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TRANSFORMING THE NAVY

Punching a Feather Bed?

Peter J. Dombrowski and Andrew L. Ross

To change anything in the Na-a-vy is like punching a feather bed. You punch it with your right and you punch it with your left until you are finally exhausted, and then you find the damn bed just as it was before you started punching.

FRANKLIN D. ROOSEVELT

The Bush administration has made military transformation a central defense and national security objective.¹ It came into office declaring its commitment to profound, potentially radical military change. Even while engaged in the global war on terror, preparing to go to war against and then fighting one rogue state, and deterring another, the U.S. military has been pressed to remake itself. Indeed, the threat of terrorism is said to demonstrate the need for transformation, and a possible war in Southwest Asia has been viewed by some as an opportunity to showcase the military's emerging transformational capabilities. While deployed across multiple theaters, the armed forces are to develop a coherent view of the future and to begin implementing the technological, doctrinal, and organizational changes necessary to meet future warfighting requirements. Moreover, this is to be done in a budget environment in which, despite dramatically increased defense spending, flexibility is limited by current operating expenses. By any standard, this is a tall order. Yet civilian officials in the Department of Defense continue to push the military to think more creatively and move more quickly. Individuals, programs, and services thought to stand in the way of building the "military after next" have been taken to task.²

The Navy claims that its challenges are particularly difficult. The fleet has shrunk. It is likely to shrink still further before it grows. Programmed recapitalization and modernization are thought to exceed the resources expected to be available. Operational requirements have dictated more frequent, and longer, deployments. Operating tempo has spiked. The fleet and resources are stretched

thin. Is now the time to transform, to introduce new platforms and force the naval acquisition system and the naval industrial base to adopt new business practices and achieve greater economies? For transformation proponents, the answer is a resounding “Yes.”

Of course, some within the Navy had begun to think about the next Navy and even the Navy after next well before Governor George W. Bush was selected to be president. Over the last decade, the concept of network-centric warfare, which calls for a profound “shift from platform-centric operations to Network Centric Operations,” gained gradual, if often grudging, acceptance.³ Network-centric warfare, in the form of “ForceNet,” is at the heart of “Sea Power 21,” which was introduced in 2002 as the Navy’s transformation vision. ForceNet is the integrating agent of SP-21’s “Sea Strike,” “Sea Shield,” and “Sea Basing,” which are to increase the Navy’s capacity to strike deeply and sustain joint operations even in the absence of land bases, as well as to help protect both the American homeland and U.S. allies and friends against ballistic missiles and other threats. Intended as a comprehensive guide to naval transformation, Sea Power 21 also reflects an appreciation of the long-term demands of waging the war on terror and combating weapons of mass destruction, as well as of how the Bush administration is likely to employ military power.

We present here a four-part, interim assessment of the Navy’s ongoing transformation project.⁴ First, we provide the context for our assessment with a review of the administration’s approach to transformation. Second, we describe Sea Power 21 and its network-centric-warfare underpinnings. In the third section we examine whether the Navy’s vision of its future is indeed transformational and the extent to which the Navy is progressing toward its vision’s promise. We conclude by evaluating the prospects for Navy transformation and by asking whether the force envisioned by Sea Power 21 will meet the nation’s national security requirements in the coming decades.

THE TRANSFORMATION IMPERATIVE

An array of joint and service transformation visions had been developed even before the Bush administration took office. *Joint Vision 2020*, like *Joint Vision 2010* before it, foresees a military able to dominate the full spectrum of military operations, from low-intensity conflict to major theater wars. Information superiority is to be the underpinning of “dominant maneuver,” “precision engagement,” “focused logistics,” and “full-dimensional protection.”⁵ U.S. forces are expected to prevail over any and all military challengers by moving more quickly, hitting harder and more precisely, and when necessary, sustaining operations longer than potential adversaries.

Not only the Navy but the Army, Air Force, and Marine Corps have developed transformation visions. The Army's transformation project promises to deliver an "Objective Force" with a Future Combat System that will be responsive, deployable, agile, versatile, lethal, survivable, and sustainable.⁶ The Air Force's *Vision 2020* promises "Global Vigilance, Reach and Power" through a full-spectrum aerospace force to control and exploit not only the air but also space.⁷ Air Force assets are to be able "to find, fix, assess, track, target, and engage any object of military significance on or above the surface of the Earth in near real time."⁸ *Marine Corps Strategy 21* and the Corps's "Operational Maneuver from the Sea" doctrine promise scalable, interoperable expeditionary forces at a high level of readiness.⁹

Since each service is attempting to exploit the opportunities presented by modern information technologies and is responding to the overarching guidance provided in such documents as *Joint Vision 2020* and the *National Military Strategy*, there are many commonalities across the individual visions. Each service claims, to one degree or another, to be expeditionary; even the Army is lightening its forces, in order to increase mobility and sustainability. Each vision also focuses on the ability to strike adversaries with a variety of weapons; no potential target anywhere in any environment—land, sea, air, space, or cyberspace—will not, in the end, be vulnerable to U.S. forces. Strike operations are to be enabled by "information dominance"—which, reduced to its essentials, means improving the intelligence available to all echelons, but especially shooters. A premium is placed on precision, speed, agility, flexibility, adaptability, and connectivity. Operations are to be conducted in parallel rather than sequentially. All of the services genuflect before the requirements for jointness and interoperability.

In 2001, the stakes were raised. A new administration took office proclaiming its commitment to transformation. Military transformation had emerged as an article of faith for the Bush team during the presidential campaign. In his September 1999 Citadel speech, then-Governor Bush called for "creating the military of the next century," seizing the opportunity "created by a revolution in the technology of war," moving beyond "marginal improvements," "skipping a generation of technology," and encouraging "a new spirit of innovation."¹⁰

In remarks at the Joint Forces Command in February 2001, the new president returned to the themes of his Citadel address:

We are witnessing a revolution in the technology [of] war. Power is increasingly defined not by size, but by mobility and swiftness. Advantage increasingly comes from information. . . . Our goal is to move beyond marginal improvements to harness new technologies that will support a new strategy. . . . On land, heavy forces will be lighter. Our light forces will be more lethal. . . . In the air, we'll be able to strike across

the world with pinpoint accuracy, using both aircraft and unmanned systems. On the oceans, we'll connect information and weapons in new ways, maximizing our ability to project power over land.¹¹

Upon assuming office, the new secretary of defense, Donald Rumsfeld, moved quickly to initiate the "comprehensive review" of military strategy, structure, and procurement priorities promised by President Bush. Andrew W. Marshall, the director of net assessment and a longtime proponent of transformation, was tapped to lead a wide-ranging review of U.S. defense strategy.¹² Additional teams were formed to focus on transformation, conventional forces, nuclear forces, missile defense, space, crisis response, acquisition reform, and quality of life, among other issues.¹³ An Office of Force Transformation, led by Vice Admiral Arthur K. Cebrowski, USN (Ret.), a leading advocate of network-centric warfare, was established. The services were directed by the Office of the Secretary of Defense (OSD) to develop transformation roadmaps. A Defense Transformation Guidance document was developed to accompany OSD's Defense Planning Guidance. These and other initiatives clearly signaled the importance of far-reaching military innovation to the Bush team.

The administration's commitment to transformation was formalized in the Defense Department's September 2001 *Quadrennial Defense Review* report. Even in the wake of the attacks of 11 September and the onset of the global war on terror, the secretary of defense continued to emphasize the importance of "the transformation of U.S. forces, capabilities, and institutions."¹⁴ Transformation was once again proclaimed to be "at the heart" of the administration's "new strategic approach."¹⁵ Indeed, a renewed sense of urgency was conveyed: "Transformation is not a goal for tomorrow, but an endeavor that must be embraced in earnest *today*."¹⁶ Four transformation pillars—joint operations; experimentation; intelligence, surveillance, and reconnaissance (ISR); and research and development and selective recapitalization—and a set of "six critical operational goals" were identified.¹⁷

Under Secretary of Defense (Acquisition, Technology and Logistics) Pete Aldridge has remarked that "transformation is a loose concept."¹⁸ Yet administration officials have attempted to pin down the meaning of "transformation." The most prominent dimensions of transformation—technology, doctrine, and organization—were evident in the characterization of transformation provided in the 2001 Quadrennial Defense Review (QDR) report:¹⁹

Transformation results from the exploitation of *new approaches to operational concepts and capabilities*, the use of old and new technologies, and *new forms of organization* that more effectively anticipate new or still emerging strategic and operational challenges and opportunities and that *render previous methods of conducting war*

obsolete or subordinate. Transformation can involve *fundamental change in the form of military operations*, as well as potential change in their scale. It can encompass the *displacement of one form of war with another*, such as *fundamental change in the ways war is waged* in the air, on land and at sea. It can also involve the *emergence of new kinds of war*, such as armed conflict in new dimensions of the battle space.²⁰

The administration's characterization of transformation suggests that re-making the armed forces requires more than routine, sustaining innovation. As the 2002 *Annual Report* explicitly recognized, transformation entails "discontinuous change," not merely the incremental change typical of modernization.²¹ Risks are to be taken.²² Transformation is to result in fundamentally new, rather than merely improved, technologies and weapons systems, doctrines, and operational concepts. Revolutionary rather than evolutionary change is the objective.²³ Marginal improvements in capabilities are to be rejected in favor of leaps ahead.²⁴ As indicated by the QDR's use of language evocative of a "revolution in military affairs," its discussion of transformation's "social" dimensions, its recognition of the necessity for "fundamental changes . . . in organizational culture and behavior," and the military's palpable concern about the administration's transformation agenda, the stage has been set for disruptive innovation.²⁵

Even in the face of the military's increased responsibilities for homeland security, the demands of Operation ENDURING FREEDOM, the complexities of the broader global war on terror, and preparations for and then war against Iraq, the transformation imperative has remained among the highest priorities of the Bush administration.²⁶ The September 2002 National Security Strategy, for example, called for transforming the U.S. armed forces and other national security institutions to maintain and enhance American primacy.²⁷ The Bush administration, seemingly, has repudiated the Clinton administration's approach to transformation and embraced the approach of the 1997 National Defense Panel, which recommended "transforming the armed forces into a very different kind of military from that which exists today," for according "the highest priority to executing a transformation strategy," and for accelerating transformation.²⁸ Against this backdrop, the U.S. Navy and the other armed services have struggled to turn such nascent concepts as network-centric warfare from abstract exercises in strategic thinking into full-fledged transformation plans.

