (SLAM), with ranges of 35 and 171 miles, respectively. With these new, longer-range, precision-strike weapons, and even more capable ones in development such as the 300-mile Joint Air-to-Surface Standoff Missile (JASSM), manned naval aviation should be able to continue to make important contributions to counter-network and subsequent fleet and joint attack operations for some time.[114]

Second, the volume of sustained firepower that can be generated off of the decks of aircraft carriers will be difficult to replace by missile forces. For example, with precision weapons like JDAM and JSOW now entering the Navy's strike inventory, a single carrier air wing can deliver the equivalent of 4,000–5,000 Tomahawk cruise missile strikes over a 30-day campaign.[115] And as planned improvements to carrier strike fighters and their ordnance are introduced over the course of the next decade, carrier striking power will only increase. By 2010, for example, once the E/F version of the F/A18 is in widespread service, a single carrier air wing is expected to be able to generate 216 strike sorties per day and service *1,080 aimpoints* in the process.[116] Moreover, even if missiles could replace the *volume* of fire that carrier air wings are capable of producing, the inherent *flexibility* of manned aircraft has yet to be fully duplicated by missile guidance systems. Although there have been great advances in missile technology, for the near to mid-term, long-range missile strikes will remain most effective against fixed or less mobile targets, and aviation strikes will be more effective for moving and time critical targets.[117] In fact, with concerns over collateral damage, some analysts posit that human pilots will become more important in the future than in the past, since only their onscene presence and judgment will be adequate to make the final decision to engage a target.[118]

Third, in the Second Expeditionary Era, U.S. joint and naval forces are most likely to be operating along the vast Asian littoral, at the end of long SLOCs, where the presence of land air bases cannot be guaranteed. Having 11 deployable air bases and the capability of *massing* an air force of equal size or larger than most world air forces, *at sea*, remains a core capability of the

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[113] Thomas E. Ricks, "Bull-Eye War: Pinpoint Bombing Shift Role of GI Joe," *The Washington Post,* (December 2, 2001), p. A1.

[114] Sweetman, "Boeing F/A-18E/F Super Hornet," pp. 46–47.

[115] Perin, "Are Big Decks Still the Answer?" p. 32.

[116] Again, this figure is based on very optimistic assumptions. The Navy could not sustain these levels at ranges longer than 200 miles. Langford, *CVW Strike Sortie/Aimpoint Improvement* and John B. Nathman, "A Revolution in Strike Warfare," *Sea Power*, (October 1999), pp. 28–31.

[117] Krepinevich, *The Trident "Stealth Battleship:" An Opportunity for Innovation*, p. 4.

[118] Norman Friedman, "Fighting Far from the Sea," World Naval Developments, *Naval Institute Proceedings*, (December 2001), pp. 4–6.

U.S. fleet. This is also a capability unmatched by any other navy, or nation, in the world. Indeed, as was shown during operations in Afghanistan, carriers can be converted for other uses, such as special operations support bases.[119] Having these mobile air bases helps to underwrite an ability to conduct world wide *unilateral* military action that defines the U.S. military's superpower status. It is a capability that the fleet, joint planners and the nation should fight to retain.

Fourth, discussions about a carrier air wings' great striking power should not mask their other vital contribution: providing local air superiority over widely dispersed naval task groups and over forces operating inland. In the early stages of World War II, when airplanes were built to perform a single primary mission, naval commanders had to make hard choices about the make up of their air wings. For example, at the start of the war, three-fourths of a carrier's air wing were strike aircraft, while the remaining 25 percent were fighters tasked with defending the carrier and its bombers. By 1944/1945, new dual-purpose fighter-bomber designs allowed 70 percent of the air wing to be able to perform defensive fighter missions with little loss to its overall strike potential. The ability to flexibly adapt the air wing for either air-to-air or air-to-ground missions proved critical when the threat of kamikaze cruise missile attacks replaced that of attacking Japanese surface units and carriers.[120] With modern, multi-purpose, strike fighters like the current F/A18 and the future JSF, 100 percent of the aircraft in the carrier air wings are capable of contributing to both fleet air defense or attacks on enemy networks and forces. As a result, the wings can add to the fleet's defensive depth early during theater break-in operations when the enemy's targeting and engagement networks are still intact, and gradually shift to offensive operations as circumstances dictate. Such built-in flexibility adds great power to fleet counter-network operations.

Fifth, it seems likely that over the course of the next two decades many of the carrier's vulnerabilities can be compensated for by adjusting battle fleet operations and tactics. These adjustments are possible because of the aforementioned flexibility of the carrier's embarked air wing, as well as the remarkable increase in the surface fleet's striking power. As recently as 1989, the striking power of the fleet resided primarily on the decks of the carriers, but it does so no longer. As will soon be discussed in detail, the surface fleet's striking power is much more evenly distributed, and it, in turn, is augmented by the stealthy strike power of the attack submarine fleet. This distribution of fleet strike power allows for more flexible and unpredictable attack options, especially during the early stages of a theater break-in operation when carriers are the most vulnerable.[121] For example, during the early stages of a counter-network attack, carriers could operate far over the horizon where their supporting missile defenses are optimized and where their air wings can greatly improve the defenses of an entire naval task force. Meanwhile, surface combatants and submarines would initiate fleet attacks with long-range, cruise-missile strikes, anti-submarine sweeps, and covert minefield mapping and destruction. Over time, these advance force operations would allow carriers to come closer to shore to add the striking power of their air wings in support of joint campaign objectives.

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[119] Steven Vogel, "A Carrier's Quiet Key Mission," *The Washington Post*, (December 24, 2001), p. 1.

[120] Bob Kress and Rear Admiral Paul Gillcrist, USN (ret), "Battle of the Super Fighters," *Flight Journal*, (February 2002), p. 31.

[121] Nathman, "A Revolution in Strike Warfare," pp. 28–29.

Sixth, attacking a carrier is not an easy proposition. To target a carrier steaming over the horizon, an enemy would either have to tag and follow it with a submarine or surface ship, find it by using reconnaissance aircraft or unmanned aerial vehicles, or use other over-the-horizon targeting methods such as satellite-based radar. All of these options are problematic. Submarines and surface ships would have to operate well inside the engagement envelope of the carrier's defensive screen; unchallenged air superiority over the carrier would place enemy air platforms at great risk; and a real-time, over-the-horizon targeting capability would require a minimum of 138 low-earth orbiting satellites—a capability nowhere on the horizon. Of course, an enemy's targeting problem would be easier the closer a carrier operates to a coast, and in chokepoints such as the Strait of Hormuz. Once again, however, one would expect enemy targeting capabilities to bear the full brunt of initial counter-network salvos, and carriers would initially be kept at the extreme edge of the enemy's targeting network.[122]

Even if a carrier is located, maintaining a reliable target track to ensure a successful terminal attack would be extremely difficult. A nuclear-powered carrier can steam at over 30 knots indefinitely. This means that in 30 minutes, the area of uncertainty in which a carrier can hide after an initial observation is 700-square miles. In 90 minutes, the area grows to over 6,000 square miles. As a result, the terminal search volume for incoming missiles must be very large. Moreover, the carrier and its escorts carry a variety of active and passive electronic countermeasures that further complicate efforts to track and target them. Taken together, the combination of continual movement, electronic countermeasures, and other passive and active deception measures presents an enemy with an extremely difficult target tracking and terminal engagement challenge. An effective engagement network would require both extensive over-the-horizon targeting capabilities and weapons with brilliant guidance mechanisms, such as maneuvering, ballistic-missile, re-entry vehicles or long-range, cruise missiles with an autonomous search capability. Both are expensive propositions, and both would require troops with years of operational training and experience to best employ them. Manned supersonic aircraft could act as modern day kamikazes, but the likelihood of these weapons being used in any other scenario than a surprise first strike against an unwarned carrier seems highly improbable.[123]

Finally, the carrier's size and flexibility allows it to readily operate new aviation platforms with modest modifications. A carrier is essentially a large flight deck and a large hangar deck. It has few onboard sensors and even fewer complicated ship missile or gun systems. Their adaptable open architecture design has allowed carriers to age gracefully and to continue to provide important fleet contributions throughout their long service lives. The U.S.S. *Midway* serves as a perfect example. It was commissioned on September 10, 1945, at the very end of World War II. Although originally designed to carry piston-engine fighter-bombers and bombers, modifications allowed it to accept and operate successively heavier and more powerful jets as they were

[122] Thompson, "What it Takes to Kill a Carrier."

[123] Lieutenant Commander Tom Druggan, USN, "Carriers Aren't Sitting Ducks," *Naval Institute Proceedings*, (July 2001), pp. 78–79.

introduced into the carrier air wings. As a result, the *Midway* served well into the jet age, ending its fleet service in 1992.[124]

The next 47 years will likely see as dramatic changes to the character of the fleet's aviation arm as was evidenced over the life of the *Midway*. It is not hard to imagine a greater preponderance of unmanned air combat vehicles or unmanned aerial vehicles in the carrier air wings of the future. Combat operations in Kosovo and Afghanistan are spurring increased attention on and priority to the role and use of unmanned aircraft of all types.[125] The inherent size and flexibility of the carrier's design will provide future fleet planners many options for integrating manned and unmanned air operations into battle fleet operations, and for responding to emerging threats as the operational competition with anti-access networks unfolds.

Given these seven factors, the near- to mid-term value of carriers in the Second Expeditionary Era still seems to be high. The key uncertainty seems to be the most prudent level of investment in the carrier fleet. Is the current carrier force, vastly more capable and powerful than it was just 10 years ago, too large for current budgets? Is the desire to maintain 11 deployable carriers starving the rest of the fleet of funds? Should the follow-on to the current *Nimitz*-class, nuclear-powered carrier, the CVNX, be cancelled? Should some carriers be prematurely retired to free up funds to start more aggressive experimentation in replacing or augmenting the carrier air wing's manned aircraft with unmanned aerial vehicles and unmanned combat aircraft?

Given the centrality of airpower in U.S. joint and naval operations, and until carrier vulnerabilities become more acute, perhaps a better first order question is this: Is there a better way to rationalize *naval* aviation in the Second Expeditionary Era? In other words, are there different ways to structure Navy and Marine Corps aviation so as to take better advantage of carrier combat capabilities and to free up funds to hasten the transformation of naval air power? The answer clearly seems to be yes.

The Navy currently has 10 active carrier air wings for its 11 deployable carriers (a twelfth always being in long-term overhaul). Although the Navy has a reserve carrier air wing, gaining an additional active air wing has long been a goal of fleet planners, if for no other reason than to solve the perpetual operational headaches of having to juggle air wing and carrier training and deployment rotation schedules.[126] The problem with this goal is the high associated cost—the procurement costs alone are estimated to be approximately $6 billion.[127] Adding to the problem, the Navy is already short of the tactical aircraft needed to fill out even its 10 current active air wings. Today, the Navy has 24 strike fighter squadrons, flying F/A18A and C *Hornets*, and 12

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[124] Polmar, *Ships and Aircraft of the U.S. Fleet*, 16th edition, p. 103.

[125] See Harvard Business School, *U.S. Department of Defense: The Case of the Unmanned Aerial Vehicles*, (Boston, MA: Harvard Business School, February 29, 2000). Also see "Pentagon Champions UAVs, Communications," *Aviation Week & Space Technology*, (December 17, 2001), and "Mutzelburg: New War May Bring Old UAVs, Targets in Combat Use," *Inside the Navy*, (December 17, 2001), p. 1.

[126] David Brown, "Leaner and Meaner: the New Aviation Plan," *The Navy Times*, (March 6, 2000), p. 18. See also Robert Holzer, "U.S. Navy to Revamp Aviation, *Defense News*, (February 28, 2000), p.1.

[127] Briefing slides, "Warfighters Conference," (Washington, D.C.: Office of the Chief of Naval Operations (N88), 2000).

fighter squadrons, flying F14 *Tomcats*. This leaves the Navy four squadrons short of the 40 minimum fighter and strike-fighter squadrons needed to fill its 10 active carrier air wings. This squadron shortfall is now being "temporarily" filled by four Marine strike fighter squadrons flying F/A18Cs. Current plans call for the Navy to "buy back" their four-squadron "shortfall" during the future JSF production run.[128]

While replacing the four Marine squadrons with Navy aircraft will provide for 10 all-Navy air wings, it will not solve the problem of having one less active air wing than deployable carriers. Moreover, current tactical aircraft procurement plans do not address a related problem. Repeated studies have shown that a large deck aircraft carrier with a large air complement returns the largest economies of scales in both cost and strike potential.[129] In 1982, the air wing consisted of 60 fighters and attack aircraft. Today, however, the number has shrunk to 46 planes. Current plans call for the future carrier air wing to include three, 12-plane, single-seat, strike fighter squadrons, and one, 14-plane two-seat strike fighter squadron, for a total of 50 "strikers." If aircraft procurement plans proceed as scheduled, then, there will be a large amount of unused carrier capacity in the future Littoral Battle Fleet.[130] Given the high cost of maintaining a carrier, this unused capacity represents an unwarranted overhead burden. Unfortunately, given the high cost of aircraft, it seems highly unlikely that the Navy will be able to increase the size of its carrier air wings within its own service budget.

Meanwhile, the Marine Corps operates one of the largest tactical air forces in the world, providing 20 percent of all U.S. tactical aircraft.[131] Marine tactical aircraft squadrons include seven light-attack squadrons flying AV8B *Harriers*, eight strike-fighter squadrons flying F/A18A/Cs (including the four squadrons now integrated into Navy carrier air wings), and six all-weather, strike-fighter squadrons flying F/A18Ds. The Corps also has four reserve strike-fighter squadrons equipped with F/A18As.[132] Current plans call for the entire Marine Corps tactical aircraft inventory to convert to a STOVL version of the JSF.[133]

The Corps' strong preference for tactical aircraft capable of vertical flight is a story unto itself. After 1952, after the Marine Corps' designation as the nation's force in readiness, Marine aviators focused more and more on preserving their own separate air force. Marine aviation was embedded into the evolving concept of the Marine Air Ground Task Force, or MAGTF, and its fixed wing component became, in effect, the MAGTF's flying artillery, making up for the Marines' general lack of heavy, long-range guns. In this role, Marine aviators emphasized close air support operations and high sortie rates from austere expeditionary airfields close to the forward edge of the battle area. In the process, vertical/short take-off and landing (V/STOL)

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[128] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, pp. 362–368.

[129] Perin, "Are Big Decks Still the Answer?" p. 31."

[130] Langford, *CVW Strike Sortie/Aimpoint Improvement.*

[131] Robert Burns, "Future of Marine Corps Aviation in Question," *Baltimore Sun*, (April 23, 2001).

[132] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, pp. 381–384.

[133] Lieutenant General Frederick McCorkle, "Marine Air Maintains Legacy," *Marine Corps Gazette*, (May 2001), pp. 26–27

capabilities became the Holy Grail for Marine aviation.[134] As a result, the Marine Corps is the only U.S. service with an operational V/STOL attack aircraft, the AV8B *Harrier* jump jet, and the STOVL version of the JSF now embodies the future *vision* of Marine tactical aviation.

There are two problems with this vision, however. Its roots are found in a by-gone strategic era, and it has major cost implications for future *Departmental* aviation plans. The Garrison Era mentality of the Marine Corps demanded an organic air arm that did not depend on the presence of friendly aircraft carriers. As mentioned, V/STOL aircraft were originally intended to provide the Marines with high, tactical aircraft sortie rates during extended ground campaigns along defined battle lines. In the Second Expeditionary Era, the presence of aircraft carriers would seem to be a given for most, if not all, joint, power-projection operations. Moreover, with the availability of air bases unlikely in the early stage of a theater break-in campaign, and with subsequent operations ashore emphasizing dispersed, non-linear, joint operations under constant threat of long-range missile attack, the prospect of basing V/STOL squadrons anywhere ashore but on a defended expeditionary airfield seems highly unlikely. Under these circumstances, arrested landing capabilities, suitable for both carrier and expeditionary airbase operations, would seem to be a suitable substitute for vertical landing capabilities.[135] Despite this, Marine aviators continue to press for a STOVL version of the JSF, ostensibly to increase the basing flexibility of Marine tactical aircraft *off of Navy amphibious ships*.[136]

Pursuing a separate STOVL JSF for the Marines, in and of itself, will increase both the DoN's near-term R&D costs, and mid- and far-term aviation procurement costs. However, the move to base the Marine JSF force off of amphibious ships will have a major impact on the future design of the big deck, air-capable amphibious assault ships designed to carry them. The JSF will be approximately twice as heavy as the AV8B *Harrier* it replaces, requiring, at a minimum, modifications to both shipboard elevators and flight decks. However, it is not yet clear that current amphibious assault ships will be able to effectively operate the new aircraft even with these modifications.[137] In any event, their long, straight flight decks are best suited for an air wing composed either of large numbers of fixed wing aircraft with a small supporting helicopter detachment, *or* large numbers of helicopters with a small fixed wing detachment. They were never designed to support concurrent squadron-level helicopter and fixed wing operations.[138] Therefore, if the fleet were to pursue the simultaneous basing onboard amphibious ships of all of its Marine helicopter and STOVL JSF squadrons, the only alternative would be to build even larger air-capable amphibious platforms, with angled or split flight decks, that could support simultaneous rotary and fixed wing operations. This would require the Navy to build more

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[134] Peter B. Mersky, *U.S. Marine Corps Aviation,* 3rd edition, (Baltimore, MD: The Nautical & Aviation Publishing Company of America, 1997), p. 289.

[135] The fleet has pre-positioned three "expeditionary airfield sets" that have portable arresting gear as part of the equipment sets.

[136] *United States Marine Corps Concepts & Issues 2000,* p. 73.

[137] McCarton, *Amphibious Warfare and the Evolution of the Helicopter Carrier,* p. 82.

[138] For example, the large *Tarawa*-class LHA can operate a helicopter-heavy air wing with 30 helicopters and six to eight AV8B Harriers, or 20 Harriers and four to six helicopters. Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th edition, pp. 176–177.

expensive new design ships rather than less expensive modified repeats of ships now in service.[139] Indeed, it seems quite likely that the second-order shipbuilding costs associated with basing the Marine STOVL JSF force at sea would exceed those of the aircraft procurement costs.

Given the fundamental changes in the current strategic environment, as well as the high first and second order costs of pursuing separate Navy and Marine Corps tactical aviation plans, it seems clear that the DoN could profit, both literally and figuratively, by reorganizing its naval air arm to take better advantage of the aircraft carriers now in the fleet. Above and beyond mere fiscal reasons, however, from an operational perspective, separate Navy and Marine Corps air forces are an anathema for integrated fleet operations in the Second Expeditionary Era. A more enlightened vision for 21st century naval aviation might emerge after reviewing the early intent of Marine aviators as well as the operational lessons learned during the Central Pacific campaign of the Second World War.

Soon after the fleet started experimenting with carriers at the end of World War I, and Marines started thinking about seizing advanced naval bases, many Marine aviators argued that until land bases could be established ashore, Marine ground forces would be best supported from the decks of aircraft carriers. Indeed, the Marine Corps officially recommended the creation of carrier-based Marine air wings as early as 1926, and the famous *Tentative Landing Manual* published in 1934 by Marine Corps planners recognized that carrier-based aircraft would probably have to provide the initial tactical air support for amphibious assaults. However, as the Marines recommended the creation of *all-Marine* carrier air wings, their writings received a cool reception from the Navy. Still, they made progress. By 1939, the Navy designated the secondary mission of Marine aircraft squadrons to be "replacement squadrons for carrier-based aircraft."[140]

Carriers ferried Marine planes to Wake Island before the start of World War II and to Midway and Guadalcanal after it began, but their normal air wings remained all Navy. And, as the war progressed, once the Marines committed their entire aviation arm in support of the land-based Solomons campaign, the idea of Marines operating off of carriers was shelved by Marine flyers. All of that changed in early 1944, with the decision to by-pass the Japanese stronghold on Rabaul. As Marine aviators ran out of forward air bases from which to support the final Marine assaults against the islands forming the inner defenses of the Japanese anti-access network, the idea of operating off of the decks of carriers once again became attractive. On the other side of the coin, as the fleet faced a fighter shortage in the face of the growing kamikaze threat, the idea of having Marine fighters on carriers was welcomed by Navy aviators. As a result, by late 1944, all-Marine "Carrier Aircraft Service Detachments" were operating off of the decks of fleet escort carriers, and 10 Marine fighter squadrons were integrated into the fleet carrier air wings.[141]

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[139] McCarton, *Amphibious Warfare and the Evolution of the Helicopter Carrier,* p. 82

[140] Robert Sherrod, *History of Marine Corps Aviation in World War II,* (Washington, D.C.: Combat Forces Press, 1952), p. 324.

[141] Ibid., pp. 326–333.

Given the likely operational similarities between fighting future anti-access networks along the Asian littoral with those of past expeditionary operations, the (re)integration of Marine and Navy air forces aboard carriers would seem highly desirable in the Second Expeditionary Era, and it defines a future vision for *naval* aviation that should be (re)embraced by both Navy and Marine Corps pilots. Accordingly, the 21st century integrated naval air arm should be rationalized and organized to support joint and fleet counter-network and power-projection operations without the presence of forward bases. Under these circumstances, the naval air arm would be postured first to operate at sea and then either at sea or ashore depending on the tactical situation. As such, naval aircraft interoperability and squadron interchangeability would be highly prized, just as it was in World War II. Such a vision suggests that the Marines pass on the STOVL version of the JSF, and the Navy curtail its F/A18E/F program, and that both pursue a single, common conventional takeoff and landing (CTOL) version, or perhaps even a short take-off and arrested landing (STOAL) version, of the JSF.

The Navy and Marine Corps need not wait for common aircraft to start their 21st century integration. Among the many organizational alternatives for an integrated naval air arm, three near-term possibilities stand out. The first would be to simply add a maintenance package to every carrier so that the carriers could support a fly-aboard Marine squadron with little or no notice. If a naval battle force was to steam in harm's way, and no theater bases were initially available, a Marine squadron would transfer aboard and integrate itself into carrier air wing operations. During the initial phases of a theater break-in operation the squadron would operate off the carrier. If and when shore bases became available, the Marine squadron would shift ashore. Such a scheme would represent the lowest level of naval aviation integration.[142]

A second intermediate level of integration would be to create an eleventh, all-Marine carrier air wing and to have the four Marine squadrons now flying off carriers remain a part of Navy carrier air wings. This would place all eight Marine F/A18C squadrons onboard carriers. In the process, it would save most of the procurement costs of an eleventh carrier air wing, as well as the procurement costs required to replace the four Marine squadrons now operating aboard carriers with Navy JSF squadrons. The remaining Marine AV8B and F/A18D squadrons would be assigned to a separate Marine Aircraft Wing. This option would not be without its own associated costs. For example, Marine squadrons permanently assigned to carrier air wings generally require increased manning. However, compared to the operational advantages of gaining an eleventh air wing and the potential procurement savings, these costs might be well worth it.

A third option would be to pursue a truly integrated naval aviation arm—one designed to operate the maximum number of Departmental combat aircraft from the sea until an enemy's anti-access network is degraded or destroyed, and from both sea and shore bases during subsequent operations ashore. Such a naval air arm might consist of 11 active naval air wings including both Navy and Marine tactical aviation squadrons, a single separate Marine air wing, and a single

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[142] All Marine squadrons maintain the capability to operate aboard carriers. This option would simply make the preparations to accommodate them without a major disruption to carrier or air wing operations. *United States Marine Corps Concepts & Issues 2000,* p. 65.

reserve naval air wing consisting of both Navy and Marine squadrons. Notably, however, Marine squadrons assigned to naval air wings—with the exception of the four squadrons already onboard carriers—would be organized to fly off carriers and to support Marine and other joint forces from expeditionary airfields ashore, if and when they became available. The reserve naval air wing would consist only of the follow-on tactical squadrons needed to backfill the carrier decks when embarked Marine squadrons flew ashore; the electronic attack, air command and control and other support squadrons now assigned to the naval reserve would be disbanded and their aircraft used to equip the 11th active naval air wing. While retaining the flexibility to operate from carriers, the single, separate Marine aircraft wing would be available to provide immediate support to deployed Marine forces from either existing in-theater air bases or expeditionary airfields.

Such an integrated naval air arm would avoid the $6 billion needed to purchase the aircraft for an 11th all-Navy carrier air wing; save the procurement costs for four Navy JSF squadrons earmarked to replace the four Marine squadrons now onboard carriers; save the costs associated with the disbandment of excess reserve tactical fighter squadrons; and gain efficiency savings over a larger Departmental air arm composed of two separate service air forces. In addition, if the Department moved to adopt an all-CTOL or STOAL JSF fleet, the plan would also save the R&D costs associated with the STOVL JSF, the higher procurement costs of the plane itself, as well as the second-order shipbuilding costs required to facilitate its fleet operation. While the resulting savings could be diverted into other Departmental priorities, the key target for the savings would be to fund experiments designed to illuminate the best mix of and types of manned and unmanned air systems in future naval air wings.

Reorganizing Navy and Marine Corps aviation forces would provide a key means for transforming the capital fleet and naval aviation for 21st century naval expeditionary operations. However, as will soon be discussed, there are other, more substantive organizational changes that could change future battle fleet operations in even more fundamental ways. The foundation for these changes rests on the aforementioned redistribution of fleet firepower, especially within the BFC combatant fleet.

THE STRIKING (R)EVOLUTION IN THE BATTLE FORCE CAPABLE COMBATANT FLEET

In 1989, guided missile cruisers, guided missile destroyers, and large anti-submarine destroyers were considered "battle force capable" combatants whose *raison d'etre* was to protect the striking power of the carriers and the battleships.[143] However, improvements that manifested themselves throughout the 1990s have given these ships advanced new defensive and offensive capabilities that provide the 21st century, 300-ship fleet with operational options unheard of little more than a decade ago.

[143] Polmar, *Ships and Aircraft of the U.S. Fleet,* 14th edition, p. 6.

The dramatic improvements to BFC combatant capabilities that became so evident in the 1990s were actually the cumulative result of six inter-related stages of a broad naval technical revolution. The first stage of the revolution occurred with the introduction of gas turbine propulsion on *Spruance*-class destroyers (DD963s) in 1975. Until then, every BFC and POS combatant in the fleet (with the exception of nine, nuclear-powered guided missile cruisers) had used evolutionary variations of the same oil-fueled, steam-powered turbine propulsion plants found on U.S. combatants since before World War II. Since then, every BFC and POS combatant built has had the same basic gas turbine propulsion plant, built around the LM2500 gas turbine, which is a modification of an aircraft turbofan engine. The gas turbine propulsion revolution eliminated many of the maintenance-intensive propulsion components of steam-powered ships like boilers and condensers, greatly simplifying the combatant's main propulsion plant. As a result, gas turbine-driven combatants are more reliable, more fuel efficient, and require less manning than steam-powered ships.[144]

The anti-air warfare (AAW) revolution started in 1983 with the introduction of the AEGIS combat system aboard the first *Ticonderoga*-class guided missile cruiser (CG47). Originally designed to deal with Soviet saturation cruise missile attacks, the AEGIS combined azimuth and height search, target acquisition, classification, and tracking functions and provided command guidance to ship-launched missiles. Its multi-functionality allowed the replacement of several different radars and greatly reduced or eliminated the handoff problems that occurred between separate, specialized radar systems.[145]

Rotating radar systems pulse targets with energy once each rotation to provide a single radar "hit." Several rotations, which can last between 10 to 30 seconds, are required to establish a target's course and speed. By comparison, the AEGIS' SPY1 radar incorporates four, fixed, phased-array antennas integrated directly into the superstructure of the ship. The system's associated computers schedule thin search beams from each of these four arrays to scan for targets. If any single beam returns a hit, the computers automatically point several other beams at the target, allowing the SPY1 to establish continuous target tracks much faster than a traditional rotating radar.[146]

Since the SPY1 radar and its supporting computers can project hundreds of electronic beams in rapid sequence, AEGIS is capable of identifying and simultaneously tracking "hundreds" of targets, out to ranges of 200 nautical miles. Moreover, earlier missile ships had to continuously guide their surface-to-air missiles from launch to target. This meant that the number of missiles a ship could control in the air at any given time was limited by the number of separate guidance radars that it carried. In contrast, the AEGIS system can continuously track both outbound missiles and inbound targets, and it can update its own missiles' guidance systems during flight to provide them with mid-course intercept corrections. Therefore, dedicated target radar

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[144] Email from Captain Trip Barber, USN, U.S. Navy Quadrennial Defense Review Task Force, March 19, 2001.

[145] This paragraph and three following are drawn with minor modification from Norman Polmar's excellent, easy to understand technical explanations in *Ships and Aircraft of the U.S. Fleet*, 17th edition. The information in this paragraph is found on p. 545.

[146] Ibid., p. 135.

guidance is required only in the final seconds of a surface-to-air intercept. As a result, depending on the number of guidance radars carried, an AEGIS-equipped ship can engage 15–20 air threats simultaneously.[147]

The system has several other key capabilities. It can send its search and tracking information to other AEGIS-equipped units and can combine its own data with other sensor information to provide operators with a highly accurate, high-fidelity picture of surrounding air activity. Because of its unique operating characteristics, the SPY1 is a difficult anti-radar missile target and highly resistance to electronic countermeasures (ECM). Moreover, with its advanced signal processing, it can counter jamming and suppress sea clutter caused by waves on the sea surface, which makes it effective in tracking sea-skimming anti-ship missiles. The system is not without flaws; designed as it was for open-ocean fleet air defense, its key limitation is in overland performance.[148] However, it was, and remains, the "most advanced anti-air warfare system in existence, land-based or naval."[149]

The introduction of AEGIS heralded a revolution in fleet air defense as well a broader, more pervasive, digital revolution. This third stage of the naval technical revolution saw the fleet shift completely from analog to digital electronics, ushering in increased system reliability for all shipboard electronic systems. As digital systems became more widespread, and as successive improvements in computing power led to increasingly sophisticated shipboard data processing, the digital revolution led to the fielding of integrated shipboard combat systems. The AEGIS was merely the first. It was followed, for example, by the SQQ89 surface ship digital anti-submarine warfare (ASW) system, which combines underwater and airborne sensors, weapons control systems, and sophisticated data processing and displays to provide major increases in fleet ASW combat capability. Similarly, the new Ship Self-Defense System (SSDS) now entering the fleet will use a fiber optic local area network and a redundant "distributed" processor and display architecture to link sensors, guns, missiles, and passive and active countermeasure systems into an integrated system that will provide individual ships with a rapid-reaction, anti-air defense capability against high-speed and low-flying anti-ship missiles.[150] Just as significant as the systems themselves, however, has been the introduction of high-speed digital data links that allow individual ships to share their data with other ships, building the foundation for networked fleet operations.

The fourth stage in the naval technical revolution, the flexible fires revolution, began in 1986 with the introduction of the Vertical Launch System (VLS) on the improved *Ticonderoga*-class CGs (CG52s). Early missile-age weapon systems consisted of above-deck rail missile launchers serviced by below deck rotary missile magazines. The VLS system combined both magazine and launcher by nestling VLS combination storage/launch cells within the confines of the ship.

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[147] Ibid., p. 546.

[148] Ibid., p. 545.

[149] Ibid., p. 135.

[150] Edward J. Walsh, "Integrated Combat Systems," *Sea Power 2002 Almanac and Centennial Edition*, (January 2002), pp. 152–159.

Standard eight-cell modules were grouped to form large missile batteries, usually in groups of 32 or 64.[151]

The introduction of the integrated VLS magazine/launcher system provided a great leap forward in operational capabilities over previous rail combatants. First, weapons in VLS cells are in a ready-to-fire status; there is no need to select a weapon from a rotary magazine, cycle it to the loader, and mate it to a launch rail. Moreover, should a weapon fail to launch, weapons reselection is greatly facilitated since the system does not have to return the inoperable missile to the magazine or jettison it overboard. As a result, VLS-equipped ships have much better reaction times and higher rates of fire—both key operational advantages for a fleet protecting itself against close-in, multi-dimensional attacks in littoral waters. Second, since all missiles are encapsulated in a ready-to-launch cell, there are reduced maintenance and manning requirements onboard VLS-equipped ships. Third, launch cells protected by the hull are far less vulnerable to weather effects, mechanical failure and battle damage than above-deck launchers. Fourth, because the integrated magazine/launcher system is much more space efficient than a rail/rotary magazine arrangement, VLS-equipped ships can carry a much higher comparative weapon load.[152] Finally, and most importantly, below deck rotary magazines were designed to accommodate weapons of similar diameter, and they were designed primarily with defensive anti-aircraft and anti-submarine missiles in mind. The relatively large size of the VLS cell (25 inches x 25 inches), coupled with the system's flexible fire control interfaces, allows a VLS-equipped ship to carry weapons of many different shapes and sizes. This gives fleet planners enormous flexibility in tailoring the types and mixes of weapons carried.[153]

The fifth stage of the naval technological revolution was the broader information revolution that dramatically manifested itself throughout the 1990s. The Navy's Information Technology for the 21st Century (IT-21) program now allows deployed naval task groups to transmit and receive vast amounts of information, from imagery to email to classified battle plans, by providing fleet platforms with greatly increased bandwidth. The unprecedented operational, administrative and personal connectivity provided by IT-21 systems has had profound effects on networked fleet operations, from coordinating dispersed unit sectors to improving the morale of Sailors. Since every deploying CVBG or ARG/MEU is provided with the most up-to-date IT-21 systems, the power of the fleet's information network is constantly improving. [154]

The sixth stage of the ongoing naval technical revolution, the standardization revolution, was both enabled and accelerated by rapid post-Garrison Era fleet contraction of the 1990s. The carriers, battleships and surface combatants that made up the 1989 fleet were a mixed-generation

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[151] Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th edition, p. 495.

[152] The first five rail-equipped *Ticonderoga*-class guided missiles cruisers carried 88 missiles in their below deck rotary magazines. The next 22 VLS-equipped *Ticonderoga* cruisers carried 122 missiles in an identical hull, amounting to a 39 percent increase in magazine capacity.

[153] Ibid., p. 493.

[154] See Rear Admiral J. Cutler Dawson, Jr., Commander James M. Fordice, and Lieutenant Commander Gregory M. Harris, USN, "The IT-21 Advantage," *Naval Institute Proceedings,* (December 1999), pp. 28–31; and Richard R. Burgess, "*Bataan* ARG Showcases IT-21 On Extended Med Deployment," *Sea Power,* (May 2000), pp. 19–20.

force. If one considers the combatants designed for fleet service just prior to and during World War II to be the Navy's first generation of modern warships, the 1989 fleet included second-generation ships consisting of World War II vessels modernized for missile- and jet-age warfare, such as the *Iowa*-class battleships and *Midway*-class carriers; third-generation combatants (ships designed in the 1950s and 1960s for missile-age combat); and the most modern fourth-generation combatants (*Ticonderoga*-class CGs, *Spruance*-class DDs, and *Oliver Hazard Perry*-class guided missile frigates) designed for combat operations against the Soviet Navy. The carrier fleet consisted of six nuclear-powered and 10 conventional-powered carriers, divided among six different classes, with no single class numbering more than five carriers. The surface combatant fleet had eight different cruiser classes, three DDG classes, one destroyer class, and four frigate classes. Ship propulsion plants included low- and high-pressure steam, nuclear and gas turbine systems. Combat systems were equally diverse, including the AEGIS weapon system and a host of older systems. Most of the active ships were extremely manpower intensive. The cruiser and guided missile destroyer force, dominated by older-generation designs, averaged crews of nearly 420 officers and Sailors; the nine nuclear-powered cruisers all required crews over 500. A decade seems to have dimmed the memories of the officers and Sailors tasked with crewing, training, and operating this mixed-generation fleet; perhaps it is true that time dulls all pain.[155]

The 2001 carrier force was divided among four different classes. However, eight come from the single *Nimitz* class, and nine of 12 are nuclear-powered. The standardization of BFC and POS combatants is even more impressive: the fleet was composed only of modern, fourth-generation designs, divided among four basic classes of ships (albeit with different flights):[156] one guided missile cruiser, one guided missile destroyer, one destroyer, and one guided missile frigate. Every one of the fleet's major 115 combatants had a variation of the same basic gas turbine-powered propulsion plant. The AEGIS combat system was found on every cruiser and guided missile destroyer. The VLS armed all BFC combatants with the exception of the first five rail-equipped cruisers of the *Ticonderoga*-class. Similarly, variants of the same digital SQQ89 ASW combat system and digital SLQ32 ECM system were found on all BFC and POS combatants. This standardization revolution was, and is, a tremendous good news story. It provides enormous comparative fleet operating cost savings, and it affords the current fleet with incalculable training and maintenance advantages over the 1989 fleet.

