Chapter 20

The Navy and the New Strategic Environment

Bradd C. Hayes

It's hard to forecast, especially about the future.
—Casey Stengel

This chapter discusses major global trends that are altering the security environment and posits how those changes might affect the roles and missions of the services, specifically the Navy. It does not attempt to cover either the breadth or depth of the subjects dealt with elsewhere in this book; rather, it skims over some of the most significant trends in a variety of areas, including security, economics, technology, social affairs, and the physical environment. Of these, economics, technology, and social affairs are perhaps the most important.

As Francis Fukuyama has noted:

> There are two separate motors driving the historical process. The first is economic. What gives History its fundamental directionality and progressive character is modern natural science. . . . The progress of science and technology . . . creates a frontier of production possibilities and thus an economic order. . . . The second motor is what Hegel called the "struggle for recognition." Human beings desire not just material well-being; they seek recognition of their dignity and status on the part of other human beings, and this demand for recognition is the fundamental passion that underlies politics.[1]

Hence, a survey of historical trends affecting the military can be too narrow, but seldom too broad. This chapter deliberately raises more questions than it answers because the future is not linear and the ultimate effects of globalization have yet to be seen.

The fact of the matter is that "today's wave of technological change seems destined to transform life over the next 20 to 30 years."[2] It is inconceivable that such changes will not result in a new security paradigm. The new economy and the new security paradigm will prove to be linked more closely than the military and the economy have been at any time during the past 100 years; unfortunately, the links will not be overt. The reason is that military support for the new economy will be

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much different than it was in the past and will require a more subtle and holistic approach to security. This will inevitably provoke cries of "mission creep," and those cries will be wrong.

Security Environment Threats

The End of Major War?

After 50 years without a conflict pitting great powers against each other, speculation is rising that we have seen the end of major wars. Because no one can confidently predict that major war will never occur again, especially if, as some believe, we are doomed to repeat historical cycles, the U.S. military must continue to field a hedging force against such an eventuality.[3] Most analysts believe, however, that major war, although possible, is unlikely. Hans Binnendijk noted that the Cold War ended without global conflict "because nuclear weapons created too dangerous a prospect for major war."[4] Michael Mandelbaum defines major war as "a war fought by the most powerful members of the international system, drawing on all of their resources and using every weapon at their command, over a period of years, leading to an outcome with revolutionary geopolitical consequences including the birth and death of regimes, the redrawing of borders and the reordering of the hierarchy of sovereign states."[5] Donald Kagan agrees with Binnendijk that "the deterrent offered by nuclear war works toward" making major war obsolete "and that the growth of trade, democracy and economic interdependence assists that prospect." But he accompanies this observation with a warning that "peace in the future depend[s] on the decisions and the actions taken by people and these, as always, provide no guarantee against war—even 'major' war as Michael Mandelbaum has defined it."[6]

How Great a Hedge?

Since the consequences of major war are so catastrophic, fielding a hedging force against its eventuality is the sine qua non of defense policy. The question is, How large a force is necessary, and what else should it be able to accomplish? If the likelihood of using such a force is truly minimal, how much are U.S. taxpayers willing to spend for such an insurance policy? Probably less than the current 3 percent of gross domestic product (GDP) that is spent on defense. The answer to this conundrum would appear to be the fielding of a dual-purpose force that serves as a hedge against major war and at the same time is capable of responding to lesser crises. Thomas Barnett argues, however, that these missions are so different that trying to field a force for both has created a military schizophrenia that is good for neither the military nor the Nation.[7] He argues that the Navy should return to its roots as a guarantor of U.S. commercial interests, helping ensure that goods and services can freely move around the globe through the mediums of sea, space, and cyberspace. With the notable exception of strategic nuclear submarines, Barnett would leave the care and feeding of the hedging force to the Army and the Air Force.[8]

Sorting Out the Threats

Ashton Carter offered a typology for thinking about America's security threats, placing them on an A-, B-, or C-List (figure 1).[9] Although Carter's typology is theoretically sound, he recommends that the active military assume some challenges better assigned to the National Guard or law enforcement agencies. The A-List (military) challenges presented by Russia and China are subject to continuing scrutiny by the military, but Carter recommends adapting a "preventive defense" strategy that requires "defense by other means." By this he means engaging in activities other than preparing for and fighting America's wars. "Preventive-defence measures range from policies to influence the strategic direction of the Russian and Chinese militaries, to initiatives such as the Nunn-Lugar programme to prevent Russian 'loose nukes,' and intelligence innovations to detect transnational 'catastrophic terrorism.'"[10] While some of these "other means" are critical, if they fail and traditional military missions have been ignored, the country truly will be in peril. Carter rightfully points out that in the absence of a peer competitor, today's military is building its force structure to meet B-List challenges. He fails, however, to note why such a force, if it continues to modernize, will be unable to meet any rising Chinese or Russian challenge. He also fails to explain how these countries are going to achieve superpower status when the United States continues to outspend them at an astonishing rate. Having said that, his typology is nonetheless useful for thinking about which challenges the military must prepare for.