THE NAVY TRANSFORMATION VISION

Publicly unveiled by the Chief of Naval Operations, Admiral Vernon Clark, at the Naval War College in June 2002, "Sea Power 21" is the most complete, and recent, depiction of the Navy's transformation vision.²⁹ It is a successor to . . . *From the Sea* and *Forward . . . from the Sea*, post-Cold War visions that profoundly reoriented the Navy away from blue-water fleet-on-fleet engagements to

projecting power ashore in the littorals.³⁰ Sea Power 21, however, is focused as much on *how* the Navy will fight in the future as on *where* it will fight. The offensive Sea Strike, defensive Sea Shield, and facilitating Sea Basing capabilities it calls for are to be integrated by ForceNet, which is to “network” the future Navy’s formidable capabilities. The inspiration for Sea Power 21’s emphasis on the force-multiplying, potentially transforming, effects of connectivity and networking is network-centric warfare, a concept of future warfare long advocated by former Naval War College president Vice Admiral Cebrowski.³¹ In the form of ForceNet, network-centric warfare is embedded in Sea Power 21’s vision of how the Navy will “organize, integrate, and transform.”³²

Network-centric Warfare

For its proponents, network-centric warfare is the emerging vision of the future of war.³³ It is a vision driven by a particular understanding of the transformation of modern society from the industrial age to a postindustrial, or information, age at the beginning of the twenty-first century.³⁴ Advances in information technologies that have resulted in widespread socioeconomic changes are expected to revolutionize the conduct, if not the nature, of war.³⁵ In particular, the increasing use of networks for organizing human activities is touted as a means for reshaping the way American forces train, organize, equip, and fight.³⁶

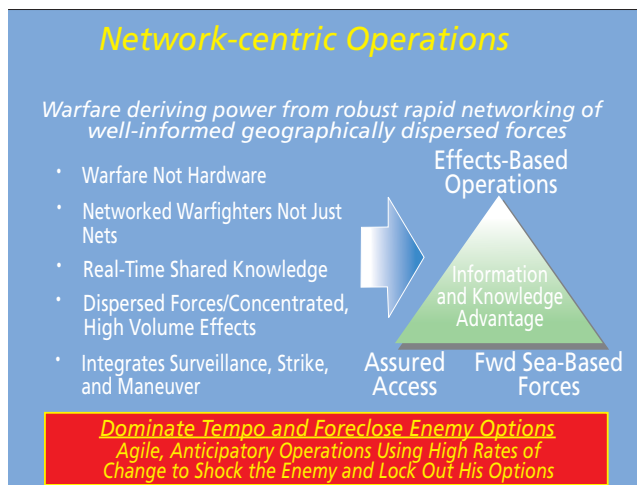
In brief, networks harness the power of geographically dispersed nodes (whether personal computers, delivery trucks, or warships) by linking them together into networks (such as the World Wide Web) that allow for the extremely rapid, high-volume transmission of digitized data (multimedia). Networking has the potential to increase exponentially the capabilities of individual nodes or groups of nodes and to render the use of resources more efficient. In theory, networked nodes have access not only to their own resident capabilities but also, more importantly, to capabilities distributed across the network. The loss of a networked node need not be crippling; in a robust network, its functions can and will be assumed by other nodes. Since networked nodes can share information efficiently, they can be designed individually as relatively simple, low-cost adjuncts to the network itself.³⁷

The Navy and the other services have been developing, individually if not jointly, the capabilities for network-centric operations (NCO).³⁸ In a draft capstone concept paper, the Navy Warfare Development Command identified four NCO “pillars,” or supporting concepts: information and knowledge advantage, effects-based operations, assured access, and “forward sea-based forces” (see figure 1).³⁹

The benefits of NCO to be provided by the pillars of information and knowledge advantage and effects-based operations include speed of command,

self-synchronization, advanced targeting, and greater tactical stability.⁴⁰ Netted sensors are to provide shooters and commanders with “unmatched awareness of the battle space.”⁴¹ Within the battle space, war fighters are to be able to “self-synchronize” their activities to fulfill a commander’s intent by drawing upon

FIGURE 1



Source: NWDC, *Network Centric Operations*, p. ii.

a shared “rule set—or doctrine,” as well as a common operational picture (COP).⁴² Self-synchronization is accomplished by devolving decision making downward to the lowest appropriate level, thus allowing war fighters to respond directly and quickly to tactical, operational, and even strategic challenges. “Fires” (munitions delivery) are to be employed in a framework of effects-based operations rather than of attrition-based warfare. Precision-guided munitions in conjunction with advanced ISR capabilities will

allow targets to be hit with greater economy—simultaneously rather than sequentially—greatly increasing the possibility of imposing disproportionate effects, particularly psychological ones, on the adversary. Tactical operations may thus achieve strategic objectives.

By geographically dispersing sensors, shooters, and their supporting infrastructure within an overarching network, U.S. forces will be able to achieve greater tactical stability—a favorable balance between survivability and combat power.⁴³ Fires, rather than forces, will be massed, and they will be delivered from beyond visual range. Ideally, effects-based operations, fueled by information and knowledge superiority, will enable U.S. forces to “lock in success and lock out enemy solutions.”⁴⁴ Smaller, lighter, faster, less complex, and less expensive nodes (i.e., platforms) linked by interoperable, highly redundant, self-healing networks will present adversaries with fewer high-value targets and improve the robustness of operations against a determined foe.

Implicitly at least, NCO is a joint vision that harnesses capabilities from all services; it is applicable to warfare on land, air, or sea.⁴⁵ That it is a Navy concept with naval origins, however, is evident in the two pillars that are more distinctly maritime: assured access and forward-deployed sea forces. “Assured access” refers to the ability of the U.S. armed forces to gain entry to and use both overseas infrastructure, such as ports and airfields, and the battle space itself, even when confronted by a capable and active adversary.⁴⁶ No sanctuary is to be ceded to the

opponent. It is the job of the Navy and the Marine Corps to enable and ensure access by follow-on elements of the Air Force and the Army—the heavier forces necessary to fight and win major theater wars. The Navy accomplishes this through the combat capabilities inherent in its forward-deployed presence assets (i.e., the ability to operate in the littoral). Since sea-based forces “do not rely on permissive access to foreign shore installations that may be withdrawn or curtailed,” they “furnish an assured infrastructure for additional joint forces.”⁴⁷

The most robust form of NCW also features a wide variety of nodes (or platforms) that are to be smaller, lighter, faster, or less complex than current platforms. Unmanned vehicles, for instance, are to deploy sensors or serve as sensors, communications relays, and weapons platforms. In the view of its strongest advocates, NCW requires innovative design concepts such as small littoral combatants (a concept formerly known as “Streetfighter”), fast lift, and small-deck aircraft carriers. According to their logic, fulfilling the ultimate promise of network-centric operations requires less complex and less expensive network-tailored nodes/platforms that will facilitate self-synchronization and “swarming” tactics and increase tactical survivability.⁴⁸ Complexity is to be located on the web rather than on the node; the expensive platform nodes that populate the legacy force will be displaced by simpler, less expensive ones. In today’s Navy, platforms are networked via, for instance, the Cooperative Engagement Capability (CEC) and IT-21. In the network-centric Navy of the future, nodes will be tailored to network requirements from their earliest conception.