The cumulative impact of the first six stages of the revolution manifested themselves in the 1990s, a decade of unparalleled turmoil in the fleet. Faced with the shift from one strategic era to another, forced to protect their provinces in a series of never-ending budget reviews, hampered by shrinking defense budgets, and juggling the enormous challenge of managing a 40 percent reduction in fleet assets, it is quite easy to understand how the story of shifting fleet capabilities got lost in the shuffle. Indeed, the ongoing quiet naval technical revolution continues without fanfare. For example, while the AEGIS system was originally optimized for open-ocean engagements, its digital architecture and advances in signal processing have allowed it to be

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[155] Polmar, *Ships and Aircraft of the U.S. Fleet,* 14th and 16th editions.

[156] A class of ships is based on an identical hull; flights within the class have different, upgraded versions of propulsion and combat systems. Flights allow the regular injection of new technology and capabilities into the same hull form.

progressively modified to give it better performance in the cluttered littoral environment, including tracking targets over land.[157] More importantly, its capabilities form the foundation for the emerging Cooperative Engagement Capability (CEC), which will become the central nervous system of future naval task forces and which promises dramatic improvements to their defenses.[158]

The CEC represents a seventh stage in the quiet naval technical revolution, combining aspects of all earlier six stages to forge a revolution in cooperative defense. Naval planners have only to recall the grievous losses suffered by destroyer radar pickets during the battle of Okinawa to conclude that isolated surface units subject to missile attack will have little chance of survival over the next two decades. However, over this same period, naval planners can plan on certain local naval air superiority (unless the carrier fleet is drastically cut), extremely dense defensive missile batteries provided by the widespread introduction of VLS, and, most critically, *air and surface units that remain digitally linked even when widely dispersed.*

If the CEC digital sensor/data network performs as advertised, it should provide naval task forces operating in the littorals with three capabilities unlike any ever taken to sea. First, it should allow CEC-equipped ships, aircraft and land-based radar systems to combine and share their diverse sensor inputs to form a single, common, distributed air defense picture, and to pass fire-control-quality radar target measurements in real time among all units plugged into the net. Second, it will allow the networked AEGIS combat system to make coordinated threat engagement decisions among widely dispersed task force units in real time. Third, it will provide a new capability referred to as "engage on remote," meaning that ships will be able to successfully engage targets using data from another ship's radar, even when their own sensors cannot pick up the target.[159]

While the integration of CEC has been slower than planned because of software incompatibility problems, the promise of these three capabilities is quite stunning.[160] If the technical issues can be resolved, the CEC would greatly extend a task force's effective counter-air and counter-missile engagement ranges, since the composite picture would extend over a much wider area and at much longer ranges than the radar on any single ship. This should allow CEC-equipped units and forces to detect and track incoming missiles and aircraft long before they cross the horizon and afford them the time and opportunity to conduct multiple anti-air and anti-missile engagements on inbound targets. The increased tracking fidelity should also allow task force units to successfully engage very difficult targets, to include low-flying, supersonic and stealthy cruise missiles. Moreover, with the incorporation of CEC capabilities into carrier-borne and joint airborne radar platforms, as well as Marine and joint land-based radars, future naval task forces

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[157] "U.S. Navy Programmes under Threat of Cancellation," *Jane's Defense Weekly*, (April 4, 2001).

[158] For a good discussion of the CEC, see Robert Kerno, "Cooperative Engagement and the Interoperability Challenge," *Sea Power*, (March 1999), pp. 45–47.

[159] Daniel Busch and Conrad J. Grant, "Changing the Face of War: the Cooperative Engagement Capability," *Sea Power*, (March 2000), p. 37

[160] For a description of CEC system problems, see Captain Richard Sharpe, R.N., "Jane's Fighting Ships Forward 1999–2000," supplement to *Jane's Navy International*, (April 1999), p. 2.

should be able to extend their CEC sensor and engagement net far inland as the theater campaign progresses. This would allow the fleet to extend its air and missile defense umbrella over naval, joint and allied forces operating ashore.[161]

Even if CEC proves less effective than hoped for, early 21st century naval task forces will still benefit from the aforementioned standardization of the highly capable AEGIS combat system. In 1989, the system was found on only 14 of 73 guided missile cruisers and destroyers; by the end of 2001, all 59 guided missile cruisers and destroyers carried the system. By 2011, as the production run of the AEGIS/VLS-equipped *Arleigh Burke* DDGs, comes to an end, 89 guided missile cruisers and destroyers should carry the system, affording tomorrow's 300-ship fleet with unparalleled situational awareness.[162]

The cooperative defense revolution also includes missile improvements. The Standard series of medium- to long-range naval surface-to-air missiles has been and will continue to be continuously improved throughout the next decade through a series of block upgrades. Each upgrade is designed to counter new or evolving threats. For example, the new Block IV design now in production provides significantly increased performance over previous versions in the areas of jam resistance, lethality and range. Another new design should provide better overland performance against incoming cruise missiles; yet another should be able to intercept incoming ballistic missiles (more on that later).[163]

Medium- and long-range SAMs, augmented by manned aircraft, will provide the fleet with important long-range defensive fires during 21st century counter-network operations. No matter how effective these long-range defenses prove to be, however, the fleet expects to deal with "leakers" through its outer air defenses, especially when they operate close to the sea-land littoral interface. As a result, great attention is also being paid to fielding rapid-reaction, high-volume-fire, short-range missile systems designed to provide individual fleet units with a high degree of self-protection. The Evolved Sea Sparrow Missile (ESSM), soon to enter fleet service, is a highly agile missile with a 15–20 mile range designed to counter both cruise missile and air targets. Moreover, because ESSMs are only 10 inches in diameter, they can be "quad-packed" into a single 25 inch x 25 inch VLS cell. This allows a standard eight-cell VLS module to carry no less than 32 missiles.[164] The ESSMs are to be backed up by the Rolling Airframe Missile (RAM), a five-mile range missile that has proven highly effective against cruise missile targets. In addition, the RAM is being modified to allow it to engage helicopters and surface craft. Because of their compact size, RAMs are carried in a small, above-deck, 21-round missile launchers that can be

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[161] Busch and Conrad, "Changing the Face of War: the Cooperative Engagement Capability," pp. 38–39; and Bryan Bender, "USN Looks to Expand Early Warning Network." *Jane's Defense Weekly*, (January 26, 2000).

[162] In 2011, the 90th BFC combatant will be a new DD(X) combatant with the follow-on to the AEGIS system.

[163] *Vision…Presence…Power: A Program Guide to the US Navy*, (Washington, D.C.: DoN), p. 71. Richard Scott, "Raising the Standard," *Jane's Navy International*, (April 2001), pp. 23–24.

[164] George K. Hamilton, "Defense in Depth: Protecting Naval Forces," and "Protecting the Battle Group," *Surface Warfare*, (March/April 1999), pp. 2–13.

reloaded by hand.[165] Both the ESSM and RAM ensure that future BFC combatants will be able to carry extremely dense, close-in, self-defense missile batteries.

The emerging *Networked Littoral Battle Fleet,* linked by the CEC and carrying dense organic missile fields firing new and more capable weapons, should provide future naval expeditionary forces with defenses that are much more effective than those of the past. Of course, the competition between saturation missile strikes and long-, medium- and close-range active defenses, even those enabled by the promise of the CEC, is by no means assured. However, as long as the Navy continues its aggressive research, development and experimentation program to improve fleet defenses, it should be able to compete against near- and mid-term threats.[166]

If the CEC represents a revolution in cooperative defense, the distribution of fleet strike power represents a striking revolution. The striking revolution is nothing more than a dramatic exploitation and expansion of the standardization and flexible fires (VLS) revolutions within the BFC combatant fleet. VLS is now the near-standard weapon system on BFC combatants; on September 30, 2001, it armed 75 of 80 active BFC ships. What does this mean in terms of fleet combat capability? In 1989, the 104 battle force combatants represented 19 percent of the TSBF and 51 percent of the overall surface combatant fleet. They provided a fleet escort-to-capital ship ratio of 5.5:1. The dominant weapon system consisted of above-deck rail missile launchers and rotary missile magazines; VLS was found on only 16 ships (nine cruisers and seven destroyers). The cumulative magazine capacity of the fleet's 73 cruiser and guided missile destroyers totaled 5,818 missiles of all types; 31 anti-submarine destroyers added 1,315 more. These 7,133 battle force missiles were divided among medium- and long-range SAMs, anti-submarine rockets, Tomahawk cruise missiles, and Harpoon anti-ship cruise missiles. Given the total displacement and manning of the 1989 fleet, this equated to an average of approximately 111.4 tons displacement and 5.8 sailors per missile carried in the cumulative fleet missile magazine.[167]

Because of the *defensive* orientation of the 1989 BFC fleet, and the weapons handling limitations of its prevalent rail launchers and rotary magazines, the overwhelming preponderance of fleet missiles carried—nearly 80 percent of the fleet's total magazine capacity—consisted of anti-air and anti-submarine rockets. As a result, surface combatants contributed little toward fleet striking power. Using notional weapon loads, the entire 104-ship BFC force carried 784 Tomahawks, amounting to 11 percent of available magazine capacity. The four battleships contributed 128 more Tomahawks, at the astounding cost of 1,792 tons displacement and 47.3

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[165] M.S. Frick, "RAM and Phalanx: System of System Testing," *Sea Power*, (September 2000), pp. 46–48.

[166] See for example Commander Mike Lancaster, USN, "Cooperative Engagement Capability Underway Nine," *Surface Warfare,* (July/August 2000), pp. 18–19.

[167] These two calculations provide simple measures of merit for determining fleet costs for delivering combat power. The first is an indirect indicator of a given fleet's procurement costs; the second is a more direct indicator of personnel costs—the key driver in fleet operations and support (O&S) costs. Together, they help compare the combat cost efficiency of two different fleets. They should not be the only measures used; taken to their logical extension, they would point to a fleet made up of a very small number of huge ships, carrying thousands of missiles, and with small crews. While such a fleet might be the most cost efficient in delivering missile fire, it would be of little utility in the Second Expeditionary Era. The numbers were calculated by using data found in Norman Polmar's *Ships and Aircraft of the U.S. Fleet,* 14th edition.

sailors per missile.[168] Moreover, only 39.5 percent of all weapons carried were in fixed, ready-to-fire missile cells requiring only an unbroken firing circuit for launch.[169]

A decade makes quite a difference. In 2001, the Navy's 80 BFC combatants accounted for 24 percent of the TSBF and 70 percent of the surface combatant fleet. Because of the drop in fleet capital ships, these 80 combatants provided an escort-to-capital ship ratio of 7.27:1—a hefty 32 percent increase over the 1989 force. Because of the comparative efficiency of the VLS system, 59 cruisers and guided missile destroyers carried 6,468 missiles, and 21 destroyers carried 1,449 more, for a total battle force missile capacity of 7,917 missiles. The smaller fleet was thus much more efficient in delivering combat power: the numbers equate to an average of 90.2 tons displacement and 3.6 sailors per missile carried, reductions since 1989 of 19 and 38 percent, respectively.[170]

More important, because the combination VLS magazine/launch cells can flexibly accommodate Tomahawk and other strike missiles in addition to SAMs and anti-submarine rockets, the offensive potential of today's surface fleet dwarfs that of the 1989 fleet. In 1989, fleet strike potential was heavily concentrated in the carrier force. Of the 108 non-carrier platforms, only 33 battleships and BFC combatants were capable of delivering long-range missile strikes, for a non-carrier strike platform-to-carrier ratio of 2.2:1. In 2001, 75 of 80 BFC combatants were strike capable, for a non-carrier strike platform-to-carrier ratio 6.8:1. Using notional weapon loads, the 2001 fleet could carry over 2,800 land attack missiles, fully 35 percent of available magazine space. Theoretically, the only limitation to the number of land attack missiles carried by the BFC combatants is the cumulative number of their VLS cells, which numbered 6,869 on September 30, 2001, and which are climbing steadily as new 96-cell *Arleigh Burke* DDGs enter fleet service.[171]

Of course, the actual weapons mix carried by the BFC combatant fleet would never be so specialized. However, the point is that in little more than a decade, the proliferation of VLS main batteries in battle force combatants has fomented a striking revolution in naval combat power. Today's 24 *fewer* battle force capable combatants carry 784 *more* missiles than the 1989 fleet, with a far greater proportion of missiles dedicated to strike tasks and with nearly 95 percent in a ready-to-fire status. The proliferation and standardization of the VLS has transformed the BFC combatant fleet from a motley group of guard dogs for carriers and battleships into a pack of thoroughbred hunting dogs, searching for trade. No longer simply battle force capable, today's surface combatants, by reason of their dramatically improved defensive and offensive capabilities, are now best thought of as *littoral battle combatants.*

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[168] Notional weapon loads for the 1989 fleet were derived from Polmar, *Ships and Aircraft of the U.S. Fleet*, 14th Edition, 1987, and Captain Richard Sharpe, editor, *Jane's Fighting Ships 1990–91* (Surrey, UK: Jane's Information Group, 1991).

[169] The Harpoon is the Navy's standard anti-ship missile. It was never modified to be fired from a VLS cell. However, it is fired from an above-deck enclosed canister that functions as both the magazine and launcher, just like VLS.

[170] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition.

[171] Notional weapon loads for the 2001 fleet were derived from the *Surface Combatant Force Level Study*, (Washington, D.C.: Office of the Chief of Naval Operations (N86), August 1995), p. 3–7.

Despite worries expressed by some members of the revolutionary faction, then, the ongoing and expanding cooperative defense and striking revolutions, themselves the expansion of six previous stages of a thorough, if quiet, naval technical revolution, would seem to well prepare the surface combatant fleet for near- and mid-term challenges. Together, they mean that future Networked Littoral Battle Forces will carry with them dense, digitally linked, missile fields—with weapon loads tailored for fleet defense, fleet offense or a combination of both. Moreover, the fleet's AEGIS/CEC-controlled combat systems and VLS-equipped missile field can easily accommodate new weapons designed to counter new and emerging threats, giving the fleet enormous combat agility in any time-based, operational naval competition.

Two examples serve to demonstrate this agility—one offensive, and one defensive. The shift of the Navy's warfighting priorities from open-ocean, fleet-on-fleet engagements to that of attacking land targets from littoral waters was accommodated in little more than a decade and with no newly designed combatants, just newly designed missiles. For example, the Tomahawk missile, developed initially to provide the fleet with both long-range, anti-ship and tactical, nuclear-weapons capabilities, was modified for conventional strike missions. It has since become a staple in naval strike operations since its combat debut in the Gulf War in 1991. Over its nominal range of 750 to 1,000 nautical miles, it can deliver a 1,000-pound warhead or submunition payloads with accuracies of 10 meters or less. It will soon be augmented and eventually replaced by the new Tactical Tomahawk, or TACTOM. The TACTOM will have a longer range than the original Tomahawk—out to 1,350 nautical miles. More importantly, it will be able to loiter at pre-programmed points and receive in-flight retargeting data, albeit at some expense to its maximum range. This will give the fleet an entirely new capability to attack time-critical targets such as mobile missile launchers. Finally, the TACTOM will carry an onboard camera that will allow it to provide its own bomb damage assessment (BDA) via a satellite link.[172]

This new land-attack capability, introduced by the simple modernization or adaptation of missiles sized to fit inside a VLS cell, will provide important new options during future anti-access operations. The TACTOM should allow littoral battle combatants to put fixed *and* mobile targets under fire from much greater standoff distances than in the past. Furthermore, the TACTOM's ability to provide its own post-attack assessment should greatly improve fleet's re-attack operations. Once the enemy's anti-access network is degraded, and as a Networked Littoral Battle Fleet closes on the coastline, new supersonic land attack missiles might augment the TACTOM to provide more responsive missile fire, especially in support of maneuver forces beyond the range of naval gunfire.[173]

The fleet's defensive agility will also be improved. As was discussed in Chapter II, tactical ballistic missiles are likely to be a part of any future anti-access network. More than 30 nations have or are pursuing ballistic missiles of varying range and capabilities. The potential threat

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[172] Capt Rick Hoffman, USN, "Tomahawk Goes Tactical," *Surface Warfare*, (May/June 2000), pp. 8–9.

[173] Major Ross Schwalm, USMC, "Fires in Support of Amphibious Operations—A Status Report," *Marine Corps Gazette*, (March 2001), pp. 22–25.

these missiles pose to expeditionary and power-projection forces is such a concern that in 1999 the CinC of U.N. and Combined Forces in Korea stated that tactical ballistic missile defense (TBMD) was his "top priority."[174]

The adaptability of the CEC and the VLS, combined with the continuing power of the information revolution, provides the springboard for a rapid fleet response to this growing threat.[175] The 22 VLS-equipped, *Ticonderoga*-class guided missile cruisers are scheduled to receive an upgrade called the Area Air Defense Commander (AADC). The AADC is designed to plug into a joint, theater, power-projection network and to control theater wide anti-air operations. Its advanced capabilities should allow fleet AEGIS radar systems and the CEC network to gather and organize target information faster and provide high-fidelity engagement solutions for short- and medium-range ballistic missiles.[176] When coupled with planned modifications to shipboard Standard missiles, this should allow the Networked Littoral Battle Fleet to defend itself and joint and allied ground forces against a full range of ballistic missile attacks.

The fleet's TBMD plan is evolutionary, sending first to sea AEGIS *area* capabilities designed to protect ports and airfields from short- and medium-range ballistic missiles. Area-TBMD capabilities are then to be followed by AEGIS *theater* capabilities, designed to kill medium- and long-range missiles during their ascent phase. The cruisers are also to be augmented by the AEGIS-equipped DDG51 force, which will also be converted to carry area-TBMD capabilities.[177] This plan is scheduled to commence in FY04, and much is sure to change between now and then. However, the plan's mere existence exemplifies how the flexibility of the fleet's vast VLS field gives the 21st century Networked Littoral Battle Fleet the agility to quickly react and adapt to emerging threats.[178]

THE BIRTH OF THE LITTORAL STRIKE GROUP

As a result of the cumulative effects and expansion of a broad naval technical revolution, in little more than a decade the U.S. capital and BFC combatant fleets have been transformed into a networked surface combatant fleet whose strength is counted less by its number of hulls and more by the number of targets its air arm can attack and the number of VLS cells it carries.

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[174] *Navy Theater Ballistic Missile Defense: Underway at Sea*, (Washington, D.C.: DoN, undated), pp. 1–5.

[175] Sandra I. Erwin, "Sea-Air Sensor Net Spurs Ship Defense," *National Defense*, (March 2000).

[176] Lieutenant Commander Irene Smith, "AADC onboard USS Shiloh," *Surface Warfare*, (July/August 2000), p. 20.

[177] *Aegis Cruiser Conversions: New Capabilities for the 21st Century*, (Washington, D.C.: DoN, undated). 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.

[178] On December 14, 2001, the current area program was cancelled because of "poor performance and projected future costs and schedules." The new Missile Defense Agency and the Navy are now reviewing future Navy programs "as part of …plans to develop an integrated ballistic missile defense system that provides a layered defense against ballistic missiles of all ranges." See Walsh, "Integrated Combat Systems," *Sea Power 2002 Almanac Centennial Edition*, p. 153.

As is the nature of profound changes to military capabilities that take several decades to manifest themselves, some might argue the transformation of the surface combatant fleet is more evolutionary than revolutionary. This is a debate for another time. What is important is that as a result of (at least) eight stages in naval technical developments, the 21st century Networked Littoral Battle Fleet will have defensive capabilities and an array of pulse and sustained, networked, strike options incomparable with past fleets. As a result, future naval strike operations should gradually shift away from CVBGs delivering small numbers of concentrated air strikes and toward *Littoral Strike Groups* delivering distributed, integrated and sustained air and missile strikes from increasingly longer ranges. Indeed, with the impending introduction of the TACTOM and other new land attack missiles, future Littoral Strike Groups should be capable of engaging components of an enemy's anti-access network with precision fire while over 1,300 nautical miles at sea and be capable of steadily increasing their volume of precision fires as they close on a theater.

By conceptualizing the ongoing transformation of the surface combatant fleet in this way, the evolutionary/revolutionary development of the Littoral Strike Group is more clearly illuminated. The 1989 CVBG represents the early first phase of the transformation (Figure 4). First phase CVBGs represented a conglomeration of second-, third- and fourth-generation aircraft carriers and BFC combatants. AEGIS and VLS equipped BFC combatants were in fleet service, but in small numbers. As a result, the strike power of first-phase CVBG

Figure 4: Charting the (R)evolution of the Littoral Strike Group

	First Phase 600-Ship Navy CVBG	Second Phase LSG	Third Phase LSG
Aircraft Carriers	1	1	1
Tactical Strike Aircraft	36	46	50
Aimpoints threatened (per day)	162	693	1,080
Guided Missile Cruisers	2 CG/CGNs, drawn from 8 different classes of nuclear powered and conventionally powered Guided Missile Cruisers (9 of 41 cruisers VLS equipped)	2 VLS-equipped CG52s	2VLS-equipped CG52s
Guided Missile Destroyers	2 DDGs drawn from 3 different classes of Guided Missile Destroyers (none VLS-equipped)	2 VLS-equipped DDG51s Flight I/II	4 VLS-equipped DDG51s Flight I/II/IIA
General Purpose Destroyers	2 DD963 or DD963 VLS destroyers (7 of 31 destroyers VLS-equipped)	2 VLS-equipped DD963s	
VLS Cells	183 (assumes 1 VLS-equipped CG and I VLS-equipped DD	546	616
Total Missiles	**432–553, depending on ship mix**	**594**	**648**

resided primarily on the decks of the carriers. The defensive firepower potential of these Groups was quite high, but because of their overall lack of network connectivity, it could not be fully exploited.

The second phase of the transformation occurred during the 1990s, when the cumulative benefits of the ongoing naval technical revolution began to manifest themselves, and the downsizing of the fleet allowed a quicker pace of standardization than might otherwise have been expected. This phase ended in 2000 with the decommissioning of the last of the non-AEGIS-equipped, guided missile cruisers and destroyers, the decommissioning of the last of the non-VLS equipped general purpose destroyers, and the commissioning of the last of 28 Flight I and II *Arleigh Burke* DDG51s.[179] The ultimate second phase Littoral Strike Group thus consists of a single carrier, two AEGIS/VLS-equipped, improved *Ticonderoga*-class cruisers, two AEGIS/VLS-equipped Flight I/II DDG51s, and two VLS-equipped *Spruance*-class destroyers. This powerful striking force includes 46 tactical strike aircraft capable of attacking 693 targets per day, 546 VLS cells and a cumulative missile load of 594 Standard, Tomahawk and Harpoon missiles. Its firepower potential is still not maximized, because CEC modifications have yet to be fully introduced into fleet service.

Fleet combat power is not restricted to the Littoral Strike Groups, however. Recall that the 2001 littoral battle combatant fleet consisted of 80 ships. With a deployable capital fleet of 11 carriers, only 66 littoral battle combatants were assigned to 11 Littoral Strike Groups, leaving 14 "extra" combatants to form task-organized Surface Action Groups (SAGs) tailored for either offensive or defensive missions. As was outlined earlier, the combined littoral battle combatant component of the second phase *Littoral Strike Fleet* carries a total of 6,869 VLS cells and a total magazine capacity of 7,917 missiles, with nearly 95% in a ready-to-fire status.

The third phase of the evolutionary/revolutionary transformation of the Littoral Strike Group should end in FY 2011, when the last of a planned production run of 34 Flight IIA *Arleigh Burke* DDGs are commissioned.[180] At that time, the notional third phase Littoral Strike Group will consist of a carrier, two CG52s, two Flight I/II DDG51s, and two Flight IIA DDG51s. All of the ships should carry the CEC, enabling them to operate as a single, digitally connected fighting entity. This networked Littoral Strike Group would carry 50 strike aircraft capable of attacking 1,080 targets per day, and its VLS battery and cumulative missile load would increase to 616 cells and 648 missiles, respectively.

In 2011, the littoral battle combatant fleet would consist of 90 ships.[181] Assuming 66 littoral battle combatants remain committed to the 11 Littoral Strike Groups, the number of "extra" combatants would increase to 24 ships. The combined littoral battle combatant component of the

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[179] The Flight I and II DDG51s carry 90 VLS cells, eight Harpoon canisters, and no helicopters. Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, p. 145.

[180] The Flight IIA DDG51s carry 96 VLS cells and no Harpoons, but they have facilities for two helicopters. Ibid., p. 143.

[181] 89 of the littoral battle combatants will be guided missile cruisers and destroyers. The 90th combatant is to be a new DD(X), which will be discussed directly. S*hips and Aircraft Supplemental Data Tables.*

second-phase Littoral Strike Fleet would boast nearly 8,596 VLS cells, and its weapon capacity would climb to 9,476 missiles with over 95 percent in a ready-to-fire status. These figures do not include the introduction of smaller missiles that can be multi-packed into single VLS cells such as the quad-packed ESSM soon to enter fleet service.

Nor do the figures include the impressive strike power that soon will be found in the fleet's revived naval gunfire support capabilities. The third ship of the DDG51 Flight IIA class, the *Winston S. Churchill*, introduced a new 5"/62 caliber naval gun that is designed to fire what is essentially a gun-launched guided missile: the Extended-Range Guided Munition (ERGM). If the associated technical challenges can be solved, this GPS-guided, rocket-assisted projectile will deliver 72 dual-purpose submunitions to within 10–20 meters of its target, at ranges up to 63 nautical miles—five times the range of today's naval guns. Current plans call for one of these new guns to be forward-fitted on the 32 newest DDG51s, and two of the guns to be back-fitted on each of the 22 improved *Ticonderoga*-class cruisers, giving the 2011 littoral battle combatant fleet a total of 76 of these long-range, gun-missile mounts.[182] As should be readily evident, then, the near- and mid-term Littoral Strike Fleet should have combat power to spare.

THINKING ABOUT FOURTH-PHASE LITTORAL BATTLE COMBATANTS

There is a heated debate now raging within the Navy over the best next steps in the surface combatant fleet's continuing transformation. There seems to be widespread agreement that fourth-phase combatants should be propelled by a new integrated electrical propulsion system. Integrated electrical power systems are composed of electric motors that provide power directly to a ship's propeller and that simultaneously power all the ship's combat and weapon systems. Their introduction would provide four significant payoffs in future ship design and operations. First, integrated electrical power systems provide more payload space for any size combatant, since they would eliminate the need for long propeller shafts and other propulsion components. Second, they would allow placement of propulsion components in less vulnerable portions of a ship's hull. Third, they would provide quieter, more fuel-efficient operations than gas turbine-powered ships. And fourth, they would allow electrical power to be distributed and shunted throughout a ship depending on the immediate need. This should allow electric-powered, fourth-phase combatants to carry more powerful radars and sonars and possibly directed energy weapons.[183]

Given the emerging threat of anti-access networks in general, and anti-ship cruise missiles and mines in particular, there also seems to be widespread agreement that future ships must be harder to locate and track. As a result, future ship designs will all have improved stealth features, including the introduction of new hull shapes and materials, conformal antennas (antennas

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[182] Cdr James E. Wise, USN, "'Fire Mission: Naval Surface Fire Support in the 21st Century," *Surface Warfare*, (May/June 2000), pp. 4–7.

[183] For a more thorough discussion on electric drive, see Lieutenant Commander Timothy J. McCoy, USN, "Powering the 21st Century Fleet," *Naval Institute Proceedings*, (May 2000), pp. 57–58; and Edward J. Walsh, "Transforming Shipboard Power," *Sea Power*, (October 1999), p. 50–52.

embedded directly into the hull of the ship), and vastly reduced radar, acoustic and infrared signatures. The combination of all-aspect signature reduction with improved, networked, self-defense capabilities will be a key aspect of fourth-phase combatants, regardless of their size.[184]

Finally, given the overall importance that sensors play in enabling knowledge-based, network-centric operations, there also seems to be widespread agreement that fourth-phase combatants should carry advanced sensors and/or be digitally linked to advanced off-board sensors specifically designed for networked operations. For example, the follow-on to the fleet's ubiquitous SPY1 radar—the SPY3 Multi-Function Radar (MFR)—is already in development. A solid-state, active, phased-array radar, it is specifically designed to detect highly maneuverable, low radar cross section, anti-ship cruise missiles in the heavily cluttered, overland, littoral environment, and to be CEC compatible. Its performance is expected to be four orders of magnitude better than the best version of the SPY1 now in service. Similar programs are in development for networked underwater and over-the-horizon targeting sensors.[185]

Beyond these three points, however, there is less agreement over the size and types of fourth-phase combatants needed to confront expected future threats. Some argue that the fleet should stop building large, multi-mission combatants and instead introduce large numbers of smaller, yet networked, littoral combat craft. Others recommend the development of minimally manned "arsenal ships" carrying extremely large missile batteries. Interestingly, however, the debate seems dominated between proponents of *large* multi-mission combatants like the DDG51, *large* single mission combatants like the arsenal ship, or *small* single mission littoral combat craft.[186] Largely missing has been any debate over whether or not the fourth-phase surface combatant fleet should include small, multi-purpose combatants like the *Oliver Hazard Perry* FFGs now in service.

The frigate component of the 2001 surface combatant fleet is fully 65 percent smaller than the comparable 1989 force, as well it should be. Beyond pirates operating in littoral waters and near maritime chokepoints, there is still no commerce raiding or open-ocean SLOC threat on the horizon, which argues against any *large* increase in the number of multi-mission POS escorts in the near to mid-term. However, large littoral battle combatants are generally poor choices to conduct counter-drug patrols or maritime intercept operations, exchanges or exercises with small navies or a host of other low-end, naval missions. These mundane yet no less important tasks would seem best accomplished by small, multi-purpose combatants.[187]

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[184] Captain Scott Anhalt, USN, "Surface Combatant Advanced Technology—Not Just for DD21," *Surface Warfare*, (May/June 2000), pp. 15–16.

[185] Undated DoN briefing paper on the SPY3 Multi-Function Radar. See also Mark Hewish, "COTS Approach Pays Off for USN ASW," *Jane's International Defense Review*, (October 1996), p. 41.

[186] For arguments for smaller carriers, see Perin, "Are Big Decks Still the Answer?" For networked littoral craft, see Commander Joseph E. Skinner, USN, "Swarm the Littorals," *Naval Institute Proceedings*, (March 2001), pp. 88–91. For more information on arsenal ships, see Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, Appendix E.

[187] Captain Don Loren, USN, "(Not Quite) The (Almost) End of the Frigate," *Naval Institute Proceedings*, (October 1996), p. 41.

In this regard, it bears remembering that many of our allies rely on the retirement of our low-end combatants to equip their own high-end navies. For example, many Garrison Era frigates and guided missile frigates remain front-line surface units in many allied fleets.[188] It is hard to imagine that these same navies could, or would, trade up to retiring *Spruance* destroyers or *Arleigh Burke* guided missile destroyers, except in the rarest of circumstances (e.g., Taiwan). In the Second Expeditionary Era, frigates should be viewed as the naval equivalent of the F15/F16 fighters during the Cold War—the allied naval import (or grant) of choice. Acquiring second-hand U.S.-built frigates is a relatively low-cost option for allied navies and one not likely to upset regional naval balances. Moreover, they allow allied navies to be part of, and plug into, U.S.-led naval expeditions. For these reasons alone, the fleet should get out of the small combatant business only after careful debate.[189]

However, the evidence suggests the debate is already decided, and that the U.S. Navy would prefer to divest itself completely of small multi-mission combatants. For example, until recently the Department planned to replace all remaining frigates with 32 large DD21 Land Attack Destroyers. At 12,000–17,000 tons displacement, the DD21s were to be the largest U.S. or allied surface combatants by a wide margin. They were to be packed with all of the emerging technologies just discussed: integrated electrical power and propulsion systems; conformal antenna arrays and other features designed to greatly reduce ship signatures; and new sensors such as integrated underwater warfare suites and multi-function and volume search radars. Furthermore, by the extensive use of automation, these large ships were designed to have a crew of only 95–110 officers and Sailors, helping to produce O&S costs amounting to 30 percent of that of a DDG51.[190]

The combat power of a DD21 would have belied the term "destroyer." Each would have carried a *minimum* of 128 VLS cells, possibly of an improved design that would accept larger diameter weapons. One of the weapons was to be a new supersonic Advance Land Attack Missile (ALAM), capable of delivering a family of modular warheads out to 300 nautical miles with high accuracy.[191] In addition to their heavy missile armament, each DD21 was to carry two powerful 155mm Advanced Gun Systems (AGSs), each serviced by an automatic loading system and a 600–750-round magazine. Each AGS was to have a sustained rate of fire of 12 rocket-assisted, extended-range, guided projectiles *per minute*, out to a maximum range of 100 nautical miles. The ballistic range of rounds fired without rocket assistance was expected to be 22 nautical miles—the same as the 16-inch guns on the *Iowa*-class battleships. Using GPS/INS guidance, these gun-launched, guided missiles were expected to deliver their payloads of dual-purpose or

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[188] See for example "Foreign Ship Transfers, 1995–2000," Appendix C in Polmar's *Ships and Aircraft of the U.S. Fleet*, 17th edition.

[189] Captain John Moore, RN, editor, *Jane's Fighting Ships 1983–1984*, (London. UK: Jane's Publishing Company, Limited, 1983), p. 125. See also "Foreign Ship Transfers, 1995–2000," in Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition.

[190] *Vision…Presence…Power: A Program Guide to the U.S. Navy 2000 Edition*, pp. 52–53. See also "DD21 and the Navy's Land Attack Renaissance," *Surface Warfare*, (May/June 2000).

[191] Schwalm, "Fires in Support of Amphibious Operations—A Status Report," pp. 22–25.

precision, anti-armor submunitions to within 10–20 meters of their targets even at their maximum range.[192]

Armed with two AGSs, a single DD21 would have been able to provide the same *sustained* firepower as two land-based, 6-gun, 155mm Marine howitzer batteries (each howitzer being able to sustain 2 rounds per minute), with four times the maximum range and with greater accuracy. Moreover, the DD21s would have had immense staying power. For comparative purposes, current plans call for a 6-gun Marine 155mm howitzer battery to expend 3,415 rounds in support of armor-heavy and 2,813 rounds in support of infantry-heavy Marine units on a 30-day sea-based operation—an average of less than 19 and 16 rounds respectively, per tube, per day. With a 1500-round cumulative magazine capacity, every DD21 would have carried the equivalent of 250 six-round battery volleys—or approximately 15 days of sustained gunfire support for a shore-based howitzer battery—without any need for at sea replenishment![193]

Given its remarkable size and combat power, a DD21 would have represented an entirely new class of *Littoral Battle Cruiser*. While its introduction certainly would have increased the combat power of the Littoral Strike Fleet, it would also have presented fleet planners and leaders with some serious fiscal challenges. Even had the LBC21 achieved its ambitious O&S savings over the long term, replacing the frigate force with battle cruisers would have sorely stressed both future ship procurement and ordnance accounts. The LBC21 would have cost well over $1 *billion* in then-year dollars, causing a mid-term procurement challenge in the second decade of the 21st century. Moreover, since their introduction would have meant that every one of the fleet's planned surface combatants would cost over $1 billion, the fleet would have been faced with a very expensive, and probably unsustainable, long-term replacement problem. As for fleet ordnance accounts, replacing 40-missile frigates with 128-cell missile combatants would have given the Littoral Strike Fleet an additional 3,852 VLS cells and have increased fleet magazine capacity by over 2,700 missiles. Future ordnance accounts would also have to be big enough to procure the tens of thousands of 155mm, gun-launched, guided missiles required to fill 64 AGS magazines. This remarkable increase in fleet ordnance requirements would be not only expensive, it would exacerbate a growing problem: the fleet currently has more VLS holes than it has weapons to fill them.[194] In any event, given *actual* threats rather than *projected* ones, even the most ardent naval advocate would have difficulty justifying substantial increases to the fleet's planned 10,000-missile capacity.

Above and beyond the fiscal ramifications of the DD21 program were the operational ramifications. The 27 *Ticonderoga*-class CGs now in the fleet and the 62 planned *Arleigh Burke*-class DDGs will give the 2011 300-ship fleet nearly the same number of cruisers and guided missile destroyers called for in the 600-ship fleet. Given the relative abundance of guided missile

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[192] Mark Hewish and Joris Janssen Lok, "Return of the Big Guns to Sea," *Jane's International Defense Review*, (April 2000).

[193] Colonel James A. Lasswell, USMC (ret), "What Is the Fire Support Answer to OMFTS?" *Marine Corps Gazette*, (July 1999), p. 32.

[194] Robert Holzer, "US Navy Running Short of Munitions, Equipment, Say Service Leaders," *Defense News*, (February 5, 2001).

destroyers in the planned force structure, the thinking was that as DD21s entered the fleet, the oldest *Arleigh Burke* DDGs would have been used for small, multi-purpose combatant missions. Would it make sense to assign an 8–9,000-ton littoral battle combatant, with a crew of well over 300, to perform frigate-type missions? Of course not. Despite its high technology promise and undeniable combat power, then, the DD21 was simply the wrong ship for the wrong time.