Figure 1: Typology of Threats

A-List	*B-List*	*C-List*
Potential future problems that could threaten U.S. survival, way of life and position in the world; possibly preventable	Actual threats to vital U.S. interests; deterrable through ready forces	Important problems that do not threaten vital U.S. interests
• "Weimar Russia" • Loose nuclear, chemical, biological weapons • A rising China that spawns hostility • Proliferation of weapons of mass destruction • Catastrophic terrorism	• Major Theater War in Northeast Asia • Major Theater War in Southwest Asia	• Kosovo • Bosnia • East Timor • Rwanda • Somalia • Haiti • …

Source: Adapted from Ashton B. Carter and William J. Perry, *Preventive Defense: A New Security Strategy for America* (Washington, DC: The Brookings Institution Press, 1999)

A-List: Missions Other Than War

Many of Carter's A-List missions are not lesser included cases of preparing for a major war, which means that hedging forces are not suited to accomplish them. Carter would divert funding and attention from the hedging force to preventive ac-

tivities for which hedging force infrastructure is ill suited. Although some of his "defense by other means" activities could play a significant noncombat role in B- and C-List missions, for the most part, traditional military forces are going to be required to respond to them. Although most discussions surrounding the proliferation of weapons of mass destruction have centered recently on chemical and biological weapons ("poor men's nukes"), *The Economist* asserts that "the chances of a smaller nuclear exchange may have already increased, or be about to. There are three factors which govern the chances of nuclear war: the number of nuclear powers; the likelihood that one of those powers will reach a point where it sees the use of nuclear weapons as its best option; and the possibility of mistakes. Together they make nuclear war seem quite possible, even likely, in the next half century."[11] This assertion was supported by the Naval War College South Asia Proliferation Project, which ran a series of decision events looking at the possibilities for and consequences of a nuclear exchange between India and Pakistan.[12] The problem is that the U.S. strategic nuclear force is not a credible deterrent against such exchanges.

B- and C-List Missions Remaining the Norm

Some pundits have argued that "superpowers do not do windows." Chester Crocker counters that "the United States cannot disavow all strategic responsibility and expect to remain a great nation, a nation that will lead and be accepted by others as a leader."[13] On occasion, he says, the U.S. military must "volunteer to walk between dogs and lamp posts." He goes on to say, "The way we Americans are thinking about war these days is deeply disturbing. We seem to believe that we can prepare for the wars that we want to fight while remaining ill-equipped for, and uninterested in, the kinds of challenges we will most likely face."[14] Bernard Trainor agrees with Crocker: "There is a tendency on the part of the Pentagon to wish all of this (that is, C-List missions) would go away and say that 'We just do classical wars' and that the purpose of the military is to fight the Nation's wars. Well, that's very nice, but they're liable to find themselves as hangar queens in the future, in that classical war on the horizon doesn't seem to be very likely, but these dirty little messy things, like Bosnia, seem to be a constant."[15] If Crocker and Trainor are correct, the implications for military roles, missions, organization, infrastructure, and training are significant.[16]

Implications of Carter's Threat Typology for the Navy

Dealing with Carter's A-List Threats

The military, including the Navy, must maintain a hedging force against the emergence of a belligerent peer competitor (China and Russia being the primary concerns), but head-on conflict is an unlikely eventuality. The hedging force should concentrate on applying appropriate force during conflicts on the periphery, since major ground operations either in China or Russia are remote. The exception, of course, is maintaining a credible nuclear deterrent force. For a number of reasons, the centerpiece of the Navy hedging force will remain the aircraft carrier battle group. First,

carriers, like other navy ships, are long-lived. The USS *Midway*, for example, was retired after 50 years of service. Second, although alternatives to manned aircraft are being developed, their capabilities will not be sufficiently robust to replace manned carrier-based aircraft before the next class of carrier is built. Hence, the United States will have carriers in its inventory for at least the next 70 years. Third, air superiority will remain an essential element of warfare, and manned aircraft will be required to achieve it well into this century and possibly into the next. Finally, the ability to linger offshore with a powerful air force will remain an important source of leverage during times of growing tensions.

The big question is, How many carriers are enough? The Navy rushed a half-dozen carriers into the fray during *Desert Storm*.[17] When the Department of Defense (DOD) developed its two major theater war requirement for force sizing, the Navy used this fact to back its claims that it needed a dozen carriers. That measurement, developed during the Clinton administration, will disappear and the Navy will be left looking for new arguments to sustain its force structure numbers. Those arguments will be difficult to find. During most Cold War crises, U.S. administrations were quick to ask, "Where are the carriers?" Today, they are more likely to ask, "Where are the Tomahawk shooters?" Twelve carriers may be the correct quantity for the future, but the Navy may not be able to afford that many if it is to meet its other surface combatant requirements. Fiscal constraints could drive the Navy, after much kicking and screaming, to retain between 8 and 10 carriers and a matching number of amphibious-readiness groups. This size of a force will require the Navy to be extremely creative in meeting its forward engagement missions.

Complementing the carrier's power projection capabilities, and integral to any future battle group, should be a surface combatant with a sea-based theater ballistic missile defense system. The Nation will be far better served developing a sea-based missile defense system than in pursuing the land-based continental system currently under consideration. Historically, the strategy of the United States has been to fight wars as far from its shores as possible. Sea-based missile defenses fit well into this traditional strategic paradigm, and they offer leverage that the United States could use to encourage coalition partners to join with it and stay the course. Thus, future carrier battle groups should include three types of capital ships: aircraft carriers, ballistic missile defense ships, and submarines. All three types offer unique capabilities, and each is a power projection platform. Unfortunately, they are all extremely expensive.

Depending upon the budgets, expensive ships could mean a smaller force. The irony is that the smaller the hedging force becomes, the more likely it is to be used belligerently—*if* that is the *only* force acquired by the Nation. No country with far-flung international interests has ever been able to protect them using garrisoned forces and a surge strategy. Nevertheless, the smaller the force, the more garrisoned it becomes, for the simple reason that there will not be enough resources to deploy effectively on a routine basis. For the Navy, a mixture of high- and low-end ships is needed to overcome this conundrum.