Sea Power 21

Network-centric warfare, in the form of ForceNet, is “the ‘glue’ that binds together” Sea Power 21’s “three fundamental concepts”: Sea Strike, Sea Shield, and Sea Basing.⁴⁹ Integrated by ForceNet, the offensive and defensive capabilities of Sea Strike and Sea Shield and the operational autonomy of Sea Basing are to provide “unprecedented maritime power”—nothing less than “decisive warfighting capabilities from the sea.”⁵⁰ The development of these capabilities will be supported by three additional elements of Sea Power 21: “Sea Trial’s” innovation processes, “Sea Warrior’s” investment in people, and “Sea Enterprise’s” improved business practices. SP-21 is driven not by the asymmetrical challenges posed by regional or transnational threats but by a concerted effort to exploit (and thereby help preserve) the asymmetry inherent in U.S. technological preeminence;⁵¹ accordingly, it is to provide “powerful warfighting capabilities” that “will ensure our joint force dominates the unified battle space of the 21st century.”⁵²

The core operational concepts of Sea Strike, Sea Shield, and Sea Basing, the “operational construct and architectural framework” of ForceNet, and the three supporting concepts had all appeared earlier in the Department of the Navy’s

Naval Transformation Roadmap.⁵³ Beginning in June 2002, these concepts took the form of “Sea Power 21” in a series of speeches and articles by the Chief of Naval Operations and other flag and general officers.⁵⁴ Sea Power 21 represents a concerted effort to market as transformational the future capabilities sought by the Navy’s leadership, civilian and military alike. The array of capabilities envi-

TABLE 1
THE NTR’S AND SP-21’S TRANSFORMATIONAL
WARFIGHTING CAPABILITIES

Sea Strike	
•	Persistent intelligence, surveillance, and reconnaissance
•	Time-sensitive strike
•	Offensive information operations
•	Ship-to-objective maneuver
•	Covert strike
Sea Shield	
•	Homeland defense
•	Sea/littoral superiority
•	Theater air and missile defense
•	Force entry enabling
Sea Basing	
•	Enhanced afloat positioning of joint assets
•	Accelerated deployment and employment time
ForceNet	
•	Expeditionary, multitiered sensor and weapons grid
•	Distributed, collaborative command and control
•	Dynamic, multipath, and survivable networks
•	Adaptive/automated decision aids
•	Human-centric integration

Source: *Naval Transformation Roadmap: Power and Access . . . from the Sea* (Washington, D.C.: Dept. of the Navy, 2002); and Admiral Vern Clark, U.S. Navy, “Sea Power 21: Projecting Decisive Capabilities,” *U.S. Naval Institute Proceedings* (October 2002), pp. 32–41.

sioned by the NTR and SP-21, which are to be developed in a phased process from 2002–2020, are depicted in table 1.⁵⁵

With the promulgation of the Naval Transformation Roadmap and Sea Power 21 in 2002, network-centric concepts, in the form of ForceNet, are for the first time firmly embedded in the official version of naval transformation. It remains to be seen, however, whether naval transformation will fulfill the overarching vision of transformation suggested by *Joint Vision 2020* and the Bush administration’s defense planning documents.

EVALUATING NAVAL TRANSFORMATION

There are two ways to assess the Navy’s transformation enterprise. First, it can be evaluated against transformation objectives articulated by President Bush and the members of his national security team. In effect, this approach uses a measure external to the Navy. Second, Navy transformation can be assessed in terms of how well the Navy has implemented to date its own concepts. This approach measures internal progress toward the Navy’s stated objectives.

We argue here that although the Navy has made progress toward developing a coherent transformation vision over the past decade, there are gaps between the administration’s stated objectives and the Navy’s transformation enterprise. As for the overall prospects for transformation, a definitive judgment cannot yet be rendered; much depends on how well the Navy supports the headline goals of Sea Power 21 and NCW over time. It is difficult to evaluate the implementation of the Navy’s vision, because the effort cannot be expected to bear fruit for another ten years or more. However, there are already signs that as a result of

budgetary, bureaucratic, and political impediments to transformation, implementation is lagging and will continue to lag.

Does Naval Transformation Measure Up?

Judged against the expectations created by the president and his defense team, the naval transformation enterprise will fall short, even *if*—and this is a big *if*—it is fully implemented in the coming decades. Transformation advocates within OSD, including the Office of Force Transformation, believe that transformation is a matter of discontinuous, even “revolutionary,” change. Yet while neither the next Navy (of 2010) nor the Navy after next (of 2020) will look exactly like today’s Navy, they will be quite recognizable. With a few important exceptions, operational capabilities are unlikely to have been transformed; instead, capabilities resident in the current Navy will have been improved.

The Navy advertises Sea Power 21 as a “new operational construct.”⁵⁶ Yet much of Sea Power 21 is a repackaging of familiar ideas. The Navy has long possessed offensive, defensive, and presence capabilities. Although relabeled “Sea Strike,” “Sea Shield,” and “Sea Basing,” those capabilities will continue to be enhanced, or modernized; they are unlikely to be revolutionized. The “new operational construct” essentially calls for routine, sustaining modernization.⁵⁷

A similar judgment can be rendered against network-centric operations. At the most basic level, the desirability of the kinds of information and knowledge advantages touted by NCO is not new. Military commanders since time immemorial have sought more and better information.⁵⁸ As for effects-based operations, the Navy, indeed all branches of the military, have often sought to destroy targets with an eye to the reactions of enemy forces and political decision makers. Was not strategic bombing in World War II intended to break the will of the English, German, and Japanese citizenries? Assured access is not a novel idea either. The Navy has long provided battlespace access for other components of the total force; did it not make it possible for the Marines and Army to island-hop across the Pacific? The Navy has also long been the provider of “forward sea-based forces.”⁵⁹ Dominating the tempo of war and foreclosing adversary options is also a traditional warfighting objective. How all of this is achieved will certainly be improved, but it is not clear that the Navy will be revolutionized.

Neither is the Navy new to the information age. ForceNet builds upon existing Navy information technology capabilities and programs.⁶⁰ Few if any of the envisioned capabilities entail skipping a generation of technology; if anything, even with the advent of spiral development, Navy information technologies will continue to lag behind those of the civilian IT sector. Indeed, existing plans from the Navy–Marine Corps Intranet (NMCI) to CEC, the Naval Fires Network (NFN), and the Expeditionary Sensor Grid (ESG) will incorporate and build

upon existing networks to enhance future connectivity. Sustaining innovation is likely to continue to be the norm. Tellingly, the performance metrics of the nodes, or platforms, and networks envisioned by NCW and NCO require less discontinuous and disruptive innovation than sustaining innovation.⁶¹

The sense of urgency attached to transformation by the president is little evident in the NTR and other Navy planning documents. For the Navy, it seems that thus far transformation means business as usual—incremental, evolutionary changes in both capabilities and the doctrine necessary to employ those capabilities. There is no evident generation-skipping. The NTR, in particular, features rampant incrementalism. It calls for “more effectively” utilizing and exploiting assets; for enhancing, increasing, improving (sometimes significantly), and leveraging existing capabilities while accelerating certain current programs. Risk taking is also difficult to detect; indeed, the Navy has remained steadfastly risk averse.

The evolution since the mid-1990s of the Navy’s plans for a future carrier is instructive. Initially, with what was “CVX,” the Navy took an ambitious, clean-sheet design approach that may well have resulted in the skipping of a generation, a leap ahead. Due to budgetary constraints and reluctance to assume technological risks, that approach was scaled back with the shift to “CVNX,” a distinctly evolutionary program intended to yield a *next-generation* carrier. By most accounts, it was only pressure from OSD for a “CVN-21” incorporating a range of emerging technologies that prevented the Navy’s next carrier from being merely a slightly improved *Nimitz*-class carrier. Just how transformational the Navy’s next carrier will actually be is an open question. The point is that the Navy reached ahead as far as it did only because it was pushed by OSD.

Some analysts have speculated that Navy programs might be vulnerable after the cancellation of the Army’s Crusader artillery system. But few Navy programs have been canceled to free up resources for transformation.⁶² Instead, such existing programs as the Joint Strike Fighter are billed as transformational. Further, the alignment of programs and resources with the Navy transformation vision and roadmap is far from seamless. Programs remain platform-centric rather than network-centric.⁶³ In the course of his remarks at Ship Tech 2003, Rear Admiral Jay Cohen, Chief of Naval Research, characterized SP-21 and the NTR as “ship-centric.” Science and technology, and research and development, programs remain focused more on near-term technology transition to the fleet than on the long-term basic S&T/R&D that may be required for true transformation. Routine modernization and the recapitalization of legacy systems appear to overshadow programs that could yield disruptive innovation.⁶⁴

Navy transformation to date is thus a rather modest enterprise. It is difficult to distinguish from modernization. It emphasizes sustaining innovation and incremental, evolutionary change. At best, it amounts to “modernization plus.”

Barring unforeseen developments, the Navy will continue to do what it does now, only better. The Navy's transformation enterprise does not live up to the expectations created by the Bush defense team; Sea Power 21 is unlikely to result in transformation.

It must be acknowledged, however, that the Navy's measured, incremental, evolutionary approach to transformation is actually not entirely out of sync with OSD's approach. The urgency attached to transformation, the emphasis on discontinuous—even disruptive—change, evident in the QDR, the 2002 *Annual Report*, and elsewhere is not absolute. Administration officials recognize that transformation is a long-term process, that its promise will be fully realized only with the passage of time.⁶⁵ “Today's challenges” must be addressed even while the military is transforming for the future; future readiness is not to be ensured at the expense of current readiness.⁶⁶ Prudence and balance are ever the watchwords: “It would be imprudent to transform the entire force all at once. A balance must be struck between the need to meet current threats while transforming the force over time.”⁶⁷ This approach, which much resembles that of the Clinton administration, is unlikely to result in a rush to transformation by the Navy—or any of the other services.