In November 2001, the Navy announced that it was replacing the DD21 program with a restructured program called DD(X). The DD(X) program is supposed to be a multi-ship program, developing a "family of advanced technology surface combatants," including a future destroyer, a new cruiser called CG(X) and an undefined Littoral Combat Ship (LCS).[195] As the title of the new program and its associated ships both suggest, there remains a strong fleet bias for large multi-mission littoral battle combatants.[196] This bias seems to be a case of budgetary and operational overkill. By 2011, the Littoral Strike Fleet will already have 24 "extra," large littoral battle combatants to complement the 66 associated with its 11 Littoral Strike Groups. Does the fleet really need more?

The fact of the matter is that the DD(X) is already in production: it is called the Flight IIA *Arleigh Burke* DDG. The *oldest* of the 28 Flight I/II DDGs was commissioned on July 4, 1991. With an expected service life of 35 years, it will not have to be replaced for nearly 25 years. The newer, more capable Flight IIA DDGs will not have to be replaced until 2035. Given the young age of the large (and growing) guided missile destroyer force, and what would seem to be an enduring requirement for the low-end, naval capabilities resident in small multi-purpose combatants, the priorities for the DD(X) program would therefore seem to be misplaced. Accordingly, the Navy should immediately change the DD(X) program to the CG(X) program, with an objective of replacing the *Ticonderoga*-class CGs during the second decade of the century. The *Ticonderoga* CG*s* have the largest radar cross-sections in the littoral battle combatant fleet; the sooner their important battle management and defensive capabilities are placed on low-signature ships resembling the DD21s, the more survivable the entire littoral battle network.[197] In any event, the relative procurement costs for the first, fourth-phase littoral battle combatants will most likely wind up approximating those of past cruisers, and the CG(X)'s main missile battery might reasonably be expected to approximate the 122 cells found on the current improved *Ticonderogas*, causing little further upward pressure on fleet ordnance accounts (above that caused by the possible introduction of the AGS). Even more importantly, replacing the large crews of the current CGs with minimally manned CG(X)s would cause the most dramatic drop in

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[195] See Ronald O'Rourke, "Navy DD(X) Future Surface Combatant Program: Background and Issues for Congress," (Library of Congress: Congressional Research Service, November 9, 2001); and Andrew Koch, "USN Restructures DD21 Programme," *Jane's Defense Weekly*, (November 7, 2001), p. 6.

[196] The attitude toward the mix between littoral battle combatants and smaller combatants may be changing. In a recent speech, the Chief of Naval Operations, Admiral Vern Clark, said that a key factor in determining the size of the future fleet will be the configuration of the littoral combat ship. Until ship programs reflect this statement, it is difficult to know which combatant will be emphasized. See "Clark Estimates Future Fleet at 375 Ships," *Defense Daily*, (February 19, 2002).

[197] The DD21s were designed to have a radar cross signature 1000 times smaller than the CG47 class cruisers. Undated unclassified briefing paper on DD21 combat capabilities, DoN.

the fleet's average number of sailors per missile—providing the largest potential savings in fleet O&S costs.

The CG(X) family of combatants should continue to include a Littoral Combat Ship, but it should cease development of a new destroyer and instead set its sights on introducing a small multi-mission combatant called FFG(X). Remember that the 600-ship fleet included escort groups assigned to protect 10 underway replenishment groups. These escort groups consisted of a single DDG escort leader and three frigates. Indeed, plans called for the escort leader to be a DDG51. The size and capabilities represented by such a multi-purpose escort group still seems relevant. The single DDG would provide an area air defense umbrella for the escort group, allowing the frigates to concentrate on local air and missile defense. Such a group could have an embarked helicopter capacity of six to eight multi-purpose helicopters and formidable anti-submarine and anti-surface capabilities. The single DDG would also give the escort group a modest littoral-strike capability including both VLS- and gun-launched guided missiles. The size and capabilities of the group would seem well suited to maritime intercept operations, open ocean escort, counter drug patrols, and other low-end naval missions.

Assuming an AEGIS-equipped escort leader and three escorts represents a logical notional escort group, what might be the best alternative for a small multi-purpose combatant in the fourth phase of the surface fleet's transformation? One option would be to introduce a highly capable escort like the Spanish F100 frigate. Despite its relatively modest size, the F100 is an impressive multi-purpose combatant, small only in relation to U.S. littoral battle combatants. It carries the AEGIS radar system, has facilities for two helicopters, is sized for a 5-inch gun forward, and has 48 VLS cells. Its planned notional missile load is 32 medium-range SAMs, and 64 ESSMs, quad packed in 16 VLS cells.[198] While redesigning this ship with electric propulsion and a minimal crew would convert the entire surface fleet to AEGIS/VLS standard, the costs likely would be prohibitive, and its relatively high capabilities might be overkill for future small combatant tasks.

A second, more attractive option would be for the FFG(X) to be a variation of the surface cutter selected for the Coast Guard's Deepwater Project.[199] The Coast Guard is a military, multi-mission maritime service within the Department of Transportation that "shall maintain a state of readiness to function as a specialized service in the Navy in time of war…" Forty-two of the Coast Guard's high- and medium-endurance deep water cutters begin to reach the end of their planned service lives within the next decade, and are to be replaced by a new class of cutters, perhaps capable of carrying two or three high-speed craft and a number of helicopters and/or Unmanned Aerial Vehicles (UAVs).[200] Designing the cutter to accept modular sensor and weapons suites may make the design suitable for both Coast Guard and Littoral Battle Fleet

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[198] Baker, *Combat Fleets of the World, 1998–1999*, p. 796.

[199] The Deepwater Program is the Coast Guard's program to recapitalize its aging offshore forces such as its medium- and long-endurance cutters, large patrol boats and fixed and rotary wing aircraft. See Scott Truver, "The Common Sense Case for Deep Water," *Sea Power*, (April 2001), pp. 81–84.

[200] Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th edition, pp. 562–568.

missions. Indeed, the vessel might also be suited for the LCS mission. The potential fiscal and operational savings to both the Navy and Coast Guard from such an approach are obvious.

On balance, then, the fleet should reconsider its current thinking about the fourth phase of the surface combatant fleet's transformation. The fleet would seem to have sufficient numbers of large, multi-mission littoral battle combatants. It should therefore modernize its cruiser fleet (thereby retaining the same number of littoral battle combatants) and its frigate fleet (thereby retaining a small, multi-purpose combatant component), leaving the follow-on to the *Arleigh Burke* DDG for later. To ensure the combat potential of the near- to mid-term fleets are maximized, the fleet should increase its ordnance buys throughout the remainder of this decade, with a goal of increasing missile inventories to provide the fleet with at least 125 percent of its notional battle force weapon load.[201] At the same time, it should experiment with a wide variety of alternative capabilities, while charting the development of world-wide anti-access and naval developments. This would position the Navy for a fifth-phase combatant course adjustment in the second decade of the century.

THE (R)EVOLUTIONARY 21ST CENTURY LITTORAL STRIKE FLEET

Those who decry the size of the 300-ship fleet are either blind to its awesome fighting power or choose to ignore it. More likely, they simply are using outdated measures of merit. The 15 CVBGs and four BB SAGs of the 600-ship fleet are relics of the past. They have been replaced by a (r)evolutionary and vastly more powerful 11 carrier, 7,000-cell Littoral Strike Fleet, itself on the way to an even more powerful 11 carrier, 8,000-cell fleet. For a Navy that prides itself, first and foremost, on its ability to put steel on target, the current and planned surface components of the Littoral Strike Fleet stand without operational peer—now or at any time in the past.

The revolutionary faction cannot be faulted for focusing on fleet numbers. Their complaint is that the current and planned fleets may not be the right ones, and that they lack the required capabilities to take on emerging anti-access networks. They may yet be proven right. However, given the early stage of the operational competition with anti-access networks, both the design and operational flexibility of the emerging Littoral Strike Fleet would seem sufficient to deal with emerging near- to mid-term threats.

Consider Figure 5, a summary comparison of the 1989 and 2001 combined surface combatant fleets. As is amply shown by these numbers, there has been a major increase in, and redistribution of, fleet strike potential. This expansion of fleet strike potential, and the shift from CVBG to Littoral Strike Group operations that it portends, should have important

[201] The level of 125 percent of fleet ordnance requirements is offered only as a straw man. The intent is to have enough ordnance to fill all fleet VLS cells and have the overhead required for the weapons refurbishment and repair pipeline. In other words, the goal is to obviate any need to "cross deck" ordnance from combatants returning from deployment to those going on deployment.

Figure 5: The 600-Ship v. 300-Ship Surface Combatant Fleets

1989		2001
15	Carriers	11
540	Total Tactical Strike Aircraft	506
2,430	Total Aimpoints Threatened (per day)	7,623
4	Battleships	0
104	BFC Combatants	80
5.5:1	Escort-to-Capital Ship Ratio	7.27:1
33	Strike-Capable Combatants (includes Battleships and BFC combatants)	75
2.2:1	Non-carrier Strike Platform-to-Carrier Ratio	6.8:1
1,525	VLS Cells	6,869
7,133	Cumulative Magazine Capacity (Missiles)	7,917
39.5%	Ready-to-Fire Missiles	95%
111.4	Average Displacement per Missile (Tons)	90.2
5.8	Average Sailor per Missile	3.6

operational consequences. Because of its vast, digitally interlinked VLS field, the 21st century Littoral Strike Fleet should be capable of delivering higher rates of pulse and/or sustained missile fire than any fleet in the past. Indeed, the widespread proliferation of the VLS gives the fleet missile-only strike options that rival the power and effect of past carrier air strikes. Given the advances in space-based navigation and timing systems, large numbers of missiles can be fired in synchronized time-on-target attacks, to both surprise and overwhelm an enemy's defenses and to achieve prompt, decisive network effects. Importantly, the sheer number of cells now planned for the fleet should allow future Littoral Strike Forces to conduct pulse missile attacks over and over again. Improvements in at-sea or in-theater VLS reloading options would improve the fleet's sustained missile firepower even more.[202]

New land attack missiles with extended ranges should allow future Littoral Strike Groups to engage an enemy's anti-access network far earlier, and at safer standoff distances, than at any time in the past. As a result, the early phases of future theater break-in operations will no longer be so dependent on carrier airpower, allowing fleet operational planners to protect these vital capital ships far better than in past carrier-centric fleets. Indeed, because of the size of the littoral battle combatant fleet's missile field, the Strike Fleet's integrated aviation arm might initially lend its defensive firepower to blunt enemy, long-range strikes and only then shift its efforts to search for and target mobile components of the enemy's anti-access network. Such an operational approach would maximize the strengths of both the fleet's missile and aviation forces. In fact, depending on the outcome of the competition between Littoral Battle Force capabilities and emerging anti-access networks, future air wings may play as important a role in fleet defense as they now do in fleet offense, reflecting the final outcome of events in the Second World War.

[202] As will be seen in Chapter VII, the Navy has opted not to reload missiles at sea.

All in all, the flexibility and combat power of the near- and mid-term Littoral Strike Groups should give the Networked Littoral Battle Fleet and joint commanders a variety of operational options when taking on an enemy's theater anti-access network. When employing missile strikes in sound combination with the greatly improved and more lethal carrier air wings flying off carrier carriers, future Littoral Strike Groups, operating in conjunction with other joint forces, should have at least an equal chance in network-versus-network combat against emerging near- to mid-term anti-access networks.

Some might say future Littoral Strike Groups will have a much better than equal chance. The discussion thus far has considered only the improvements in carrier strike power and the redistribution and increase of missile strike power in the littoral battle combatant fleet. As will be seen in the next chapter, there has been a similar increase in the strike power of the nuclear submarine fleet, providing fleet planners with even more sophisticated, and deadly, counter-network strike options.

IV. THE STRIKING TRANSFORMATION OF THE ATTACK SUBMARINE FLEET

THE (R)EVOLUTION OF COVERT LITTORAL BATTLE COMBATANTS

Being a card-carrying member of the large fleet faction seems to be a requirement for anyone who wears the Dolphins.[203] To hear nuclear, attack submarine officers tell it, the attack submarine fleet has been gutted; they constantly argue that a fleet of "only" 50 attack submarines threatens the very security of the nation.[204] But once again, the cries of alarm are based not on combat capability, but on keeping subs forward deployed during peacetime. When returning the focus of the argument to the submarine fleet's fighting power, the story is a far less worrisome one.

On December 31, 1989, the attack submarine fleet consisted of one diesel (SS) and 95 nuclear attack boats (SSNs).[205] The single SS and three old *Skipjack* SSNs were all second-line units approaching the end of their service lives. Two of the boats were former ballistic missile submarines converted into special operations transports. And one new *Los Angeles*-class boat (the *Memphis*) was operating as a full time R&D platform for the Advanced Research Projects Agency. The remainder of the attack submarine fleet consisted of 10 *Permit-*, 37 *Sturgeon-*, one *Narwhal-*, 30 Flight I and eight Flight II *Los Angeles- (LA-),* and three *Improved LA*-class boats, for a total of 89 front-line units.[206]

Faced with the prospect of taking on the Soviet's very capable undersea fleet, the primary focus of the 1989 submarine fleet was anti-submarine warfare. The SSN fleet had two primary wartime responsibilities: to shadow and, if necessary, to sink Soviet ballistic missile submarines operating under the polar ice cap or in protected bastions close to Mother Russia; and to detect and sink the Soviet's growing number of fast, deep-diving, nuclear-powered attack boats operating against carrier and amphibious strike forces and Atlantic convoys. Accordingly, they most often operated independently from surface task forces and primarily with advanced Mk48 torpedoes and submarine launched anti-submarine rockets (SUBROCs) filled their torpedo rooms.

In addition to their pre-eminent ASW role, attack submarines made important, if smaller, anti-surface and land-attack contributions. Harpoon anti-ship missiles fired from torpedo tubes augmented the Mk48 torpedoes in the anti-surface role, and all boats except the 10 *Permits* were being converted to fire the Tomahawk land attack cruise missile—either from their torpedo tubes

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[203] Members of the U.S. submarine force wear a Dolphin pin on their uniform to indicate their warfare specialty.

[204] See for example Mike Gordon, "Opposition Surfaces: Silent Service Says No to Further Cuts," *Navy Times*, (January 17, 2000), pp. 14–16.

[205] Submarines are referred to as "boats" instead of "ships."

[206] *Ship Forces of the U.S. Navy: Historical Force Levels FY62 through FY93,* and Polmar, *Ships and Aircraft of the U.S. Fleet,* 14th edition.

or in new, bow-mounted, 12-cell VLS batteries on the Flight II and *Improved LA*-class boats. The maximum cumulative weapons capacity for the 89 front-line boats consisted of a mix of 2,416 torpedoes, SUBROCs, Harpoons, and Tomahawks, for an average weapons capacity of 27 weapons per hull.[207]

With the diminution of the Russian submarine threat, throughout the 1990s the U.S. attack submarine force downsized along with the rest of the fleet. If anything, however, the downsizing was more jarring and difficult for submariners. Whereas the surface fleet contracted by discarding unneeded frigates and difficult to man and maintain nuclear-powered and older steam-powered surface combatants, the attack submarine fleet was forced to retire modern front-line units far before the end of their expected service lives. For example, the *Boston*, a *LA*-class SSN, was decommissioned in 1998 after only 16 years of fleet service.[208] After this difficult decade of contraction, by September 30, 2001, the attack submarine force consisted of one special operations transport and 54 front-line boats including one *Sturgeon,* 20 non-VLS equipped *LAs,* 31 VLS-equipped *LAs,* and two new *Seawolf*-class SSNs.[209]

The naval technical revolution in the surface combatant fleet has yet to be fully coupled with an associated doctrinal, organizational or operational transformation. In contrast, prodded by what submariners took to be a threat to their existence, SSN doctrine and operational patterns have shifted significantly since 1989. Moreover, they continue to evolve, resulting in important new Littoral Battle Force capabilities that will be vitally important if the fleet is confronted by future anti-access networks.

Given the presence of any serious naval anti-access threat, the attack submarines' natural stealth and combat endurance will mean they will often be the first fleet units to penetrate a littoral operations area and carry the fight to the enemy. SSNs would seek first to map out opposing network vulnerabilities by conducting covert ISR missions. They would also conduct anti-submarine and anti-surface sweeps to detect and destroy any enemy submarines or major surface units that could threaten friendly surface ships. Once these tasks were accomplished, the SSNs would then provide strike support to the Littoral Battle Fleet and other joint forces.

While littoral anti-submarine sweeps remain an important advance force task, given the paucity of contemporary underwater threats, peacetime ISR missions and wartime strike support are now the main focus of the attack submarine fleet. Indeed, an instructor at the Submarine Officer Basic Course recently told prospective submarine officers that "you are more likely to shoot a Tomahawk missile than any other weapon during your time in the military—even a handgun."[210] In other words, in little more than ten years, the attack submarine fleet has seen its primary mission change from hunting submarines in the open ocean and under the polar ice cap to covering the advance of the Networked Littoral Battle Fleet and delivering land-attack strikes in

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[207] Ibid.

[208] Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th edition, p. 83.

[209] *Ships and Aircraft Supplemental Data Tables,* December 10, 2001.

[210] Lieutenant (JG) Alexander Barbara, USN, "The 'Big Gun's' Two-Theater TLAM Tally," *Undersea Warfare,* (Winter 1999), p. 14.

support of littoral battle or joint forces from crowded and noisy littoral waters. As such, SSNs are now better thought of as being *covert littoral battle combatants*—the Networked Battle Fleet's stealth strike arm—a title more consistent with their future operating environment, more attuned to their expected operational taskings, and more representative of the ongoing transformation of the SSN fleet.[211]

While this transformation had important stimuli from both bureaucratic and operational circumstances, it was hastened by the prudent exploitation of five improvements to the attack submarine force: increased weapons capacity; increased strike potential; increased command and control capabilities; increased special operations capabilities; and increased littoral operations capabilities. Increased weapons capacity evolved as a consequence of larger torpedo rooms and the steady increase of VLS-equipped submarines. Early *Permit*-class SSNs could carry four warshots in their tubes and an additional 18 stowed weapons, for a maximum patrol load of 22 weapons. In later *Sturgeon*- and *LA*-class SSNs, the number of stows was increased to 22, for a maximum patrol load of 26 warshots. This standard Cold War weapon load was to be significantly increased with the introduction of the large *Seawolf*-class SSN, which could carry eight warshots in their torpedo tubes and 50 additional stows. However, the class was terminated after only three hulls.[212]

The new bow-mounted VLS batteries introduced on Flight II and *Improved LA*-class boats were *additive* to their torpedo room storage capacity, causing an immediate and dramatic increase to their maximum patrol weapon loads. With their 12-cell VLS field, these SSNs can carry a maximum patrol load of 38 weapons—representing a 46 percent increase in their potential combat power. Because of the steady increase of VLS-equipped *LAs* since 1989, the number of stealth VLS shooters and fleet covert missile cells has nearly tripled, rising from 11 shooters (representing 12 percent of the front-line force) with 132 cells, to 31 shooters (representing 56 percent of the front-line force) with 372 cells.[213]

As a result of improvements to both its torpedo carrying capacity and the widespread proliferation of VLS-equipped submarines, although only 61 percent the size of the 1989 force, the FY 2001 attack submarine fleet carries over 75 percent of its cumulative weapon load (1,824 torpedoes and Tomahawk missiles), with a 24 percent increase in the average number of weapons carried per hull (34 weapons). Operationally, an increased weapons capacity means current submarines can make longer combat patrols until compelled to withdraw and rearm—an important consideration when operating in distant theaters.

The increase in submarine strike potential that accompanied the increase in submarine weapons capacity went beyond the mere addition of VLS-equipped submarines. Because their 21-inch

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[211] Guy Gugliotta, "For Attack Subs, New Roles in a Changing World," *The Washington Post*, (March 5, 2001).

[212] The actual patrol loads of submarines are usually one to two weapons below their maximum carrying capacity to allow for change-outs of weapons pre-loaded in the torpedo tubes. Numbers are derived from Polmar's *Ships and Aircraft of the U.S. Fleet*, and input provided to the author from the Office of Program Appraisal, Office of the Secretariat, DoN.

[213] Polmar, *Ships and Aircraft of the U.S. Fleets*, 17th edition.

diameter torpedo tubes accommodate many of the same diameter weapons as those fired from VLS cells, an SSN's four torpedo tubes (the *Seawolfs* carry eight apiece) essentially comprise a Re-loadable Horizontal Launch System, or RHLS. Since RHLS tubes can fire any weapon that can be encapsulated inside of a launch sleeve, their associated torpedo handling rooms have less handling restrictions than did the rotary magazines found on 1989 surface vessels, allowing even non-VLS equipped SSNs to carry and fire strike weapons.

Because of the rapid decline in post-Garrison Era undersea and surface threats, the flexibility of submarine fleet's RHLS could be immediately exploited. Both the SUBROC (and its planned follow-on) and Harpoon anti-ship missiles have been removed from SSN torpedo rooms, freeing up magazine space for strike weapons. As a result, current boats can carry a much higher percentage of land-attack missiles than could 1989 SSNs, with no increase in their operational risk. For example, notional magazine load-outs for non-VLS and VLS-equipped SSNs are eight and 20 Tomahawks, respectively. These notional loads give the Networked Battle Fleet a stealth strike potential of nearly 800 land attack missiles—not counting land attack missiles carried on the two *Seawolfs*. Moreover, if the littoral submarine threat is low, this number could easily be increased for specific contingencies. Indeed, the only theoretical limit to the number of potential stealth strike weapons is the submarine fleet's total weapons capacity of 1,824 warshots.[214]

The cat-and-mouse games the silent service played with Soviet submarines during the Cold War called for independent operations, and coordination and data connectivity with fleet surface units was neither required nor desired. As the stealth strike arm of the Networked Littoral Battle Fleet, however, reliable communications between surface combatants and submarines is a key operational requirement. Without the means to reliably tie the submarine force into Networked Littoral Battle Fleet operations, its increased strike potential would contribute far less to coordinated anti-access operations than possible. As a result, submarine communications are being thoroughly upgraded. For example, the Navy is now installing a submarine communications suite that will allow deployed attack submarines to transmit and receive data at speeds of 128 to 256 kilobits per second while operating at periscope depth and high-data rate antennas and systems that will allow them to plug into a Littoral Battle Force's digital battle network. In 2003, the force will receive a new floating wire antenna system that will give it a somewhat lesser communications capability while traveling submerged and at full speed.[215] With these and future command and control advances, Littoral Battle Force Commanders should be able to confidently communicate with supporting covert littoral battle combatants, and to effectively mesh their stealthy fires into those of the entire Battle Force in near real time.

Some pundits downplay the stealthy aspect of covert littoral battle combatants, pointing out that submarines compromise their location once they fire land strike missiles. While technically true, this observation misses the point. The primary threats to an SSN firing land-attack missiles from its operating area are nearby undersea and surface threats or quick reacting ASW helicopters. Prior to firing, a SSN would work to neutralize submarine and surface threats, and carrier air

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[214] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, and input provided to the author from the Office of Program Appraisal, Office of the Secretariat, DoN.

[215] John G. Roos, "Weighing the Options," *Armed Forced Journal International*, (April 2001), p. 56.

forces and littoral battle combatants would work to keep the skies clear of air threats. Once secure in their operating areas, a submarine's temporary loss of stealth while firing strikes would be no different than the temporary loss of stealth that a low observable aircraft suffers when opening its bomb bay doors. Once its strikes are fired, the submarine would return to its stealth mode and reposition itself for a strike from a different location.

As a result of their inherent stealth and increased strike potential, covert littoral battle combatants should allow future Littoral Battle Force commanders to cross swords with any anti-access network by first conducting an *asymmetrical missile attack*, whereby submerged submarines attack an enemy's fixed, land-based command and control nodes, missile launch sites and strike airfields, from close range, *without fear of effective land-based counter-fire*. Such an asymmetrical missile engagement capability would in turn allow littoral battle combatants to initially strike targets while remaining farther out at sea and outside of more dangerous, restricted littoral waters. Indeed, given the improvements in submarine command and control, the shorter times of flight of weapons launched close to shore, and improved strike missiles that can loiter and be reprogrammed in flight such as TACTOM, submarines might increasingly hold mobile targets at risk—a task now generally reserved for aerospace and carrier strike forces.

This asymmetrical engagement advantage might be made even more pronounced if Navy SEALs, Marine reconnaissance and joint special operations forces can be covertly inserted ashore during advance force operations. As was demonstrated in operations throughout Afghanistan, these highly trained forces can greatly improve a Littoral Battle Force's situational awareness by operating as the extended eyes and ears of the littoral strike network, helping to refine its targeting data and providing terminal precision guidance for friendly counter-fire.[216]

For the 1989 SSN fleet, focused as it was on open-ocean and under-ice ASW, special operations support capabilities were a relatively low priority. These capabilities were concentrated in two former ballistic missile submarines whose missile tubes were deactivated and which were then converted into special operations transports. The transports were each capable of carrying up to 67 special operations personnel and the swimmer delivery vehicles for their clandestine insertion. These special-purpose transports were augmented by a small number of attack submarines converted to carry removable Dry Deck Shelter (DDS) hangars. DDS hangars are designed to accommodate a swimmer deliver vehicle and to lock out a group of special operations swimmers, allowing them to leave the submarine while it is fully or partially submerged.[217]

For covert littoral battle combatants, focused as they are on operations in support of the Networked Littoral Battle Fleet in the Second Expeditionary Era, special operations support capabilities promise to become as important—and as ubiquitous—as were SSN under-ice capabilities during the Cold War. The commissioning of the third and last *Seawolf*, the *Jimmy Carter*, has been delayed to 2004 so that it could be specially modified to support special operations forces (as well as remotely operated submersibles and other special reconnaissance

[216] Ricks, "Bull's Eye War: Pinpoint Bombing Shifts Role of GI Joe," p. A1.

[217] Polmar, *Ships and Aircraft of the U.S. Fleet,* 14th edition, p. 66.

capabilities). The *Carter* will have an integral nine-diver lockout chamber, be able to transport up to 50 special forces personnel and be able to mate with a DDS. The *Carter* will be joined in the year of its commissioning by the first of the new *Virginia*-class SSNs, now in serial production, which will be able support up to 40 SEALs for short periods of time, albeit at the expense of their weapons payload. All *Virginias* will carry a nine-swimmer lockout chamber, stowage space for SEAL Team Combat Rubber Raiding Craft, and be able to mate with a DDS. As these new submarines are introduced into fleet service, the covert littoral battle fleet will provide impressive new capabilities for the insertion and support of SEAL, Marine Reconnaissance and special operations forces during joint campaigns.[218]

The *Virginias*' improved ability to support special operations forces are just one aspect of its improved littoral operations capabilities.[219] Like the *Improved Los Angeles*-class SSNs, the *Virginias* will carry four RHLS, 12 VLS cells and have a weapons capacity of 38 warshots. However, the boats are expected to be much quieter, having an designed acoustic signature (self-radiated noise) equal to or lower than much larger *Seawolfs,* the quietest attack submarines now in the fleet. Moreover, their underwater combat system is expected to have 26 times the signal processing capability and 55 times the data processing capability of the *Seawolf's* combat system. This combination of superior silencing and signal/data processing is designed to give the class a first-shot advantage in any underwater and acoustical environment, especially in noisy littoral waters.[220]

In addition to their impressive combat system capabilities, the *Virginias* will be capable of mapping enemy minefields using unmanned underwater vehicles (UUVs), allowing them to safely penetrate anti-access networks during covert advance force operations and provide mine avoidance routes to follow-on Littoral Battle Force units. By virtue of their modular construction, future *Virginias* can be built with special 30-foot, mission-specific, hull plugs at the cost of 800 tons more displacement and only .5 knots in maximum speed. These special purpose modules can be designed to add weapons capacity or to introduce new capabilities to counter emerging threats. For example, if enemy anti-ship cruise missile technology advances more rapidly than expected, a VLS module might be added, allowing the Navy to quickly increase the number of covert strike missiles available for naval expeditionary operations. In any event, as the *Virginias* start to replace the older pre-VLS *LAs* in numbers toward the end of this decade, their improved, littoral-combat capabilities will make the huge advantage our current covert littoral battle force enjoys over any potential undersea opponent even more daunting.[221]

This conclusion in no way detracts from the impressive littoral combat capabilities now resident in the residual Cold War submarine force. With their very high sustained speeds of 35 knots, maximum acoustic speed of 20+ knots, deep diving ability, advanced underwater detection

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[218] Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th edition, pp. 68–77.

[219] Norman Friedman and Scott C. Truver, "It's What's Inside That Counts," *Naval Institute Proceedings*, (February 1997), pp. 41–44.

[220] William H. Kowenhoven and Frederick J. Harris, "The NSSN: A 21st Century Design," *Naval Institute Proceedings,* (June 1977), p. 36.

[221] Ibid., p. 36

systems, and large weapon loads, the *Seawolfs* are ideally suited to serve as anti-submarine warfare "shotguns" for future Littoral Battle Forces, protecting them from enemy submarine attack.[222] Meanwhile, the littoral combat capabilities of the older *LA*-class boats are also improving, by virtue of the ongoing Acoustic Rapid COTS[223] Insertion (ARCI) program. Started in FY 1997, this effort upgrades the *LAs*' older sonars and combat systems into a more powerful and flexible commercial open-systems architecture, with more signal processing than the advanced system originally specified onboard the *Seawolfs*. In noisy littoral waters, advanced signal processing is the key for retaining a first shot advantage over quiet diesel submarines. As a result, ARCI-equipped *LAs* should be able to confidently venture into littoral waters and prevail over any likely undersea opponent to the end of their normal service lives.[224]

Improvements since 1989 to attack submarine weapons carrying capacity, strike potential, and command and control, special operations, and littoral combat capabilities have created a stealth Littoral Strike Fleet component with combat power simply unmatched by any navy in the world. With future planned improvements such as "flexible payload interfaces" that allow the employment of larger diameter weapons or even small unmanned underwater combat craft, the covert littoral battle combatant fleet should be able to dominate any potential underwater opponent for the next several decades.

RIGHT-SIZING THE 21ST CENTURY COVERT LITTORAL BATTLE FLEET

The 1997 QDR concluded the attack submarine fleet could shrink to a total of 50 SSNs. A 1999 JCS assessment, prodded in no small way by the attack submarine community, disagreed. The assessment concluded that by 2015 the fleet would require 68 boats to meet the *projected peacetime ISR requirements of the regional CinCs*, and that the fleet should under no circumstances be allowed to fall below 55 boats.[225] A 55-boat force can be maintained in the near- to mid-term by refueling pre-VLS *LA*-class boats now scheduled for decommissioning, extending the service life of SSNs from 30 to 33 years, and, over the long-term, by increasing the build rate of *Virginia* SSNs.[226]

By the JCS' own assessment, however, the CinCs' insatiable peacetime demand for covert intelligence gathering likely will continue to outstrip the ability of even a 55-boat SSN force. Should submarines prove to be the only viable means of meeting the CinC's covert intelligence collection requirements, perhaps additional Department of Defense funds should be diverted to

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[222] "Acoustic speed" is the speed at which a submarine can operate while maintaining a sufficiently low, self-radiated noise level to detect other submarines. For comparative purposes, Soviet submarines built during the Cold War had acoustic speeds of only six to eight knots. Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, p. 79.

[223] Commercial-off-the-shelf

[224] Mark Hewish, "COTS Approach Pays Off for US Navy ASW," *Jane's International Defense Review*, (August 2000).

[225] Rear Admiral Al Konetzni, "How Many Subs Do We Need?" *Naval Institute Proceedings,* (November 2000), p. 56.

[226] "Increasing Submarine Force Level," unclassified point paper, (Washington, D.C.: DoN, September 26, 2000).

the DoN budget to build more of them. From a DoN perspective, however, given the excess undersea *warfighting* capacity of its submarine fleet, the opportunity costs associated with increasing the attack submarine force above a level of 55 boats do not seem worth it.

The numbers tell the story. Assuming that a force level of 55 boats is maintained, in 2011 the covert littoral battle fleet would consist of seven *Virginias*, three *Seawolfs*, 31 VLS-equipped *LAs*, and 14 early *LAs*, with a cumulative weapons capacity of 1,982 weapons, including 456 missiles carried in VLS cells, and a notional land-attack missile load of 872 missiles (not counting the *Seawolfs*).[227] Moreover, throughout the century's second decade, both pre-VLS- and VLS-equipped *LAs* will be steadily replaced by the more modern *Virginias*, resulting in even greater force capabilities. To the limit of the operational horizon, given the lack of any credible undersea opponent, this is a submarine force that seems in no way in danger of losing its commanding lead over potential undersea threats.

Within the confines of a 55-boat force, however, there are cost effective ways to increase its operational effectiveness. For example, the Navy will soon station the first of three *LA*-class boats on Guam. When all three of these covert littoral battle combatants are operating from this forward operating base, for the relatively modest costs associated with housing and other quality of life improvements and improvements to the on-island maintenance support facilities, the Navy will get the equivalent of seven to nine attack submarines operating out of San Diego, California. This equivalency metric is based on the "decreased submarine transit times from San Diego to Pacific operating areas, and by other factors such as minimum turn-around ratios and employment strategies."[228] Perhaps similar forward basing operations could be considered on Diego Garcia.

With a nod to many in the revolutionary faction, and at the direction of the Secretary of Defense, the Navy will also soon take advantage of current arms control limits, which will force the premature retirement of at least four of its 18 superb *Trident* ballistic missile submarines, each with a minimum of 22 years of remaining hull life. By modifying the *Tridents* to carry up to 154 Tomahawk missiles in VLS cells, loaded into 22 of their 24 existing ballistic missile launch tubes, the Navy plans to introduce a new class of nuclear-powered, guided (cruise) missile submarines (SSGNs). For comparative purposes, each SSGN would carry the equivalent of a normal CVBG Tomahawk load, and the 616 VLS cells carried on four SSGNs would represent the equivalent VLS capacity of five *Ticonderoga* CG52s or nearly seven Flight I/II *Arleigh Burke* DDGs. [229]

Many in the Navy believed the *Trident* SSGN conversion option to be unnecessary. They argued the same point introduced earlier—that the fleet already has more VLS cells that it can fill.

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[227] The current *Ships and Data Supplemental Tables* actually project a 2011 SSN fleet of 56 boats, including seven *Virginias*, three *Seawolfs*, 31 *Improved LAs*, and 15 *LA*s.

[228] Comments made by Admiral Frank L. "Skip" Bowman in "Transformation in Their Scope," *Armed Forces Journal International*, (November 2001), p. 34–38.

[229] Commander Robert Aronson, USN, "SSGN: A 'Second Career' for the Boomer Force," *Undersea Warfare*, (Winter 1999), pp. 19–22.

However, this point is more of an indictment of Navy procurement priorities rather than a justification to forego the conversion. A four-boat SSGN squadron will increase the number of fleet covert VLS cells available in 2011 from a planned total of 456 to 1,072 cells. Operationally, this will improve the fleet's planned ratio of stealthy-to-non-stealthy VLS cells from 1:18.9 to 1:8.0, providing a substantial operational hedge against either an aggressively fielded, missile-reliant, naval anti-access network or rapid improvements to anti-ship cruise missile effectiveness. Moreover, since the basic *Trident* hull is specifically designed for continual service by virtue of having two complete crews per ship, the four SSGNs will have an availability rate of nearly 70 percent. This will ensure at least two would be always deployed, with 308 land-attack missiles among them—the equivalent of 37 non-VLS or 15 VLS equipped SSNs using notional weapon loads, or eight VLS-equipped SSNs armed entirely with strike weapons.[230]

The price of getting this impressive covert littoral strike capability is relatively cheap: ship conversion costs are expected to be approximately $500–600 million per *Trident*, for an annualized procurement cost over its remaining 22 years of service life of only $23–27 million dollars.[231] Moreover, the costs to cover the conversions could also be offset, if necessary, by canceling the planned refueling of four non-VLS equipped *Los Angeles*-class boats. These submarines can carry only 26 weapons in their torpedo rooms and have only 12 years of remaining service life. Their loss would seem more than compensated for by the increase in fleet combat power provided by the SSGNs. The substitution of four SSGNs for four SSNs would keep the size of the submarine force at 55 boats.[232]

In addition to buying a substantial increase in fleet covert strike firepower, the conversion costs would also include modifications to allow each converted *Trident* to carry a detachment of 66 SEALs or Reconnaissance Marines and their equipment (with the ability to surge to 102 personnel), as well as their supporting swimmer delivery systems.[233] Rather than assigning a swimmer detachment permanently, a more practical alternative would be for the boats to carry a pre-loaded set of special operations equipment and swimmer systems, and, if a crisis erupts, to surface and take aboard special operations units flown into theater. This would prevent the deterioration of mission skills that one might expect if these highly trained personnel were permanently embarked on long, submerged patrols. One could also imagine improvements to the boat's ISR capabilities that would allow them to function very effectively as long-dwell, covert intelligence collectors. Indeed, the size and capabilities of these impressive underwater combatants would seem better captured by the title Covert Littoral Battle Cruiser.