Increased attention should be given to intelligence collection and analysis aimed at thwarting proliferation and terrorism. Ehud Sprinzak asserts that

> the intelligence community should naturally assume the most significant role in any productive campaign to stop chemical and biological terrorism. However, new early warning CBW (chemical/biological weapons) indicators that focus on radical group behavior are urgently needed. Analysts should be able to reduce substantially the risk of a CBW attack if they monitor group radicalization as expressed in its rhetoric, extralegal operations, low-level violence, growing sense of collective paranoia, and early experimentation with chemical or biological substances. Proper CBW intelligence must be freed from the burden of proving criminal intent.[18]

The military, including the Navy, has a role in such a scheme, but the bulk of intelligence gathering and analysis is beyond the scope of the operating forces.

The proper role for the military is to respond as directed to terrorist acts and to punish terrorist groups and states that sponsor or permit terrorist organizations to operate within their borders. The military should be wary about accepting roles dealing with terrorism in domestic settings. Just as DOD has been given an extensive, if unwanted, role in the "war on drugs," there will be increased calls for it to get involved in the war on terrorism. Terrorist organizations such as the one run by Osama bin Laden, whose primary aim is to punish the United States for its decadence, will keep terrorism high on the political agenda.

Dealing with Carter's B-List Threats

Major theater war remains the likeliest setting for high-intensity conflict involving the deployment and buildup of significant U.S. forces. These conflicts will occur suddenly and require the military to deploy quickly and execute operations rapidly. Hence, the emphasis for the Navy should be on forward presence for its own forces and fast sea lift in support of other services' forces. Hedging forces will prove extremely useful during these conflicts and will justify taxpayer confidence in maintaining them. These conflicts will confront the Navy with asymmetrical challenges and the concomitant risks of operating in the littorals. Access to conflict zones will be the issue.

The Navy must continue to explore strategies to ensure that it can execute operations in the littoral. Access challenges can be handled in a number of ways. The best way is by adopting a strategy aimed at blinding an opponent. An enemy cannot hit what it cannot see. Unfortunately, this ideal is difficult, if not impossible, to achieve. Severely blurring an adversary's vision, however, is possible. Stealth is part of the answer, but its primary benefit is forcing an opponent to invest in large, powerful counterstealth systems (so large that they can be identified, located, and destroyed). Decoys and operational deception also play a role, as do size (the smaller the better) and speed. A debate rages within the Navy about the effectiveness of developing a new class of small, fast ships that could be built at less cost (therefore in greater numbers) and that are capable of operating in restricted access environments. Dubbed "streetfighters" for their ability to get in close and mix it up with the enemy, these ships would be highly dependent on a robust sea base (a so-called mother ship or mother fleet) or on nearby ports. They would be complemented by a new class of mini-sub designed for operations in the littoral. For autonomous operations, "marsupial battle groups," consisting of a mother ship (carrying a number of streetfighters

and mini-subs in a large well deck), and a couple of escort ships could prove extremely useful against most B- and C-List challenges. These concepts, however, exist only on paper, and they will stay that way until more detailed cost estimates and feasibility studies are available. Marsupial battle groups, if they are built, could help resolve the problem of numbers.

Numbers matter, and streetfighters could help get the Navy's numbers up. Without some kind of low-end ship, budget realities could drive the Navy to an overall fleet of 200 to 300 ships (probably closer to 200 than to 300). That level is too low to handle the number and range of missions the Navy *should* be tasked with. (I emphasize "should" because the United States needs to continue an active role in maintaining world stability and that means tackling a lot of C-List threats.) Streetfighters could be useful in satisfying many of the peacetime forward presence missions demanded of the Navy.

Figure 2. Economics and Security

1. The global energy market has the necessary resources . . .
2. But no stability, no market
3. No growth, no stability
4. No resources, no growth
5. No infrastructure, no resources
6. No money, no infrastructure
7. No rules, no money
8. No security, no rules
9. No Leviathan, no security
10. No U.S. military, no Leviathan—*so the military-market connection must be understood*

Dealing with Carter's C-List Threats

The U.S. military will continue to respond to these kinds of threats, although crisis fatigue or different policies could result in fewer responses in this decade than in the 1990s. Failure to respond often enough, however, will result in informed and influential people continuing to ask the same question as did Secretary of State Madeleine Albright: "What's the point of having this superb military that you're always talking about if we can't use it?"[19] Or, as former Assistant Secretary of State for Human Rights Patricia Derian, put it, "Wait a minute. If the soldiers don't want to fight, what are we paying them for?"[20] Forward presence will remain critical if the Navy and Marine Corps are to maintain their traditional roles as America's emergency response forces. The Department of the Navy's budget will likely be tied more closely to its capabilities to respond in this area than in any other. Hence, the probability that C-List missions will continue to engage the military should be viewed as good news for both the Navy and the Marine Corps.

For most people, the gut reaction to hearing that the United States is the world's police force is immediate and negative. Yet, in effect, that is exactly what is required to maintain future peace and prosperity. The investment required to meet C-List challenges is a bargain—especially since most of the world's problems, from the U.S. point of view, are virtual crises, in that the United States has the luxury of choosing the crises to which it will respond. The rationale for remaining the world's police force is best summed up in the attached decalogue developed by Thomas Barnett (figure 2). It is drawn from lessons learned during an economic security exercise that he conducted on

Wall Street that looked at Asia's energy future. Although the decalogue discusses energy markets, it holds true for the global economy as well. The bottom line, to borrow a cliché from Wall Street, is that the cumulative effect of unconstrained C-List crises is as problematic for U.S. interests as any threat on Carter's B-List.