Modernization Plus

Each of Sea Power 21's major foci provide possible exceptions to the argument that current plans for Navy transformation do not measure up. Several initiatives particularly deserve attention.

Sea Strike. A range of strike platforms have been portrayed as “undergoing a revolution in capability.”⁶⁸ For instance, SSGNs—Trident ballistic-missile submarines converted to attack boats, carrying cruise missiles and unmanned vehicles and deploying special-operations forces—will have Arsenal Ship-like capabilities; indeed, they will be even more stealthy than the Arsenal Ship would have been. SSGNs will also bolster the Navy's existing cruise-missile launch capability (if not the number of cruise missiles available for launch). Why four SSGNs should be regarded as transformational, however, is not evident.

The DD(X) destroyer, CG(X) cruiser, and Littoral Combat Ship (LCS) have also been characterized as revolutionary.⁶⁹ This “Surface Combatant Family of Ships,” however, may be no more a radical departure than the aforementioned CVN(X). That DD(X) is being designed as a multimission *land-attack* destroyer is in line with the Navy's post-Cold War reorientation from blue water to the littoral. As for the LCS, given the vehement reaction to the concept of a Streetfighter when it was introduced, it is no less noteworthy that the Navy is not only proceeding with the program but is seriously considering alternative hull designs, some of which are of foreign origin.⁷⁰ Yet the mix of surface

combatant capabilities represented by this family of ships inspires a sense of *déjà vu*. As two retired admirals have pointed out, “The Family of Ships is really a 21st-century version of the high-low mix of the 1970s.”⁷¹ This reincarnated high-low mix may be undermined by two of the problems that doomed the earlier attempt: at the low end, cost growth; at the high end, inability to procure the number of platforms required to make the mix work. The Navy has not yet escaped the tyranny of resource constraints.

Many transformation proponents have highlighted the potentially revolutionary impact of unmanned vehicles on military operations from reconnaissance to strike. Sea Strike envisions a future battle space populated by an array of unmanned vehicles—aerial, surface, and subsurface. Yet the Navy’s unmanned-vehicle programs appear to lag behind Air Force, Army, and Marine counterparts. This is especially true for unmanned aerial vehicles (UAVs). According to one recent report, there are fourteen separate Navy unmanned-vehicle programs. Seven are UAVs; of those, five are being used, or will be used, in very limited numbers for testing, training, or developmental training; the other two (Northrop Grumman’s Pegasus and Boeing’s X-45) are largely funded by the Defense Advanced Research Agency and are not projected to see naval service until 2015. As for Global Hawk, a now well-known UAV that was first rushed into operation for the Afghanistan campaign, the Navy plans to purchase only two systems, one in 2005 and one in 2007.⁷² The Navy has also sought a hundred million dollars to upgrade a Pioneer system that dates back to the mid-1980s. By contrast the U.S. Air Force, Army, and Marine Corps have deployed relatively new, relatively capable UAVs even as they continue to test and evaluate next-generation systems.

Perhaps this is unfair. After all, there is something to the claim that operating UAVs in a maritime environment poses challenges not faced by ground-based systems. Launch and recovery of ship-based naval UAVs, for example, presents serious technical challenges. Finding space to store, maintain, and operate UAVs on vessels not originally designed to host them can be problematical. Moreover, if the Navy is able to field reconnaissance variants of either the Pegasus or the X-45 by 2015 as planned, the service will actually be on track to meet the needs of the Navy after next.

Even though the utility of UAVs has become increasingly clear over the past two decades, the Navy has been slow to recognize their value. It has pursued unmanned aerial vehicles only in fits and starts. Representatives of one major UAV manufacturer told one of the authors that they “hated” doing business with the Navy, because it spent so much time researching operational requirements and testing existing systems. They doubted that the Navy would ever actually field a system.⁷³ The Fire Scout vertical-takeoff-and-landing UAV program, whatever

its specific merits, seems representative; after an initial investment the Navy pulled back from production in early 2002, all but terminating the program, and began thinking once again about new UAV designs and concepts. Then, early in 2003, Fire Scout was reinvigorated.⁷⁴

Even UAV-related developments with regard to one of the Navy's most highly touted near-term transformation programs, the SSGN conversion, may represent less than meets the eye. In the winter of 2003, the Giant Shadow experiment "absolutely validated that UAVs provide a great value, on the tactical and operational level of war, to an SSGN that's operating as . . . an ISR home base," according to the commander of the experiment's joint force maritime component.⁷⁵ One element of the overall experiment tested the ability of a land-launched Boeing/Insitu ScanEagle UAV to communicate with the submarine and other naval assets. Yet *Aerospace Daily* quoted the maritime component commander as concluding, "I'd like to pursue a UAV for submarines, although I'm not convinced that [ScanEagle] is it. . . . Its wingspan is too big [and] the launching . . . was sometimes problematic."⁷⁶ Modification of the ScanEagle, other competing UAV designs, or the development of a UAV designed specifically to operate from submarines may have to wait, however, given current programming.

Sea Shield. Much of Sea Shield, at least as described in publicly available documents, is not new. It prominently features traditional force protection missions—air defense, mine countermeasures, and antisubmarine warfare programs—and ensuring access to the littoral. Potentially more disruptive, however, are plans to provide theater ballistic missile defense and ballistic missile defense from sea-based platforms. In the words of Admiral Clark,

It [Sea Shield] is about projecting global defensive assurance, projecting defense. . . . Traditionally, naval defense has been concerned with protecting our units or the force, and the sea lines of communication. Tomorrow's navy must of course do all of that, but we must be able to do much more: projecting defensive technology beyond the task force, providing theatre and strategic defense for the first time.⁷⁷

In short, the U.S. Navy is preparing to play a central role in defending the homeland not against the seaborne invasions of old but ballistic missiles armed with weapons of mass destruction.⁷⁸ The Navy's sea-based "Mid-Course" system is expressly intended to protect population areas from ballistic missile threats. Navy assets committed to this homeland defense mission become "strategic" in the same sense that the fleet's ballistic missile submarines (SSBNs) have been strategic.⁷⁹ Also like SSBNs, they are unlikely to be available for other missions.

Although the long-term effects of this aspect of Sea Shield on the Navy remain to be seen, stationing a picket line of ships to track and intercept ballistic missiles aimed at the American homeland or an allied population center may

very well change the culture of the service. Rather than engaging the enemy fleet on the high seas or striking enemy forces in the littoral or far inland, Navy officers and enlisted personnel will be asked to wait and respond to an attack. Taken to the extreme, crews onboard ships dedicated to missile defense will be akin to missile launch officers sitting in silos waiting for the balloon to go up.⁸⁰

Sea Basing. Since 11 September 2001 it has become apparent that the United States may be involved in conflicts of longer duration than at any time since the Vietnam War. Future operations in failed or failing states, for example, may require it to commit forces for years rather than months. Access to bases in neighboring countries will not always be readily available; neutral states and even a few allies have been reluctant to grant the U.S. military unrestricted access to facilities or overflight rights at various points during the war on terror and during preparations for a potential invasion of Iraq. More of the same can be expected in the future. As a result the United States may increasingly rely on sea-based forces to conduct strike operations and support ground forces.

Sea Power 21's emphasis on sea basing has reinvigorated discussions about the need for mobile offshore bases (MOBs) that have continued since Admiral William Owens first raised the idea in the mid-1990s.⁸¹ Thus, for example, some planners want next-generation Maritime Prepositioning Force (Future), or MPF(F), vessels to have "the ability to selectively onload and offload military gear at sea."⁸² One concrete means to accomplish sea basing that differs somewhat from the MOB concept involves combining the Joint Command and Control Ship, or JCC(X), with the MPF(F) program.

Although, again, it is too early to know what form Sea Basing will take as it moves beyond the concept development stage, some form of a MOB could provide a transformational capability. At least for some missions and finite periods of time, they would free American forces from the tyranny of land bases. They would also tie the Navy still more closely to its Marine and Army counterparts, placing it in a distinctly supporting role and making it joint in a way envisioned only in rhetoric today.