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[230] Ibid., p. 21.

[231] The cost listed is for a START-accountable version that would not require removing the original SLBM tubes. A START-compliant version with the SLBM tubes totally removed would be approximately twice as expensive. In *Memorandum for the Record on Submarine Force Structure*, (Washington, DC: Office of the Secretary, DoN, October 5, 1999), p. 3. .

[232] Should the money for both the *Trident* conversions and the SSN refueling be available, the submarine fleet would expand to 59-boats

[233] Aronson, "SSGN: A 'Second Career' for the Boomer Force," p. 20.

Covert Littoral Battle Cruisers, working in tandem with, or independently from, Littoral Battle Forces, would offer naval operational planners significant new operational and strike options. They could add their weight of stealthy firepower in support of Littoral Strike Groups during theater break-in operations. They could form an independent "economy of force" Littoral Strike Group, covering gaps in the theater strike coverage normally provided by carriers and littoral battle combatants. They also could support independent covert strike raids in conjunction with special operations forces. It seems safe to assume fleet operators will find other exciting operational possibilities once these boats are in service.

THE COMBINED LITTORAL STRIKE FLEET

As can be seen, the transformation of the attack submarine fleet has been no less dramatic than that of the surface combatant fleet. If anything, it has been even more dramatic, primarily because submariners, unlike their surface counterparts, have shown a ready willingness to adapt to current and expected future operating environments in addition to changing their operational concepts and patterns. Such willingness to adapt provides the emerging Networked Littoral Battle Fleet with increased combat power, as well as enormous operational flexibility than can be exploited during later stages of the emerging competition with anti-access networks.

Figure 6 recaps the actual and planned end states for the second and third phases of the 21st century fleet's evolutionary/revolutionary development, including carriers, littoral battle combatants and covert littoral battle combatants. Again, as is amply suggested by the data, judging the combined Littoral Strike Fleet solely by the number of its carriers, ships and submarines fails to give a true appreciation for its enormous combat power.

In addition to its formidable combat power, the combined Littoral Strike Fleet is enormously supple. Because of the flexible loading capability of its vast VLS field, force weapon load outs can be adjusted to emphasize either defensive or offensive capabilities, depending on the mission or threat. Moreover, because VLS cells are not closely coupled with specific types of weapons, future littoral battle and covert littoral battle combatants will be able to confront new threats without substantial modification. For example, new weapons like supersonic, land-attack missiles or even anti-ballistic and anti-satellite missiles could be rapidly integrated into fleet service with little more than changes to combat system software and fire control interfaces. Finally, the ready availability of *Trident*-class Covert Littoral Battle Cruisers and the flexibility of the new modularly designed *Virginia*-class submarine means the fleet's mid- to far-term ratio of stealthily delivered to non-stealthily delivered munitions can be easily increased should threats to surface ships develop more rapidly than expected.

Figure 6: Combined Littoral Strike Fleet

2001		2011
	Carrier Strike Potential	
693	Air Wing Daily Strike Potential (Maximum aimpoints threatened per day)	1,080
7,623	Total Carrier Force Deep Strike Potential (Maximum aimpoints threatened per day)	11,880
	Littoral Battle Combatant Strike Potential	
6,869	VLS Cells	8,596
7,917	Cumulative Missile Capacity	9,476
	Covert Littoral Battle Combatant Strike Potential	
372	VLS Cells	456/1,072*
1,452	RHLS rounds	1,526/1,470*
1,824	Cumulative Weapons Capacity	1,982/2,542*
9,741	**Total Fleet Weapons Capacity**	**11,458/12,018***
1:18.5	Covert-to Non-covert VLS cell ratio	1:18.9**/**1:8.0*
1:4.3	Covert-to-Non-covert weapons ratio	1:4.8/1:3.7*

* Numbers reflect a 55 boat force with and without a four-boat Covert Littoral Battle Cruiser Squadron

Given the enormous strike power resident in the combine Littoral Strike Fleet, it is not hard to imagine a future wherein the Navy concentrates more and more on delivering long-range precision fire from the sea and becomes increasingly disconnected from the Marine Corps. Such a future would simply continue and emphasize the divergence in Navy and Marine Corps visions that began during the Garrison Era. From a Departmental perspective, such a future would be a bleak one. During the Second Expeditionary Era, it seems likely that Networked Littoral Battle Forces will rely on its organic maneuver arm to a degree not seen in the recent past. This will be especially true for potential theater break-in operations against cohesive anti-access networks, where maneuver from the sea can both complement and amplify fleet striking power. For the 21st century Networked Littoral Battle Fleet to reach its ultimate transformative level of fighting power and capability, a Revolution in Maneuver Affairs equal to the Revolution in Strike Affairs will be needed. As will be seen in the next section, this new revolution is just around the corner.

V. From Amphibious Assault to Operational Maneuver from the Sea: Charting the Ongoing (R)evolution in Littoral Maneuver

A Naval Maneuver Force in Readiness

The Marine Corps, a separate service within the Department of the Navy, has provided the fleet with its own organic maneuver arm since the Revolutionary War, when the Continental Congress called for two battalions of men who were "good seamen, or so acquainted with maritime affairs as to be able to serve to advantage by sea…" Little more than four months later, the fleet conducted its first seaborne assault, landing 268 Marines on New Providence Island in the Bahamas for operations against the British.[234]

At the end of 1989, the Marine Corps was still near its post-Cold War high of 200,000 active duty officers and Marines, making it the world's largest naval infantry force by a wide margin. The Marines were organized into three infantry divisions, three aircraft wings and three large force service support groups that provide logistics and other combat service support. This basic organizational structure reflected the Marine's statutory tasking to "…provide forces of combined arms, including aviation…" for the conduct of naval expeditionary campaigns. As was discussed in Chapter III, while limited in armor and heavy artillery, the Corps operates its own large, tactical air arm with both fixed rotary wing aircraft. [235]

The Marines' divisions, wings and logistics groups would contribute units to Marine "warfighting" organizations. Beginning in the 1970s, and reflecting their combined arms nature, the Marines started to organize for combat by forming Marine Air-Ground Task Forces. Whatever its size, each MAGTF has a headquarters element, a ground combat element, an aviation combat element, and a combat service support (i.e., logistics) element. MAGTFs were originally envisioned to be ad hoc units assembled only for specific missions. But during the latter part of the Garrison Era, as Marine and Navy visions drifted more and more apart, standing MAGTFs became the exception rather than the rule. By layering standing MAGTF headquarters over their old organizational structures, the Marines paid a heavy price in staff overhead. In 1989, for example, there were headquarters for Atlantic and Pacific Marine forces, three large MEFs, six MEBs, and seven MEUs. These were in addition to the three Division, three Wing and

[234] Polmar, *Ships and Aircraft of the U.S. Fleet*, 13th edition, p. 18; Patrick Hayes, "U.S. Marine Corps Leading in Transformation," *Defense Watch*, (December 12, 2001).

[235] The Corps' organization of three Divisions and three Aircraft Wings is specified by congressional legislation. See *United States Marine Corps Concepts & Issues 2000*, p. 2. Polmar, *Ships and Aircraft of the U.S. Fleet*, 13th edition, p. 18.

three Force Service Support Group headquarters, as well as 12 regimental and 11 air group headquarters, giving the Corps a total of 50 higher unit headquarters![236]

This structure was large enough to support the forward basing of the III Marine Expeditionary Force on Okinawa, Japan, as well as the routine forward deployment of two to three battalion-sized MEUs on ARGs. The rotational deployment of ARG/MEUs can be traced back to the 1950s, when the United States began to permanently man naval garrisons along the periphery of the Soviet Union.[237]

At the end of FY 2001, the Marine Corps had undergone little substantive change from the previous 12 years. Indeed, as was discussed in Chapter II, of the four services the Marines were least affected by the shift from the Garrison Era to the Second Expeditionary Era, since they had worked hard to maintain an expeditionary outlook and culture throughout the long Cold War. The most noticeable change after the passage of more than a decade is that the Corps now numbers "only" 172,000 officers and Marines and that the six standing MEB headquarters no longer exist. The MEB headquarters are instead embedded in the larger MEF headquarters. With the exception of a reduction in the number of infantry regiments from nine to eight, some modest organizational additions, and the addition of more modern equipment, the 2001 Marine Corps is remarkably unchanged from the 1989 Marine Corps.[238]

THE (R)EVOLUTION OF OPERATIONAL MANEUVER FROM THE SEA

The Corps' unchanging nature over the past decade masks the impending revolution in the way it will wage war from the sea. With the shift to a new expeditionary age the Marines saw a future in which maneuver operations from the sea gained new relevance. However, these operations did not include seizing defended beaches, building up forces ashore and then pushing inland—the earmarks of a traditional Marine amphibious assault. Since the late 1980s, Marine planners have, instead, sought to perfect the art of driving forces deep into an enemy's rear directly from a mobile sea base—an art they refer to as Operational Maneuver From The Sea (OMFTS).[239]

OMFTS is the Marine Corps vision for integrated fleet maneuver operations within the framework of its overall service concept of Expeditionary Maneuver Warfare.[240] As its name implies, OMFTS focuses on an operational objective and seeks to use the sea as maneuver space both to pit the strengths of the littoral maneuver force against an opponent's weaknesses and to

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[236] Polmar, *Ships and Aircraft of the U.S. Fleet*, 16th edition, p. 39 and 353. For a concise discussion about Marine Corps organization, see "How Marines are Organized," Appendix A, in *United States Marine Corps Concepts & Issues 2000*, pp. 248–259.

[237] Polmar, *Ships and Aircraft of the U.S. Fleet*, 13th edition, p. 19.

[238] Ibid., p. 42.

[239] For a thorough discussion of OMFTS, see *United States Marine Corps Warfighting Concepts for the 21st Century*, (Quantico, VA: Marine Corps Combat Development Command), pp. I-1 to I-22.

[240] General James L. Jones, USMC, "Strategic Agility, Operational Reach, and Tactical Flexibility," *Naval Institute Proceedings*, (February 2001), pp. 2–4.

control a battle's tempo and momentum. The aim of OMFTS is to overwhelm and paralyze an adversary.[241] In this, OMFTS seeks to replicate the disruptive and paralyzing effects that Cold War Soviet war planners hoped to gain from their Operational Maneuver Groups. Soviet Operational Maneuver Groups were powerful combined arms teams whose combat power was never to be wasted on costly frontal assaults against the forward edge of NATO's defenses. They instead were to be held in reserve until assault forces could achieve a breakthrough or until a seam in NATO's defenses could be discovered through reconnaissance. Once either of these two situations occurred, the Groups would have then been thrust deep into NATO's rear area of operations with the aim of disrupting the cohesion of its entire defense.

Marine planners are confident that by integrating naval, joint and national reconnaissance assets, they will be able to identify gaps in an enemy's defenses during advance force operations. By using the inherent operational mobility of naval forces, they are equally confident that they will be able to move to exploit those gaps faster than the enemy can close them. The exploitation will come by launching a combined arms MAGTF, organized and trained to conduct thrusts from a mobile and dispersed sea base, deep into an enemy's vulnerable rear area. Once ashore, these fast-moving combined arms MAGTFs would focus on important joint operational objectives, which might include rolling back enemy missile forces; inducing an enemy to commit his hidden operational reserves; or, after the enemy's anti-access network has been degraded, seizing and defending an airfield or port critical to the flow of follow-on joint forces.

In other words, FMF planners have neither the desire nor intention of ever again assaulting a defended beach. Instead, they count on future MAGTFs—the main battery of the Networked Fleet's *littoral maneuver forces*—to be able to maneuver freely throughout the littorals, on both sides of the land-sea interface and to accomplish critical naval and joint operational objectives. However, unlike the more advanced technical developments associated with the revolution in the littoral strike fleet, the means to make OMFTS a reality are not yet fully in fleet service. Should programs proceed as planned, this circumstance is expected to change by the end of this decade.

OMFTS is inextricably linked to the ships on which Deep Operations MAGTFs will deploy and from which they will fight.[242] The radical difference between OMFTS and traditional amphibious assaults is now mirrored by the vastly improved capabilities found on what previously have been known as amphibious assault ships. The differences between modern amphibious assault ships and those of the past are so marked that future Deep Operations MAGTFs would be best thought of as deploying from a relatively small but highly capable fleet of *littoral maneuver combatants*.

In 2001, the littoral maneuver combatant fleet received its seventh *Wasp*-class LHD, completing the replacement of the seven old *Iwo Jima*-class LPHs in service in 1989. Along with the five earlier *Tarawa*-class amphibious assault ships (LHAs), the *Wasp* gives the littoral maneuver fleet

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[241] *United States Marine Corps Warfighting Concepts for the 21st Century*, pp. I-1 to I-22.

[242] As used herein, "deep operations" refers less to distance and more to the goal of quickly moving Marine forces beyond the beach and into the enemy's rear area or against operational objectives farther inland than those currently planned in an amphibious assault.

its twelfth, and last, planned big-deck, air-capable littoral maneuver combatant. Another LHD is being built, and it should replace the namesake of the *Tarawa*-class in 2007. Both the LHAs and the more modern LHDs are the largest amphibious ships in the world, having larger displacements than any non-U.S. aircraft carrier. Indeed, these ships exceed the displacement of the famous World War II *Essex*-class fleet carriers, and, as previously discussed, carry the facilities to operate both large helicopter air groups as well as V/STOL strike fighters such as the AV8B *Harrier*. In addition to their impressive aviation capabilities, and unlike the LPHs they replaced, both LHAs and LHDs have large, floodable well decks that allow them to carry and launch a variety of landing craft directly into the ocean. Their large storage and billeting capacity also allow them to carry a reinforced battalion of over 1,800 Marines along with much of their supporting equipment.[243]

The combined capabilities of theses 12 impressive combatants dwarf those of the 13 big decks found in the 1989 amphibious fleet. While embarking approximately 364 fewer Marines (20,367 versus 20,751), among them they can carry nearly seven more medium helicopter squadrons (88 more CH46 equivalents), over three times the number of landing craft (26 Landing Craft Air Cushion (LCAC) equivalents versus eight), and more cargo and vehicles. They also have more and better medical handling facilities and increasingly sophisticated command and control facilities.[244]

The fleet's landing craft carrier component has been also thoroughly modernized. The *oldest* of the eight *Whidbey Island*- and four *Harpers Ferry*-class Landing Ship Docks (LSDs) entered the fleet in 1985. These 12 littoral maneuver combatants are in every way superior to the LSDs they replaced as they can carry more troops, more cargo and more helicopters. However, their major role remains the same: to serve both as primary control ships for the surface-borne, ship-to-shore movement of landing craft and as fleet boat havens. Among them, in their floodable well decks, they can carry up to 40 LCACs, fully 55 percent of the 72 such craft planned for fleet service or a combination of LCACs and other large landing craft designed for heavy lift of supplies and equipment.[245]

The littoral maneuver combatant fleet will complete its modernization when the last of 12 planned *San Antonio*-class Landing Platform Docks (LPDs) are commissioned at the end of this decade. In comparison to the LPDs in the fleet in 1989 (and 2001), the *San Antonio*-class LPDs will have far more advanced command and control facilities, be able to carry and service more helicopters, and be able to carry 2 LCACs in their well decks instead of one. They will also have twice the vehicle stowage space of previous LPDs, albeit at the expense of their comparative cargo- and troop-carrying capabilities. Their advanced capabilities will allow 12 of them to

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[243] *Decisive Power From the Sea: Naval Amphibious Warfare Plan*, (Washington, D.C.: DoN), pp. 49–50.

[244] McCarton, *Amphibious Warfare and the Evolution of the Helicopter Carrier*, pp. 36, 52, 66.

[245] The largest landing craft now in service is the Landing Craft Utility, or LCU. It can carry up to 160–225 tons of cargo ashore over a range of 1,200 miles. *Decisive Power From the Sea: Naval Amphibious Warfare Plan*, pp. 55, 61.

replace *41* older amphibious assault ships from four different ship classes and to remedy the lack of vehicle storage space, the only critical operational deficiency in the littoral combatant fleet.[246]

During combat operations, littoral maneuver combatants would operate under the long-range air- and air-defense umbrella provided by the Littoral Strike Groups. However, as befits their title, every one of these 36 planned littoral maneuver *combatants* will be armed with versions of the highly capable Ship Self-Defense System. As was mentioned earlier, this system uses a fiber optic local area network to link shipboard radars, the RAM, quick-firing gatling guns, and electronic warfare countermeasures and decoy systems into an integrated combat system. The highly automated system identifies and evaluates potential missile and air threats and executes defensive engagements. The SSDS will provide all future littoral maneuver combatants with a rapid-reaction, close-in self-protection capability against cruise missile, helicopter and patrol-boat attack. In addition, the *San Antonio* LPDs will also carry the space and weight for a 16-cell VLS field should additional defensive weapons be required in the future.[247]

These 36 ships will provide the 21st century Networked Littoral Battle Fleet with a littoral maneuver force composed of 12 identical building blocks: three-ship *Littoral Maneuver Groups* (LMGs), consisting of a either a big deck LHD or LHA, a *Whidbey Island* or *Harpers Ferry* LSD, and a *San Antonio*-class LPD, carrying among them a reinforced battalion-sized Deep Operations MAGTF, including a supporting air wing composed of rotary wing, and possibly V/STOL, aircraft. By combining these building blocks into larger groups, the combined littoral maneuver force will be capable of carrying two brigade-sized Deep Operations MAGTFs, while retaining the residual capability to support one, or possibly two, smaller battalion-sized MAGTFs (i.e., 2.5 brigade equivalents).[248]

Ship-to-shore maneuver systems also will be thoroughly modernized over the next decade, providing Deep Operations MAGTFs with the improvements in tactical speed and mobility needed to exploit the Littoral Maneuver Force's high operational mobility. These systems should allow a Networked Littoral Battle Force to quickly assemble and launch a Deep Operations MAGTF through gaps in an enemy's defenses through a process called ship-to-objective maneuver, or STOM.[249] The three key STOM systems now in service or under development are the previously mentioned LCAC, the Advanced Amphibious Assault Vehicle (AAAV) and the MV22 Tilt-rotor aircraft.

As their name implies, LCACs are high-speed landing craft that ride on a cushion of air above the water or on dry land. They can deliver up to 75 tons of vehicles and equipment across a

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[246]Construction of the first of the class, LPD17, is well along, and the contracts for three more have been awarded. However, the first ships are experiencing serious cost overruns and production schedules have slipped. It is increasingly unclear when the last of the class will enter the fleet. Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, p. 179.

[247] Hamilton, "Defense in Depth: Protecting Naval Forces," p. 5.

[248] *Decisive Power From the Sea: Naval Amphibious Warfare Plan*, p. 32.

[249] For a thorough discussion of STOM see *United States Marine Corps Warfighting Concepts for the 21st Century*, pp. II-3 to II-24.

beach and up onto dry, trafficable land, thus reducing the vulnerable buildup of troops, vehicles or supplies on a beach. Because of their 40-knot speed and 200-mile range, and because they are not restricted by tides, beach gradients or surf conditions, LCACs allow the littoral maneuver combatant fleet to deliver Marines to over 70 percent of the world's beaches. Although primarily designed to land tanks, light armored vehicles, fire support and logistic support vehicles, and equipment, LCACs can be fitted with a personnel transportation module, capable of carrying up to 180 troops or 54 stretcher litters, making them ideally suited as a support vehicle for a host of humanitarian missions and non-combatant evacuation operations. The last of 91 first-generation LCACs was purchased in March 2000, and 72 of these craft will undergo a SLEP over the course of the next decade.[250]

While LCACs allow for the high-speed buildup of vehicles, equipment and supplies ashore, the Marines have long sought a companion high-speed fighting vehicle that would give their infantry units a full combat capability from the moment they debark from a littoral maneuver combatant. The current Amphibious Assault Vehicle (AAV), in service with the Marines since the 1970s, is best thought of as a littoral battle taxi and logistics vehicle with modest amphibious and cross-county mobility. In addition to carrying troops, its relatively large, unobstructed rear compartment can accept supply pallets through a large roof opening; indeed, the vehicle was originally designed to accept a small M151 Jeep in its aft compartment. Although the AAV now carries a small weapons turret and bolt-on armor, its high silhouette and low cross-country mobility make it a poor choice for mechanized infantry operations in the littorals.[251]

In sharp contrast, the AAAV is designed to be a true littoral combat vehicle, optimized for high-speed offensive maneuver from a sea base. These highly capable vehicles will be unlike any other amphibious fighting vehicle in the world, providing tactical capabilities far superior to the AAV they will replace. They will travel over water at speeds in excess of 25 miles per hour by virtue of their "planing" hulls, and will have land mobility equal to that of the M1A1 Abrams battle tank. The AAAV will be manned by a crew of three and be armed with a 30mm gyro-stabilized cannon with a shoot-on-the-move, direct-fire capability out to 1,500 meters both day and night. Although not yet so configured, the cannon's ballistic computer could be modified to provide indirect fires out to seven kilometers, providing Marine infantry units with a highly mobile, highly reactive and highly lethal suppressive fire capability in all types of terrain. As currently designed, the AAAV will carry 17–18 Marines in its rear troop compartment, protected by twice the armor of the earlier AAV, and by the only collective nuclear, biological and chemical (NBC) over-pressure protection system in a U.S.-made fighting vehicle.[252]

In the past, Marines have organized their amphibious vehicle units and infantry units in separate battalions. Since the AAV was little more than an amphibious truck, there was no reason to form special "mechanized" Marine Battalions. Indeed, given a modest amount of training, any Marine

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[250] "Navy Ships," *Almanac of Sea Power 2001,* (January 2001), pp. 135–136.

[251] Ibid., pp. 192–193. See also Polmar, *Ships and Aircraft of the U.S. Fleet,* 13th edition, pp. 212–215, and Clancy, *Marine: A Guided Tour of a Marine Expeditionary Unit,* pp. 118–120.

[252] *Almanac of Sea Power 2001*, pp. 192–193, and Mark Hewish, "Solving the Amphibious Puzzle," *Jane's International Defense Review,* (November 2001), pp. 56–57.

infantry battalion could operate effectively with an assigned AAV unit. However, the AAAV's high speed, maneuverability and dramatically improved weapon systems will provide a quantum leap in combat capabilities for Marine maneuver operations in the littoral. Indeed, these capabilities suggest that when the AAAV is introduced later this decade, the old paradigm of having separate amphibious tractor and infantry units may no longer germane. To fully exploit this vehicle's impressive combat potential, its crew and embarked Marines should be merged into a single vehicle fighting team that trains and fights together.[253]

The notion of integrated tractor and infantry units suggests some immediate system and organizational changes. For example, as now designed, the AAAV's troop compartment is an extremely tight fit for 17–18 dismount Marines. While troop compartment crowding would be less of a problem if the transported Marines were to disembark from the AAAV on or near the beach and then fight inland, it will be a serious problem for Marines expected to remain in fighting trim while traveling over great distances during long, deep operations. Therefore, the AAAV should be redesigned to carry a combat team of 15 Marines in relative comfort, with expanded storage space for their gear, weapons and ammunition. The exact composition of the team should be determined by experimentation. For illustrative purposes it might consist of a Staff Non-Commissioned Officer combat team leader, sergeant assistant team leader/vehicle commander, a two-man vehicle team, two three-man maneuver teams, and a five-man combat support team with a team leader/sniper, two combat engineer/demolitions specialists, and a two-man assault team capable of employing portable anti-tank and assault systems. The vehicle's dismount team would in essence replicate the decentralized combined arms combat power found in the World War I German *Sturmtrupp*, and in the reinforced Marine squads that stormed the beaches in World War II.[254] It would be capable of semi-independent operations in all terrain, and its organic combined arms capabilities would be relevant and applicable throughout the full range of infantry operations. Empowered by the AAAV's unparalleled littoral maneuver capabilities and supported by its 30mm cannon, modified to provide an indirect fire capability, such a vehicle fighting team would constitute a formidable littoral combat capability across the spectrum of conflict.

These integrated vehicle combat teams would be the building blocks for specialized Deep Maneuver Battalions, organized and trained to conduct deep thrusts into an enemy's operational rear. The Deep Maneuver Battalions would then be combined with other special units to form the ground combat element of a Deep Operations Brigade. For example, Marines have been thinking about and experimenting with the infestation of an enemy's area of operations with small, sensor-to-shooter teams.[255] One or two Raider Battalions, designed for dispersed, small unit operations and trained to act as the forward eyes and ears of the fleet strike network, would complement the combined arms capabilities found in the Deep Maneuver Battalions and would

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[253] See Captain Charles A. McLean II, "The Future of Mechanized Warfare," *Marine Corps Gazette,* (December 1999), pp. 35–37.

[254] For a fascinating discussion about the decentralization of combat power on the Western Front in World War I, see Bruce I. Gudmundsson, *Stormtroop Tactics: Innovation in the German Army, 1914–1918,* (New York: Praeger, 1989).

[255] Anderson, "Infestation Tactics and Operational Maneuver from the Sea," pp. 70–75.

extend the sensor and engagement grids of the entire Littoral Battle Fleet. As recent operations in Afghanistan suggest, such small, highly trained maneuver units are extremely effective at directing long-range, precision fires against enemy forces.[256] The Raider Battalions would also be trained to conduct battalion- and company-size air-mobile raids against high-value enemy targets, providing even more flexibility in fleet strike and maneuver operations. While the idea of specialized units is unpopular in Marine culture, the idea of specialized Deep Operations Brigades is consistent with both the improved capabilities of the AAAV and the emerging operational challenges of the Second Expeditionary Era. (This idea will be expanded upon in later sections.)

The MV22 is the third STOM combat system Marine planners hope to introduce over the next decade. The MV22 is designed to be the first U.S. tilt-rotor aircraft in operational service. A tilt-rotor aircraft is a hybrid between a helicopter and a turbo-prop aircraft that can literally tilt its engine nacelles either vertically or horizontally, giving it both the vertical landing capability of a helicopter and the high cruising speed of a turbo-prop aircraft. As designed, the MV22 is expected to carry 24 combat-equipped Marines or 10,000 pounds of cargo internally at speeds up to 300 miles per hour and at altitudes to 25,000 feet. Fitted with two retractable cargo hooks, it is also designed to externally sling up to 10,000 pounds of outsized cargo on a single hook, or a projected 15,000 pounds on two hooks, albeit with a reduction of its top speed to approximately 100 knots. It will also be able to self-deploy, as it is designed to have a 2,100 nautical mile range with a single aerial refueling. This combination of speed, range and payload is far superior to the aging CH46 and CH53D helicopters that now equip Marine rotary wing squadrons. Marine planners like to say the MV22s will go twice as fast, carry three times the load and have five times the range of the tired, 30-year old, Vietnam-era helicopters they will replace.[257]

Despite the undeniable promise of tilt-rotor technology and the fact that the MV22 has been assessed to be the first choice among available alternatives in no less than seven Cost and Operational Effectiveness Analyses, the MV22 has had a long and troubled history. The program can be traced all the way back to the Joint Services Advanced Vertical Lift Aircraft (JVX) program begun in 1981. Indeed, the MV22 program was cancelled in 1989 by then-Secretary of Defense Cheney, only to be reinstated three years later as an Engineering and Manufacturing Development Program through a combination of sheer Marine persistence and a sympathetic Congress. Now, two decades after its inception, over a decade after its initial cancellation and after $12 billion in investments, the Marines are still waiting to introduce the first MV22 into operational service. A series of crashes involving early versions of the aircraft, as well as allegations of discrepancies in their maintenance programs, prompted then-Secretary of Defense Cohen in December 2000 to order a review of the program by a distinguished panel of experts.[258]

While the panel ultimately endorsed the tilt-rotor concept, it recommended a series of design and other changes to the MV22 that will delay its full-scale production even longer. Moreover, the

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[256] Ricks, "Bull's Eye War: Pinpoint Bombing Shifts Role of GI Joe," p. A1.

[257] Frank Jensen, "Osprey Critics Operate Without Facts," *Defense News*, (April 9, 2001).

[258] *V22 Resource Book*, (Washington, D.C.: Headquarters, U.S. Marine Corps), pp 13–18. See also Tony Capaccio, "Navy 'Cut Corners' in Testing V22 Osprey, Defense Panel Says," *Bloomberg.com*, (February 20, 2001).

design changes and resultant delay in production will likely raise the ultimate procurement cost of the aircraft, already estimated to be $67.3 *million* per copy in then-year dollars.[259] In addition, the MV22, like the JSF, will be much larger and heavier than the aircraft it replaces, which will force modifications to older air-capable amphibious ships and the likely redesign of future big deck, littoral maneuver combatants.[260]

There is no argument that the MV22 is potentially more capable than the helicopters it is designed to replace. However, it represents an extremely pricey option for an assault support aircraft.[261] The Department must therefore carefully consider the opportunity cost of pursuing the aircraft in its present form, especially given mounting funding pressures in naval aviation modernization (and shipbuilding construction) plans. Likewise, the Marines must weigh the benefit of pursuing an aircraft whose high unit cost will likely result in a fielding plan that will span a decade or more. It might be time to consciously delay the near-term introduction of tilt-rotor aircraft, to continue to explore its unquestioned potential through more vigorous operational evaluation and testing, and to opt immediately for a new and less expensive medium helicopter fleet that could be fielded more quickly with the same amount of money and which would require no near-term redesign of littoral maneuver combatants.

Such a move would entail fewer operational penalties than imagined. While the MV22 undoubtedly would be more capable than helicopters in inserting small teams from far over the horizon, it is an uneasy fit for the assault support mission. Its range and speed far exceed those of the utility helicopters and helicopter gunships that would support the Marines it inserts on the ground. More importantly, the MAGTF's heavy lift helicopter, the CH53E, is able to carry supporting combat vehicles loads only out to ranges of 200 nautical miles.[262] As a result, despite the MV22's passionate defenders, the fact is that modern helicopters should be able to support OMFTS and maneuver ashore, albeit somewhat less effectively, for at least the next two decades.

There seem to be three near-term alternatives to fill the requirement for the Marine's assault support mission. The first would be to reopen the CH53E heavy lift helicopter line and to convert the entire Marine Corps helicopter force to a CH53E standard. Developed specifically for heavy cargo duties from fleet ships, the CH53E is much larger than medium lift helicopters, having a maximum take-off weight that is nearly three times that of a medium helicopter. However, it is much more capable. It can carry 55 troops or 10 tons of internal cargo up to 500 miles, or sling 16 tons of cargo externally and transport it up 50 miles. While a CH53E force would be attractive in terms of rate of troop buildup ashore, range, and logistical capability, an all-CH53E force would probably require the same type of extensive ship redesign discussed for the JSF and the MV22. Furthermore, Marines generally have avoided the use of heavy lift helicopters in the

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[259] Procurement costs include the recurring flyaway costs plus nonrecurring expenses and ancillary equipment plus support and training equipment and contractor support and initial spares. If RDTE and associated facility costs are considered, unit costs would be $83.2 million a copy. *V22 Resource Book*, p. 93.

[260] McCarton, *Amphibious Warfare and the Evolution of the Helicopter Carrier*, pp. 77–79.

[261] Assault support defines the mission of inserting Marine units ashore by rotary wing aircraft.

[262] McCorkle, "Marine Air Maintains Legacy," p. 25.

assault support mission, since the loss of any single helicopter would have potential crippling effects on a fighting unit.[263]

A second option would be to adopt a version of the Sikorsky UH60 *Blackhawk*, modified for service from ships at sea. The UH60 is in production and is used by both the Army and Air Force for a variety of battlefield tasks. More importantly, however, the Navy is replacing all of its older helicopters with its own versions of the UH60, referred to as the SH60R and MH60S. Adopting a CH60 version for the Marines would therefore provide attractive potential savings through commonality of joint and Departmental spares and support pipelines.

Despite the potential cost savings of this alternative, adopting the CH60 would force some modifications to the way the Marines now plan and organize for STOM. For example, a CH60 would be too small to carry a reinforced Marine rifle squad as it is currently configured, and its employment in an amphibious operation would require Marine planners to choose between either a slower rate of troop buildup ashore, or increasing the number of CH60s per helicopter squadron.[264] The first choice is operationally unattractive, while the second would increase costs. "Stretching" the CH60 might be possible to increase its troop carrying capacity, but this would delay its introduction and also increase costs.[265] All in all, the extra costs associated with increasing the number of helicopters per squadron or stretching the CH60 would not seem warranted; if the helicopter was adopted, the Marines could adjust their tactics without a crippling loss in effectiveness. Indeed, the Marine lift study upon which the requirements for the littoral maneuver combatant fleet now rest is based on an assault support fleet composed of a mix of CH60 and CH53E heavy-lift helicopters.[266]

However, a readily available third alternative would have less of an operational impact on the Marine assault support mission and at the same time would offer much of programmatic benefits of the CH60 approach. Sikorsky has designed a new medium lift helicopter based on the UH60 called the Sikorsky-92. A CH92 helicopter would share many of the same cockpit, electronic, and structural and mechanical components as the UH60, meaning many of the cost savings associated with adopting the CH60 helicopter could be realized. More to the point, it can carry 22 combat-equipped troops at speeds up to 165 knots to objectives nearly 200 miles away, numbers comparable to current medium helicopters and compatible with the utility, gunship and heavy lift helicopter force with which it would operate. The CH92 is also compatible with current fleet big-deck, air-capable littoral maneuver combatants. Although approximately 2,500 pounds heavier than the CH46 it would replace, it occupies about the same storage space when its blades are in the folded position. The shipboard modifications to support the CH92 would be minimal.[267] Moreover, its cheaper cost might allow a much more aggressive fielding plan than

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[263] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, pp. 447–452.

[264] The CH60 could carry 11 combat-equipped troops. The Marine rifle squad numbers 13 men and a reinforced squad (i.e., a squad with an attached machine gun or assault team) might number as many as 15–18 Marines.

[265] *V22 Resource Book*, p. 35.

[266] "Executive Summary," *DONLIFT II*, (Washington. D.C.: DoN, 1990), pp. 2–12.

[267] *Sikorsky H-92 Helicopter: The Next Generation of Military Transport*, Sikorsky/United Technology briefing slides, undated.

the MV22, allowing for the quicker replacement of the Marines aging helicopter force. This would seem to be a key advantage: a sufficient MAGTF rotary wing support plan executed today might be far better than an optimal MAGTF rotary wing support plan executed tomorrow.

The foregoing discussion in no way implies that the Marines should abandon their long-fought battle to introduce tilt-rotor technology; it is quite likely that tilt-rotors will be as transformative as their proponents anticipate. However, it may be that the tilt-rotor's truly revolutionary contributions may be different than some experts expect. A fundamental characteristic of OMFTS deep operations, or of small units acting as the Networked Battle Fleet's forward eyes and ears, will be widely dispersed combat forces operating over large areas, at extremely high-tempos, 24 hours a day, and in all weather conditions. A key goal for Marine logisticians is to sustain these widely dispersed units *from the sea*. This will be a formidable task; a single brigade uses up an average of 2,000 tons of consumables a day.[268]

In the future, pushing such large amounts of supplies ashore will be operationally unattractive, especially in the face of long-range missile threats or irregular infantry forces that can interdict ground-based, supply routes. The real revolution in Marine littoral maneuver operations, especially those in the face of a credible anti-access network, will therefore occur when MAGTFs operating ashore, even those far inland, can be *indefinitely sustained* from their sea base; in other words, when Networked Littoral Battle Fleet logisticians can match up STOM with STUL: Ship-to-Unit-Logistics. The goal of STUL would be:

> …to replace cumbersome logistics processes that are predicated on large volumes of materials that might be needed, with responsive, or, if possible, anticipatory processes that deliver only what is needed, when and where it is needed.[269]

One solution for such a STUL network might be to match the speed and range of tilt-rotor aircraft with a cargo delivery system already optimized for sea-based operations: cargo containers. The building block for the resulting STUL system would be a family of 20-foot and 40-foot disposable and/or reusable containers built to International Organization of Standardization (ISO) standards, or smaller, ISO-compatible containers such as the Marine QUADCON.[270] Different containers would be purpose-built to store, transport and dispense fuel, water or other liquids; supplies; food; ammunition; even people and vehicles.

A STUL network designed to load, store, transport, and deliver tactical ISO compatible containers would afford the Networked Fleet tremendous operational advantages in the Second Expeditionary Era. First and foremost, it would make the entire U.S. container fleet suitable for emergency service as "assault follow-on echelon" shipping, and allow joint planners to

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[268] *Naval Expeditionary Logistics: Enabling Operational Maneuver from the Sea*, (Washington, D.C.: National Academy Press, 1999).

[269] Ibid.