National Security Strategy

Some critics continue to bemoan the fact that a U.S. grand strategy has not emerged since the end of the Cold War.[21] They are looking for what cannot be found. There is no grand strategy because there is no grand threat. Regional threats now dominate the security landscape, and with them should come a series of regional strategies. Hugh De Santis calls this approach "mutualism." He writes that "mutualism is an interest-based rather than a norm-centered concept of international cooperation. It emphasizes regional rather than global approaches to international cooperation, recognizes the continued importance of the nation-state, and is ipso facto a nonhegemonic approach to international security."[22] The logical result of such thinking is the establishment of a series of regional security relations, equivalent to NATO, but not formal alliances. Adopting this approach would require that the military spend more time and money than it now does on overcoming the challenges of coalition operations.

Toward Regional Strategies

De Santis is not alone in believing that regionalization will be the hallmark of the future. For several years, Robert Kaplan has been describing a new world in which regions (sometimes defined as "vast city-states") will be the main political organizations.[23] Such a development may seem counterintuitive to globalization, but it is not. Kaplan argues that geography will once again matter as regions, regardless of borders, will find that they have much in common and that working together can better promote their economic interests in the global marketplace than working through national capitals. Regionalization also complements another trend—urbanization.

As the trend for regionalization becomes more pronounced, the importance and influence of U.S. regional commanders in chief should also increase. Eventually, they may have a greater input into what kinds of forces and equipment they receive, as well as into how deploying forces are trained. Such a development will have a profound impact on the services.

Two aspects of the national security strategy, or the lack of one, will continue to affect the military. The first aspect is that over the course of the 1990s, "Force has become the preferred instrument of American statecraft."[24] Whether this trend proves irreversible remains an open question, but it does signal that the military will remain engaged in messy intervention situations. The second aspect is the regionalization of strategy. This trend naturally leads to regional security arrangements that offer transparency and cooperation as a path to peace. Because of its prominent geographical and political positions, the United States will likely seek to be a part of most, if not all, of these arrangements. This will have an enormous bearing on the required infra-

structure for both the Navy and the Marine Corps. Being a part of these arrangements means being deployed to areas where they will operate. How many ships one needs can be directly correlated to how many places one wants to be.

Implications of National Security Strategy for the Navy

The naval services should work more closely with regional combatant commands to develop regional strategies for the use and deployment of forces. Continued attempts to develop separate service strategies in hopes that unified commanders will adopt them will result in a mismatch between strategy and forces, and the political backlash will reduce the influence of the services. The Navy may end up floating three or four different kinds of fleets: so what? The Information Age brought with it a new economy, but less well understood is that it brought with it a new security paradigm as well. National security is no longer the private domain of the Departments of Defense and State. Neither the regional commanders nor the services have fully adjusted to this new reality.

As a result of this new security paradigm, regional unified commanders should go beyond examining their warfighting capabilities and develop a new approach to theater engagement. The Commander in Chief, U.S. Naval Forces, Europe (CNE), is developing a new cross-sector approach to engagement that has much to offer. During a period of decreasing force structure and constrained budgets, the CNE believes that it makes sense to preserve scarce resources through preventive actions. A truism accepted by everyone is that peace is cheaper than war—peace is also easier on personnel and equipment. Nevertheless, the military has concentrated its efforts on planning for crisis response and has woefully ignored how it might assist in crisis prevention. Past peacetime engagement activities have relied for the most part on military-to-military relationships, exercises, educational opportunities, and port calls. The last activity is good for bar owners and other ancient professions, but not much good for sustainable development or crisis prevention. The CNE staff asked, "What organizations are involved in sustainable development activities (that is, crisis prevention), and what can the military do to assist them?"

Sustainable development per se is not the military's business, but the military will continue to make port calls and country visits, so why not make the most of them? The CNE is realistic in what the military *can* do in this area (not much), but its new approach is an attempt to leverage mili-

Figure 3. Security and Economics

1. International security is based on a single global rule set (free markets)
2. No regional security, no single global rule set
3. No internal stability, no regional security
4. No increased consumption, no internal stability
5. No energy growth, no increased consumption
6. No infrastructure, no energy growth
7. No money, no infrastructure
8. No rules, no money
9. No reform, no rules
10. No economic downturn, no reform—*an Asian downturn puts at risk the single global rule set*

tary assets in order to get the most out of what little it *does* do. The CNE's approach is cost-effective, sensible, and well conceived. It also helps align the new security with the new economy.

Economic Environment

This book serves as testimony to the fact that no trend has been more discussed than globalization. As one author noted, "Although the pace and structure of globalization are still open to debate, the phenomenon of globalization is a fait accompli."[25] There is perhaps no greater indicator of this phenomenon than the increase in foreign direct investment around the world, which increased fourfold between 1982 and 1994.[26] This begs the question of what it means for the military to protect U.S. property and investments overseas. Fears raised about globalization generally focus on its negative impact on nation-states and local cultures.[27] The Seattle riots that exploded in early 2000 during the meeting of the World Trade Organization are an early warning of the backlash that globalization is likely to engender. While globalization may make major war less likely, it will probably increase the number of local conflicts that will involve U.S. global interests. As a result, national governments will have to deal with the phenomenon that Thomas Barnett calls "glocalization"—the need to engage globally while protecting interests locally. Nevertheless, "there remains no viable alternative development model that promises better results than globalization."[28]

As mentioned earlier, economic growth relies on the benign (and sometimes compelling) presence of military might. In areas outside Europe, one could go even further and say that economic growth relies on the military might of the United States. The global economy does not run on money—it runs on trust that is developed through transparency and stability. Markets provide the transparency, and the military helps provide the stability. Thomas Barnett's companion decalogue to the one shown earlier demonstrates how today's rosy economic picture could go awry in a big way—especially in Asia. Its logic underscores the important connection between the new economy and the new security (figure 3).