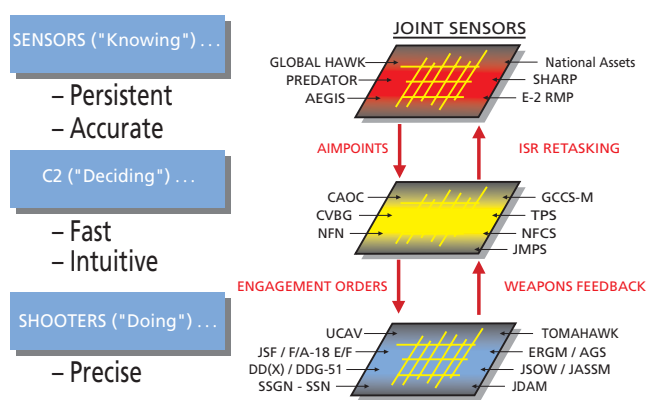
ForceNet. The claim that the range of Sea Strike, Sea Shield, and Sea Basing capabilities are indeed transformational rests largely on ForceNet. ForceNet was presented in the Naval Transformation Roadmap as the Navy's framework for implementing network-centric warfare.⁸³ Originally developed by the Chief of Naval Operations' Strategic Studies Group, it has been billed variously as putting the "warfare" in network-centric warfare and as "the next generation of NCW." According to Admiral Clark, ForceNet is the plan for making NCW an "operational reality": it will integrate "warriors, sensors, command and control, platforms, and weapons into a networked, distributed combat force."⁸⁴ This

planned network of networks and system of systems is expected to be the information-technology backbone of information-age naval warfare. Today the ForceNet concept serves as an umbrella both for existing programs such as the NMCI, IT-21, CEC, and NFN and for major future programs such as the ESG and the Expeditionary Command and Control, Communications, Computers, and Combat Systems Grid (EC5G)(see figure 2).

It is the connectivity and synergy to be provided by such efforts that is intended to be the source of any transformation brought about by SP-21's core

FIGURE 2
THE EC5G: A NOTIONAL DEPICTION

Network-centric Warfare



Source: Chief of Naval Operations HQWeb, [ucso2.hq.navy.mil/n7/webbas01.nsf/\(wwwwebpage\)/webbase.htm](http://ucso2.hq.navy.mil/n7/webbas01.nsf/(wwwwebpage)/webbase.htm).

transformation rests on ForceNet. Unless its promises are realized, the potential of platforms such as CVN(X), DD(X), CG(X), LCS, and SSGNs; unmanned aerial, surface, and undersea vehicles; and combat force structures such as "expeditionary strike groups" and missile-defense surface action groups will not be fully exploited.

A principal "enabling element" of ForceNet is the planned set of information, sensor, and engagement grids capable of linking all elements of the network with each other and with the wider information "back plane" that constitutes the World Wide Web and Defense Department-specific networks. This is not a single network but a network of networks, "a global grid of multiple, interoperable, overlapping sensor, engagement, and command nets."⁹⁰ The success of ForceNet requires the development, procurement, and deployment of large numbers of more capable sensors to populate the sensor grid and provide a common operational picture.

Among existing programs, as illustrated in figure 3, the Cooperative Engagement Capability, IT-21, the Radar Modernization Program (RMP), the Web

operational concepts. Sea Strike's time-sensitive strike;⁸⁵ offensive information operations from the sea, shared situational awareness, simultaneous strike, and sensor fusion; Sea Shield's layered theater air and missile defense;⁸⁶ the common air, surface, and underwater picture;⁸⁷ forward homeland defense;⁸⁸ Sea Basing's distributed and networked platforms;⁸⁹ and the interoperability touted by SP-21 generally—all are to be either provided or enabled by ForceNet. The weight of Navy

Centric Anti-Submarine Warfare Net (WeCAN), and the Navy–Marine Corps Intranet will help the Navy evolve further toward the ability to conduct network-centric operations.⁹¹ A critical step is the deployment of a multitiered—space, air, surface/ground and undersea—expeditionary sensor grid combining, among other things, invasive sensing systems, unmanned platforms, massively distributed information systems, and computer network attack and defense capabilities.⁹² At its simplest, the ESG is a “toolbox of sensors and networks necessary to build . . . real-time battlespace awareness.”⁹³

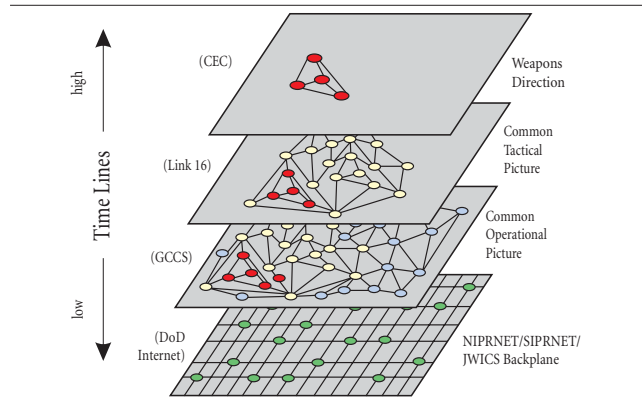
A network-centric future has implications for the Navy’s doctrine, organization, and relationship with the other services. In 1998, the Navy Warfare Development Command was stood up as an institutional champion for innovation. It was specifically tasked to develop new concepts of operations and new doctrine. In addition to NCO, it is developing operational concepts for Sea Strike, Sea Shield, and Sea Basing. Also in development are a range of supporting and functional

concepts for informational operations, homeland defense, theater air and missile defense, future naval fires, high-speed lift, and the Littoral Combat Ship. Whether the impact of these new operational concepts and doctrine will be transformational remains to be seen. But the Navy will not transform without them.

In addition to the establishment of the Navy Warfare Development Command, there have been a number of other organizational initiatives.

Under Admiral Clark, NWDC itself has been subordinated to the Commander, U.S. Fleet Forces Command (CFFC), Sea Trial’s designated lead agent, to coordinate experimentation programs. To facilitate integrated platform and network planning, the Navy Staff’s N6 and N7 codes have been merged under a new Deputy Chief of Naval Operations for Warfare Requirements and Programs, who was designated the director of ForceNet. Information operations have been added to the list of major warfare areas, and the Naval Network Warfare Command has been established to coordinate information technology and information operations activities.⁹⁴ None of these initiatives, however, yet poses a serious challenge to the dominance of the Navy’s platform-centric baronies.

FIGURE 3
THE INFORMATION GRID: DETAILED VIEW



Source: Jim Eagle's Web Page, Operations Department, Naval Postgraduate School, Monterey, California, spica.or.nps.navy.mil/netusw/CebrowskiNetWar/sld005.htm.

The shift to a network-centric force could have profound implications for the Navy's relationship with its sister services. ForceNet and its NCW/NCO foundation assume a high level of jointness and interoperability. The language of jointness and interoperability actually suffuses all of Sea Power 21. Sea Strike's operational capabilities are to be employed in joint campaigns; Sea Shield is to provide protection for the joint force; and Sea Basing is to support joint operations. The promise of jointness has serious implications for the implementation of ForceNet. If jointness is to be taken seriously and the advantages of connectivity and integration are to be exploited fully, all of the military's offensive and defensive capabilities, not just the Navy's, must be networked. A common operational picture, for instance, is not really common unless it is shared by the Air Force and the Army as well as by the Navy and the Marine Corps. The difficulties of ensuring a common operational picture should not be underestimated, however. How is it to be achieved? Should the services pursue separate but coordinated capabilities? If so, can they be confident that the resulting systems will mesh to form an integrated system of systems with the seamless connectivity required for a joint COP? Or should the approach be joint from the start, with system acquisition assumed by the Joint Staff or Joint Forces Command and the services required to tailor their new platforms to joint NCW requirements? There is an undeniable logic to the joint acquisition of joint capabilities. That logic is particularly compelling in the case of the network capabilities that are at the heart of the sought-after transformation. The jointness required to realize fully NCW's potential may be profoundly transformational. A truly joint Navy would be a transformed Navy. But that does not appear to be the transformation the Navy has in mind.

IS THE LACK OF TRANSFORMATION A PROBLEM?

Thus far, what passes for transformation within the Navy is less revolutionary than official rhetoric suggests. Even under a best-case scenario—where most if not all of the Navy embraces current transformation initiatives, the resources necessary to implement transformation are readily available, and the technological challenges inherent in developing new capabilities are met—it is difficult to avoid concluding that the Navy after next will be a modernized version of the existing fleet. It is possible that over time the accumulation of small-bore changes will yield a force that deserves to be characterized as transformed. However, the prospects for discontinuous, disruptive change appear slim.

Programs billed as transformational will add important capabilities to the Navy. The Navy's abilities to collect and share information, sustain operations, operate in a more stealthy fashion, and directly contribute to the defense of the American homeland will improve. But these capabilities are unlikely to provide the virtual "lockout" of competitor options envisioned by proponents of

transformation. Nor will they prevent adversaries from devising asymmetric strategies for countering U.S. naval power. But they may further ongoing changes in the organization of the Navy, its culture, and perhaps even the nature of the officers and enlisted men and women serving their country.

Is the lack of real transformation a problem?⁹⁵ Not especially. In our view, no compelling strategic rationale for transformation has yet been articulated. Transformation that equates to a revolution in military affairs is not required for the maintenance and extension of either U.S. military dominance specifically or American primacy generally. Nor is it a requirement for fighting and winning the global war on terror. Generic capabilities designed to meet generic threats (as in capabilities-based planning) or old threats pumped up for a new millennium (as in threat-based planning against a North Korean foe) in the service of force protection will suffice in the absence of a clear and present danger on the order of that posed by the former Soviet Union.