[270] QUADCONs, for Quadruple Containers, consist of four individual cargo containers that can be interlocked to form a shipping module the same size as a standard 8x8x20 foot container. *United States Marine Corps Concepts & Issues 2000*, p. 184.

concentrate vast floating warehouses outside the range of many enemy indirect fire systems. Container ships with computerized cargo handling systems that would allow the selection of specific containers from their holds for offload would be particularly valuable STUL assets. However, a simple substitute would be to store identically loaded containers on particular ships. Both approaches would allow joint and naval logisticians to *selectively* offload the right containers for needy units ashore. Second, containerization would also allow the pre-loading of unit *mission loads* designed to support specific maneuver forces. For example, imagine an 8x8x20 delivery container consisting of four inter-locked QUADCONs. One would carry and dispense fuel, another water and food, another ammunition, and the last supply parts, providing a one-stop replenishment station for a single AAAV and its combat team. Mission loads would be positioned at GPS-rectified cache sites or delivered directly to a unit position, allowing a Deep Maneuver Battalion to conduct rapid, in-stride replenishment while operating far from the sea and behind enemy lines, much like a naval task group conducts underway replenishment while steaming at sea.

Taking the STUL concept one step further, it would be easy to imagine new containers designed with important operational capabilities: remotely fired, vertical-launch, missile batteries; autonomous mortars with automatic ammunition feeding systems; prefabricated bunkers suitable for burial; prefabricated communication suites; food or water distribution sites; the possibilities are literally endless. These containers could be delivered to reinforce Deep Operations MAGTFs or other Marine and joint forces, especially when they are compelled to assume defensive positions. They would also be ideally suited for operations other than war, many urban operations, and for the combat reinforcement of parachute or air-mobile units operating throughout the enemy's operating area.

While the Marine Corps truck fleet is already being converted to transport ISO compatible containers and loads, the ideal STUL delivery system would be a high-speed aircraft capable of picking containers up from cargo ships at sea, speeding them directly to a requesting unit, setting them down in any type of terrain, and then picking up empty containers for their return to a resupply ship. These characteristics seem ideally matched to a tilt-rotor aircraft. Accordingly, a new logistics version of the MV22, an MV22L, should be designed to nestle over and pick up an 8x8x20 ISO container, which would form an integral attachment with the frame of the MV22L to minimize drag. Alternatively, the body of the current aircraft might be modified to roll-on and roll-off containers inside its cargo compartment. Although designed primarily for the STUL mission, the MV22L could still be used deliver tactical units ashore, since containers could be easily designed to transport troops or small vehicles. The MV22L would be developed in conjunction with a larger Quad Tilt-Rotor or QTR, which would be designed to pick up and deliver a single 8x8x40, or two 8x8x20, ISO containers.[271] Another option might be to develop an unmanned tilt-rotor container delivery aircraft. All could operate from minimally converted merchant ships.

[271] For a good discussion on the QTR, see Major General Richard L. Phillips, USMC (ret), and Lieutenant Colonel Mark J. Gibson, USMC (ret), "The Missing Piece of the OMFTS Puzzle," *Naval Institute Proceedings*, (November 2000), pp. 70–72.

In other words, the Marines might best view tilt-rotors less as a one-for-one replacement for the its assault support helicopters, and more as an airborne STUL delivery system optimized for logistic support of dispersed, high-tempo littoral maneuver operations. The marriage of vertical landing capabilities and high delivery speeds offered by tilt-rotor aircraft would seem to be a perfect match for the STUL mission. And as suggested above, tilt-rotors designed for logistics delivery could still be used to support other missions such as the long-range insertion of troops. Follow-on analyses and experiments would be required to more fully develop this concept and to determine the best mix of MV22Ls, QTRs, or unmanned tilt rotors for the future STUL delivery system.

The combination of the modernized littoral maneuver combatant fleet, new ship-to-shore delivery and logistic support systems, and reorganized Marine units specifically trained to support Networked Littoral Battle Fleet operations promises a true revolution in littoral maneuver. This combination will empower Marine units with theater and tactical mobility that will be difficult for any land-based force to match and give the Networked Fleet a range of maneuver options when confronted by an anti-access network. One option might be to insert large numbers of small units that seek out enemy network targets to bring to bear the precision fire of the Littoral Strike Fleet. Another option would be to conduct deep air-mobile raids on key anti-access network targets. Yet another would be to try to exploit gaps in the enemy's networks with little warning by inserting a fast moving combined arms task force deep in the enemy's rear. The high speeds and ranges of the AAAV/LCAC force will allow the Networked Littoral Battle Fleet to launch a brigade-sized combined arms thrust while still 25 miles from shore and have its forward elements speeding over land toward its inland objectives in one hour. These flexible maneuver options would provide both naval and joint commanders with tactical maneuver options during theater break-in operations and subsequent operations ashore that are now just dimly understood.

To both better understand these emerging new capabilities and to more fully integrate them in Networked Littoral Battle Fleet operations, the Marine Corps should move to strengthen its FMF organization. Indeed, because of the unique requirements for littoral deep operations, and consistent with the foregoing discussions, the FMF should have standing brigade-sized Deep Operations MAGTFs for both Atlantic and Pacific Fleets. The final character of the Deep Operations MAGTF would be defined only after experimentation. For illustrative purposes, however, its headquarters element might include a Reconnaissance and Surveillance Unit that would operate both manned and unmanned reconnaissance and target acquisition systems, and a ground combat element that might include one or two Deep Maneuver Battalions; one or two Raider Battalions; a Fire Support Battalion; and a Combat Support Battalion. The Fire Support Battalion would be equipped with lightweight and mobile direct support fire systems; heavier, general-support fires would be provided from littoral battle combatants and naval aviation squadrons. The Combat Support Battalion would include a Combat Engineer Company as well as an Unmanned Systems Company that would operate a range of autonomous combat support systems. The associated combat service support element would include vehicles designed to transport ISO containers in pre-configured mission loads as well as mobile repair units. The supporting air combat element would be designed to support the insertion of the MAGTF's Raider Battalions, provide reconnaissance and fire support with attack helicopters, and conduct logistical resupply missions.

These two standing Deep Operations Brigades would be the "sharp edge" of littoral maneuver operations designed for "projecting power in the face of capable area denial defenses."[272] As such, they would train to conduct over-the-horizon operations while at least 25 miles out to sea. Some analysts seem to question whether the initial 25-mile standoff distance for the initiation of such maneuvers will make much of a difference in the missile age. Of course it will! Operating over the horizon greatly complicates an enemy's targeting problem, keeps the highly valuable littoral maneuver combatants beyond the range of most general support *artillery* systems, and provides fleet defenses more reaction time to respond to incoming missile fire. Even more importantly, it greatly reduces the mine threat to the littoral maneuver combatant fleet or the time required for the fleet to neutralize the threat.

The threat of enemy missile attack on littoral maneuver combatants will be omnipresent—as it has been since the Battle of Leyte Gulf in World War II—and missile attacks will undoubtedly tax battle network defenses. However, one would expect the littoral maneuver force to approach within 25 miles only after advance force operations had degraded the enemy's over-the-horizon targeting network or only under the cover of extremely dense defensive fires. One must also look at this problem through the eyes of an opposing enemy commander. Without line of sight to the invasion force, and after his own remote eyes and ears have been degraded by U.S. advance force operations, the enemy commander will have a much more difficult time determining where and when to respond to an OMFTS attack and will be greatly susceptible to operational feints and deception.

Even if the launch of an OMFTS attack is detected, it would be difficult for an enemy to respond quickly enough to stop it. Once launched, Deep Maneuver Battalions would head for pre-selected and prepared littoral penetration points at high speeds. Raider units would be inserted along the shoulders of the penetration points to screen the advancing surface waves of AAAVs and LCACs, and deeper inland along pre-selected avenues of advance toward the MAGTF's objectives. The AAAVs would arrive at the waterline first, spreading out to link up with the lighter reconnaissance/strike units and to cover the unloading of supporting vehicles, such as tanks, from the LCACs. As these LCACs returned to load follow-on units, those already ashore would form up and move quickly toward their objectives, either in small, dispersed formations or larger combined ones. Speed of advance would be hastened by information provided by the reconnaissance assets of the entire Littoral Battle Force, the support of Raider units inserted along the MAGTF's line of advance, the light logistical tail on the ground, and supporting fires from Littoral Strike Groups.[273]

Some defense analysts also downplay the future importance of naval fire support. One has gone so far as to refer to the idea of firing ship-based artillery in support of Marine and joint forces as "quaint."[274] However, to mount the type of fast-moving, high-tempo penetration attacks envisioned by the Marines, the need for high-volume precision fires, especially during the early

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[272] Professor Thomas Mahnken, Naval War College, as cited by Patrick Hayes in "U.S. Marine Corps Leading in Transformation."

[273] *United States Marine Corps Warfighting Concepts for the 21st Century*, pp. II-3 to II-24.

[274] See Loren Thompson, "Navy Shipbuilding Faces Funding Crisis," *Defense Week*, (February 20, 2001).

stages of a STOM, will be critical. The naval fire support missiles now on the drawing board fill one VLS cell and are best suited for engaging point targets or small area targets. They are less suitable for sustained area bombardment and are very expensive to waste on suppression missions, where the goal is only to keep an enemy's head down until friendly maneuver units can close within their own direct fire range. As a result, high-volume, sustained gunfire often will be more cost-effective than missile fire for sealing the shoulders of a littoral penetration point or for suppressing enemy activity around selected helicopter/tilt-rotor landing sites. Because of its adjustable rates of fire, gunfire can also be scaled to many maneuver support missions more effectively than missile fire.[275]

As a Deep Operations MAGTF pushes further into an enemy's rear, however, the difference between ship-based gun and missile fire would start to disappear. The extended-range, guided munitions fired from both the 5"/62 and the AGS naval guns are expected to have seven to 10 minute times of flight to their maximum ranges—times similar to those of the planned ALAM missile to its maximum range. As Marine units maneuver more than 50 miles inland, then, naval surface fire support would shift to the role of general support artillery and Marine artillery units would take over the direct support mission.[276] Therefore, although naval surface fire support would never fully replace Marine artillery systems, it would provide critical direct support during the early stages of a littoral penetration. Just as important, shipboard fires would often allow MAGTFs to leave their heavy general artillery systems aboard ship and to carry ashore only lightweight direct support fire systems that are much less burdensome to supply and much easier to maneuver.

THE (R)EVOLUTION OF LITTORAL MANEUVER (SUPPORTED) FROM THE SEA

While Integrated Fleet Marine Forces (IFMF) and their special Deep Operations Brigades would be designed primarily for high intensity theater break-in operations, they would have utility across the spectrum of conflict. However, because of their cost and specialized nature, their high-end combat capabilities would be difficult to replicate throughout the Corps. Accordingly, the 21st century Networked Littoral Battle Fleet would continue to benefit from general purpose MAGTFs supported from, but not necessarily fighting from, a mobile sea base. These Littoral Maneuver MAGTFs would most often be deployed and supported by the 18 specially modified cargo ships now comprising the MPF(E).[277]

The MPF(E) includes 16 ships divided into three squadrons, each squadron carrying the full equipment set and 30 days of supplies for a Marine Expeditionary Brigade, as well as the equipment for a Naval Construction Battalion, a full field hospital, and the materials necessary to

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[275] Hewish and Janssen Lok, "Return of the Big Guns At Sea."

[276] Ibid.

[277] The origins of the Maritime Prepositioning Force (MPF) can be traced back to the late 1970s when President Carter signed Presidential Directive 18, which led to the establishment of the Rapid Deployment Force, a force designed to support U.S. interests in the Persian Gulf. See David F. Winkler, "Ten Years Ago, Half a World Away," *Sea Power*, (May 2000), p. 23.

construct a fully capable expeditionary airfield. The three squadrons are currently anchored in the Mediterranean, Diego Garcia and Guam. Two additional aviation support ships, one located on each coast of the continental United States (CONUS), augment the three squadrons. Both ships carry the intermediate maintenance activity for a Marine Aircraft Wing in 352 standard 20-foot ISO cargo containers.[278]

The prepositioning of heavy MAGTF equipment in potential operating theaters allows the Marines to deploy a brigade-size Littoral Maneuver MAGTF to any location along the world's littorals where there is a protected anchorage or port and nearby airfield within 14 days and to support it logistically for 30 days once it arrives. Operational plans call for an MPF squadron to set sail from its anchorage toward a designated offload area during an emerging crisis. Should the crisis continue to escalate, strategic or tactical airlift would then deliver a brigade's worth of Marines and Sailors to the airfield closest to the squadron's location. From there they would move to marry up with the MPF squadron, offload their equipment from the waiting ships, prepare the squadron for operations, and re-deploy to perform their operational mission. Significantly, this concept of operations is not an all or nothing proposition; MPF squadrons are loaded so that mission packages tailored for smaller MAGTFs can be offloaded in instances where the deployment of a full brigade is unwarranted.[279]

Although not designed to support STOM, MPF(E) ships both supplement and complement the littoral maneuver combatant fleet. After conditions have been created for the safe offload of their equipment and the safe air landing of their associated Marines, the MPF(E) would allow the Littoral Battle Fleet to quickly reinforce and exploit the initial actions of Deep Operations MAGTFs. In more benign environments, MPF-delivered Littoral Maneuver MAGTFs would contribute to the Networked Fleet's combat power immediately. In either case, however, MPF ships would continue to operate as supporting logistics bases. As can be seen, then, the MPF offers the Networked Littoral Battle Fleet much more than a logistic capability; it represents an important operational capability in its own right. Accordingly, to better highlight its operational contributions, in the future the MPF(E) should be best thought of as the Littoral Maneuver Support Force (LMSF) and its vessels as littoral maneuver support ships.[280]

As previously discussed, during the Garrison Era four to five ship ARGs and their embarked battalion-sized MEUs helped to man the nation's forward naval garrisons. Over time, the rotational operational and maintenance cycles required to keep the ARG/MEUs forward caused the littoral maneuver combatant fleet to lose its ability to quickly aggregate and support large-scale amphibious operations. As a result, Marine expertise in brigade and larger ship-to-shore movements deteriorated. In the process, the MPF(E) became the Marine's primary deployment means for mid- to high-intensity combat operations, and its combat load was optimized to support heavy mechanized MAGTFs. As the MPF(E) has been rarely used for day-to-day operations, Marines have become increasingly identified with battalion-sized crisis response

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[278] *United States Marine Corps Concepts & Issues 2000*, p. 60.

[279] Ibid.

[280] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, p. 43.

operations mounted from small groups of littoral maneuver combatants. This circumstance has both undercut their ability to conduct larger scale attacks from the sea and their contention that the MPF(E) represents a flexible operational capability in its own right.

As outlined in this paper, the primary mid- to high-intensity warfighting challenge facing the fleet is likely to be defined by theater break-in operations against enemy anti-access networks. In the early phases of theater break-in operations, when the enemy still retains the means to deliver long-range precision strike, it seems highly unlikely that the ports and airfields necessary for LMSF (future MPF) operations will be available. In the Second Expeditionary Era, then, the roles of the littoral maneuver combatant fleet and the littoral maneuver support fleet seem destined to switch, with the littoral maneuver combatant fleet concentrating on mid- to high-intensity combat missions, and the LMSF concentrating on the many operations other than war in which the Marines have long specialized. To increase their utility and relevance, Littoral Maneuver MAGTFs supported by the LMSF should therefore be slightly expanded and lightened up. One possible MAGTF structure among many might consist of one or two Light Armored Vehicle (LAV) Battalions, two or three Littoral Infantry Battalions and a Tank Company. The Littoral Infantry Battalions would be organized to conduct foot-, truck- or airmobile operations. These maneuver units would be supported by large combat engineer, motor transport, and other combat support units—units generally in short supply during operations other than war.

The LMSF might also provide the Marines and the Networked Fleet with a new and important mission support capability. In the future, much of the littoral will be urbanized, and urban terrain is ill-suited for the fast moving combined arms teams that characterize the Deep Operations Brigade. Moreover, military operations in urban terrain (MOUT) are among the most demanding military activities, and units require both special training and equipment to prepare for it.[281] As a result, the Marine Corps is planning to convert a 1,750-acre deactivated Air Force base on Guam into an urban warfare training facility.[282] Just as the LMSF was associated with high-intensity mechanized combat in the Garrison Era, so too might it be associated with urban warfare in the Second Expeditionary Era.

Given its inherent loading flexibility, LMSF squadrons could be modified to carry the special systems and equipment designed to support urban operations. For example, MOUT is extremely risky, and much effort is being spent in developing unmanned systems for urban reconnaissance, counter-sniper support, explosive ordnance disposal duties, and a host of other urban combat missions.[283] The large storage capacity of the LMSF seems an ideal match for the large array of unmanned systems likely to be developed to support urban combat. The colocation of an LMSF squadron and an urban training center on Guam would allow the Marines to experiment to determine the optimal equipment list for future LMSF squadrons.

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[281] For a good overview on the challenges of MOUT, see "Focus on MOUT," *Marine Corps Gazette,* (July 2001), pp. 15–28. See also Geoff S. Fein, "War Game Identifies Key Improvements for Joint Entry Ops," *Inside the Navy,* (September 4, 2000), p. 1, and Ralph Peters, "The Human Terrain of Urban Operations," *Parameters,* (Spring 2000).

[282] Hayes, "U.S. Marine Corps Leading in Transformation."

[283] Captain Brian W. Neil, "Future Military Operations on Urbanized Terrain," *Marine Corps Gazette,* (July 2001), pp. 23–25.

By organizing and using LMSF-supported Littoral Maneuver MAGTFs more for operations other than war, low- to mid-intensity military operations, and operations in urban terrain, their day-to-day contributions to 21st century Battle Force operations would be greatly highlighted and enhanced. In the process, it would likely become clear that improving their ability to contribute earlier in anti-access operations would be both prudent and desirable. These improvements could range from something as simple as designing more rapid in-stream offload of equipment using organic high speed lighterage, thereby lessening the force's reliance on secure ports, or something more elaborate such as converting the force to serve as floating combat bases. The latter would allow a Marine fly-in echelon to come aboard, prepare the equipment for combat, and conduct STOM like those Marines onboard littoral maneuver combatants.[284] Another option would be to design the ships to operate offshore at much greater ranges than they do today, by giving them the capability to conduct offloads at sea onto high speed, medium- to long-range littoral maneuver ferries. Operational fleet experience and experimentation should determine the best character of future LMSF operations.[285]

As should be obvious from the foregoing discussion, the potential payoff of unmanned systems for an organization planning to conduct routine combat operations from a mobile sea base is enormous. Every future MAGTF should be able to call upon a host of unmanned reconnaissance, air combat and ground combat vehicles, as well as autonomous resupply vehicles, robotic sentries and other unmanned systems. An aggressive program of MAGTF robotic experimentation and exercises should mark the first decade of the 21st century.

THE (R)EVOLUTIONARY 21ST CENTURY MARINE CORPS

Once the naval maneuver revolution is complete, FMF in the Second Expeditionary Era should be capable of conducting operations from the sea that would leave the amphibious assault planners of the First Expeditionary Era in awe. Deep Operations Brigades, operating from 36 highly capable littoral maneuver combatants, should be organized, trained, and equipped to conduct ship-to-shore movements that would speed directly from assembly areas at sea to objectives deep inland. Once ashore, these Deep Operations Brigades would operate much like a naval task force operates at sea, seeking to cause havoc by exploiting their high operational and tactical mobility. For heavy, general support artillery, they would rely on shipboard aviation and naval strike support; for direct support artillery they would rely on lightweight expeditionary fire support systems that are easy to resupply. While ashore they would conduct a land-based variation of underway replenishment, using STUL delivery systems to keep from offering the enemy vulnerable, concentrated logistics targets ashore.

Meanwhile, Littoral Maneuver MAGTFs, supported by the 18 special purpose ships of the LMSF, would concentrate first on responding to operations other than war, military operations in urbanized terrain and maneuver operations after an anti-access network is taken down. In the process, the LMSF would be recognized by its operational rather than its sealift and pre-

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[284] This is the current preference of Marine Corps planners, as outlined in their new concept MPF(Future). See *United States Marine Corps Concepts & Issues,* pp. 24–25.

[285] Hunter Keeter, "Navy to Launch Advance Prepositioning Ship Study," *Defense Daily,* (February 29, 2000).

positioning contributions. As such, the littoral maneuver support ships of the future LMSF would be counted as battle force ships, resulting in a combined littoral maneuver fleet of 54 vessels.

VI. From Afterthought to Enabling Force: Charting the Ongoing (R)evolution in Fleet Mine Warfare Capabilities

Cold War Mine Warfare Forces in the Second Expeditionary Era

For Littoral Battle Forces to gain and maintain their freedom of action on (and under) littoral waters, they will need to defeat the mine threat, and quickly. Although more U.S. naval vessels have been lost to mines since 1950 than any other type of combat casualty, mine countermeasure forces have seldom enjoyed widespread support in the fleet. This unhappy circumstance has been perpetuated by the residual effects of the Navy's Cold War focus on independent, open-ocean, carrier-strike operations.[286]

The numbers tell the story. In 1989, the Navy's mine countermeasure fleet accounted for less than one percent of the TSBF; two of the five countable ships were more than 35 years old. These few active ships were augmented by 18 obsolescent NRF ocean minesweepers held in a low reserve readiness status (MobCat B); they were incapable of countering modern mines. It is true that the first three of the modern, open-ocean, *Avenger*-class mine countermeasure ships (MCMs) had finally entered the fleet, and new *Osprey*-class coastal minehunters (MHCs) were soon to come. However, by any measure, the 1989 mine warfare force provided little value to the Battle Force; had war broken out with the Soviet Union, the Navy would have been hopelessly dependent on allied mine countermeasures support in the face of any credible mine threat.[287]

Little more than ten years later, the fleet's mine warfare force has undergone an apparent revival. Eighteen modern or modernized vessels, accounting for 5.7 percent of the current Battle Force, serve either in the active Navy or in the NRF, with mixed active and reserve crews and in a state of high readiness (MobCat A). All ships except one are less than 14 years old. The single exception is the modernized, 31-year old, former helicopter carrier *Inchon*, modified to serve as a mine countermeasure support ship (MCS) and to employ two squadrons of minesweeping helicopters. These vessels are backed up by an additional nine mine warfare ships in NRF MobCat B status. In marked contrast with the 1989 fleet, however, these reserve mine warfare vessels are as capable as those in the active fleet: all are less than 10 years old, and they would provide significant contributions during a time of war.[288]

In spite of this welcome increase in capabilities, fleet mine warfare forces face serious challenges in the Second Expeditionary Era. Mines are effective in all ocean environments, and the different

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[286] National Research Council, *Naval Mine Warfare: Operational and Technical Challenges*, p. 2.

[287] Polmar, *Ships and Aircraft of the U.S. Fleet*, 14th, 16th and 17th editions.

[288] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, pp. 216–230; *The Department of the Navy Ships and Aircraft Supplemental Data Tables*, December 10, 2001.

requirements for neutralizing them have caused mine warfare experts to divide the ocean into five mine warfare zones. The deep-water zone, characterized by depths in excess of 300 feet, generally sees moored and rising bottom mines; however, there are some deep-water bottom mines. The shallow-water zone, extending from 300 feet into 40 feet, can have bottom, moored and rising mines. Neutralizing mines in these two zones requires ocean-going mine countermeasure ships utilizing mine-hunting sonars, mechanical sweep gear, and remotely-operated mine neutralization vehicles, augmented by helicopters towing minesweeping sleds.[289]

The very-shallow-water zone extends from 40 to 10 feet deep. While bottom, moored, controlled and buried mines can be found in this environment, it is generally too shallow for mine countermeasure ships to operate effectively. Accordingly, the primary means to fight mines in this zone are marine mammals and divers trained to locate mines, autonomous underwater vehicles, and explosive ordnance disposal teams. The surf zone, extending from 10 feet to the water line, has anti-invasion mines, controlled mines, and buried mines hidden among obstacles. The preferred neutralization tactic in the surf zone is to clear relatively narrow assault lanes wide enough to allow both LCAC and AAAV passage, by using explosives that sympathetically explode enemy mines. Beyond the surf zone is the craft landing zone, which is on the beach itself. Conventional land mines are found in this zone.[290]

The mine countermeasure ships now in service were designed for the Cold War mine warfare threat. The large MCMs were designed for open-ocean sweeping, while the smaller MHCs were designed for U.S. harbor clearing operations if Soviet submarines attempted to close down ports by laying mines. As a result, the current mine countermeasure fleet is optimized for counter-mine operations in the deep- and shallow-water zones. Both the MCMs and MHCs employ the highly capable SQQ32 variable-depth mine-hunting sonar to localize mines in water at least 40 feet deep; the sonar can be employed from the ship's hull in somewhat shallower water depths. Once the SQQ32 localizes a potential mine target, these ships use either conventional sweep gear or the SLQ48 Mine Neutralization System (MNS) to destroy it. The MNS is a state-of-the-art, remotely operated submersible, capable of speeds of up to six knots and controlled through a 3,500-foot cable. It uses a closed-circuit television and close-range sonar to provide real-time views of objects detected by the SQQ32, and it can cut the cables for moored mines or plant explosives near bottom mines.[291]

Mine countermeasure ships operating in the deep- and shallow-water zones are augmented by a small but capable airborne mine countermeasure force, consisting of two mine countermeasure squadrons, each with eight to ten MH53E *Sea Dragons.* The *Sea Dragons* are capable of employing a variety of mine warfare systems, among them the ASQ14 side-scan radar for localization, the ALQ141 acoustic countermeasures system, and a family of towed sleds, or

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[289] *U.S. Naval Mine Warfare Plan,* (Washington, D.C.: DoN, January 2000), p. 89.

[290] Ibid., p. 89.

[291] Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th Edition, pp. 221–225.

"sweeps," for neutralizing different type mines (i.e., the Mk103 mechanical sweep, Mk104 acoustic sweep, Mk105 magnetic sweep, etc.).[292]

The very-shallow-water zone presents the greatest mine neutralization challenge to mine warfare forces since shipboard and towed mine hunting sonars work less effectively in water less than 40 feet deep. To combat mines in this zone, the Navy has a special Very Shallow Water Mine Countermeasures Detachment. The detachment includes 26 bottlenose dolphins and sea lions trained to locate mine-like objects. These dolphins and sea lions are organized into five operational Marine Mammal Systems (MMS), which work in conjunction with four specialized MMS explosive ordnance disposal (EOD) teams, supporting Navy SEAL and Marine Reconnaissance swimmers, and special UUVs. The marine mammals and UUVs are used to localize mines, which can then either be marked for avoidance or destroyed by supporting EOD teams or swimmers. The entire Countermeasures Detachment, including human, marine mammal and robotic systems, can be transported via transport aircraft or littoral maneuver combatant to a forward operating area.[293]

Current mine countermeasure tactics in the surf zone and the landing craft zone call for assault breaching lanes to be cleared just prior to an assault. The only available means to do this is to employ the Mk58 Interim Mine Clearing System. The Mk58 is an adaptation of systems used to breach minefields on land. It shoots a long length of explosive "det" cord from the deck of a hovering LCAC toward the beach. Once the head of the cord hits the beach and its length settles to the bottom of the surf zone, it is remotely exploded, destroying mines by sympathetic detonation.[294]

Although current mine countermeasure systems are truly the result of a belated fleet response to its Cold War mine deficiencies, they nonetheless provide the fleet with a solid foundation of littoral mine warfare capabilities in the 21st century. Indeed, the mine countermeasures force is the only component of the fleet that grew during the general demobilization of the 1990s. This in and of itself provides credible evidence that the fleet is taking the mine threat more seriously than it has in the past. Other organizational and operational improvements provide additional evidence. In 1992, a dedicated Mine Warfare Command was established in Corpus Christi, Texas, a fleet first. In 1994, two MCMs were home-ported in Japan, marking the first overseas home porting of mine warfare units. As was previously mentioned, in 1996 the force received its first dedicated mine countermeasure control ship, the converted LPH *Inchon*, which is used as the command center for deliberate minesweeping operations, and as a base for mine-hunting helicopters.[295] And in 2000, two MCMs, two MHCs, and four MH53E helicopters were home-ported in Bahrain in the Persian Gulf, giving the Navy forward deployed minesweeping assets in two of its three main operating hubs—the Pacific and Persian Gulf.[296] In the third—the

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[292] National Research Council, *Naval Mine Warfare: Operational and Technical Challenges,* p. 76.

[293] *U.S. Naval Mine Warfare Plan*, pp. 94–96.

[294] Hunter Keeter, "Navy Lays Out Mine Countermeasures Campaign Plan, *Defense Daily*, (February 29, 2000).

[295] Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th edition, pp. 216–217.

[296] Peter Skibitski, "US to Begin Homeporting Mine Ships in Persian Gulf This Spring," *Inside the Navy*, (January 17, 2000).

Mediterranean—the Navy can generally count on immediately available and highly competent allied mine countermeasures support.

AN ORGANIC REVOLUTION: INTEGRATING MINE WARFARE CAPABILITIES INTO THE LITTORAL BATTLE FLEET

Despite the great strides made since 1989, the Navy's current mine countermeasure force would be highly stressed supporting the Networked Littoral Battle Fleet operations during theater break-in operations. As was discussed, the current 26-ship MCM and MHC force was sized to perform the Cold War mine warfare missions of open-ocean mine warfare and sweeping U.S. harbors mined by Soviet submarines. It is simply not large enough to meet the high wartime demand for a fleet looking to operate in shallow littoral waters—an environment ideal for mines. For example, a 1991 Battle Force study called for 45 additional MCM/MHC ships and more mine countermeasure helicopters. Other studies have indicated the need for 60–300 mine countermeasure ships.[297]

In addition to being too small to accomplish its expected wartime taskings, the mine countermeasures fleet has several additional shortcomings. Although six mine countermeasure ships are now forward deployed, the balance of the 26-ship force would have to sail to a distant theater to reinforce them. These vessels are too slow to keep up with a high-speed transit made by littoral strike and maneuver forces, and they would take considerable time to deploy. Estimates for mine warfare force closure rates vary between 30 to 60 days depending on the area of operations. Moreover, although marine mammals are extremely effective in the very shallow water environment, their living/transport containers are very large, and they would take vitally needed space away from MAGTF equipment onboard littoral maneuver combatants. Finally, the Mk58 Interim Mine Clearing System is assessed to be only 80–90 percent effective in the surf zone, even under ideal circumstances. In other words, while significantly more capable than its 1989 predecessor, the current mine countermeasure fleet would have a hard time performing its wartime mission.[298]

Faced with these operational shortcomings, the Navy has opted not to develop more dedicated mine countermeasure ships. Instead, it plans to *integrate* mine countermeasure capabilities into the Networked Littoral Battle Fleet by providing each littoral battle and covert littoral battle combatant with its own organic mine countermeasure capabilities. The current emphasis on organic mine countermeasure capabilities is intended to ensure that carriers and littoral strike and covert littoral strike combatants retain their operational mobility on and under the sea, even before dedicated mine warfare forces arrive in theater. This plan involves the fielding of remotely controlled mine-hunting systems, autonomous mine-hunting vehicles, and ubiquitous

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[297] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, p. 216.

[298] *U.S. Naval Mine Warfare Plan*. See also Hunter Keeter, "Officials: Navy Still Short on Amphibious Landing, Fire Support Capabilities," *Defense Daily*, (March 27, 2000), p. 7.

airborne countermeasure systems to give future Littoral Battle Forces an in-stride mine avoidance and breaching capability.[299]

The primary organic shipboard mine countermeasure system will be the Remote Mine-hunting System, or RMS. The RMS is a high-endurance, unmanned, diesel-powered semi-submersible, launched and operated from a littoral battle combatant. The semi-submersible itself tows a variable-depth sensor body capable of detecting, localizing and identifying mines in water depths of at least 30 feet. By feeding inputs from the sensor body directly into the controlling ship's SQQ89 anti-submarine combat system, the RMS will give future surface combatants an ability to conduct their own mine reconnaissance and to avoid mines before entering the engagement envelope. A similar system, called the Long-Term Mine Reconnaissance System, will use UUVs to give submarines the same off board, mine-hunting capability.[300]

The real key to future battle force organic mine countermeasures, however, will come in the form of improvements to, and proliferation of, airborne mine countermeasure capabilities. The Fleet's MH53E *Sea Dragon* mine countermeasure helicopters—as well as all fleet cargo helicopters—will be replaced by up to 237 MH60S helicopters. The multi-mission MH60Ss will be capable of hauling battle group cargo and passengers, conducting combat search and rescue, and, more to the point, performing mine warfare support. In their mine countermeasure role, the MH60S can be employed in squadron strength from the flight deck of an MCS, or in one- or two-helicopter detachments onboard littoral battle combatants and frigates. Under current plans, then, the number of potential airborne mine countermeasure platforms will increase *by a factor of 15*.[301]

When employed in the mine countermeasure role, the MH60S is to be equipped with a host of new airborne detection and neutralization systems, among them:

- the AQS20X Sonar designed to detect and classify bottom, close-tethered and volume mines;
- the Organic Airborne and Surface Influence Sweep, a towed sled designed for high-speed (40 knot) magnetic or magnetic/acoustic minesweeping missions in the shallow-water zone;
- the Rapid Airborne Mine-Clearance System, which will use a special 20mm cannon and ammunition to destroy near-surface moored mines; and

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[299] See for example Robert Holzer, "U.S. Shifts Antimine Strategy: Navy to Distribute Capability throughout the Battle Group," *Defense News*, (March 13, 2000).

[300] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, p. 228.

[301] Robert Wall, "Navy Eyes Faster MH-60R Procurement," *Aviation Week & Space Technology*, (July 16, 2001), p. 34.

- the Airborne Mine Neutralization System, which will use remotely operated and expendable explosive mine neutralization devices to destroy moored and volume mines that are either impractical or unsafe to counter using existing mine-disposal techniques.[302]

Complementing the future aviation countermeasures force should be a host of new unmanned mine warfare systems. In February 2000, the Naval Research Advisory Panel released an unclassified executive summary from its year long, classified study on unmanned vehicles for mine countermeasures. It concluded that unmanned systems could make important contributions to mine countermeasure operations in the future. Future technology would allow the shallow and deep-water domains to be covered, by and large, by autonomous or remotely controlled surface, semi-submersible, and underwater vehicles. And in the area of clandestine mine clearing, UUVs provided the only realistic option. The Panel therefore recommended that the Navy embark on a rigorous program of research to develop these capabilities.[303]

While organic mine countermeasures will allow future Littoral Battle Forces to conduct rolling, in-stride mine countermeasure operations while maneuvering within littoral waters, these capabilities will not rival the efficiency and high volume clearing capabilities of dedicated mine warfare forces, at least in the near to mid-term.[304] As a result, the Navy is introducing new Integrated Combat Weapon and Integrated Ship Control Systems for its MCMs and MHCs, thus standardizing the combat system configurations on all 26 ships. Moreover, to make mine countermeasure forces an integral part of the Networked Battle Fleet, the Navy is developing a new tactical command and control data link for all dedicated and organic mine warfare assets.[305]

The new link, while welcome, will not solve the dedicated mine warfare fleet's force closure problem. Accordingly, the Navy should experiment with new means to rapidly move these forces to a theater. One way would be to purchase or lease dedicated heavy lift transport ships that could move the MCMs and MHCs to an operating theater at high(er) speeds. Another would be to integrate a mine warfare squadron into the each of the Littoral Maneuver Support Squadrons, and to preposition them in likely operating theaters. Regardless of the method selected, the key objective would be to improve the responsiveness of the dedicated mine warfare force.

In summary, future theater break-in operations count heavily on an organic mine countermeasure revolution that will allow early arriving littoral battle and covert littoral battle combatants to operate in mine infested waters by using mine avoidance tactics. As reinforcing littoral strike and maneuver forces arrive in theater, they would rely on a combination of both manned and unmanned surface, subsurface and airborne organic mine countermeasure systems to conduct in-stride minefield breaching. Deliberate minefield neutralization and harbor clearing would be accomplished by later arriving, dedicated, mine warfare forces.

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[302] Greg Seigle, "US Navy Moves to Improve Mine Countermeasures," *Jane's Defense Weekly*, (February 9, 2000).

[303] Christopher J. Castelli, "Panel Urges Investment in Unmanned Mine Countermeasures Systems," *Inside the Navy*, (March 12, 2001), p. 1.

[304] Lieutenant Commander Patrick A. Molenda, USN, "Don't Forget Dedicated Mine Countermeasures," *Naval Institute Proceedings*, (October 2001), pp. 38–41.

[305] *U.S. Naval Mine Warfare Plan*, p. 7.