Implications of Globalization for the Navy

Some people view the Federal budget as a zero-sum game. Representative Barney Frank (D–MA) represented the views of these people when he stated, "Every dollar spent for the military is a dollar that cannot be spent to alleviate poverty, to fight against crime, to improve our environment." He further commented, "The biggest threat to the American way of life now, in many ways, is the globalization of the economy. . . . How can we maintain our standard of living, our environmental standards, our wages, our working conditions, in a world in which we are competing with people who do not follow those standards, who have a much lower standard?"[29] Representative Frank's argument can be turned on its head, allowing us to view defense budgets in a new light. The congressman is really complaining about the fact that the global economy is not operating according to a single rule set, not about globalization per se. From that perspective (and accepting Barnett's two decalogues), defense ap-

propriations are not a zero-sum game, but an essential investment in America's economic future. Unfortunately, the connection between defense budgets and prosperity is neither as direct nor as immediate as one would hope in order to capture the public imagination. As a result, defense budgets are not going to grow dramatically. On the other hand, neither should they decline dramatically.

There are, of course, alternative scenarios that could result in dramatic increases in defense spending—for example, threats from an expansionist and well-armed China[30] or from a resurgent Russia. As mentioned earlier, Ashton Carter's "preventive defense" program is aimed at ensuring those futures never mature. That begs the question about whether the current level of defense spending is enough. As of this writing, defense spending is scheduled to decline every year after 2004. At the Naval War College Current Strategy Forum 2000, Ron O'Rourke noted that efficiency efforts would not pay the bills in the future. Daniel Gouré and Jeffrey M. Randy refer to this recapitalization shortfall as a "train wreck."[31] To avert it, they argue, defense spending must increase significantly, force structure must reduce significantly, or technologies must be applied in a way that they drastically reduce the cost to procure, operate, and maintain forces so that their numbers can be maintained at required levels.

Neither the defense budget nor the Navy's share of it is likely to increase or decrease dramatically. That being the case, the Navy must make some difficult choices between readiness and modernization. To date, it has chosen readiness over modernization. This is fine in the short run, but in 20 years this policy will result in a dramatic decline in the number of ships that can be forward-deployed and tasked with engagement activities. The most drastic result of this policy could be the curtailment of capital ship construction in order to pump out larger numbers of low-end ships just so the American flag can continue to be shown around the world. That is not the balance required to keep the Navy the world's best. A low-end ship program needs to begin now so that future required capital ships are not held hostage to low fleet numbers in 20 years. Aircraft modernization is in better shape, but all of the aircraft types desired by the military are unlikely to be acquired and, if they are, it certainly will not be in the quantities desired.

Implications of Regionalization for the Navy

As noted earlier, globalization and regionalization are not inconsistent concepts. For years, the economics of competition has created pockets of associated businesses. Michael Porter calls these pockets "*clusters*: critical masses—in one place—of unusual competitive success in particular fields." He goes on to note that "enduring competitive advantages in a global economy lie increasingly in local things—knowledge, relationships, motivation—that distant rivals cannot match."[32] As these clusters develop, some of them may be critical to the continued economic well being of the United States (that is, they become new-economy Persian Gulfs). This notion also supports Kaplan's prediction that geography will remain important in the future.

The new economy is going to be a major driver in determining where naval forces deploy and for what purpose. The Persian Gulf region will remain important over the next half-century because gas and oil will continue to power the global

economy. Interestingly, however, the United States will remain there for different reasons. Instead of being there to protect Western (American and European) interests, the United States will be there primarily to protect Asian (Japanese, Korean, and Chinese) interests as well as its own—not its oil interests (since up to 90 percent of the oil will be going to Asia), but its economic interests. Economic analysts are predicting that the largest massing of capital in history will occur in Asia over the next 50 years. The money will be invested primarily in Asian energy infrastructure in order to keep the global economy moving forward. That money will come mostly from the West, and the U.S. military will be expected to protect that investment by helping to maintain a secure and stable environment.

In addition, South and Southeast Asia will play much larger roles than they have in the past because they are areas of enormous tension and unrest. The tensions between India and Pakistan are well documented, as is China's interest in Southeast Asia. Less studied is the effect that a breakup of Indonesia would have on Asia and the rest of the world. Indonesia has global ties in economics and religion, and its fate is of no small concern. New forward presence challenges like these may be met not only with new ships but also with new deployment patterns. The Navy will not have the luxury of tethering ships to a single area, such as the Northern Arabian Sea, but will have to swing them through several areas during the course of a single deployment. By purchasing smaller, but much faster, ships (with transit speeds exceeding 40 knots), maritime action groups could dash between these spots and linger in place longer than is possible using today's force—thereby helping create the stable security conditions needed for economic progress.

For years, analysts have warned that the economic gap between the developed and developing worlds is growing and could lead to unrest and instability.[33] The rapid transition by the industrialized world into the Information Age is exacerbating this trend, with the economic gap between connected and unconnected nations increasing dramatically. Michael Porter asserts that this will continue as long as poor countries try to "compete in the world market with cheap labor and natural resources. To move beyond this stage, the development of well-functioning clusters is essential."[34] If these areas of specialization emerge and the global economic gap begins to narrow, a new definition of U.S. interests might also develop as new hubs become essential to the Nation's well being. Hence, whether the gap widens or narrows, the military must pay attention to what happens because it will affect deployment patterns and requirements.