According to the NTR, the objective of naval transformation is “to achieve a broad, sustained and decisive military competitive advantage over existing or potential adversaries.”⁹⁶ The Navy, however, already possesses that competitive advantage. It is the world’s preeminent naval force. It already exercises virtually unchallenged command of the seas and possesses unrivaled power projection capabilities. There is nobody in the rear-view mirror. At worst, the Navy will face asymmetric challenges in the littoral and perhaps the emergence of a regional competitor, such as China. While these are difficult challenges, there seems little reason to think that they constitute a “competitive challenge” to the dominance of the U.S. Navy. That preserving and extending its preeminence requires “substantially extending boundaries of necessary military competencies and . . . discovering fundamentally new approaches to military operations”⁹⁷ remains to be demonstrated. What future challengers require that the Navy embrace fundamentally new approaches that challenge it to reinvent itself?

The Navy that will gradually emerge from the naval transformation enterprise will be well suited to carry out the roles and missions implied by the evolving U.S. grand strategy initiated by the Clinton administration and more fully, and bluntly, articulated by its successor. The Navy will be better equipped to strike terrorists and rogue states posing either conventional or WMD threats to the American homeland, installations abroad, or allies. It will contribute to both active and passive defense against ballistic missile threats. And it will operate more jointly than in the past and with a high level of connectivity.

Civilian officials in the Department of Defense intent on transformation may indeed feel that attempting to change the Navy (and the rest of the military) is like punching a pillow. But the Navy’s modernization-plus approach is likely to provide the nation with the capabilities required for the future.

NOTES

1. Epigraph as quoted in Richard H. Kohn, "The Erosion of Civilian Control of the Military in the United States Today," *Naval War College Review* 55, no. 3 (Summer 2002), p. 20.
2. Paul Bracken, "The Military after Next," *Washington Quarterly* 16, no. 4 (Autumn 1993), pp. 157–74.
3. Navy Warfare Development Command [hereafter NWDC], *Network Centric Operations: A Capstone Concept for Naval Operations in the Information Age* (Newport, R.I.: NWDC, draft dated 19 June 2001), p. 1.
4. We write not as transformation advocates but as analysts of the transformation phenomenon.
5. *Joint Vision 2020* is available at www.dtic.mil/jv2020/.
6. For the Army's Vision and Army Transformation, go to www.army.mil/armyvision. For a useful overview of Army transformation issues see Edward F. Bruner, *Army Transformation and Modernization: Overview and Issues for Congress*, RS20787 (Washington, D.C.: Congressional Research Service, Library of Congress [hereafter CRS], 4 April 2001).
7. The U.S. Air Force *Vision 2020* can be found at www.af.mil/vision/.
8. From *The Aerospace Force: Defending America in the 21st Century*, p. iii, at www.af.mil/lib/taf.pdf. An overview of Air Force transformation issues is provided by Christopher Bolkom, *Air Force Transformation and Modernization: Overview and Issues for Congress*, RS20787 (Washington, D.C.: CRS, 1 June 2001).
9. James L. Jones [Gen., USMC], *Marine Corps Strategy 21* (Washington, D.C.: Dept. of the Navy, Headquarters U.S. Marine Corps, 3 November 2000), available at [www.usmc.mil/template1.nsf/25241abb036b230852569c4004eff0e/\\$FILE/strategy.pdf](http://www.usmc.mil/template1.nsf/25241abb036b230852569c4004eff0e/$FILE/strategy.pdf). See also *Expeditionary Maneuver Warfare: Marine Corps Capstone Concept* (Washington, D.C.: Dept. of the Navy, Headquarters Marine Corps, 10 November 2001), available at 192.156.19.109/emw.pdf.
10. Governor George W. Bush, "A Period of Consequences," address delivered at The Citadel, South Carolina, 23 September 1999.
11. "Excerpts from Bush's Remarks on the Military," *New York Times*, 14 February 2001, p. A26. Also available at www.whitehouse.gov/news/releases/print/20010213-1.html.
12. Thomas E. Ricks, "Pentagon Study May Bring Big Shake-Up: Unconventional Defense Thinker Conducting Review," *Washington Post*, 9 February 2001.
13. See William M. Arkin, "Rumsfeld Top-to-Bottom Review Evolves," *Defense Daily*, 16 April 2001.
14. *Quadrennial Defense Review* [hereafter QDR] Report (Washington, D.C.: Dept. of Defense, 30 September 2001), p. iv.
15. *Ibid.*, p. 16.
16. *Ibid.*, p. iv. Emphasis added. In DoD's 2002 *Annual Report to the President and the Congress*, it is explicitly the attacks of 11 September 2001 that lend urgency to transformation. Donald H. Rumsfeld, *Annual Report to the President and the Congress* (Washington, D.C.: Dept. of Defense, 2002), p. 1. On page 67 of the *Annual Report*, at the outset of chapter 6, "Transforming the Force," it is argued that "September 11 made manifest the danger of postponing preparations for the future. We must prepare now to anticipate future surprises and mitigate their effects." Available at www.defenselink.mil/execsec/adr2002/index.htm.
17. *QDR Report*, pp. 30–47.
18. He added (unhelpfully, in our view) that "we are the better for it." E. C. "Pete" Aldridge, Jr. [Under Secretary of Defense (AT&L)], "Technology and National Defense," address to Darpa Tech, 30 July 1992, available at www.acq.osd.mil/usd/new_speeches/peo.doc.
19. On the dimensions of transformation, see Andrew F. Krepinevich, "Calvary to Computer: The Pattern of Military Revolutions," *National Interest*, no. 37 (Fall 1994), pp. 30–42.
20. *QDR Report*, p. 29. Emphasis added.
21. Rumsfeld, *Annual Report*, p. 68.
22. See Donald H. Rumsfeld, "Transforming the Military," *Foreign Affairs* 81, no. 3 (May/June 2002), pp. 20–32.
23. According to Deputy Secretary Paul Wolfowitz, "Our overall goal is to encourage

- a series of transformations that, in combination, can produce a revolutionary increase in our military capability and redefine how war is fought.” Paul Wolfowitz, “Prepared Statement for the Senate Armed Services Committee Hearing on Military Transformation,” 9 April 2002, available at *DefenseLink*, www.defenselink.mil/speeches/2002/s20020409-depsecdef2.html.
24. As Under Secretary Aldridge put it, “resources are finite and if we can do better, we will not hesitate to bypass a good program today in favor of a profoundly transformational one tomorrow.” Aldridge, “Technology and National Defense.”
 25. On the importance of the RMA for military transformation see Robert Tones and Peter Dombrowski, “Arguments for a Renewed RMA Debate,” *National Security Studies Quarterly* 7, no. 3 (Summer 2001), pp. 109–22. For the reference to culture and behavior, *QDR Report*, pp. 6, 29. On the distinction between sustaining and disruptive innovation, see Clayton M. Christensen, *The Innovator’s Dilemma* (New York: HarperBusiness, 2000).
 26. The Bush administration’s commitment to transformation may even exceed that exhibited by the military itself. See, for instance, Donald Rumsfeld, remarks as delivered at the National Defense University, Fort McNair, Washington, D.C., 31 January 2002, available at *DefenseLink*, www.defenselink.mil/speeches/2002/s20020131-secdef.html; “Transforming the Military”; and “A Choice to Transform the Military,” *Washington Post*, 16 May 2002, p. 25. See also Wolfowitz, “Prepared Statement for the Senate Armed Services Committee Hearing on Military Transformation.”
 27. *The National Security Strategy of the United States of America* (Washington, D.C.: White House, September 2002), pp. 29–31. Specifically called for is the development of “assets such as advanced remote sensing, long-range precision strike capabilities, and transformed maneuver and expeditionary forces” (pp. 29–30).
 28. National Defense Panel, *Transforming Defense: National Security in the 21st Century*, December 1997, p. iv, available at *Federation of American Scientists*, www.fas.org/man/docs/ndp/toc.htm. On the Clinton administration’s “balanced” approach to transformation, see William S. Cohen, *Report of the Quadrennial Defense Review* (Washington, D.C.: Dept. of Defense, May 1997).
 29. Vernon Clark [Adm., USN], “Sea Power 21: Operational Concepts for a New Era,” remarks delivered at the Current Strategy Forum, Naval War College, Newport, R.I., 12 June 2002.
 30. On this reorientation see Jan S. Breemer, “The End of Naval Strategy: Revolutionary Change and the Future of American Naval Power,” *Strategic Review* 22, no. 2 (Spring 1994), pp. 40–53; and Edward Rhodes, “‘From the Sea’ and Back Again: Naval Power in the Second American Century,” *Naval War College Review* 52, no. 2 (Spring 1999), pp. 13–54.
 31. See Arthur K. Cebrowski [Vice Adm., USN] and John J. Garstka, “Network-centric Warfare: Its Origin and Future,” U.S. Naval Institute *Proceedings* (January 1998), pp. 28–35. On NCW see also David S. Alberts, John J. Garstka, and Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority*, 2d ed. (Washington, D.C.: C4ISR Cooperative Research Program, 1999); Committee on Network-Centric Naval Forces, Naval Studies Board, *Network-centric Naval Forces: A Transition Strategy for Enhancing Operational Capabilities* (Washington, D.C.: National Academy Press, 2000); and Edward P. Smith, “Network-centric Warfare: What’s the Point?” *Naval War College Review* 54, no. 1 (Winter 2001), pp. 59–75. Admiral Clark was not the first CNO to embrace transformation and network-centric warfare. In his preface to the April 2000 *Navy Planning Guidance*, then Chief of Naval Operations Adm. Jay L. Johnson wrote of building “a Navy for the Information Age” and its “transformation to a network-centric and knowledge-superior force.” Chief of Naval Operations, *Navy Planning Guidance: With Long Range Planning Objectives* (Washington, D.C.: Dept. of the Navy, April 2000), p. 1. Similarly, the Vice Chief of Naval Operations declared, “We are moving away from a platform-centered Navy to one being built around data networks. . . . [O]ur concept of operations will use as its basis an integrated, common network.” William J. Fallon, “Fighting to Win in the Littoral and Beyond,”