For Marine units approaching a mine-infested shore, however, the organic mine countermeasure revolution will be much less than advertised unless the problem of reliably clearing mines in the very shallow water, surf, and landing craft zones can be solved. The systems designed to tackle this difficult problem are the Shallow-water Assault Breaching System (SABRE), designed to neutralize mines in three to ten feet of water, and the rocket-propelled Distributed Explosive Technology (DET) System, designed to neutralize mines in zero to three feet of water. Like the Mk58 Interim System they are designed to replace, both are to be employed from LCACs hovering just beyond the surf zone. However, both have experienced technical difficulties, and their delivery has been delayed to at least 2004. As a result, there will be no reliable way in the near-term to clear the seven AAAV and LCAC assault lanes required to support even a single brigade-sized STOM. In any event, the prospect of hovering within direct-fire range of enemy weapon systems is a distinctly unhappy one for the LCAC crews assigned to employ these short-range systems.[306]

The Networked Littoral Battle Fleet needs a dedicated assault lane breaching concept in line with its vision of OMFTS and STOM. One approach might be to forego another service life extension of the *Inchon*, to take the *Tarawa* (the oldest big deck ship in the littoral maneuver combatant fleet) immediately out of commission, and use the resulting O&S savings to help convert it into a mine countermeasure command ship.[307] Its larger size and more flexible shipboard capabilities would provide a significant boost to the dedicated mine warfare fleet. In addition to being able to carry a substantial MH60S mine countermeasures air wing, the *Tarawa's* floodable well deck could be modified to transport space-eating Marine Mammal Systems or LCACs converted into mine countermeasure craft. The ship might also be able to carry, launch and control unmanned mine sweeping drones like those pioneered by the German mine warfare forces.[308] Its cavernous billeting spaces could also easily carry supporting Marine Reconnaissance, SEAL and EOD detachments.

To help solve the surf zone breaching problem, the modernized *Tarawa* should mount several Multiple Launch Rocket Systems (MLRSs) on its flight deck, preferably serviced by below deck magazines. These launchers would fire guided rockets delivering bomblets with special fuses that would allow them to settle to the bottom of the surf zone and explode either on contact or at a preset time, achieving the same effect as a line charge system, albeit over a greater area.[309] For mines hardened to withstand destruction by sympathetic detonation, it would also carry in its

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[306] Captain Billy J. Short, Jr., "Mines Challenge Our Maneuver," *Marine Corps Gazette*,(March 1999), pp. 28–30.

[307] The current MCM Command Ship, the *Inchon*, will reach the end of its service life in 2005. Studies have concluded it should receive a service life extension. See Peter Skibitski, "Study Says Navy Needs *Inchon* Mine Command Ship Another Ten Years," *Inside the Navy*, (March 20, 2000), p. 1. The Naval Studies Board also recommended that a replacement for the *Inchon* be pursued. See *Naval Mine Warfare: Operational and Technical Challenges for Naval Forces*, pp. 44–46.

[308] The German Navy's HL 352 minesweepers use remotely controlled Troika minesweeping drones for minesweeping operations. See "Command and Control for Remote Minesweeping," *Naval Forces* (January 2000), p. 8.

[309] This concept expands on the Hydra 7 project, a developmental program that used a rocket delivered precision breaching munition to detonate mines in the surf zone. See Majors Chris Yunker USMC (ret) and Bryan Scott, USMCR, "Seaward Maneuver in Quantico: Mine Countermeasures in Support of STOM," *Marine Corps Gazette*, (September 2000), p. 52.

vehicle storage holds large numbers of robotic countermine kamikazes—vehicles that mimic the magnetic, acoustic, and influence signatures of either an LCAC or AAAV and which would clear assault lanes by running over and detonating mines.[310]

If technically feasible, the combination of a long-range, area-bombardment system and robotic countermine systems would provide the Littoral Maneuver Forces with an *over-the-horizon* surf zone (and potentially very-shallow-water zone) breaching capability. As a result, the Battle Force would not have to telegraph its chosen littoral penetration points with advance mine countermeasure activities; it could instead launch its MLRS mine clearing rockets just ahead of approaching AAAVs and LCACs, which would then adjust their final penetration headings on the explosive plumes of the minefield breaching volleys. The fearless robotic mine clearing systems would lead the assault waves through the surf zone and onto the beach, sacrificing themselves as they cleared the way for the manned systems that followed. As the landing craft neared the surf zone, the MLRS batteries would then shift the direction of their fires to cover the shoulders of the littoral penetration point.

Such a concept of operation would deny the enemy any time to reseed mines before MAGTF advance elements reached the shore. Moreover, it would also provide new options for operational deception. For example, as outlined in Chapter V, future Littoral Battle Forces should be able to launch a mechanized attack while still 25 miles at sea. Even if an enemy has warning that the mechanized attack has begun, the exact point of littoral penetration would be unknown. By firing deceptive volleys of MLRS fires, Battle Fleet commanders might be able to induce an enemy to start moving his operational reserves either prematurely or toward the wrong location.

(R)EVOLUTIONARY MINE WARFARE IN THE 21ST CENTURY NETWORKED LITTORAL BATTLE FLEET

As in the littoral maneuver forces, the technical advances associated with the 21st century mine countermeasures force are not as developed as those found in the littoral combatant or covert littoral battle combatant fleets. Be that as it may, the combination of organic in-stride mine avoidance and breaching capabilities with the shallow- and deep-water capabilities of the dedicated mine countermeasures force appears to be sound, and it seems well attuned to the expected mine warfare challenges of the Second Expeditionary Era. Should the fleet continue to upgrade its dedicated mine countermeasure forces and aggressively test and field UUVs designed for clandestine minefield mapping and neutralization, autonomous minesweeping drones, and mine kamikazes or other remote assault breaching techniques, the plan will be even stronger.

In sum, *given the appropriate attention and funding for both organic and dedicated mine warfare forces,* future Littoral Battle Forces should be able to penetrate any littoral area of operations where mines are suspected or found and continue to conduct force projection operations until dedicated mine warfare forces arrive in-theater. However, neither appropriate

[310] Seigle, "US Navy Moves to Improve Mine Countermeasures."

attention nor the required funding is a sure thing. Indeed, the Naval Studies Board recently concluded that:

> …progress toward mainstreaming mine warfare is being retarded in part because the readiness to conduct mine warfare operations is not now highly valued as a component in assessing the readiness of battle groups for deployed operations. In the fleet, mine warfare is practiced only in selected special exercises, and facilities for such practices are minimal.[311]

One way to ensure the proper level of attention would be to form dedicated Littoral Mine Warfare Squadrons and integrate them directly into Littoral Battle Fleet operations. Perhaps then a battle group's ability to conduct mine warfare would be seriously tested prior to deployment. These dedicated Mine Warfare Squadrons would also serve as an operational test bed for solving the most pressing mine warfare challenges and in determining the right balance of organic and dedicated manned and unmanned mine warfare forces for the 21st century Networked Littoral Battle Fleet.

[311] National Research Council, *Naval Mine Warfare: Operational and Technical Challenges For Naval Forces*, p. 4.

VII. Fleet Auxiliary and Littoral Warfare Support: Achilles Heel for 21st Century Naval Expeditionary Operations?

The Neglected Component

Littoral strike, littoral maneuver and littoral mine warfare forces are supported by a variety of different vessels that perform a variety of different missions. While these auxiliary ships and littoral warfare support craft perform missions that are less visible than those performed by littoral battle combatants, littoral maneuver combatants and littoral mine countermeasure forces, they are no less important to the success of 21st century Networked Littoral Battle Forces.

Unfortunately, the constant, shrill cries of the large fleet faction and their call for more *combatants* have helped mask the plight of these less glamorous, but critically important, Battle Fleet components. The fleet tolerates patrol combatants, and no more. Despite ample fleet experience that Inshore Warfare Squadrons would greatly facilitate operations in littoral waters, there is no strong institutional support for their services. The Combat Logistics Fleet, which excels at the underway replenishment of Battle Force ships, is relatively modern, but it is small, and becoming smaller. Additionally, the mobile logistics and salvage fleets are mere shadows of past fleets. Indeed, current fleet support capabilities fall far short of any in recent history.

Inshore Warfare Squadrons

The fleet's operational experience in Vietnam suggests that Inshore Warfare Squadrons—groups of small, purpose-built combatants designed for work extremely close to the littoral land-sea interface, or in the "brown water" of littoral rivers and tributaries—would provide useful capabilities in the Second Expeditionary Era.[312] Despite their potential high value, the Navy has been reluctant to divert resources to small combatants designed specially to operate in the shallower regions of the littoral. The history of the fleet's patrol combatant force is instructive in this regard.

The 1989 patrol combatant fleet consisted of six *Pegasus*-class Patrol Combatants Missile (Hydrofoils), or PHMs. In the early 1970s, then Chief of Naval Operations Elmo Zumwalt envisioned a class of 30 of these small, high-speed hydrofoils that would to engage enemy surface vessels from and in restricted seas. Armed with up to eight Harpoon anti-ship missiles and a 76mm automatic cannon, the PHMs were exceptionally stable weapons platforms, even at their top foil-borne speeds of 50 knots. However, the class never enjoyed widespread acceptance in the Navy, and support for the program died soon after Admiral Zumwalt retired. Only six were built (these only as the result of Congressional pressure), and they were all were soon relegated

[312] Love, *History of the U.S. Navy, 1942–1991*, pp. 538–558.

to conducting counter-drug patrols in the Caribbean. Their inclusion in the 1989 TSBF count reflected less an acceptance of their fleet contributions and more a desire to move the fleet towards its goal of 600 ships. All six PHMs were decommissioned by July 30, 1993.[313]

In 2001, the 13 *Cyclone*-class Patrol Combatants (PCs) are similarly disdained by Navy leadership; indeed, they do not even contribute to the TSBF. Instead, they are counted in the Local Defense and Miscellaneous Support Forces category along with sealift ships and MobCat B mine warfare ships. Although they are manned by active duty crews, have larger displacements and crews than the PHMs, and are 70 percent as fast, they are apparently excluded from the Battle Force count for two reasons: they are considered replacements for the small MkIII patrol *boats,* and they fall under the operational control of the U.S. Special Operations Command. Moreover, they are judged to "have limited endurance for their size, and their combat systems and ammunition do not compare with those of similar ships in most other navies."[314]

While this assessment may well be true, the *Cyclones* are not designed for *offensive* naval operations in the littoral. These ships are purpose-built to operate close inshore and to conduct two key missions: coastal interdiction and clandestine special operations support. In these roles, they seem more than capable. For example, each PC can carry two 16-foot combat rubber raiding craft and one 20-foot, rigid, inflatable swimmer delivery craft and can support up to 25 SEALs on multi-day patrols. Consider the following assessment of the current commander of the US Naval Special Warfare Command:

> They (the PC13 class) have been an unqualified success. They've crossed the ocean to serve in every theater. They are able to go where other Navy ships can't go…The Navy and joint operational commanders overseas have used them in key roles, including both wartime and peacetime missions. Their record of performance is impressive by every measure. They've been particularly effective in counter-drug operations in support of US Southern Command.[315]

Despite their useful capabilities, the Navy continues to ignore their potential littoral contributions or contributions of small combatants like them. In 2000, PC14, the *Tornado*, joined the fleet. Congress added this ship to the Fiscal Year 1996/97 budget without a Navy request. As built, it had a lengthened stern and boat ramp to better support small boat operations, as well as other improvements.[316] As soon as it was commissioned, however, PC1 was then transferred to the Coast Guard, maintaining the total number of patrol combatants in commission at 13. Moreover, due to lack of institutional support, two additional PCs will be transferred to the Coast Guard in FY02, and all will be removed from fleet service by FY03.[317]

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[313] Polmar, *Ships and Aircraft of the U.S. Fleet,* 13th edition, pp. 216–219; 17th edition, pp. 194–195.

[314] Baker, *Combat Fleets of the World, 1998–1998,* p. 1031.

[315] Remarks made by RADM Eric T. Olson, Commander, US Naval Special Warfare Command, in an interview with Glenn W. Goodman, "Waterborne Commandos," *Armed Forces Journal International*, (January 2000).

[316] Polmar, *Ships and Aircraft of the U.S, Fleet,* 17th edition, pp. 208–210.

[317] William H. McMichael, "Fine ship, no money to man," *Navy Times,* (April 17, 2000), p. 26.

Even if all of the remaining *Cyclones* were modified to the PC14 standard and they were retained in fleet service, however, their numbers would be woefully inadequate for the wide variety of missions easily imagined in littoral waters. Given its general disinterest, the Navy should divert some resources to experiment with a host of off-the-shelf, in-shore combatants, so that when the need arises, they will have at least developed fleet cooperative operating doctrine for Inshore Warfare Squadrons and identified readily available alternatives to equip them.[318]

There are indications that the Navy is actually going to conduct such experiments. As mentioned in Chapter III, the DD(X) program includes among its family of future combatants a Littoral Combat Ship. Although its requirements are undefined, the LCS appears to be inspired by the *Streetfighter* concept first introduced by retired Vice Admiral Art Cebrowski and retired Captain Wayne P. Hughes.[319] For Admiral Cebrowski and Captain Hughes, the principal requirement for naval access in the face of modern threats is not networked strike potential, but network survivability potential. They believe that the current fleet is "tactically unstable," that is, that the Navy has "unwisely" allowed its combat strike power to grow while allowing fleet survivability to remain constant or go down. The result is a "risk adverse" force, especially in the face of modern anti-access weapons such as subsonic cruise, supersonic cruise, or tactical ballistic missiles. To restore "fleet balance," they argue for "a family of numerically larger but physically different ships…intended to gain and sustain access in the face of an adversary's sophisticated (or not so sophisticated) area-denial strategy." In other words, the *Streetfighter* concept greatly elevates the importance of Inshore Warfare Squadrons by assigning them responsibilities as the leading edge of fleet counter-network operations.[320]

A *Streetfighter* counter-network force would be employed early in a theater break-in operation, especially when major components of an enemy's anti-access network remained intact and the threat environment was extremely high. The force would be made up of small, "cheap," minimally crewed combatants that would depend on speed and stealth for individual survivability, and which would be link together digitally to form a distributed fighting network. The ships "would operate along crowded coastal waters, hiding in coves and springing out to destroy enemy subs, hunt down mines, and disrupt enemy missiles that could more easily target larger, slower ships." So constructed and employed, the *Streetfighter* counter-network force would be able to take multiple "hits" and continue to operate.[321]

Of course, any "network hit" would likely result in the complete loss of a small combatant and its crew. Indeed, proponents of the *Streetfighter* concept stress that the individual components of the *Streetfighter* network would be designed to be, and would be considered to be, "expendable."

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[318] There are many possible littoral patrol craft to choose from. For example, see "Designed for the Job," *Naval Institute Proceedings,* (October 1996), pp. 26–30.

[319] O'Rourke, "Navy DD(X) Future Surface Combatant Program: Background and Issues for Congress."

[320] VADM A.K. Cebrowski, USN, and Captain Wayne P. Hughes Jr., USN (ret), "Rebalancing the Fleet," *Naval Institute Proceedings*,(November 1999), p. 34. See also VADM Art Cebrowski's comments in Hunter Keeter, "Cebrowski: Today's Thinking Won't Do for Tomorrow's Navy," *Defense Daily*, (November 3, 1999), p. 1.

[321] Cebrowski, and Hughes, "Rebalancing the Fleet," and Harold Kennedy, "Multi-Mission Ships No Substitute for More Vessels, Admiral Says," *National Defense*, (January 2000).

As one officer who experimented with the concept in a recent war game at the Naval War College remarked: "We were far more callous in our use of them. We wanted them to go out and do good things, and if they didn't come back, well…"[322] The cost effective logic of the model is that the sacrifices of *Streetfighter* crews would be well worth it if they could beat back an anti-access network and enable larger littoral battle and maneuver combatants to operate closer to shore with lower levels of risk.[323]

In essence, then, the *Streetfighter* concept is not unlike that of the "Forlorn Hope" developed by Arthur Wellington in the Iberian Campaign during the Napoleonic Wars. Given his relative paucity of high-quality infantry battalions, when compelled by tactical circumstances to attack a heavily fortified town, Wellington was loath to waste them on costly breaching assaults. His solution was to first affect a breach in the enemy's defenses by artillery bombardment, and then to force the breach using a preliminary assault composed entirely of volunteers. Survivors of these so-called Forlorn Hopes were accorded high status. The lieutenants who led them and survived were awarded an immediate captaincy; sergeants who led them and survived were promoted to ensign; men who participated were either promoted, decorated or both. The promised awards ensured that there was never a lack of volunteers from among the more ambitious junior officers and hard-treated, enlisted "rankers." Of course, the number of promotions actually awarded were quite low, since the chances of surviving a Forlorn Hope were essentially nil. One wonders what similar inducements might entice future volunteers for the "*Streetfighter* Hope."[324]

The moral questions of the concept aside, there are a number of operational assumptions made by *Streetfighter* proponents that bear scrutiny. First, the small *Streetfighter* vessels would seem best employed forward in a theater, since their endurance and ocean transit capabilities likely would be far less than those of larger ships. The forward basing of small combatants was exactly what was tried with the aforementioned PHMs in the late-1970s. As envisioned by Admiral Zumwalt, the PHMs—like *Streetfighters*—were to be a "cost effective" naval warfighting concept that would provide more platforms at sea and free up battle force combatants for other duties. Reflecting the Navy's reluctance to use the term "expendable," the PHMs were designed to be "low-value trailers of high-value Soviet ships" in enclosed seas like the Mediterranean. In the event of combat operations, they were to attack their assigned high-value ship with a volley of Harpoon missiles and rely on their small size and superior speed to break contact and survive. However, operational experience showed that the relatively low sea-keeping abilities of these small ships, as well as their need for frequent logistical support, made them unsuitable for their designed mission. As a result, they were moved closer to shore where they could hide in the

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[322] See "Debate Surrounding Small Ship Poses Fundamental Questions for U.S. Navy," *Wall Street Journal*, (July 11, 2001), p.1.

[323] Captain Wayne P. Hughes, "22 Questions for Streetfighter," *Naval Institute Proceedings*, (February 2000), pp. 47–48.

[324] Bernard Cornwall, S*harpe's Company*, (New York: The Viking Press, 1982), pp. 12–13, and in "Historical Note," pp. 277–280.

dense in-shore surface traffic, conduct missile ambushes of passing Soviet combatants, and be supported by "mother ships" that provided repair, consumable and crew support.[325]

Because of their small size and relatively short endurance, *Streetfighters* presumably would also be supported by mother ships.[326] However, the operational conditions faced by *Streetfighter* and PHM mother ships are fundamentally different. The shift of the PHMs and their support to the coastal waters of the Mediterranean made a great deal of sense during the Cold War, since the coasts were controlled by *friendly* forces and they provided good concealment from larger Soviet combatants operating farther to sea. When faced by an anti-access network capable of over-the-horizon targeting, or when coastal waters are observed and controlled by an enemy, the early investment of the littoral region by even small, speedy combatants appears problematic. If the enemy's targeting network is sophisticated enough to threaten low-signature ships operating far out to sea, it would seem more than capable of targeting low-signature ships operating close to the coast. Moreover, where would the mother ships operate? If the mother ships could operate within the enemy's engagement fan, what would keep a more durable and protected littoral battle combatant from doing the same? Alternatively, if the mother ships operated far to sea, would not the *Streetfighters* be extremely vulnerable during their trips to their assigned operating areas?

More troubling, the concept seems to presuppose that the only way to defeat an anti-access network is to get *surface units* close to shore, immediately. As has been discussed, the early stages of a theater break-in campaign would see intensive reconnaissance activities to identify key enemy network targets, and counter-reconnaissance activities designed to keep enemy scouting elements from targeting the fleet and other joint forces. The joint power-projection network will be able to call upon space-based reconnaissance systems, manned and unmanned air assets, submarine, and special operating forces that would seem more than capable of identifying the enemy's shore-based, anti-access network nodes. Submarines, deployable underwater sensor grids, UUVs, and stand-off naval and joint aerial reconnaissance would seem to be able to characterize littoral mine, submarine, and surface threats both more efficiently and safely than small crewed vessels operating in the heart of the enemy's sensor grid and engagement envelope.[327] Moreover, once the shooting started, the increased ranges of future naval air and strike weapons would seem sufficient to put the enemy under fire, and the joint fire plan would be specifically designed to help roll back the enemy's engagement network and to allow *all* joint forces—air, sea and ground—to move closer to shore. It is not clear what *added* capabilities a small manned S*treetfighter* force would provide in a network-versus-network fight.[328]

All in all, the concept would appear to be far more powerful and morally palatable if the *Streetfighters* were unmanned. Imagine advanced force operations involving hundreds of

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[325] Vice Admiral Jerry Miller. "re: The Need for Speed," *Naval Institute Proceedings*, (April 2001), pp. 28–32.

[326] Hughes, "22 Questions for Streetfighter." See also Skinner, "Swarm the Littorals," p. 90.

[327] Lieutenant Mike Parry, USN, "*Virginia* Can Be a Streetfighter," *Naval Institute Proceedings*, (June 2000), pp. 30–32.

[328] For a more detailed critique of the concept, see Stephen C. Audrand, "Blue Water Power," *Naval Institute Proceedings*, (September 2001), p. 42.

unmanned littoral combat craft, digitally linked, and controlled by Littoral Battle Forces operating far over the horizon. Working in concert to destroy the most threatening sea-based components of an enemy's anti-access network, such craft would perform the same function envisioned for unmanned combat air vehicles during suppression of enemy air defense operations and would reduce the likelihood of friendly casualties to zero. Moreover, control of the craft could be distributed among many ships, reducing the tactical instability of a network built around a few vulnerable mother-ships whose loss would threaten the integrity of the entire network.

One has to wonder why the *Streetfighter* concept is so closely tied to crewed vessels. Once again, it seems likely to be the result of the pervasive influence of the large fleet faction. The leading proponent of the concept, Admiral Cebrowski, has plainly stated that "numbers count" in an theater break-in operation and that by pursuing the *Streetfighter* concept the Navy could see a combatant fleet of 225 combatants (*Streetfighters* included).[329] Representative Ike Skelton, another proponent of the concept, put it, "I know it's hard or even distasteful to imagine a Navy with smaller *ships*. But it is harder and even more repugnant to imagine a Navy rendered irrelevant or shrunken to Lilliputian proportions by a tunnel vision fealty to large *platforms*" (emphasis added).[330] In other words, the concept seems as much about maintaining ship counts as it is about increasing fleet combat effectiveness. After all, while small, crewed combatants would allow the Navy to build up its TSBF count, unmanned littoral combat craft probably would not.

The real danger is that the *Streetfighter* concept will be prematurely adopted, either because of perceived operational threats or real budget pressures. The Navy should vigorously resist this course. Despite the confident view of some officers and analysts, increasing fleet size by building large numbers of small combatants is a question best answered by experimentation instead of pronouncement. Standing Inshore Warfare Squadrons would be the best testbed for such problems. Experiments could be designed to determine if small combatants would be better employed as the *leading* or *trailing* edge of a littoral break-in operation and whether their missions would be best handled by manned or unmanned combatants, or a mix of both. Under any circumstances, however, the goal of the experiments should be about improving fleet combat capability, not about maintaining or expanding the Total Ship Battle Count.

THE COMBAT LOGISTICS FORCE

During the First Expeditionary Era, the U.S. Navy pioneered underway refueling and at sea replenishment of fast moving naval task forces. The subsequent development of the combat logistics force (CLF)—ships purpose-built to resupply task forces operating at sea—greatly increased the operational and tactical freedom of World War II task forces as well as the

[329] Kennedy, "Multi-Mission Ships No Substitute for More Vessels, Admiral Says."

[330] "Debate Surrounding Small Ship Poses Fundamental Questions for U.S. Navy," p. 1.

sustained tempo of naval offensive operations. No other navy on earth has emphasized the importance of underway replenishment more than the U.S. Navy. [331]

The 600-ship Navy called for a CLF composed of 15 station ships—large, multi-purpose ships that could carry large amounts of fuel, food, weapons, and supplies and which could keep pace during high-speed, carrier battle group operations. These 15 high value assets would provide one station ship for each Carrier Battle Group. The station ships, in turn, would be supplied and augmented by 10 Underway Replenishment Groups (URGs), each consisting of an ammunition ship, a stores ship and one or two oilers. The URGs would sail from fleet logistics resupply hubs, or "log heads," to the battle groups, transfer fuel and supplies to both combatants and the station ships, and return for more supplies. The combination of station ships and shuttle ships was designed to sustain wide-ranging carrier battle and surface action groups around the periphery of the Eurasian land mass should war break out with the Soviet Union.[332]

By the end of 1989, the CLF numbered 56 ships. The fleet consisted of 11 station ships (four fast combat support ships, or AOEs, and seven replenishment oilers, or AORs), and 45 shuttle ships including ammunition ships, store ships and oilers. Nearly two-thirds of the ships were active Navy; the remainder were manned and operated by the MSC with civil service or contractor civilian crews. The 1989 CLF was large enough to make up its four station ship shortfall by pairing an ammunition ship and an oiler to serve as a station ship substitute and still have enough shuttle ships to source the 10 URGs called for in wartime plans. Moreover, with the exception of its oilers, the CLF ships were in relatively good material shape, having been built during the late 1960s and early 1970s. In addition, the oiler force, which had started the 1980s with large numbers of World War II and 1950s-built vessels in service, was in the midst of a thorough upgrade with the introduction of five *Cimarron*-class fleet oilers and the first six of an eventual class of 16 *Henry J. Kaiser*-class fleet oilers. The 1989 CLF therefore met the wartime requirement, and could easily meet the peacetime support requirements for forward-deployed fleet ships.[333]

The FY 2001 CLF is generally an older, smaller version of the 1989 fleet. With the planned modernization of oiler fleet complete, the most important change in force assets has been in its station ships: the seven *Wichita*-class AORs have been replaced by four new *Supply*-class AOEs. The *Supply*-class carry slightly less fuel and slightly more dry stores, three times the ammunition and four times the refrigerated stores than the ships that they replaced. In sheer numbers, the retirement of the *Wichitas* resulted in a 27.3 percent reduction in the number of fleet station ships (from 11 to eight). However, because of concomitant reductions to the carrier fleet, the ratio of

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[331] Before World War II ended, the Navy had over 1,000 ships in its service force, of which over 200 were combat logistics force ships capable of underway replenishment. See Williamson and Murray, *A War to be Won*, p. 337.

[332] John F. Ince, *Transitioning the Combat Logistics Force into the 21st Century*, (Alexandria VA: Center for Naval Analysis, CRM 98-69/May 1998), pp. 10–16.

[333] Polmar, *Ships and Aircraft of the U.S. Fleet*, 16th edition, pp. 209–255.

station ships to deployable carriers remained essentially unchanged, moving from 1:1.36 in 1989 to 1:1.37 in 2000.[334]

In comparative terms, the current 34 CLF ships represent the same percentage of the 300-ship Navy as the 56 ships in the 1989 fleet (10.3 percent versus 10.0 percent). At first glance, then, it would seem that the CLF force is right-sized for 21st century TSBF requirements. However, a naval campaign against the Soviet Union would have focused on operations in the North Atlantic and Northern Pacific, and fleet units would have been supported by a large network of allied ports and resupply hubs located around the periphery of Europe and Asia. Operations in the Second Expeditionary Era seem less likely to be able to count on ready access to close-by ports or support. This would seem to argue for a larger relative CLF component than in the past.

One reason why the CLF has seen no relative increase since the end of the Garrison Era is the way CLF wartime requirements are calculated. The CLF force is currently sized to support two major theater wars (MTWs)—MTW West (i.e., Korea), and MTW East (i.e., Southwest Asia). For current wartime scenarios, naval planners count on bases in Japan to support a Korean contingency and bases in Bahrain and Oman to support operations in the Persian Gulf. Using these assumptions, the wartime requirement for CLF forces is approximately 30 ships. However, since the number of CLF ships required is heavily dependent on the proximity of friendly supply bases from which shuttle ships can operate, the short distance of log heads from potential operating wartime operating areas has a major dampening effect on the overall size of the CLF. Is the assumption of major fleet bases essentially right next door to potential contingencies the most prudent one for the strategic and operational circumstances of the Second Expeditionary Age? It seems unlikely. Given the critical dependency of expeditionary naval operations on the fleet's ability to replenish itself at sea, it would appear far more prudent to use more stressful planning factors with a goal of adding redundancy and depth to the CLF.[335]

The CLF's lack of depth also may be masked by the fact that the entire shuttle fleet has been transferred to the MSC. Under current OPTEMPO/PERSTEMPO policies, a CLF ship crewed by active duty sailors is generally available for deployment only six out of every 24 months. In contrast, since MSC ships have civilian contractor crews not bound by fleet OPTEMPO/PERSTEMPO rules, ships are available for fleet support 12 out of every 15 months. As a result, MSC-manned CLF ships can sustain much high peacetime availability rates.[336] When adding in the significant manpower savings accrued by converting active crews to contractor crews, it is not surprising that station ships will also soon be transferred to the MSC, making the combat logistics fleet an all-contractor operation for the first time in fleet history.[337]

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[334] Ibid., pp. 243–244, and Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, pp. 262–263.

[335] Ince, *Transitioning the Combat Logistics Force into the 21st Century*, pp. 15–17.

[336] Alan C. Moser, "Explanation of CLF Transition Advantages on Battle Group Coverage," email dated February 9, 2000 to Captain Harry E. Palm, Navy Staff, and forwarded to the author.

[337] The first AOE was transferred to the MSC in 2001. All are to be in the MSC by FY 2004. *Ships and Aircraft Supplemental Data Tables*, December 10, 2001.

The higher peacetime availability of MSC-manned CLF ships will not count for much when the fleet is mobilized for an expeditionary campaign, however. During contingency operations, when OPTEMPO and PERSTEMPO policies are waived, 34 CLF ships will always equal 34 CLF ships, and the number of battle force ships they will have to support forward will increase dramatically. In 2001, the CLF fleet provides a ratio of CLF ships to supported combatants (carriers, battleships, surface combatants, and amphibious and mine warfare ships) of 1:5.6. While this ratio is essentially identical to that found in the 1989 fleet (1:5.5), the 1989 fleet enjoyed a much more robust world-wide support structure. These numbers and ratios would seem out of balance with the demands of anti-access operations in the Second Expeditionary Era, especially at the distances involved in the Asian theater of operations.

Notwithstanding the predictable stresses wartime demands will place on the CLF, its small size also presents an attractive asymmetrical target for a potential adversary. This is especially true since upon their conversion to the MSC, CLF ships lose most, if not all, of their defensive weapons. Rather than expending a great deal of money on sea-denial weapons and fighting the U.S. Navy in the enemy's own back yard, a smart opponent might instead try to sink or disable a portion of the relatively small, unarmed, civilian-manned, CLF fleet. If successful, he might just be able to keep the fleet from being able to get to, much less stay in, his own back yard.

The lack of depth in the CLF will become even more pronounced when the planned production run for the newest CLF ship—the T-AKE Auxiliary Dry Cargo Ship—is complete.[338] These large, multi-purpose supply ships are required to simultaneously carry at least 63 percent of a nominal ammunition ship load, 63 percent of a nominal stores ship load *and* 18,000 barrels of cargo fuel. The convertible cargo holds will also allow them to carry 100 percent of either an ammunition ship or a stores ship load, if required. As a result of this inherent design flexibility, these 12 ships are intended to act as shuttle ships, or, in conjunction with a fleet oiler, as a station ship substitute. Under current plans, the 12-ship T-AKE class will replace 13 ammunition ships and store ships in the force today, as well as the four-ship AOE1 class.[339]

If current production plans remain on track, the first two T-AKEs will enter the fleet in FY 2005 and the entire class will be in commission by FY 2010, whereupon the 2011 CLF will shrink by another five ships to a total of 29 vessels (four T-AOEs, 12 T-AKEs, and 13 T-AOs). [340] While an additional three to five CLF ships might remain in the Mobilization Reserve Fleet, with only 29 active ships, the Navy's CLF would fall below 10 percent of the total fleet, the ratio of purpose-built station ships to deployable aircraft carriers would drop to 1:2.75, and the ratio of CLF ships to supporting combatants would drop to 1:6.7. These numbers are alarming and argue for a reassessment of CLF plans.

Other CLF operational assumptions are in need of review. For example, the Navy has all but abandoned the at-sea transfer and loading of VLS-compatible missiles. The "strike down

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[338] The "T" in T-AKE indicates the ship is operated by the MSC.

[339] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, pp. 233–234.

[340] Arnold Litteken et al., "Sustaining the Force," *Sea Power*, (May 2001), p. 34–36.

modules" to allow at-sea weapon loading have been removed from the Flight IIA DDG51s. Ammunition replenishment of surface combatants and submarines is now conducted either alongside a pier or a tender.[341] At-sea reloading operations are, no doubt, difficult. But the outright abandonment of at-sea missile resupply seems counter-intuitive for a fleet that has adopted the VLS as its primary main battery and for a Navy that has emphasized underway replenishment since before World War II. Moreover, given the reductions to the mobile logistics force, which in the past has provided a readily available option for forward in-theater rearmament, this decision seems even more suspect.

THE MOBILE LOGISTICS FORCE

The Navy's mobile logistics force (MLF) has been gutted. Of the 23 destroyer tenders, submarine tenders, and repair ships in active service on December 31, 1989, only two submarine tenders remain.[342] This reduction exceeds that of any other fleet component or subcomponent by far. A major contributing reason for these drastic reductions is that these ships normally have crews numbering between 500 and 1,300 Sailors. Indeed, one of the immediate benefits derived from their wholesale retirement was an immense manpower savings, which helped to pay for a large chunk of the Navy's manpower reductions mandated by the post-Cold War defense reviews.

From a historical perspective, the diminutive size of the present-day mobile logistics force is striking. From 1975 through 1990, at the height of the Garrison Era when many overseas bases were available, approximately 20 destroyer and submarine tenders and repair ships were in commission, supporting an average of 407 attack submarines, carriers, surface and patrol combatants, and amphibious, mine warfare, and combat logistics ships. This amounted to an average of about one mobile logistics ship for every 20 ships that might sail in harm's way. [343] In 2001, two submarine tenders, one in Italy and one in Guam, support forward deployed nuclear attack submarines. There are no mobile logistics ships dedicated to surface combatant support beyond two destroyer tenders held in Mobilization Reserve.[344]

These numbers, while eye opening, may be somewhat deceiving. Tenders and repair ships have lost much of their usefulness with the manifestation of the propulsion and digital revolutions. The mobile logistics force was able to keep steam power plants operating by conducting high pressure welding and condenser repairs, as well as repairing a large percentage of analog combat systems. The former capability is now required for an increasingly small number of steam powered combatants (concentrated in the littoral maneuver combatant fleet) and the latter capability obsolesced.[345]

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[341] Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th edition, p. 493.

[342] Ibid., p. 230.

[343] *Ship Forces of the U.S. Navy: Historical Force Levels FY62 Through FY93.*

[344] Polmar, *Ships and Aircraft of the U.S. Fleet,* 17th edition, 269.

[345] Email from Captain Trip Barber.

Acknowledging that older tenders and repair ships may be less relevant to 21st century Networked Battle Fleet forward maintenance operations is not the same as concluding that new mobile logistics ships will be unnecessary in the future. In the face of any capable anti-access network, fleet units will undoubtedly suffer battle damage. While ship repair facilities are now available in every theater, access to them cannot be guaranteed. Even if future mobile logistics force ships were capable only of providing forward combat system and propulsion system triage and emergency repairs, they would offer some benefit. Moreover, as was mentioned earlier, these ships have traditionally provided important in-theater rearmament capabilities. Indeed, during the War in Kosovo, the submarine tender stationed in Italy rearmed an attack submarine that had expended its basic Tomahawk load after conducting earlier missile strikes in the Persian Gulf and subsequent strikes into Serbia and Kosovo.[346] The loss of such a forward rearming capability, especially in light of the CLF's aforementioned inability to resupply missiles at sea, would seem to be an alarming one.[347]

Manpower costs should not deter the Navy from developing new 21st century mobile logistic concepts and capabilities. Converted merchantmen might become the tenders of the 21st century, with large cranes for gas turbine change outs, space for special ISO vans with digital repair equipment and spares, and an over-the-side VLS rearming capability. They might be manned by MSC crews and have living accommodations for weapon system repairmen and contractors, as well as active duty and reserve augmentees. Whatever the answer, defining the requirements for the future mobile logistics force would seem to be a pressing need.

THE FLEET SALVAGE ARM

The fleet's salvage arm has also seen a similar dramatic decrease in capabilities. Since 1989, the number of salvage-capable submarine ships and fleet tugs have decreased by 57.6 percent, shrinking from a total of 26 vessels to 11. This number is slightly misleading. The four new, highly capable *Safeguard*-class salvage ships, commissioned between 1985 and 1986, were designed to replace seven obsolescent salvage ships commissioned between 1944 and 1946. The decommissioning of four of these older ships had simply not yet occurred by the end of 1989. Moreover, two further losses were World War II-era fleet tugs that had been re-commissioned out of reserve in 1987 to serve as Caribbean-area, counter-drug patrol ships, not as fleet salvage assets. A more accurate comparison of fleet salvage and diving capability would therefore indicate a more modest, but still substantial, 45 percent reduction, from 20 dedicated vessels to 11.[348]

In any case, the fleet's current salvage and dedicated diving capabilities are far inferior to those of past fleets. Submarine rescue ships, designed primarily to support the McCann submarine rescue chamber, Deep Submergence Rescue Vehicle (DSRV) or both, were also fitted with

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[346] Barbara, "The 'Big Gun's' Two-Theater TLAM Tally," p. 15.