Globalization refers most often to the world economy—an area of limited involvement for the military until unrest spawned by poverty erupts into violence. As noted earlier, the CNE cross-sector approach utilizing partnerships with other U.S. Government departments and agencies, as well as with those in the nongovernment and private sectors, offers a new and innovative process for leveraging limited military resources and promoting sustainable development and peaceful change. As Michael O'Hanlon notes, "In today's world, the United States should sustain a defense strategy emphasizing forward presence operations, exercises with allies and neutrals, military-to-military exchanges, peacekeeping missions, and response to crisis when necessary. . . . Nonmilitary tools of foreign policy, such as foreign aid, also have an important role in this broader security policy and are being underfunded."[35]

For greatest effectiveness, this approach needs to be undertaken on a regional basis with the full involvement of all services and U.S. country teams. The naval services should support this approach, since its success could preserve scarce military resources and support U.S. foreign policy objectives. Military-to-military engagement programs using traditional avenues such as UNITAS or West Africa Training Cruises should continue (with other regions adopting similar approaches). These rolling exercises cover large areas and engage a number of countries while fostering interoperability and cooperation.

Technological Environment

Much has been written concerning the benefits of and fears about the Information Age. The up side seems to be much larger than the down side, especially when considering the international security environment.

Information Age

As Joseph Nye has written, "The ability to disseminate information increases the potential for persuasion in world politics. NGOs [nongovernmental organizations] and states can more readily influence the beliefs of people in other jurisdictions. If one actor can persuade others to adopt similar values and agendas, that is soft power. Free information and soft power can, if sufficiently persuasive, change perceptions of self-interest and thereby alter how hard power is used."[36] The implication for military operations of Nye's assessment is profound. Information warfare takes on an entirely new meaning, and how the forces equip themselves to conduct it needs thorough review. There is a down side to this. Democratic states are vulnerable to cyberterrorism, and their leaders are more susceptible to being swayed by persuasive, if flawed, arguments. The result, according to Nye, is that democracies will have difficulty maintaining "a coherent ordering of foreign policy."[37]

Speed and Flexibility. According to Larry Carter, chief financial officer of Cisco Systems, in the Information Age, "it's no longer about the big beating the small, it's about the fast beating the slow."[38] This is just as true in the security sector as it is in the commercial. The critical factor is not technology, but how one organizes to take advantage of its opportunities. "The technologies of the late twentieth century," asserts Fukuyama, "seem to encourage flexibility and decentralization."[39] Although some attention has been given to this subject, more emphasis needs to be made concerning what organizational and cultural changes the military is going to require.

Computing with Light. Optical computers that use light instead of electricity probably will enter the marketplace in the next 20 years. They are expected to operate 1,000 times faster than electronic computers do. Currently, there are "more than 3,000 companies . . . hard at work in a virtual 'Photon Valley' to develop optical computers. Much of the infrastructure for computing with light is already in place. Fiber-optic cables provide high-speed lines, lasers serve as modulating devices, and CDs [compact disks] allows high-capacity optical storage. . . . Ultimately, a single fiber should be able to transmit 200 terabits, equivalent to the entire Library of Con-

gress, in one second."[40] Coupled with anticipated breakthroughs in artificial intelligence, smart software, and robotics, many activities currently conducted by humans may be carried out by robots or virtual assistants. This trend holds the promise of drastically reducing personnel requirements aboard ships.

Digitization of Communications. Michael O'Hanlon points out that "today's information and communications systems are largely service-specific and analog. In the years ahead they will be integrated between military services. They will also be digitized. Digital radio can transmit impressive amounts of data among a large group of weapons platforms or soldiers."[41] This is extremely important because aircraft, tanks, and ships cannot use fiber optics to connect to other platforms. Hence, data will still have to be forced through slower and more limited radio links. As a result, future conflicts may well be characterized as battles of bandwidth. One example of how digitization and compression technologies can drastically improve performance is found in the world of popular music, where MP3 files will soon overtake cassette tapes and CDs as the medium of choice. An MP3 player similar in size to a portable CD player can hold the equivalent of 100 albums.

Implications of the Information Age for the Navy

Left to their own devices, the services will continue to support legacy systems and favor homegrown data links over developing the ability to connect with others. The first job for the Joint Staff is to establish mandatory standards to which all the services must conform when building future systems. These systems must be digital and, where possible, take advantage of fiber optics in order to maximize their effectiveness and provide the infrastructure foundation for further modernization. The Navy has an even bigger challenge: to communicate through the ocean itself. The technological challenges are daunting, but no other service has reason to devote resources toward this challenge. Until the submarine force can be netted in a significant way to the rest of the force, the full promise of network-centric warfare will remain unrealized.

Alternative Fuels

The end of the oil era is just around the corner, and alternative fuel sources need to be developed. There are predictions that over the next 5 years, companies involved in fuel-cell technology will start turning a profit. Fuel cells turn hydrogen and oxygen into electrical power and water, offering pollution-free power generation using an inexhaustible source of fuel. "The technology seems likely to become more efficient and less expensive than traditional power sources."[42] Some biomass fuels (such as ethanol) also hold promise as substitutes for current oil products. Nuclear power remains an option, but it comes with a high political price tag.