- Armed Forces Journal International* (June 2001), pp. 67–68. Dennis McGinn (then a vice admiral) asserted that “investment in networks and sensors is transformational.” Quoted in Robert Holzer, “U.S. Navy Mulls Fundamental Shift in Tactics, Funds,” *Defense News*, 7 May 2001, p. 1.
32. Vern Clark [Adm., USN], “Sea Power 21: Projecting Decisive Joint Capabilities,” U.S. Naval Institute *Proceedings*, October 2002, p. 33.
 33. The account of network-centric warfare provided here draws upon Peter J. Dombrowski, Eugene Gholz, and Andrew L. Ross, *Military Transformation and the Defense Industry after Next: The Defense-Industrial Implications of Network-Centric Warfare* (Newport, R.I.: Strategic Research Department, Center for Naval Warfare Studies, U.S. Naval War College, September 2002).
 34. For serious treatments of the forces at work see Daniel Bell, *The Coming of Post-Industrial Society: A Venture in Social Forecasting* (New York: Basic Books, 1999), and Manuel Castells, *The Rise of the Network Society*, 2d ed. (Oxford: Blackwell, 2000). For popular treatments, see Thomas L. Friedman, *The Lexus and the Olive Tree: Understanding Globalization* (New York: Farrar, Straus, and Giroux, 1999), and James Gleick, *Faster: The Acceleration of Just About Everything* (New York: Pantheon, 1999). Works that have received far more attention in military circles than they deserve include Kevin Kelly, *New Rules for the New Economy: 10 Radical Strategies for a Connected World* (New York: Viking, 1998); Alvin Toffler, *The Third Wave* (New York: William Morrow, 1980); Alvin Toffler, *Powershift: Knowledge, Wealth, and Violence at the Edge of the 21st Century* (New York: Bantam Books, 1990); and Alvin Toffler and Heidi Toffler, *Creating a New Civilization: The Politics of the Third Wave* (Atlanta: Turner, 1995).
 35. See John Arquilla and David Ronfeldt, eds., *In Athena’s Camp: Preparing for Conflict in the Information Age* (Santa Monica, Calif.: RAND, 1997); Eliot A. Cohen, “A Revolution in Warfare,” *Foreign Affairs* 75, no. 2 (March/April, 1996), pp. 37–54; Victor A. DeMarines, with David Lehman and John Quilty, “Exploiting the Internet Revolution,” in *Keeping the Edge: Managing Defense for the Future*, ed. Ashton B. Carter and John P. White (Cambridge, Mass., and Stanford, Calif.: Preventive Defense Project, 2000), pp. 61–102; Joseph S. Nye, Jr., and William A. Owens, “America’s Information Edge,” *Foreign Affairs* 75, no. 2 (March/April 1996), pp. 20–36; and Bill Owens, with Ed Offley, *Lifting the Fog of War* (New York: Farrar, Straus and Giroux, 2000). For a more popular account see Alvin Toffler and Heidi Toffler, *War and Anti-War: Making Sense of Today’s Global Chaos* (New York: Warner, 1993).
 36. See, for example, Cebrowski and Garstka, “Network-Centric Warfare,” and Alberts, Garstka, and Stein, *Network Centric Warfare*, esp. pp. 15–23. A useful discussion of NCW/NCO is provided by Scott C. Truver, “Tomorrow’s U.S. Fleet,” U.S. Naval Institute *Proceedings* (March 2001), pp. 102–10. For a comparison of U.S. and Swedish versions of NCW see Nick Cook, “Network-centric Warfare: The New Face of C4I,” *Interavia* (February 2001), pp. 37–39. Cautionary notes are provided by Thomas P. M. Barnett, “The Seven Deadly Sins of Network-centric Warfare,” U.S. Naval Institute *Proceedings* (January 1999), pp. 36–39; Richard J. Harknett and the JCIS Study Group, “The Risks of a Networked Military,” *Orbis* 44, no. 1 (Winter 2000), pp. 127–43; Milan Vego, “Net-centric Is Not Decisive,” U.S. Naval Institute *Proceedings* (January 2003), pp. 52–57; and Franklin Spinney, “What Revolution in Military Affairs?” *Defense Week*, 23 April 2001.
 37. Not all nodes, of course, are created equal. Some are more complex and, therefore, more expensive than others. The point is that networked nodes should be simpler and lower in cost than stand-alone nodes.
 38. There is no real consensus among its proponents about precisely what NCW is or entails. Its proponents charitably view NCW as a dynamic, living, evolving concept. Skeptics are more inclined to characterize NCW as a moving target, riddled with ambiguities and informed by dubious analogies. In a definition attributed to John Garstka, NCW is “warfare which harnesses information technologies in the form of global sensor, connectivity, and engagement grids to achieve a common operational picture that will lead to self-synchronization, massed effects, and the desired lock-out of a given enemy’s courses of action.” See Robert Odell, Bruce Wald, Lyntis

- Beard, with Jack Batzler and Michael Loescher, *Taking Forward the Navy's Network-Centric Warfare Concept: Final Report*, CRM 99-42.10 (Alexandria, Va.: Center for Naval Analyses, May 1999), p. 11. The Naval Studies Board's Committee on Network-centric Naval Forces defined network-centric operations as "military operations that exploit state-of-the-art information and networking technology to integrate widely dispersed human decision makers, situational and targeting sensors, and forces and weapons into a highly adaptive, comprehensive system to achieve unprecedented mission effectiveness." Committee on Network-centric Naval Forces, Naval Studies Board, *Network-Centric Naval Forces*, p. 12. NWDC has described NCO as "deriving power from the rapid and robust networking of well-informed, geographically dispersed war fighters. They create overpowering tempo and a precise, agile style of maneuver warfare." NWDC, *Network Centric Operations*.
39. NWDC, *Network Centric Operations*.
 40. On information and knowledge advantage see www.nwdc.navy.mil/Concepts/IKA.asp. On effects-based operations see www.nwdc.navy.mil/Concepts/EBO.asp.
 41. Quoted in Truver, "Tomorrow's U.S. Fleet," p. 103.
 42. For "rule set," NWDC, *Network Centric Operations*, p. 9.
 43. *Ibid.*, p. 11.
 44. *Ibid.*, p. 10.
 45. The joint aspects of NCW are highlighted in John J. Garstka, "Network Centric Warfare: An Overview of Emerging Theory," available at www.mors.org/Pubs/phalanx/dec00/feature.htm; John G. Roos, "An All-Encompassing Grid," *Armed Forces Journal International* (January 2001), pp. 26–35; Hunter Keeter, "Cebrowski: Joint Philosophy Fosters Network Centric Warfare," *Defense Daily*, 12 April 2002, p. 8; and Fred P. Stein, "Observations on the Emergence of Network Centric Warfare," available at www.dodccrp.org/steinncw.htm and as "Information Paper: Observations on the Emergence of Network-Centric Warfare" at www.dtic.mil/jcs/j6/education/warfare.html.
 46. NWDC, *Network Centric Operations*, p. 10.
 47. *Ibid.*, pp. 4–5.
 48. On swarming, see Joseph E. Skinner [Cdr., USN], "Swarm the Littorals," U.S. Naval Institute *Proceedings* (March 2001), pp. 88–91.
 49. Clark, "Sea Power 21: Projecting Decisive Joint Capabilities," pp. 33, 37. Alternative visions of naval transformation are provided by Robert O. Work [Col., USMC (Ret.)], *The Challenge of Maritime Transformation: Is Bigger Better?* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 2002); and Andrew F. Krepinevich, Jr., *A New Navy for a New Era* (Washington, D.C.: Center for Strategic and Budgetary Assessments, May 1996).
 50. Clark, "Sea Power 21: Projecting Decisive Joint Capabilities," p. 41.
 51. Particularly information technologies and systems integration capabilities.
 52. Clark, "Sea Power 21: Projecting Decisive Joint Capabilities," p. 41.
 53. *Naval Transformation Roadmap: Power and Access . . . from the Sea* (Washington, D.C.: Dept. of the Navy, 2002).
 54. See, particularly, Clark, "Sea Power 21: Operational Concepts for a New Era," and "Sea Power 21: Projecting Decisive Joint Capabilities"; Mike Bucchi [Vice Adm., USN], and Mike Mullen [Vice Adm., USN], "Sea Shield: Projecting Global Defensive Assurance," U.S. Naval Institute *Proceedings* (November 2002), pp. 56–59; Cutler Dawson [Vice Adm., USN] and John Nathman [Vice Adm., USN], "Sea Strike: Projecting Persistent, Responsive, and Precise Power," U.S. Naval Institute *Proceedings* (December 2002), pp. 54–58; Charles W. Moore, Jr. [Vice Adm., USN] and Edward Hanlon, Jr. [Lt. Gen., USMC], "Sea Basing: Operational Independence for a New Century," U.S. Naval Institute *Proceedings* (January 2003), pp. 80–85; Richard W. Mayo [Vice Adm., USN], and John Nathman [Vice Adm., USN], "ForceNet: Turning Information into Power," U.S. Naval Institute *Proceedings* (February 2003), pp. 42–46.
 55. During the first phase, 2002–2004, the focus will be on improving networks, sensors, people, and weapons, with networks and sensors the highest priorities. People and infrastructure will be accorded highest priority during the second stage, 2004–2010, and platform