[347] A Joint Staff Study concluded that the limited number of forward-deployed submarine tender assets may become a problem in future operations. See Hunter Keeter, "Technology Keys Sub Force's Role in Strike Missions," *Defense Daily*, (March 14, 2000).

[348] Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, pp. 268–269.

important general salvage and diving capabilities. While fleet submarine rescue capabilities still reside in SSN-delivered DSRVs, the loss of these ships' general salvage and diving capabilities has not been recouped. Moreover, in 1989, the four *Safeguard*-class salvage ships and the three large, ocean-going tugs of the *Edenton* class allowed for the continuous peacetime deployment of one salvage-capable ship in both the Mediterranean and Western Pacific. With the decommissioning of the *Edenton* class in the mid-1990s, the 2000 Navy could provide forward deployed salvage assets in no more than one theater. It an era of tight budgets, it appears the fleet's salvage capability is to be increasingly outsourced.[349]

FLEET SUPPORT: MISSING THE BOAT

The emerging contrast between the apparent over-capacity in fleet combat potential and the apparent under-capacity in fleet support potential is quite stark. The Navy's combat logistics forces, mobile logistics forces, salvage arm, and supporting littoral combat craft enter the 21st century seemingly less prepared for the potential demands of the Second Expeditionary Era than any other fleet component. This is the most troubling aspect of the current fleet, and one that needs far more attention. As A.D. Baker, III, put it:

> In the increasing conflict for a share of budgets that are slowly shrinking, and in the face of ever-escalating costs and drawn-out development times for the latest and greatest gadgetry, important capabilities are being sacrificed, regardless of whether they might leave the fleet vulnerable, in order to pay for a projected simplistic future dominated by frightening levels of threat technology that are less and less likely to prove actual. [350]

Indeed, proponents of a reduced risk fleet might find the arguments for more CLF, MLF, salvage ships, and patrol combatants or littoral combat craft more compelling than the calls for more combatants. But how to best define the target for increases to the fleet auxiliary force? One way to approach the problem would be to form standing *Theater Support Groups*, composed of CLF, mobile logistics and salvage vessels. Like the standing Littoral Mine Warfare and Inshore Warfare Squadrons previously discussed, these Theater Support Groups would be tasked to both support ongoing fleet operations and to identify and experiment with the new vessels and capabilities needed to support sustained Littoral Battle Force counter-network and combat operations in a distant littoral. Solutions identified by the Theater Support Groups would be gradually introduced into fleet service. Such a plan would do for the 21st century Networked Battle Fleet what the experiments in underway replenishment during the interwar years did for the World War II expeditionary Navy.

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[349] Ibid.

[350] Baker *Combat Fleets of the World, 1998–1999,* p. xiv. See also his comments in "Shrinking Fleets, Expanding Technology," *The Year in Defense 1999,* p. 113.

VIII. TRANSFORMING THE 21ST CENTURY NETWORKED LITTORAL BATTLE FLEET

TIME FOR A CHANGE

The 21st century Networked Littoral Battle Fleet is not your father's Battle Fleet. Indeed, this fleet defies easy comparison with fleets as recent as a decade ago. Empowered by a naval technical revolution of breathtaking scope, its standardization, connectivity, comparative defensive and offensive combat power, latent maneuver power, and emerging mine warfare capabilities far outstrip those of any previous fleet to an astonishing degree. Despite this remarkable development, the 300-ship fleet has yet to fully transform. There seems to be two primary reasons. First, the ongoing naval technical revolution is still playing out in the surface combatant fleet, and the operational impact of improved littoral maneuver and mine warfare capabilities are about a decade away. On its current trajectory, then, the true power of the revolution will manifest itself in the second decade of the 21st century. Second, and more importantly, in contrast to the bureaucratic and operational impetus for change found in the attack submarine force, the Navy and the Marine Corps have yet to adopt a common vision for the 21st century, and they lack a mutually agreed upon operational concept for battle fleet operations in the Second Expeditionary Era. As a result, they remain mired in Garrison Era operational patterns and held back by Cold War organizational structures.

The Navy's current operational concept is essentially synonymous with its preferred operational pattern: to keep combat-credible naval forces constantly forward deployed by organizing the fleet for continual rotational deployments. This operational pattern/concept of presence was honed to an art during the Garrison Era, whereby battle force ships would deploy for approximately six months and be home for 18, resulting in a fleet deployment ratio of approximately 25 percent. Although this deployment ratio was relatively low, the large size of the Garrison Era's Navy allowed continuous CVBG coverage in the Mediterranean Sea, Persian Gulf and the Pacific Ocean.

As has been remarked, many Navy officers believe this operational concept/operational pattern to be an enduring one. By continuing to man forward naval garrisons, they argue, the Navy "extends U.S. sovereign power forward…reassuring allies and demonstrating U.S. commitment to defending its interests." Keeping forces deployed also allows the fleet to create and maintain up-to-date, regional "knowledge bases" that are extremely helpful during emerging crises. Further, forward deployed forces "assure access" for joint forces **"**because they are already there." Should a crisis occur, their speed of response might prove critical, since they can "alter initial conditions," possibly decisively. Thus, forward deployed naval forces "enable the transformation" of the joint force, which includes Marines along with the Army and Air Force.[351]

[351] VADM Edmund P. Giambastiani, Jr., USN, "An Investment Portfolio for the Navy After Next," *Sea Power,* (April 2001), p.10.

There is just one problem. As has been discussed. the current fleet is simply too small to maintain continuous CVBG and ARG presence in all three of the Navy's operational hubs without violating current PERSTEMPO and OPTEMPO rules. The minimum number of ships required to sustain the Cold War naval garrisons is defined by the 360-ship reduced risk fleet—with its 15 deployable CVBGs, 14 ARGs, 125–135 surface combatants, and 55–72 submarines. However, even if one accepts the proposition that *continuous* forward presence reduces the risk to the nation, and even if future budgets saw the substantial increases necessary to built the 360-ship reduced risk fleet, one must ask a simple question: what would the Networked Littoral Battle Fleet do with its excess fighting capacity?

In comparative terms, the current 11-ship carrier fleet has over three times the equivalent strike potential of the 1989 15-ship carrier fleet. The current littoral combatant fleet already carries 784 more missiles than did the comparative fleet at the twilight of the Cold War, despite numbering 23 fewer warships. Although the attack submarine fleet is smaller, because of an increase in the average number of weapons carried per SSN and the decrease in the undersea threat, its comparative strike power vastly exceeds that of the 1989 fleet. Moreover, the Battle Fleet's comparative combat power will grow as the third-phase transformation of the Littoral Strike Fleet runs its course; each time a 61-cell *Spruance* destroyer or a 40-missile capacity *Perry* guided missile frigate is replaced by a 96-cell Flight IIA *Arleigh Burke* guided missile destroyer, fleet magazine capacity grows by some 35–56 missiles. By any measure, the second- and third-phase combined Littoral Strike Fleets already boast pulse and sustained firepower capabilities that far exceed any plausible near- to mid-term threat.

Perhaps the fighting power of the tomorrow's fleet will have to grow beyond that now planned in response to emerging threats. However, it would be exceedingly difficult to justify such an increase now, especially in terms of war fighting risk. It would be equally hard to justify paying for excess combat capacity simply to mitigate the risk associated with gaps in continuous naval coverage, especially in such areas like the Mediterranean where allied naval power is becoming demonstrably stronger. In any event, the fact is that today's naval and joint military leaders have judged the national security risks associated with naval gaps to be less compelling than the risks to fleet manning should current OPTEMPO/PERSTEMPO rules be waived to close them.[352]

More to the point, the unsuitability of "being there" as an *operational* concept is quite easy to discern. First, because of the distances involved, having one CVBG deployed to Southwest Asia and another in Northeast Asia will not guarantee the ready availability of naval task forces when a crisis erupts; at best, it guarantees only an improved relative speed of crisis response compared to CONUS-based naval forces.[353] Second, just "being there" may not provide sustainable access; indeed, it may provide an enemy with attractive preemption options. For example, while the fleet continues to forward deploy ARGs and their embarked MEUs, their rotational patterns are not synchronized with those of CVBGs, and they often deploy and operate separately from them.

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[352] During the early 1980s, the Navy attempted to keep continuous theater coverage by extending Battle Group cruises beyond their nominal six months duration. The result was a precipitous decline in the reenlistment rate. As a consequence, the Navy adopted more rigid OPTEMPO/PERSTEMPO rules limiting deployments to six months.

[353] Giambastiani, "An Investment Portfolio…For the Navy After Next," p. 10.

Whenever this happens, ARG/MEUs routinely sail without any surface combatant escort, leaving them highly vulnerable to surprise air or missile attack.[354] Third, maintaining small naval task groups forward does less to assure *sustained*, long-term access than does maintaining high quality combat logistics and mobile logistics forces. Fourth, with the entire fleet locked into a rotational pattern that demands rigid enforcement of OPTEMPO/PERSTEMPO rules, it is extremely difficult to reinforce forward naval forces except in an extreme emergency. Indeed, it is quite common for CVBGs and ARG/MEUs that are near the end of their six-month scheduled deployment to turn for home even while other joint forces are in the midst of sustained theater combat operations.[355]

So here is the rub: while the Battle Fleet has too few hulls to maintain its Garrison Era operational pattern, the ongoing naval technical revolution has given it combat power to spare. On balance, it would therefore seem prudent to spend less time and energy fighting to expand the fleet (except in regard to fleet auxiliaries), and more time and energy exploring other operational patterns that take better advantage of the evolving capabilities of naval combatants and their support forces.

The Marines also remain hampered by Garrison Era holdovers. First, they also continue the Cold War operational pattern of "being there," to the point that day-to-day FMF operations have become increasingly associated with the peacetime deployments of small MEUs better suited for operations other than war and small raids, rather than with brigade- or larger-sized MAGTFs with potentially decisive operational maneuver capabilities. As a result, the art of large-scale attacks from the sea is an increasingly lost one.

Second, despite having long ago adopted MAGTFs as the preferred means of deploying and employing their combat forces, the Marines continue to try to meet the dictates of five decade-old Congressional committee language, which directs them to maintain a Marine Corps of three divisions, three aircraft wings, and supporting combat service support units. The result has been a proliferation of active staff headquarters. Even after slimming down from a Garrison Era high of 50 higher headquarters, the Corps retains 42 high-level staffs (two Marine Forces (MarFors), three MEFs, seven MEUs, three Divisions, 11 Regiments, three Marine Aircraft Wings, 10 Marine Aircraft Groups, and three Force Service Support Groups). In an information age that increasingly sees flatter, more efficient organizations, this would seem to be a drag on progress.

Third, the Marines largely have divested themselves of the *standing* MAGTF most useful and relevant for the Second Expeditionary Era: the Marine Expeditionary Brigade. The larger MEFs are most suitable for sustained theater ground combat operations, like those seen in the Vietnam and Persian Gulf Wars. In contrast, the Brigade is a relatively nimble organization, capable of being deployed and employed on littoral maneuver combatants, or deployed and supported from

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[354] Captain George Galdorisi, USN (ret), "Expeditionary Forces at the Crossroads," *Naval Institute Proceedings*, (June 2001), pp. 36–37.

[355] In any event, the United States can "be there" in different ways. For example, increasing U.S. embassies, consulates, and other interagency organizations, and having an integrated U.S. military role in each of them, is one alternative. See *America's Overseas Presence in the 21st Century*, (U.S. Department of State: Overseas Presence Advisory Panel, November 1999).

the LMSF. Moreover, its size seems a good fit for the operations other than war in which Marines have traditionally specialized, as well as for the specialized deep operations that may be required during anti-access operations. While the Marines have recently begun to tout the brigade as a viable deployment and employment option, and brigade headquarters are embedded in the larger MEF organizations, perhaps the time has come to "brigade the Corps" and to reinvest the resulting staff and manpower savings staff in its fighting forces.

For both the Navy and the Marine Corps, maintaining Garrison Era rotational deployment patterns and organizational structures ensures that the naval technical revolutions in fleet strike, maneuver, and fleet mine warfare will offer nothing more than evolutionary capabilities, and fall far short of the revolutionary possibilities promised by bolder transformational change. Such a transformation cannot and will not occur by mere coordination of Navy and Marine Corps activities and visions. The challenges of the operational competition with anti-access networks and the goals of NCW will require a degree of integration far beyond that of "stapling service capabilities together."[356] The final transformation of the current 300-ship fleet will occur only when both Navy and Marine Corps leaders lose their Garrison Era "hangovers," embrace a common vision for the future, move to change the organizational and operational patterns with which they have grown so comfortable, and integrate their future activities more thoroughly than in the immediate past.

EXPEDITIONARY LITTORAL WARFARE AND COUNTER-NETWORK OPERATIONS

The guiding organizational vision for integrated naval operations in the Second Expeditionary Era should be a Networked Littoral Battle Fleet, designed for Expeditionary Littoral Warfare and Counter-Network Operations**.** Given continued peace in Europe and the positive developments in European naval capabilities, the Networked Littoral Battle Fleet should concentrate its peacetime presence operations along the vast Asian littoral. Presence operations would be greatly facilitated by the continued forward basing of a carrier and its escorts in Japan, but long-term contingency planning would account for the possible loss or diminution of U.S. forces permanently based there. Accordingly, forward presence and contingency response forces operating to the west of the Malaccan Straits would be supported from an expanded forward fleet support base on Diego Garcia, while forward presence and contingency response forces to the east and north of the Straits would be supported by an expanded forward fleet support on Guam. Additional contingency fleet support sites, with as many service and support capabilities as could be negotiated with friendly host countries, would facilitate peacetime, and potentially wartime, operations. However, the combat and mobile logistics forces would be sized to support sustained combat operations along the Asian littoral from either Diego Garcia or Guam. As in the First Expeditionary Era, the operational mindset of fleet planners in the Second Expeditionary Era should consider access to forward bases to be a luxury and not a given.

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[356] Paul K. Davis, James H. Bigelow, Jimmie McEver, *Analytical Methods for Studies and Experiments on Transforming the Force*, (Santa Monica, CA: RAND Corporation, 1999), p. 2.

While available and ready to immediately respond to contingencies throughout the conflict spectrum, the Networked Littoral Battle Fleet would concentrate its peacetime training on honing the operations, tactics, techniques, and procedures necessary to disassemble naval anti-access networks as part of a wider joint, power-projection operation. In network-versus-network combat, the ability to quickly create a large, distributed, fighting network would be as important, if not more so, than simply having small network components forward. Given the probable characteristics of future anti-access networks, the Networked Littoral Battle Fleet will need the ability to promptly aggregate naval air and missile, mine countermeasure, and maneuver forces capable of prompt, integrated, and dominating counter-network operations. In other words, for Battle Fleet Counter-Network Operations, being able to quickly assemble a large, flexible, adaptable, and survivable network will be as important as "being there."

RATIONALIZING THE 300-SHIP NETWORKED LITTORAL BATTLE FLEET

How might the 21st century Networked Littoral Battle Fleet be best equipped and organized to support the operational concepts of Expeditionary Littoral Warfare and Battle Fleet Counter-Network Operations? There are many alternatives worthy of debate. However, the debate should explicitly exclude alternatives that rely on a substantial fleet expansion, and instead focus solely on those that take better advantage of existing and emerging Navy and Marine capabilities. What follows is an illustrative concept for a combined 300-ship Networked Fleet organized for 21st century counter-network and power-projection operations. It is an extremely conservative example; it seems likely the fleet could shrink even more and still retain an overpowering combat advantage over near- to mid-term threats if its operational patterns were modified even more radically. However, the concept is not intended to be prescriptive. It is instead offered to help stimulate thought on how the Navy and Marine Corps might change and combine their organizational and operational patterns to create a truly integrated Networked Littoral Battle Fleet capable of dominating any anti-access network for the foreseeable future.

The 21st century Networked Littoral Battle Fleet should be structures and organized to support the phased deployment of two *Littoral Battle Forces* (LBFs): LBF Atlantic and LBF Pacific. Even when these two warfighting LBFs are simultaneously deployed, the fleet would retain a residual capability to deploy an economy of force LBF to a third theater.

The basic building blocks for the LBFs would be 11 deployable LSGs, consisting of an aircraft carrier and six supporting littoral battle combatants, 11 deployable naval air wings consisting of both Navy and Marine tactical aircraft squadrons, and 11 deployable LMGs. The LMGs would consist of three littoral maneuver combatants embarking a battalion-size Deep Operations MAGTF, and a habitual escort of two combatants. A twelfth carrier would be always in long-term overhaul, and a twelfth LMG, without a habitual escort, would be assigned to the NRF.

The 11 Littoral Strike and 11 Littoral Maneuver Groups would themselves be combined to form 11 standing Littoral Battle Groups (LBGs)—integrated Littoral Strike and Maneuver Groups *with a habitual relationship.* In other words, the Littoral Strike and Maneuver Groups forming a LBG would neither rotate nor change, ensuring a close and continual relationship between their staffs. Each of these LBGs would also include a single habitually assigned naval air wing.

Nine of the LBGs would form a rotational base to keep three LBGs deployed. Eight carriers, four on each coast, would keep two of their number on traditional six-month deployments.[357] One LBG would remain forward based in Japan as long as its continued presence is sanctioned by the Japanese government; like today, it would be considered constantly forward deployed. Given the long transit times from the CONUS, the operational goal would be to keep at least one LBG on station in the Indian Ocean/Persian Gulf, to the west of the Malaccan Straits, and one in the Western Pacific to the east and north of the Malaccan Straits. Forward deployed LBGs would be viewed as the Advance Force Component of the more powerful LBF networks assembled to support major, joint, theater campaigns. They would, however, continue to respond to short-notice, joint contingency operations.

Advance Force LBGs would sail with a Navy Advance Force Commander and a Marine Deputy Commander. These commanders would train their subordinate units to operate initially unsupported in the face of enemy anti-access forces, and to identify, target and, if possible, destroy key components of an enemy's over-the-horizon targeting capability. Advance Force LBGs would emphasize ISR gathering; carry with them a heavy load of manned and unmanned expeditionary sensors; and have robust organic mine countermeasure capabilities. They would be accompanied by covert littoral battle combatants, for both their stealthy ISR and strike capabilities and their ability to sweep operating areas of potential undersea threats. Because these Groups would often operate within the engagement envelope of potential adversaries, they would train to take the first punch; their VLS magazines would carry a heavier preponderance of defensive weapons (SAMs and Anti-Tactical Ballistic Missiles) and a high density of short-range anti-missile missiles. Modest long-range strike and deep maneuver would round out their capabilities.

As is common today, the Advance Force LBGs could split apart and conduct distributed operations over wide areas. First, the component LSGs and LMGs could split up and sail independently ("split LBG operations"). Under these circumstances, the LMG would be accompanied by its habitual 2-ship escort. Each component could further split, with the carrier and one to three escorts operating separately from three to five ship SAGs, and the big deck amphibious ship, LSD, and one escort operating separately from a LPD17 and a second escort. The ability to operate as dispersed, but protected, network components capable of fire and maneuver and to quickly coalesce into massed networks would provide greater theater strike/maneuver and reconnaissance coverage as well as greater flexibility in advance force network operations.

Because Advance Force LBGs would be subject to asymmetrical attacks such as those mounted on the U.S.S. *Cole*, they would also sail with an organic Combined Force Protection Group, consisting of Navy SEALs, Marine Fleet Anti-terrorist Support Teams (FAST), and Coast Guard

[357] This would require improvements in carrier turn around times. Today it generally takes 4.5 carriers to keep one carrier forward deployed. Email from Captain Trip Barber.

harbor protection detachments.[358] If operating as separate LBG nodes, all vessels would sail with a detachment from the Combined Force Protection Group.

The two LBGs not belonging to the Advance Force rotational pool would form the core for the two standing LBFs, one on each coast. In addition to their habitually assigned LBG, each LBF would include a single *Seawolf*-class nuclear attack submarine as a permanently assigned anti-submarine shotgun. All vessels and units assigned to the LBG would operate under the same OPTEMPO/PERSTEMPO rules now used by forward deployed naval forces. These rules allow for 50 percent at sea availability. While the LBFs could, if operationally required, temporarily deploy to cover gaps in theater Advance Force LBG coverage, their first priority would be to form the fleet's surge echelon during time of crisis and to assume operational control of on-scene and reinforcing LBGs and supporting naval forces. Accordingly, they would serve as the network hub for counter-network operations, and would have the most robust communications and data connectivity in the fleet. In addition, they would carry the larger staffs, including both joint and allied exchange officers, needed to plan large coalition or independent U.S. naval operations in support of joint campaigns.

A deployed LBF would be supported by a habitually assigned Littoral Mine Warfare Squadron, Inshore Warfare Squadron and Theater Support Group. The Littoral Mine Warfare Squadron would plug dedicated mine warfare forces into the littoral battle network to augment the organic mine countermeasures found on LBF combatants. Inshore Warfare Squadrons consisting of patrol combatants and other special small craft, including both manned and unmanned vessels, would support LBF operations both during and after advance force operations. A task-organized Theater Support Group, consisting of combat logistics, mobile logistics and salvage ships, would provide sustained at-sea replenishment and in-theater rearming and emergency repair for LBF ships.

Each Littoral Battle Force would include a standing Marine Deep Operations Brigade, trained and equipped to conduct counter-network and theater break-in operations from littoral maneuver combatants. The Brigade Commander would serve also as the Deputy LBF Commander. The two Deep Operations Brigades would be complemented and supported by remaining Marine forces, organized into a single, large Marine Expeditionary Command (MEC), and deployed primarily by the LMSF.

Theater Support Group ships would be escorted from the fleet forward operating bases on Diego Garcia and Guam to, in and from fleet replenishment areas by Multi-purpose Escort Groups, composed of a single littoral battle combatant and three small, frigate-size combatants. The Groups would also provide escort protection for LMSF squadrons as they sailed to their operating areas, and perform other supporting LBF tasks such as maritime interdiction operations.

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[358] For a discussion on Marine Corps FAST and Coast Guard harbor protection capabilities, see Norman Polmar, *Ships and Aircraft of the U.S. Fleet*, 17th edition, p. 42, and pp. 562–575.

In keeping with an operational concept that emphasizes the ability to quickly surge ready naval components to form large, expeditionary battle networks, this general force posture would allow the fleet to quickly form a networked LBF with two to three LBGs and supporting elements (by combining one to two Advance Force LBGs with the standing LBF's assigned LBG). In major emergencies, this LBF network could, in turn, be expanded by an additional forward deployed LBG, by an LBG either just returning from a six-month deployment or in the final stages of its pre-deployment, or by the reserve LMG. In this way, the fleet could, if required, quickly concentrate a combined LBF network with a littoral strike component including three to five carriers, 18–40 littoral battle combatants, numerous covert littoral battle combatants, and a littoral maneuver component consisting of a brigade-sized Deep Operations MAGTF embarked aboard littoral maneuver combatants, backed up by one to two Littoral Maneuver MAGTFs supported by the LMSF.

NEXT STEPS: THE NAVY

Within the operational construct of Expeditionary Littoral Warfare and Battle Fleet Counter-Network Operations, what might be the notional force structure requirements for the supporting Networked Littoral Battle Fleet? To help answer this question, it is helpful to steal a page from the playbook for the 600-ship fleet and build a simple template like the one discussed in Chapter III that outlines the basic building blocks of the 21st century Battle Fleet.

Figure 7 matches today's ships within the context of the operational and organizational framework outlined above. As can be seen, near-term requirements for the Networked Littoral Battle Fleet would be 11 deployable carriers (with an additional carrier in long-term overhaul) and 120 total surface combatants, divided between 85 littoral battle combatants and 35 multi-purpose escorts (eight in the NRF). While slightly over the QDR authorized force level of 116 combatants, current fleet plans call for 120 combatants in the FY 2011 TSBF.[359] Recall that the FY 2001 fleet includes 11 carriers, 80 littoral battle combatants, and 35 multi-purpose escorts (eight in the NRF), which amounts to 96 percent of the Networked Littoral Battle Fleet's notional "wartime requirement."

Note that each LMG has a two-ship habitual escort, consisting of a DDG assigned as the anti-air shotgun for the big deck amphibious assault ship, and a frigate. When conducting spit LMG operations, this two-ship escort would allow both LMG components to sail with organic protection. Note too that the first five *Ticonderoga* guided missile cruisers are redesignated as DDGs in this template and earmarked as Multi-purpose Escort Leaders, a role more consistent with their rail launchers and missile capacity. In the 21st century Networked Littoral Battle Fleet, ship designations would be based on one simple and measurable metric: the number of full-size missiles carried either in VLS cells, Harpoon canisters or rotary magazines.[360] Ships carrying greater than 120 missiles would be designated cruisers; those carrying between 90–120 missiles would be guided missile destroyers; those carrying between 60–90 missiles would be destroyers;

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[359] *Ships Aircraft and Data Tables*, December 10, 2001.

[360] Full-size missiles are long-range strike, anti-air, or anti-submarine missiles that fill up a single VLS cell. Missiles that can be dense packed into a single VLS cell are considered to be one full-size missile.

those carrying 40–60 missiles would be multi-purpose escorts; and those carrying less would be littoral combat craft.

Figure 7: Surface Combatant Force-Level Objectives for Today's Fleet

	CG52	DDG51	DDG47	DD963	FFG7	Total
8 Advance Force Littoral Battle Groups						
8 Littoral Strike Groups	16	16	0	16	0	48
8 Littoral Maneuver Groups	0	8	0	0	8	16
1 Forward-Deployed Advance Force Littoral Battle Group						
1 Littoral Strike Group	2	2	0	2	0	6
1 Littoral Maneuver Group	0	1	0	0	1	2
2 Littoral Battle Forces						
2 Littoral Strike Groups	4	4	0	4	0	12
2 Littoral Maneuver Groups	0	2	0	0	2	4
1 NRF Littoral Maneuver Group						
8 Multi-Purpose Escort Groups (active/NRF)	0	3/0	5/0	0	16/8	24/8
Total	**22**	**36**	**5**	**22**	**27/8**	**112/8**

With today's Battle Fleet thus rationalized, some modest changes to the ship construction program for tomorrow's fleet are suggested. The total requirement for guided missile destroyers and general purpose destroyers is 63. This is a near match with the current planned production run of 62 DDG51s. The inherent advantage of having a standardized destroyer fleet would argue for building one additional DDG51 Flight IIA (the current flight in production). The immediate decommissioning of the DDG47 class could be used to help pay for the additional DDG, with little near-term loss in fleet combat capability. Alternatively, these five ships might be placed in the NRF. Either move would convert the entire active littoral battle combatant fleet to VLS-standard.

In conjunction with the standardization of the fleet's guided missile/general purpose destroyer force, the DD(X) program would be re-designated as the CG(X) program, with a goal of replacing the 22-ship CG52 class sometime in the next decade. Accelerating the replacement of the CG52s with new CG(X)s would argue against spending the full $6 billion now earmarked for the cruiser modernization and conversion program.[361] Instead, a more modest program would be pursued, funding the engineering and combat system upgrades required to extend their service into the next decade. Since each LSG would have two cruisers, only one would be AADC configured and modified to fire theater-wide, anti-ballistic missiles; the remaining cruiser would

[361] Robert Holzer, "U.S. Naval Chiefs Aim to Extend Life of the Ticonderogas," *Defense News*, (February 12, 2001), p. 6.

be modified to fire only area anti-ballistic missiles. This more modest plan would still give each LSG near-term capabilities against all cruise- and ballistic-missile threats. Moreover, the cruisers would not receive the new 5”/62 naval gun; they are too vulnerable and valuable to assign to naval gunfire missions. The 44 gun mounts thus freed up would be used to backfit 22 DDG51s not already carrying the new mount and to arm a new class of interim LMG Escorts, which will be discussed in a moment.

The fleet would retain a near-term multi-purpose escort force consisting of eight Multi-purpose Escort Groups, each with a guided-missile destroyer escort leader and three frigates (with one in the NRF). When both LBFs are engaged, eight groups would allow an escorted rotation of two high value underway replenishment groups loading at the forward fleet operating bases on Diego Garcia and Guam, two transiting to the fleet replenishment areas, two conducting replenishment operations, and two returning for new supplies. If it were judged that the underway replenishment groups could sail unescorted, the Groups would support general LBF operations. As previously discussed, an additional 11 frigates would be habitually assigned to the 11 active LMGs for a near-term frigate force of 35 ships.

To bolster the naval gunfire and organic mine warfare support for both LMGs and Advance Force LBGs, the 11 frigates assigned as habitual LMG escorts would be replaced by 11 Interim Littoral Maneuver Group Escorts, modified *Spruance*-class destroyers. In addition to habitability and engineering upgrades, they would receive two of the 5”/62 gun-missile mounts, be modified to fire up to 64 land attack missiles, and receive an aft eight-cell VLS field carrying 64 ESSMs in quad-packs and additional RAM launchers. They would have upgraded SQQ89 ASW systems, and their towed sonar array would be replaced or augmented by a remote mine-hunting system. They would also carry two MH60S helicopters. Eleven such LMG Escorts would provide every LMG with a modest counter-mine warfare capability and a useful level of gun/missile fire support, and the Networked Fleet with a class of dedicated land attack ships with a cumulative total of 704 VLS cells. Studies should also be conducted to see if the *Spruance* hull could support one AGS, which would improve their combat power even more.

An FFG(X) or combined FFG(X)/LCS program would determine the best solution for the Navy’s long-term small combatant needs. The preferable solution would be to replace current guided missile frigates with a ship that shares the same hull, engineering plant and living spaces as those carried on the Coast Guard’s Deepwater Cutter. Its combat systems would be designed as an open architecture and its hull would have space and weight for modular mission packages suitable both for Coast Guard, open-ocean escort and littoral combat missions. In any event, the Navy would remain in the small combatant business; over the near to mid-term, no less than 24 of 120 surface combatants would be frigates earmarked for a variety of less stressful, but no less important, naval missions.

Figure 8 sums up how the surface combatant fleet might look by 2011 with the aforementioned changes to current plans. The *Spruances* are tired ships and the Interim LMG Escort conversion might not be cost effective. However, with 20 spare destroyers available as a class parts bin, the costs for converting the youngest ships in the class may be worth it, especially if they had to serve only long enough to be replaced by an additional 11 CG(X)s after the *Ticonderogas* were replaced. Such a plan might give future LMGs a two-ship escort consisting of a CG(X) and a

DDG51, with possibly two 155mm AGS and one 5”/62 gun mounts and 224 VLS cells among them—a potent Advance Force fire support capability.[362] It would also provide the 2020 Networked Littoral Battle Fleet with 33 CG(X) and 63 DDG51 high end combatants. All would have AEGIS or follow-on combat systems,, and all would carry VLS as their main batteries with a cumulative magazine capacity of no less than 10,104 VLS cells. In addition, they could bring to bear a general support artillery force of 66 155mm AGSs, and 63 5”/62s (or other advanced gun systems) among them. All would have advanced CEC, and all would have either area- or theater-TBMD capabilities. These 96 high-end, networked combatants would be supported by 24 low-end, multi-purpose escorts.

Figure 8: Surface Combatant Force-Level Objectives for the 2011 Fleet

	CG52 AADC	CG52 Area	DDG51 Flt I/II	DDG51 Flt IIA	DD963 LA	FFG7	Total
8 Rotational Littoral Battle Groups							
8 Littoral Strike Groups	8	8	16	16	0	0	48
8 Littoral Maneuver Groups	0	0	4	4	8	0	16
1 Forward-Deployed Littoral Battle Group							
1 Littoral Strike Group	1	1	2	2	0	0	6
1 Littoral Maneuver Group	0	0	1	0	1	0	2
2 Littoral Battle Forces							
2 Littoral Strike Groups	2	2	4	4	0	0	12
2 Littoral Maneuver Groups	0	0	1	1	2	0	4
1 NRF Littoral Maneuver Group	0	0	0	0	0	0	
8 Multi-Purpose Escort Groups (Active/NRF)	0	0	0	8	0	16/8	24/8
Total	**11**	**11**	**28**	**35**	**11**	**16/8**	**112/8**

Turning from the surface combatant fleet, as outlined in the previous section, the covert littoral battle force would consist of 55–59 boats. The force would include a four-boat Covert Littoral Battle Cruiser Squadron equipped with former *Trident* ballistic missile submarines converted into stealthy, land-attack, ISR, and special operations platforms. This squadron would keep two Covert Littoral Battle Cruisers deployed at all times to cover gaps in Advance Force LBG coverage, to reinforce Advance Force LBGs or later arriving LBFs engaged in combat operations, or to form an economy of force LBF in a third theater. Depending on resources, this squadron would be either additive to the 55 minimum attack submarines called for by the JCS or replace four *Los Angeles*-class attack boat refuelings now planned. The build rate for the *Virginia*-class SSN would be adjusted to maintain a covert littoral battle force of no less than 55 boats over the mid- to long term.

In addition to providing the two *Seawolfs* to the standing LBFs, the Covert Littoral Battle Force would also provide one SSN in direct support of each of the nine rotational Advance Force LBGs. Depending on whether or not the Trident conversions were in addition to, or in lieu of

[362] VLS cell count assumes a 128-cell main battery on the CG(X).

four *LA*-class refuelings, this would leave 39–44 Covert Littoral Battle Combatants to perform peacetime ISR missions and to support LBF wartime deployments. During combat operations, covert littoral battle combatants would form the stealth portion of the LBF warfighting network and would protect LBF forces from underwater attack, sweep littoral operating areas of enemy submarines, conduct covert mine reconnaissance and neutralization, support LBF special operations activities, and provide covert intelligence and strike support.

The Littoral Maneuver Combatant Fleet would maintain 11 active and one reserve LMGs. With nine LMGs in the Fleet's Advance Force rotational pool and 3 in the LBF surge pool (one on each coast in the standing Littoral Battle Fleets and one in the NRF), the Navy could quickly assemble a powerful littoral maneuver forces consisting of three to six LMGs capable of deploying and employing a brigade-size Deep Operations MAGTF, backed up by up to three Littoral Maneuver Support Squadrons each capable of supporting a brigade-sized Littoral Maneuver MAGTF for 30 days. In other words, the Networked Littoral Battle Fleet could, if necessary, quickly deploy and employ four brigade equivalents with little disruption in fleet peacetime operational patterns. Depending on the outcome of fleet experimentation, future LMSF ships might gain important new operational capabilities during the second decade of the 21st century. Under any circumstances, in recognition of their important operational contributions to the Networked Fleet, these ships would contribute to the TSBF count as part of a 54-ship littoral maneuver fleet.

Mine warfare programs would be accelerated and expanded. Should the conversion of the *Tarawa* to a mine warfare control ship outlined in Section VI prove to be cost and operationally effective, a second *Tarawa*-class LHA should be modified, providing a mine warfare command ship with an over-the-horizon, surf-zone breaching capability for both standing Littoral Battle Forces. Should the conversion not be judged to be cost-effective, an alternative program for surf zone mine warfare countermeasures would be urgently pursued. Also, two heavy lift cargo ships would be purchased or leased to give both standing LBFs the ability to quickly transport their supporting, dedicated mine warfare ships to an operating theater. Alternatively, in keeping with their increased operational role, mine warfare ships could be made part of the LMSF and pre-positioned forward at LMSF anchorages. Rotational crews would be flown to the LMSF anchorage to operate the vessels and to maintain their minesweeping equipment and systems.

The Navy would field two Inshore Warfare Squadrons, one for each LBF. Initially, the squadrons would be experimental units. The primary aim of their experiments would be to determine if small combatants should form the leading or trailing edge of a littoral break-in operation, or both. Results would reveal the type of small combatants that should be bought during the second decade of the 21st century, and whether or not they should be crewed or uncrewed. The squadrons would also explore the doctrine, tactics and techniques for small combatants performing other missions such as inshore maritime interdiction operations or support to special operations forces. These missions could most likely be performed by off-the-shelf combatant designs from both domestic and international naval builders.

Two Theater Support Groups would be formed out of existing assets to support the two LBFs. Total station ship requirements for the two Theater Support Groups would be four fast combat support ships and seven station ship substitutes consisting of T-AKE/oiler combinations to give

every deployable LBG its own dedicated station ship capability. Shuttle ship requirements would be met by eight underway replenishment groups consisting of a T-AKE and an oiler. This plan would require a CLF fleet of 4 fast combat support ships, 15 T-AKEs and 15 fleet oilers, for a total of 34 ships—three more T-AKEs and two more oilers than now planned. These 34 ships would support 11 carriers, 120 combatants, 36 littoral maneuver combatants, and 28 mine warfare ships, for a CLF to combatant ratio of 1:5.7, restoring the ratio to that found in the 600 ship and 2001 fleets. In addition, each LBF would also have an assigned destroyer tender, perhaps in the NRF and dedicated fleet salvage assets. To minimize costs, all Theater Support Group Ships would operate in the MSC.