The services should begin now to study how to deal with the energy problems of the future.[43] The Navy may very well be building its last few classes of surface combatants that rely on carbon-based fuel. The decision to pursue electric-drive propulsion takes the Navy one step down this course. Complementing this decision, Congress has funded an Energy Systems Analysis Consortium, led by engineers at Purdue University and the University of Missouri. They are working on a system that

automatically reroutes ship power in case one part of a ship is damaged during a conflict. This automated system, which should be in service by 2010, will help reduce the number of personnel aboard new ships by half.[44] Robust electrical systems are required if electric drive and future weapons systems, such as electromagnetic rail guns, are to be fielded. If fuel-cell technology develops as anticipated, it would be the final step to an all-electric fleet. The advantage that fuel-cell technology has over nuclear power is that it promises pollution-free transportation without the waste problem. As the White House Office of Science and Technology stated, "Fuel cells will take us beyond the age of fire."[45] The use of hydrogen fuel cells would encourage the development of hydrogen gas guns as well. Obviously, establishing an energy policy and supporting a robust research and development program should be at the top of the services' agendas.

Nanotechnology

Science fiction writers over the past 100 or so years have correctly predicted many of the discoveries that we now enjoy—from nuclear power to computers. They all failed to predict, however, how miniaturization would influence our lives. With scientists now capable of manipulating individual atoms, our minds no longer suffer from a lack of imagination when it comes to picturing how small useful gadgets can become. Miniaturization will allow us and everything we use to connect to the *ever-net*, to use Thomas Barnett's term.[46] Unless we choose to unplug ourselves, the day will come when we have constant connectivity to everybody and everything that is important in our lives. Our appliances will tell us when we are running short of milk, as well as when they are in need of repair. We will download books onto electronic paper. Implants will monitor our health the same way that imbedded chips now monitor the condition of machinery. William Halal calls this "teleliving," and he believes a new lifestyle will "emerge around the use of information devices and the Internet for shopping, working, learning, playing, healing, praying, and conducting all aspects of life seamlessly."[47]

Smaller generally means "cheaper," which means things can be bought in greater numbers for the same cost. This will be extremely important for sensors because more is better. Technology should offer improved sensors of all types—for example, sensors to monitor equipment, sensors to help navigation, sensors to detect targets. Improvements in target location and marking will have greater impact on weapon efficiency than any other course that can be taken. The Navy should field a full array of expeditionary sensors. Some can be carried by long-endurance unmanned aerial vehicles (UAVs) that can be launched as a virtual satellite constellation, providing both surveillance and communications capabilities for theater forces. Not all sensors need to be indigenous to the fleet. The Navy should work closely with the Air Force to develop theater- and space-based sensors that can benefit sea, land, and air operations. If urban operations become prominent, sensors that can continuously monitor swept buildings or that can conduct autonomous reconnaissance missions in high-risk areas will need to be developed.

The flip side of the sensor story is that sensors will also become available to potential adversaries, making access a problem for the military. Learning to blind or degrade these sensors will become an increasingly important, but difficult, challenge. "The popular notion of information dominance, voiced by most RMA [revolution in military affairs] proponents and repeated in the Pentagon's *Joint Vision 2010*," concludes Michael O'Hanlon, "simply goes too far, as does the concept of dominant battlespace knowledge."[48] The technology is simply not available in either the offensive or defensive arenas to achieve these ends.

The value of small computer chips for the Navy is that they should allow off-site managers to monitor the status of shipboard equipment as well as the level of afloat supplies. Savings should result from reduced stockpiles, similar to those achieved by Wal-Mart, and readiness should improve, since systems could remain online until sensors indicate a problem is developing. The use of virtual assistants or long-distance, over-the-shoulder supervision should help reduce personnel requirements aboard ships.

Biotechnology Breakthroughs

For 200 years, people have been saying that mankind has discovered all the significant things that need to be discovered—and for 200 years, scientists have continued to prove them wrong. We now stand on the cusp of a new era of biotechnologies that promises again to transform the world. The possibilities range from growing our own replacement organs from stem cells to harvesting replacement human organs from swine. The human genome has been fully mapped, promising to help rid the world of genetic flaws within the next 25 years. Biomedical breakthroughs will also spawn "what promises to be the largest industry in the world: the life-science industry."[49] Fukuyama says, "Just as the twentieth century was the century of physics . . . the twenty-first promises to be the century of biology."[50] Dramatically increased life expectancies (at least for those who can afford proper medical treatments) will be possible in the next 50 years.[51] William Halal predicts that by midcentury the average life expectancy in developed nations will rise to 100 years.[52] Sanguine as all this sounds, this biomedical revolution will not be available to everyone and will change the economic and social landscapes as we now know them. Fukuyama goes so far as to predict that "the ultimate implication of this is that biotechnology will be able to . . . bring about a new type of human being."[53]

Advances in biotechnologies with their promises of increased life expectancies will have a profound effect on the military. Robert J. Samuelson, among others, has noted, "Most European countries, Japan and the United States face rapidly aging populations that will compel them to reduce sharply welfare benefits for their elderly or face the prospect of much higher taxes or budget deficits—developments that could endanger their economies."[54] As populations age, the able-bodied workforce, in relative terms, decreases, placing a premium on the worker. This will ultimately result in increased compensation. For business, increased wages mean reduced profits. For the military, it means that a greater percentage of its budget will be spent on personnel, which, on top of increased fuel prices, could drastically curtail readiness,

modernization plans, and force size. No one can argue persuasively concerning the future size of the defense budget. The graying of America, however, could present a double blow to the budget, as defense dollars are siphoned off to pay welfare bills and the American economic growth rate suffers.

The graying of America will make recruitment more difficult and should have a far-reaching effect on service personnel policies. For example, as people live longer and healthier lives, current "up-or-out" policies will make less sense. As the services attempt to compete for the same skill sets from a diminishing pool of qualified individuals, they may have to consider a mixture of career personnel and temporary hires to fill specific deployment gaps. All this will require careful analysis and the cooperation of Congress.