- and infrastructure improvements are to be added to the agenda. Platform and infrastructure improvements join the list of high priority efforts during the third stage, 2010–2020. See Gopal Ratnam, “New Office to Drive U.S. Navy Transformation,” *Defense News*, 8–14 April 2002, p. 6.
56. Clark, “Sea Power 21: Operational Concepts for a New Era.”
 57. Some commentators have even suggested that the version of transformation advanced in Sea Power 21 amounts to little more than employing “sea” as an adjective in a series of bumper stickers.
 58. John Keegan, *The Mask of Command* (New York: Viking, 1987).
 59. “A permanent Mediterranean squadron was established in 1815 to keep the Barbary pirates in check.” Walter Russell Mead, *Special Providence: American Foreign Policy and How It Changed the World* (New York: Knopf, 2001), p. 26.
 60. See Ronald O’Rourke, *Navy Network-centric Warfare Concept: Key Programs and Issues for Congress*, RS20557 (Washington, D.C.: CRS, 6 June 2001).
 61. See Peter J. Dombrowski, Eugene Gholz, and Andrew L. Ross, “Selling Transformation: The Defense Industrial Sources of Sustaining and Disruptive Innovation,” *Orbis* 46, no. 3 (Summer 2002), pp. 523–36.
 62. Although in a technical sense DD-21 was canceled, it seems clear that much of the preparation for DD-21 has merged directly into the DD(X) program.
 63. It may be that even in a network-centric Navy spending on future programs will remain platform-centric. But the balance between spending on network-centric programs and platform-centric programs should shift in favor of the former more than it has thus far.
 64. Transformation does not require that all navy programs be revolutionary, discontinuous, and disruptive. But the Bush administration’s characterization of transformation suggests that the balance between routine, sustaining innovation and potentially discontinuous, disruptive innovation should shift in favor of the latter more than it has thus far.
 65. *QDR Report*, p. v; and Rumsfeld, *Annual Report*, p. 22.
 66. *QDR Report*, p. 10.
 67. *QDR Report*, p. 16. Also, on pp. 47–48: “This transformation will be conducted in a timely but prudent manner. In particular, prudence dictates that those legacy forces critical to DoD’s ability to defeat current threats must be sustained as transformation occurs. . . . DoD must overcome trends of the past to sustain a balanced defense program that maintains near-term readiness without mortgaging the long-term capabilities of the force.”
 68. Dawson and Nathman, “Sea Strike,” p. 56.
 69. Charles Hamilton [Rear Adm., USN] and Donald Loren [Rear Adm., USN], “It’s All in the Family,” U.S. Naval Institute *Proceedings* (August 2002), pp. 68–70.
 70. However, recent designs for the Littoral Combat Ship look less like the “Street-fighters” (which were to have fought in “swarms”) proposed by Vice Admiral Cebrowski than like modern frigates.
 71. Henry C. Mustin [Vice Adm., USN (Ret.)] and Douglas J. Katz [Vice Adm., USN (Ret.)], “All Ahead Flank for LCS,” U.S. Naval Institute *Proceedings* (February 2003), p. 32.
 72. All data from David Brown, “Battle Bots,” *Navy Times*, 3 February 2003, pp. 14–16.
 73. Author interview, June 2002.
 74. Christopher J. Castelli and Jason Ma, “In Reversal, Navy Praises Fire Scout UAV, May Buy Improved Versions,” *Inside Defense.com*, 20 January 2003.
 75. Jefferson Morris, “UAVs Prove Value to Submarines in ‘Giant Shadow’ Experiment, Captain Says,” *Aerospace Daily*, 30 January 2003.
 76. Ibid.
 77. Vernon Clark [Adm., USN], “Remarks,” 2002 Naval-Industry R&D Partnership Conference, Washington, D.C., 15 August 2002, available at www.chinfor.navy.mil/navpalib/cno/speeches/clark-rdpc02.txt.
 78. On the role of the Navy, see Rodney P. Rempt [Rear Adm., USN], “Using the Oceans for Missile Defense,” address, 8 January 2002, available at www.nwc.navy.mil/pres/speeches/rotary.htm#top.

79. We are indebted to our colleague Timothy Somes for this insight.
80. For a useful historical perspective, see Joseph F. Bouchard, "Guarding the Cold War Ram- parts: The U.S. Navy's Role in Continental Air Defense," *Naval War College Review* 52, no. 3 (Summer 1999), pp. 111–35.
81. Christopher J. Castelli, "DOD Panel Mulls Seabasing Ideas, including Mobile Offshore Bases," *Inside the Navy*, 18 November 2002. On the mounting opposition to MOBs, see Pat Towell, "'Mobile Offshore Base' Proposal Has Slew of Powerful Opponents," *Congres- sional Quarterly Weekly* (15 February 2003), p. 382.
82. Christopher J. Castelli, "Navy Envisions MPF(F) Multimission Sea Bases for DJC2 and Special Ops," *Inside the Navy*, 17 June 2002.
83. *Naval Transformation Roadmap: Power and Access . . . from the Sea* (Washington, D.C.: Dept. of the Navy, 2002), p. 5. ForceNet was rendered as "FORCEnet" in the NTR. For useful reportage on ForceNet see Gopal Ratnam, "New Office to Drive U.S. Navy Transformation," *Defense News*, 8–14 April 2002, p. 6; and Gail Kaufman and Gopal Ratnam, "U.S. Navy Releases Broad Transfor- mation Outline," *Defense News*, 15–21 April 2002, p. 8.
84. "We have been talking about network-centric warfare for a decade, and ForceNet will be the Navy's plan to make it an operational real- ity." Clark, "Sea Power 21: Projecting Deci- sive Joint Capabilities," p. 34. As Mayo and Nathman, "ForceNet," put it, "ForceNet im- plements the theory of network-centric war- fare" (p. 43).
85. With promises of "sensor-to-shooter closure . . . measured in seconds, instead of hours or minutes." Dawson and Nathman, "Sea Strike," p. 54.
86. With its "single integrated air picture." Bucchi and Mullen, "Sea Shield," p. 57.
87. Which is to ensure "battlespace dominance on, above, and below the sea," and access to the littorals. *Ibid.*, p. 58.
88. Which requires "expanded sensor coverage," "increased situational awareness by networking," and "sharing information with other services and agencies." *Ibid.*, p. 59.
89. Which are to enable the joint force to main- tain operational autonomy and exploit the maneuver space of the sea. Moore and Hanlon, "Sea Basing."
90. *Ibid.*, p. 6.
91. Background on CEC, IT-21, and NMCI is provided in Ronald O'Rourke, *Navy Network- Centric Warfare Concept*. On IT-21 see J. Cutler Dawson, Jr., James M. Fordice, and Gregory M. Harris, "The IT-21 Advantage," U.S. Naval Institute *Proceedings* (December 1999), pp. 28–32. For Admiral Clark, Chief of Naval Operations, the NMCI is "the gateway to transformation." See Dept. of the Navy, *Electronic Business Strategic Plan 2001–2002*, available at [www.ec.navsop.navy.mil_eb/ strategic_plan_toc.asp](http://www.ec.navsop.navy.mil_eb/strategic_plan_toc.asp).
92. NWDC, *Expeditionary Sensor Grid*, undated brief, p. 4. See also Robert Holzer, "Massive Sensor Grid May Reshape U.S. Navy Tactics," *Defense News*, 14 May 2001, pp. 1, 4; and Catherine MacRae, "Services, DARPA Doing Early Research on 'Expeditionary Sensor Grid,'" *Inside the Pentagon*, 21 June 2001.
93. NWDC, *The Expeditionary Sensor Grid: Gaining Real-Time Battlespace Awareness in Support of Information and Knowledge Advan- tage*, post-workshop draft, 19 June 2001, p. 3.
94. Previously, there had been a Director of Space, Information Warfare, Command and Control (N6) and a DCNO, Warfare Require- ments and Programs (N7).
95. We do not here attempt to provide an expla- nation of why the Navy's transformation en- terprise falls short of the expectations created by the Bush defense team. That would require another article. In the meantime, see the fol- lowing insightful piece: Thomas G. Mahnken, "Transforming the U.S. Armed Forces: Rhet- oric or Reality?" *Naval War College Review* 54, no. 3 (Summer 2001), pp. 85–99.
96. *Naval Transformation Roadmap*, p. 6.
97. *Ibid.*