During peacetime, the Theater Support Groups would sustain the Advance Force LBGs and at the same time conduct trials and experiments to identify the best mix and types of new combat logistics, mobile logistics and salvage ships necessary for operations in the Second Expeditionary Era. For example, as outlined in Chapter VI, future tenders might be converted merchantmen or tankers that serve as mobile piers to aid in the change-out of gas turbines or to conduct in-theater VLS rearming. They would also carry containers with digital test and repair equipment and the berthing for contractors and other support personnel. These mobile piers could be laid up on the two coasts with the aviation support ships found in the LMSF or be attached to LMSF squadrons pre-positioned forward. Another option would be to berth the vessels on both Diego Garcia and Guam, which in any case would be upgraded to serve as the primary Forward Fleet Operating Bases for 21st century operations.

R&D priorities include, but are not limited to, expanding the CEC and networking the entire fleet with high-capacity, high-reliability, data and communication links; fielding more and improved command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) systems; completing the fielding of improved precision weapons; and, most critically, examining a full range of unmanned naval systems, to include autonomous mine-hunting vehicles, surf-zone mine vehicles, UUVs, and unmanned littoral combat craft.

NEXT STEPS: THE MARINE CORPS

The Marine Corps would reorganize to better support the Networked Littoral Battle Fleet and to streamline its headquarters overhead. The primary combat unit of the 21st century Marine Corps would be a brigade-sized MAGTF, although the Marine Corps would retain the ability to form a single large MEF in the case of a major theater war or sustained joint combat operations.

The IFMF would consist of two standing brigades habitually associated with LBF Atlantic and LBF Pacific. These Brigades, organized for deep maneuver operations in the face of enemy anti-access networks, would reflect several important changes. To best exploit the dramatically improved capabilities of the new AAAV, specialized Deep Maneuver Battalions, consisting of integrated Amphibious Tractor and Infantry Units, would be formed. The AAAV should be redesigned to carry a combat team of 15 Marines in relative comfort, with expanded storage space for their gear, weapons and ammunition. While the exact composition of the team would be determined by experimentation, for illustrative purposes it might consist of a Staff Non-Commissioned Officer combat team leader, sergeant assistant team leader/vehicle commander, a two-man vehicle team, two three-man maneuver teams, and a five-man combat support team

with a team leader/sniper, 2 combat engineer/demolitions specialists, and a 2-man assault team capable of employing portable anti-tank and assault systems. Empowered by the AAAV's unparalleled littoral maneuver capabilities and supported by its 30mm cannon, modified to provide an indirect fire capability, such a vehicle fighting team would be a formidable opponent across the spectrum of conflict.

One or two Deep Maneuver Battalions would be combined with one or two Raider Battalions, designed for small unit dispersed operations and trained to act as the forward eyes and ears of the fleet strike network, to form the core units in the ground combat element of an IFMF Deep Operations Brigade. The Raider Battalions would also be capable of conducting battalion- and company-sized raids against high-value enemy network targets. The combat service support element would consist of a Brigade Service Support Group optimized for STUL operations. The air combat element would consist of a Marine Aircraft Wing equivalent fully integrated into the naval air arm, but organized and trained to shift operations ashore (to be further discussed in the next section). The final character of the Deep Operations Brigade would be defined after experimentation, however it would be organized so it could source four combined arms Advance Force MAGTFs in support of the Networked Fleet's Advance Force Rotational Pool.

Although the two Deep Operation Brigades would continue to routinely deploy battalion-size Advance Force MAGTFs, which would concentrate on mounting phased, brigade-size operations instead of routine presence operations. Assigning one LMG to each LBF and another to the Naval Reserve would allow the IFMF Deep Operations Brigades to practice routinely MAGTF assembly and STOM operations with a minimum of nine littoral maneuver combatants, including three big-deck aviation platforms. Such routine training is now rarely possible with the entire littoral maneuver combatant force locked into a rotational deployment pool. However, to forge the skills necessary to conduct OMFTS, such routine training will be mandatory.

The Marines have long considered the merits of consolidating higher headquarters and globally sourcing Marines and MAGTFs from a centralized pool of resources. Given the advances in information technologies and the inefficiencies inherent in large numbers of higher level head-quarters, the Marines' primary organizational goal during the first decade of the 21st century should be to overhaul and streamline its Garrison Era administrative and command structures. One alternative would be to form a super MAGTF pool called a Marine Expeditionary Command. The MEC would globally source Marine forces in support of joint combatant commands, reinforce the IFMFs, and would provide the nucleus for a large MEF fighting sustained ground combat operations or contributing to other major joint campaigns. Accordingly, the MEC Headquarters would be sized to source either a single MEF Headquarters or two separate MEB Headquarters. Its three component elements would consist of a Reinforced Division consisting of five to six regiments and supported by a Force Fires Group; a single separate Marine Aircraft Wing with one fixed-wing and one rotary-wing Air Group; and a single, large Force Service Support Group.[363]

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[363] In addition to these warfighting units, the MEC would also include a special brigade dedicated to antiterrorism operations. On 29 October 2001, the Marines activated the 4th Marine Expeditionary Brigade, which is organized, trained, and equipped to conduct antiterrorism operations. It includes a Marine Security Force Battalion composed

The primary means of deploying and employing MAGTFs formed from the MEC's force pool would be the LMSF. The LMSF would gradually shift its operational focus away from mid- to high-intensity mechanized operations and towards operations other than war, crisis response, MOUT support, and maneuver operations after theater anti-access networks have been disassembled. To increase their utility and relevance, the future LMSF would be slightly expanded and lightened. One possible MAGTF structure among many might consist of one or two LAV Battalions, two or three Littoral Infantry Battalions and a Tank Company. Again, the final character of Littoral Maneuver MAGTFs would be defined by experimentation.

Consistent with a shift of strategic focus to the Asian/African littoral, all three of the current LMSF squadrons would be positioned along the periphery of Asia. One squadron would be located at the Forward Fleet Operating Base located on Diego Garcia. A second squadron would be located at the Forward Fleet Operating Base on Guam. The third would shift from its current location in the Mediterranean and join the LBG now forward based in Japan, preferably on Okinawa.

Simultaneous with the shift of an LMSF squadron to Japan, the MEF on Okinawa would become a standing Marine brigade, with a concomitant reduction of Marines actually based on that island. This brigade would be equipped and configured identically to the standing brigades assigned to the IFMF, except it would be flexibly organized to deploy either via littoral maneuver combatants or by LMSF. Brigade forces in Japan would include the Headquarters element, portions of its associated Marine Air Group, and a standing Brigade Service Support Group organized both to service equipment aboard the LMSF squadron and to sail with the squadron during contingency operations. The only ground combat units permanently based on island would be an Advance Force Battalion operating with the LMG already based in Japan. This battalion could be either a permanently based unit, or sourced from a rotational pool within the MEC.

Such a move would require the agreement of the government of Japan. However, given the increasing pressure from the Okinawans to reduce the presence of American forces there, it would likely be an attractive political initiative.[364] In return, the U.S. government would ask the Japanese for assistance in two things: converting existing facilities on Okinawa to support rotational maintenance schedules associated with LMSF equipment and substantially expanding the Okinawa-based LMSF squadron to accept a large portion of Marine equipment now on the island. The former would give the Marines an in-theater refurbishment capability for LMSF equipment, and would obviate the current requirement for LMSF ships to return to the United States to conduct periodic maintenance on their cargo. The latter would allow the Marines to form the equivalent of a fourth LMSF squadron, giving the Networked Littoral Battle Fleet the capability to simultaneously deploy 6.5 brigade equivalents.

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of 13, 50-man Fleet Antiterrorism Security Team platoons, a new antiterrorism infantry battalion, the Chemical Biological Incident Response Force (CBIRF), and the Marine Security Guard Battalion that provides Marine detachments at U.S. embassies and consulates around the world. See Arthur P. Brill, Jr., "To the Caves of Tora Bora," *Sea Power 2002 Almanac Centennial Edition*, (January 2002), pp. 27–28.

[364] See "Okinawa Can No Longer Bear U.S. Military, Says Governor," *Japan Times*, (February 26, 2001).

Current plans call for 843–1,013 of the highly capable AAAVs to be purchased. However, this plan reflects the old AAV paradigm of marrying up separate infantry units and amphibious assault vehicle units, as well as the MPF's emphasis on supporting mechanized MAGTFs in mid- to high-intensity ground combat operations. As a result, the AAAVs are to be spread among all three MEFs, and 258–318 are to be stored in the holds of the LMSF. Adopting specialized Deep Operations Brigades and refocusing the LMSF mission on operations other than war and crisis response would allow the Marines to reduce the planned buy of these highly expensive vehicles to support only the two IFMF Brigades and the Brigade on Okinawa, and an appropriate pre-positioned war reserve onboard the LMSF.[365]

The resulting cost savings might then be diverted to expand and upgrade the vehicle fleets that would support the Littoral Maneuver MAGTFs supported by the LMSF. Two potential alternatives immediately suggest themselves: a service life extension of the current AAV battle taxi fleet and a service life extension and/or modernization of the existing LAV fleet. The former is a planned program which replaces the AAV's drive train and suspension with systems derived from the Army's Bradley Infantry Fighting Vehicle, giving it 90 percent commonality with the Bradley's comparative systems. The latter is a wheeled vehicle operated by the Marine Corps since the 1980s, and one proven to be very effective in operations at the lower end of the conflict spectrum. Moreover, the Army recently selected a modernized version of the LAV to equip its new rapidly deployable Interim Brigade Combat Teams. Retaining the AAV and LAV would impose no additional operational training requirements for the majority of Marine units and would make Marine units more interoperable with Army forces.[366]

To save the high first and second order costs associated with fielding the MV22, the Marine Corps would adopt a suitable helicopter alternative for its assault support mission, preferably a version of the CH92. Development of the MV22 and its associated tilt-wing technology would continue, with the objective of developing a high-speed, STUL delivery system capable of carrying either an 8x8x20 ISO container or four QUADCONs at high speeds to distances of at least 200 miles. This technology exploration program would be expanded to examine larger tilt-rotor aircraft that could replace the CH53E heavy-lift helicopter, the KC130 turbo-prop tanker/airlifter, or both. A minimum goal would be to introduce a tilt-rotor capable of delivering one 8x8x40 ISO container or two 8x8x20s from ship-to-shore. One option might be a large QTR; another might be an unmanned, autonomous container delivery system. Experiments would determine the best mix and numbers of helicopters, MV22Ls, QTRs, or unmanned delivery systems in the mid- to far term.

Simultaneously, the Department would embark on a supporting container development program. The aim of the program would be to shift the focus of all ship-to-shore logistics to a ship-to-shore delivery network that delivered disposable or reusable ISO containers. The development program would include designing and testing containers with tactical capabilities such as autonomous mortar systems or vertical launch missile batteries, in addition to a wide array of

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[365] Numbers for the AAAV program were provided by Colonel Paul Gido, Program and Requirements, Headquarters Marine Corps, Washington D.C.

[366] *United States Marine Corps Concepts and Issues 2000*, p. 143 and p. 155.

fuel, water, food, and equipment storage and delivery containers. With regard to the latter, innovative programs with the shipping industry or even non-governmental organizations (NGOs), such as a logistics container program based on the Civil Replacement Air Fleet (CRAF) model, might be pursued. In this program, NGOs would utilize the logistic containers for humanitarian purposes with the proviso that they turn the containers over to the Networked Fleet when combat or fleet operations required.

The 21st century Marine Corps would thus be organized with three standing brigade Headquarters—IFMF Pacific and IFMF Atlantic and the brigade in Japan. The MEC would have a headquarters element capable of forming a large MEF staff. The staff would also be structured to split into two MEB headquarters. In this way, the Marines could simultaneously deploy five Brigades, or a MEF and three separate Brigades, or any combination thereof. The MEC would constantly push and refine LMSF operations, especially in support of operations other than war. By so doing, the operational contributions and flexibility of the LMSF would be constantly highlighted and future required operational capabilities would be better illuminated.

As in the Navy, Marine R&D would include C4ISR systems, as well as lightweight fire support systems and unmanned combat systems of all types, to include reconnaissance, fire support, and combat service support. The development of a family of tactical reusable containers would also be pursued.

NEXT STEPS: THE NAVAL AIR ARM

Consistent with the organizational vision of a Networked Littoral Battle Fleet and operational concepts of Expeditionary Littoral Warfare and Counter-Network Operations, current Navy carrier air wings and Marine aircraft wings would be reorganized and more thoroughly integrated than ever before. The naval air arm would consist of 11 active naval air wings, one active Marine aircraft wing and one reserve naval air wing. Figure 9 outlines how the current number of Navy and Marine tactical squadrons might be best combined and integrated to form the naval air wings required to support the operational concept defined by this paper.

Eight advance force air wings would support the eight CONUS-based Advance Force LBGs. They would be the largest of the carrier air wings, consistent with their mission of operating early against anti-access networks. Each wing would include five squadrons—four Navy stay-aboard squadrons, and one Marine fly-away squadron. Marine fly-away squadrons would consist of 14 AV8B Harriers. The choice of the AV8Bs for the Advance Force air wing is a measured one. When conducting split LBG operations, a four- or six-plane AV8B detachment would shift to the big-deck littoral maneuver combatant to provide the independently steaming LMG with a modicum of air cover. However, to facilitate assault support and logistics delivery operations from the big-deck littoral maneuver combatants, whenever the LBG is operating together, all fixed wing operations would be mounted from the carrier. The Harriers would also provide the maximum flexibility when shifting Marine air operations ashore. The Commander Air Group (CAG) would always be a Navy officer.

Figure 9: Networked Littoral Battle Fleet Naval Air Wings

	Navy a/c	USMC a/c
8 Advance Force Naval Air Wings (Navy CAGs)		
8 x 3 VFA = 24 VFA x 12 PAA =	288	
8 x 1 VF = 8 VF x 14 PAA =	112	
8 x 1 VMA (Fly-away) = 8 VMA x 14 PAA =		112
1 Forward Deployed Naval Air Wing (Alternate CAGs)		
1 x 2 VF = 2 VF x 14 PAA =	28	
1 x 2 VMFA (Integrated) = 2 VMFA x 12 PAA =		24
2 Littoral Battle Force Naval Air Wings (Marine CAGs)		
2 x 1 VF = 2 VF x 14 PAA =	28	
2 x 1 VMFA (Integrated) = 2 VMFA x 12 PAA =		24
2 x 2 VMFA (Fly-away) = 4 VMFA x 12 PAA =		48
1 USMC Air Group		
6 x 1 VMFA(AW) = 6 VMFA(AW) x 12 PAA =		72
1 Reserve Naval Air Wing		
2 x 1 VMA = 2 VFA x 12 PAA =	24	
2 x 1 VMFA = 2 VMFA x 12 PAA =		24
Total aircraft	480	304

Legend:
CAG: Commander Air Group
VFA: Navy Strike Fighter Squadron (F14)
VF: Navy Fighter Squadron (F/A18)
PAA: Primary Aircraft Authorized
VMA: Marine Attack Squadron (AV8B)
VMFA: Marine Fighter Attack Squadron (F/A18)

The forward deployed LBG in Japan would have an air wing consisting of two Navy squadrons (initially F14s), and two Marine squadrons (initially F/A18Cs). The two Marine squadrons would be a habitually assigned to the forward based carrier; they would never phase ashore. The air wing's CAG would rotate between Navy and Marine officers.

Because the air wings assigned to the two LBFs would arrive simultaneously with the bulk of Marine maneuver forces, they would be composed of one Navy and three Marine squadrons. The CAG would normally be a Marine aviator. However, the LBF would also include a Commander, Battle Force Aviation Forces, normally a Navy officer. This officer would coordinate all LBF tactical aviation operations. One of the Marine squadrons in the LBF air wing would be habitually assigned to the carrier, while two would be organized to phase ashore when air bases became available. To maintain the notional strike wing onboard the carrier, these fly away squadrons would be replaced by either a Navy or Marine reserve squadron flying in from CONUS.

The Marines would also retain a separate Marine Aircraft Wing associated with the Marine Expeditionary Command. Initially, the organic fixed-wing Marine Air Group would consist of

the Marines' six F/A18D squadrons. While retaining the ability to operate from carriers, these squadrons would normally support MAGTFs from air bases ashore once the conditions had been established for their introduction into theater.

This integrated naval air arm would allow the flexible basing of naval air units either afloat or ashore. Initially, the majority of Marine squadrons would deploy to a theater on a carrier. Once in a theater, and as soon as the tactical situation permitted, most embarked Marine squadrons would phase ashore to operate from expeditionary airfields. They could also fly ahead of the carrier if theater bases were immediately available. However, regardless of the tactical situation, the naval air arm would be structured to keep a minimum of four tactical strike squadrons aboard every carrier. Consistent with today's practice, this would require that four Marine squadrons be designated as stay-aboard squadrons permanently assigned to carrier duty. Again, note the reserve naval air wing would be a combined wing sized to replace Marine fly-away squadrons once they phased ashore.

The Department would cease development of the STOVL variant of the JSF, and would accelerate development of a common Departmental conventional take-off and landing or short take-off and arrested landing version, with a goal of a mixed F/A18E/F and JSF force by 2020. The final number of F/A18E/Fs bought would depend on the production schedule of the JSF. Whatever the final mix of F/A18E/F or JSFs finally decided upon, the structure outlined above (or one similar to it) would presumably save the Department a considerable sum of money. These savings could in turn be diverted to aggressively experiment with a range of unmanned reconnaissance and other combat support aircraft, as well as unmanned air combat vehicles. These experiments should include the introduction of different prototypes into both advance force and LBF air wings, so that fleet experience would help to point to the proper mix of manned and unmanned aircraft in future naval air operations.

IX. NUMBERS COUNT, BUT CAPABILITIES MATTER: PREPARING THE 300-SHIP NETWORKED LITTORAL BATTLE FLEET FOR THE 21ST CENTURY

Numbers count…

> Numbers count, they count a lot, and they always counted…The fact that we load up combat power on a smaller number of hulls is merely a way of salving our conscience over the fact that we don't have enough numbers…I contend that that is not the kind of logic that will take us very well into the future.
>
> Vice Admiral Arthur Cebrowski[367]

But capabilities matter…

> The 600-ship Navy of the 1980s cannot compare with the combat capability of the present fleet.
>
> Vice Admiral Dennis McGinn[368]

The current 300-ship fleet is the most capable navy ever put to sea by this, or any other nation, and one well suited for the challenges of the Second Expeditionary Era. As a result of the cumulative impact of the quiet propulsion, anti-air warfare, digital, flexible fires, information, and standardization revolutions, the 2001 Littoral Strike Fleet already possesses capabilities that many in the 1989 600-ship fleet would consider to be revolutionary. Whether evolutionary or revolutionary, however, these capabilities make today's Littoral Strike Fleet superior in every way to the 1989 fleet, with the exception of numbers of hulls and peacetime, theater-strike coverage. Moreover, the ongoing and expanding cooperative defense and striking revolutions promise to give the Networked Littoral Battle Fleet even more awesome fighting power. The first will link and forge fleet units into digitally connected and cohesive fighting entities, while the second will provide levels of pulse and sustained firepower that appear more than up to any near- to mid-term operational challenge.

The striking revolution in the Covert Littoral Battle Fleet provides the 21st century battle fleet with a highly capable anti-submarine and stealth strike arm. Readily available options to create a higher percentage of stealthily delivered attack weapons, such as converting *Trident* ballistic missile submarines into Covert Littoral Battle Cruisers, or adding modular VLS missile plugs to

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[367] VADM Arthur Cebrowski, as quoted by Hunter Keeter in "Cebrowski: Today's Thinking Won't Do For Tomorrow's Navy."

[368] VADM Dennis McGinn, in testimony before the House Armed Services Committee. From transcript of testimony prepared by the Department of the Navy, Office of Legislative Affairs, February 2001.

the *Virginia*-class covert littoral battle combatants, serve as a hedge against the early fielding of anti-access networks with large numbers of anti-ship cruise missiles. The development of unmanned underwater vehicles and new weapons and underwater combat capabilities should give each Covert Littoral Battle Combatant even greater combat power in the future.

The revolution in maneuver affairs should give future Networked Littoral Battle Forces an ability to extend the eyes and ears of its battle network deep into an enemy's operating area, to conduct raids against high-value, counter-network targets, or to mount combined arms counter-network maneuver attacks in conjunction with other fleet and joint forces. The LMSF is likely to make increasing contributions to fleet operations, especially in operations other than war and support to military operations in urban terrain.

The organic revolution in mine warfare promises to give littoral battle combatants, Covert littoral battle combatants and Littoral Maneuver Forces freedom of action in the face of mine threats, even before dedicated mine warfare forces arrive in theater. Improved assault breaching capabilities should allow Marine MAGTFs to speed directly from ship, through the surf zone and across the beach, and toward distant inland objectives without disruption. Increased use of unmanned mine warfare systems should make mine hunting and mine sweeping operations both less risky and faster.

The fleet is not without weaknesses, particularly in its combat logistics, mobile logistics and fleet salvage forces. Moreover, despite its mission to project power ashore and the likelihood it will operate closer to shore than in the past, the fleet still pays scant attention to the potential contributions of small combatants. Be that as it may, given its combined capabilities, the 300-ship fleet finds itself in a strong position to compete in a network-versus-network operational competition with regional anti-access networks. While the results of this competition will play out over time and are impossible to predict with certainty, as a result of a fortuitous combination of changed strategic and operational circumstances, the effects of the ongoing naval technical revolution, sound planning, and good luck, Navy and Marine Corps have every reason to be confident that fleet capabilities will be able to overcome near- to mid-term challenges.

While the ongoing naval technical revolution is providing the fleet with incomparable capabilities, transformation is not just about technology. Real transformation comes from using new capabilities in new and innovative ways, as the Germans did during the interwar years. Remember that all major powers had access to airplanes, tanks and radios during that period. Like the French, however, most used them to simply improve their existing vision of warfare. Only the Germans experimented with new organizations like the panzer division, which led the way to a whole new approach to combined arms combat. Similarly, the fleet could use its newfound capabilities simply to improve its CVBGs and ARG/MEUs, and to continue manning the forward naval garrisons of the by-gone Garrison Era. The danger in doing so is that sometime in the future it could find itself with a fleet more capable than past fleets, but one totally ill prepared for a new way of war. To fully transform itself and to be better prepared for the emerging network-versus-network operational competition, the Navy and Marine Corps must be willing to change their organizations and operational patterns.

The keys to this operational competition are equal parts patience and boldness. The outlines of the fleet-after-next have yet to fully form. Quick decisions are not necessary. The right strategy now is to trust in the fleet's current strength and agility, to use both to set the pace of the emerging competition, and to work to better understand the requirements for future network-versus-network combat. By simply changing the fleet's organization and operational patterns to better exploit its new capabilities, tomorrow's fleet could be more thoroughly transformed. By simultaneously embarking on a wide-ranging, decade-long experimentation program to determine the proper balance of littoral battle combatants and multi-purpose escorts, the proper balance of combatants and auxiliaries, the role of small littoral combat craft, and the extent to which manned and unmanned systems can and should be integrated into networked fleet operations, so too might be the fleet-after-next.

There are four ways in which the operational competition with anti-access networks could go poorly for the fleet. The first would be that the Navy and Marine Corps fail to rekindle their cooperative *naval* spirit, concentrate more on their own service agendas and pursue programs that are good for their service but not for the Department. A Networked Littoral Battle Fleet, with exquisite integration of fleet strike, maneuver, and mine countermeasure capabilities, seems ideally suited to the requirements of the Second Expeditionary Age. The only real question is whether Navy and Marine leaders can arrest the divergence of service visions that started in the Garrison Era and which continues today. If they are successful in doing so, the 21st century offers great promise to the Department and the nation. If they are unsuccessful, it seems likely that the great potential of the Networked Littoral Battle Fleet never will be fully realized.

Truly integrated concepts like Expeditionary Littoral Warfare and Counter-Network Operations will demand tradeoffs by both of the Services in order to maximize the power of the Networked Littoral Battle Fleet. For example, the Department should reorganize its tactical aviation assets to form an integrated naval air arm, along the model developed before and during the Second World War and with common airframes. The mid-term Marine assault support mission should shift from tilt-rotor aircraft back to helicopters. The Navy should forego plans to adopt a surface combatant fleet composed entirely of all large combatants, and instead accept some numbers of smaller multi-purpose escorts. All of these cost avoidance approaches would help to free up the resources necessary to speed up introduction of the fleet's CEC network, conduct experimentation in unmanned systems, improve the combat and mobile logistics fleets, develop a high speed STUL capability based on ISO containers, speed up the delivery of a fleet surf zone mine breaching system, and to develop other new capabilities demanded by the emerging anti-access challenge.

A second way the competition could go poorly is if the administration heeds the arguments of large fleet faction. Large fleet proponents want a larger fleet simply to maintain Cold War naval garrisons, and they will label any smaller alternative as risky, even when the evidence clearly suggests that the warfighting potential of the alternative greatly overmatches any existing threat. The danger in heeding their calls is that money would pour into unnecessary near- to mid-term combat capability and away from the experimentation and research necessary to forge the fleet-after-next.

A third danger is that the Navy and Marine Corps refuse to change their operational patterns and organizations to exploit the ever-growing capabilities forged by the ongoing naval technical revolution. By failing to change their Garrison Era habits, it seems likely that they will forego the opportunity to fully transform tomorrow's fleet. There are many ways that the final impact of the naval technical revolution might manifest itself in changed organizations and operating patterns. This paper offers just one of them. However, the point is that in this time of stunning technological change, failing to reorganize and operate in new ways will dampen the possibilities of tomorrow's fleet, delay the identification of attributes for the fleet-after-next, and may ill position the fleet when a real operational competitor arrives on the scene.

Finally, intertwined with these first three dangers is a fourth one: failing to experiment. In this, the warnings of the revolutionary faction seem compelling. Their calls to hedge as many bets as possible make great operational sense. The strategic and operational circumstances of this decade could hardly be more favorable. The circumstances are highly conducive for increasing the pace and scope of fleet experimentation. Because Navy and Marine leaders are loath to designate special purpose experimental units, one way to ensure that experimentation continues is to stand up new operational units such as a Covert Littoral Battle Cruiser Squadron, a LBF, a Littoral Mine Warfare Squadron, a Theater Support Group, or a Inshore Warfare Squadron. *Such units can experiment while simultaneously performing their assigned missions*. Ideally, there would be at least two of each type unit, to spark competition in innovation. In any event, "operational experiments" would be designed to better illuminate the capabilities required in the fleet-after-next, with an emphasis on more fully networking the fleet and integrating manned and unmanned fleet operations.

Which brings up a final point. While the *final* outcome of the emerging competition is not in our control, the *early* course of the competition most surely is. The time is both right, and ripe, for a change. By recognizing and avoiding these four dangers, the Department will be able to create a revolutionary future—a future of awesome fighting potential and continued maritime dominance. It is time to get on with it.

X. GLOSSARY

AAAV	Advanced Amphibious Assault Vehicle
AADC	Area Air Defense Commander
AAV	Amphibious Assault Vehicle
AAW	Anti-Air Warfare
AEGIS	Primary anti-air warfare combat system on U.S. Navy surface combatants
AGS	Advanced Gun System
AIDS	Acquired Immune Deficiency Syndrome
ALAM	Advanced Land Attack Missile
AOE	Navy designation for Fast Combat Support Ship
AOR	Navy designation for Fleet Replenishment Oiler
ARCI	Acoustic Rapid COTS Insertion
ARG	Amphibious Ready Group
ARG/MEU	Amphibious Ready Group with embarked Marine Expeditionary Unit
ARS	Navy designation for Salvage Ship
ASR	Navy designation for Submarine Rescue Vessel
ASUW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
ATACMS	Army Tactical Missile System
ATF	Amphibious Task Force
AV8B	Vertical/Short Takeoff and Landing aircraft known as the *Harrier*
BAT	Brilliant Anti-Tank submunition carried by ATACMS
BB	Navy designation for Battleship
BB SAG	Battleship Surface Action Group
BDA	Bomb Damage Assessment
BFC	Battle Force Capable (combatant)
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAG	Commander Air Group
CEC	Cooperative Engagement Capability
CG	Navy designation for Guided Missile Cruisers
CG(X)	Navy designation for future cruiser
CG47	*Ticonderoga*-class Guided Missile Cruiser; non-VLS equipped
CG52	Improved *Ticonderoga*-class Guided Missile Cruiser; VLS-equipped
CGN	Navy designation for nuclear-powered Guided Missile Cruiser
CH(number)	Cargo Helicopter
CH46	Medium-lift helicopter called the *Sea Knight*
CH53E	Heavy-lift helicopter called the *Sea Stallion*
CH60	Medium-lift helicopter based on the UH60 *Blackhawk*
CH92	Sikorsky's medium lift helicopter based on the UH60
CinC	Commander in Chief
CIWS	Close-in Weapon System
CLF	Combat Logistics Forces
CONUS	Continental United States

COTS	Commercial Off The Shelf
CRAF	Civil Replacement Air Fleet
CTOL	Conventional Takeoff and Landing
CVBF	Carrier Battle Force
CVBG	Carrier Battle Group
DD	Navy designation for Anti-Submarine/General Purpose Destroyers
DD(X)	Navy designation for future destroyer
DD21	Land Attack Destroyer
DD963	*Spruance*-class ASW/General Purpose Destroyer
DDG	Navy designation for Guided Missile Destroyers
DDG47	*Ticonderoga-class* Guided Missile Destroyer*;* non-VLS equipped
DDG51	*Arleigh Burke*-class Guided Missile Destroyer
DDG993	*Kidd*-class Guided Missile Destroyer
DDS	Dry Deck Shelter
DET	Distributed Explosive Technology
DoD	Department of Defense
DoN	Department of the Navy
DSRV	Deep Submergence Rescue Vehicle
EAF	Expeditionary Aerospace Force
ECM	Electronic Countermeasures
EOD	Explosive Ordnance Disposal
ERGM	Extended-Range Guided Munition
ESL	Expected Service Life
ESSM	Evolved Sea Sparrow Missile
F(number)	Fighter aircraft
F/A(number)	Fighter/Attack aircraft
F/A18A/C	USN or USMC single seat fighter attack aircraft known as the *Hornet*
F/A18D	USMC two-seat version of the *Hornet*
F/A18E/F	USN single (E) and two seat (F) fighter attack aircraft called *Super Hornet*
F14	Long-range fleet interceptor known as the *Tomcat*
FAST	Fleet Anti-terrorist Support Team
FF	Navy designation for Frigate
FFG	Navy designation for Guided Missile Frigate
FFG(X)	Designation for a future guided missile frigate
FFG7	*Oliver Hazard Perry*-class Guided Missile Frigate
FMF	Fleet Marine Forces
FY(date)	Fiscal Year (date)
FYDP	Future Years Defense Program
GIUK	Greenland-Iceland-United Kingdom (gap)
GPS/INS	Global Positioning System/Inertial Navigation System
HARPOON	Anti-ship cruise missile fired from surface ships, aircraft and submarines
IFMF	Integrated Fleet Marine Forces
INMARSAT	International Maritime Satellite
INS	Inertial Navigation System
ISO	International Organization of Standardization

ISR	Intelligence, Surveillance and Reconnaissance
IT-21	Information Technology for the 21st Century
JASSM	Joint Air-to-Surface Standoff Missile
JCS	Joint Chiefs of Staff
JDAM	Joint Direct Attack Munition
JFACC	Joint Forces Air Component Command
JSF	Joint Strike Fighter
JSOW	Joint Stand-Off Weapon
JVX	Joint Services Advanced Vertical Lift Aircraft
KC130	Tanker/Cargo aircraft
LAs	Los Angeles class attack submarines
LAV	Light Armored Vehicle
LBC	Littoral Battle Cruiser
LBF	Littoral Battle Force
LBG	Littoral Battle Group
LCAC	Landing Craft Air Cushion
LCS	Littoral Combat Ship
LCU	Landing Craft Utility
LHA	Navy designation for *Tarawa*-class Amphibious Assault Ships
LHD	Navy designation for *Wasp*-class Amphibious Assault Ships
LHD(X)	Navy designation for the *Wasp*-class follow-on
LM2500	Marine gas turbine engine
LMG	Littoral Maneuver Group
LMSF	Littoral Maneuver Support Force
LPD	Navy designation for Landing Platform Dock
LPH	Navy designation for *Iwo Jima*-class Amphibious Assault Ships
LSD	Navy designation for Landing Ship Dock
LSG	Littoral Strike Group
MAGTF	Marine Air Ground Task Force
MarFors	Marine Forces
MCM	Navy designation for Mine Countermeasure Ship
MCS	Navy designation for Mine Countermeasure Control Ship
MEB	Marine Expeditionary Brigade
MEC	Marine Expeditionary Command
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MFR	Multi-Function Radar
MH60S	Navy cargo and mine countermeasure helicopter based on the UH60
MHC	Navy designation for Coastal Minehunter
MLF	Mobile Logistics Force
MLRS	Multiple Launch Rocket System
MMS	Marine Mammal System
MNS	Mine Neutralization System
MobCat	Mobilization Category
MOUT	Military Operations in Urban Terrain

MPF	Maritime Pre-positioning Force
MPF(E)	Enhanced Maritime Pre-positioning Force
MSC	Military Sealift Command
MSO	Navy designation for Ocean Minesweepers
MTR	Military Technical Revolution
MTW	Major Theater War
MV22	Tilt-rotor aircraft slated to replace Marine helicopters
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
NCW	Network Centric Warfare
NGO	Non-Governmental Organization
nm	nautical miles
NRF	Naval Reserve Force
O&S	Operations and Support
OMFTS	Operational Maneuver From the Sea
OPTEMPO	Operational Tempo
OSD	Office of the Secretary of Defense
PAA	Primary Aircraft Authorized
PB	Navy designation for Patrol Boat
PC	Navy designation for Patrol Combatant
PERSTEMPO	Personnel Tempo
PHM	Navy designation for Patrol Combatant Missile (Hydrofoil)
POS	Protection of Shipping (combatant)
QDR	Quadrennial Defense Review
QTR	Quad Tilt-Rotor
QUADCON	Quadruple Containers
R&D	Research and Development
RADM	Rear Admiral
RAM	Rolling Airframe Missile
RHLS	Re-loadable Horizontal Launch System
RMA	Revolution in Military Affairs
RMS	Remote Mine-hunting System
RRF	Ready Reserve Force
SABRE	Shallow-water Assault Breaching System
SAG	Surface Action Group
SAM	Surface-to-air missile
SEAL	Sea, Air and Land special forces commando
SH60R	Navy helicopter based on the UH60
SLAM	Stand-off Land Attack Missile
SLBM	Submarine Launched Ballistic Missile
SLEP	Service Life Extension Program
SLOCs	Sea Lines Of Communications
SLQ32	Surface ship electronic countermeasures combat system
SOF	Special Operations Forces
SPY1	Phased array radar of the AEGIS combat system

SQQ32	Variable-depth, mine-hunting sonar
SQQ89	Surface ship anti-submarine warfare combat system
SS	Navy designation for diesel-powered attack submarine
SSBN	Navy designation for nuclear-powered ballistic missile submarine
SSDS	Ship Self-Defense System
SSGN	Navy designation for a nuclear-powered cruise missile submarine
SSN	Navy designation for nuclear-powered attack submarine
STOAL	Short Take-off and Arrested Landing
STOM	Ship-to-Objective Maneuver
STOVL	Short Take-off, Vertical Landing
STUL	Ship-to-Unit-Logistics
SUBROC	Submarine Rocket
TACTOM	Tactical Tomahawk (long-range, land-attack cruise missile)
T-AE	Navy designation for MSC-operated ammunition ship
T-AFS	Navy designation for MSC-operated stores ship
T-AKE	Navy designation for MSC-operated underway replenishment ship
T-AO	Navy designation for MSC-operated oiler
T-ATF	Navy designation for MSC-operated fleet tug
TBMD	Tactical Ballistic Missile Defense
TOMAHAWK	Long-range land attack cruise missile fired from the VLS or torpedo tubes
TSBF	Total Ship Battle Force
UH60	Army/Air Force medium-lift helicopter called the *Blackhawk*
UHF	Ultra-High Frequency
URG	Underway Replenishment Group
UUV	Unmanned Underwater Vehicle
V/STOL	Vertical/Short Takeoff and Landing
VADM	Vice Admiral
VF	Navy Fighter Squadron (F14)
VFA	Navy Strike Fighter Squadron (F/A18)
VLS	Vertical Launch System
VMA	Marine Attack Squadron (AV8B)
VMFA	Marine Fighter Attack Squadron (F/A18A/C)
VMFA(AW)	All-weather Marine Fighter Attack Squadron (F/A18D)
WMD	Weapons of Mass Destruction