Personnel numbers (and/or retirement entitlements) must be reduced drastically or long-lived retirees will consume a greater share of the services' budget as their numbers continue to grow. Technology applications that slash personnel requirements must be a top priority. One unintended, but certain, consequence of fewer military personnel, however, will be that the gap between them and the U.S. public will continue to grow as fewer and fewer civilians have knowledge of or experience with the military. Pension systems will have to become more similar to (and interchangeable with) those in the private sector. An active preventive health care system for retirees should also be put in place in order to reduce medical costs. Today's health care system is reactive, not proactive.

Implications of New Technologies for the Navy

The Navy will face several challenges in this area. First, maintaining a technological edge will be more difficult because information technologies have released a genie that permits the free flow of data around the globe, and that genie cannot be put back in the bottle. Another challenge will be to adapt information technologies in such a way that they increase warfighting capabilities and yet reduce costs through reduced personnel, better maintenance, and more efficient sustainment. Finally, managing the rate and direction of technological change will not be easy. A debate already swirls around the direction and rate of Navy transformation. Some analysts believe that the Navy is moving too fast and as a result is outpacing its ability to form meaningful coalitions. Others believe that the Navy is transforming too slowly and will end up with a traditional, albeit smaller, maritime force.

The Transformation Task Force formed at the Naval War College, in responding to the Secretary of the Navy, favored an evolutionary, not revolutionary, approach to transformation.[55] A *Harvard Business Review* article cautioned, "If an organization faces major change . . . the worst possible approach may be to make drastic adjustments to the existing organization. In trying to transform an enterprise, managers can destroy the very capabilities that sustain them."[56] Such an outcome could prove fatal for both the Navy and the Nation. The task force recommended a peripheral transformation strategy that involved the establishment of an experimental squadron and "operational" strategic studies group to examine new hardware and concepts. Its mission would be to introduce the best, not the riskiest, of these into the fleet. The task force supported the robust use of prototypes and concept demonstrations as part of

the strategy. Although transformation would take longer following this path, it would be more affordable and less risky. It would also face less opposition.

Just as important as adapting technological advances into war fighting is organizing properly around them. Taking Fukuyama's and Carter's points, a cultural clash between traditional hierarchical military structures and Information Age flexible and decentralized structures is inevitable. This will come to a head when optical computers and artificial intelligence progress sufficiently to allow some target-designation and weapon-assignment tasks that now require a human in the decision loop.

Social Environment

Although early dire predictions about overpopulation have had to be reevaluated, Bill McKibben notes that "the world is still growing, at nearly a record pace—we add a New York City every month, almost a Mexico every year, almost an India every decade."[57] The most depressing of the world's augurs predict that overpopulation will lead to massive famines, which will lead to the spread of disease, which will lead to political instability, which will lead to the proliferation and use of terror weapons by desperate nations. The ultimate result will be widespread death. "The temptation in the 21st century will be to lock the gates and let the neighbours kill and die."[58] On the other hand, some pundits rejoice over the population growth, insisting that "population growth . . . is a driving force for democracy and prosperity, the true long-term threat comes from declining population."[59]

The United Nations estimates that the total population living in towns and cities will double by 2030, and that 6 billion of the 9 billion people on the planet will be living in urban areas.[60] People are drawn to the cities primarily out of economic necessity. Once there, however, they generally find only poverty and hopelessness; in fact, they find themselves contributing to both conditions. The trend toward urbanization is actually gaining speed. In China, it is being exacerbated by the Three Gorges Dam project being built on the Yangtze River. The project will force the migration of approximately 3 million people and has encouraged the Chinese government to draw up plans to move as many as 300 million people into tens of thousands of new towns.[61] The Chinese believe that this unprecedented urbanization plan will stimulate economic growth and keep it moving toward a consumer-based economy, as new urbanites buy refrigerators and television sets. Even without this plan, "megacities—those populated by at least 10 million people—are projected to double by 2025."[62] There are presently 21 such cities. Recent studies have shown that megacities present other problems for the planet besides unhealthy living conditions and poverty. Such cities "increase temperatures by up to 12ºF relative to the surroundings."[63] The result is increased smog and thunderstorms and reduced land productivity. Not everyone laments this trend. Lawrence Solomon has pointed out, "In modern times, no nation has maintained high per-capita increases in income without having urbanized. Cities consume far less resources to get work done, and generate far more wealth in the process."[64]

War, weather, and the search for wealth have combined to create nearly 100 million migrants worldwide.[65] The growth of this group shows no sign of abating. Refu-

gees generally become regional problems since they "become economic liabilities, have increased health risks, and form the core of politically discontent groups."[66] In other words, the more refugees, migrants, and displaced persons at large in the world, the more pronounced the crisis that fostered them will become. For the military, this means that humanitarian interventions are likely to continue to consume both time and resources.

Continued population growth and urbanization mean that an increasing number of crisis responses will be undertaken in metropolitan settings. Human intelligence, along with the sensors discussed earlier, will be critical for operational success in these settings. Precision and nonlethal weapons will also be essential for these missions. As discussed elsewhere, preventive engagement activities must be adopted as part of the military's arsenal. United States casualties are predicted to be high in any urban conflict; thus, preventing such conflicts is in the U.S. interest.

If the United States does get involved in urban conflict and if recent experience holds, casualties will make sustained operations difficult. To minimize casualties, UAVs, unmanned sensors, and autonomous reconnaissance robots must be developed.

Health

The human immunodeficiency virus and acquired immunodeficiency syndrome are ravaging the African continent and may intensify on other continents in the future. In addition, virulent strains of tuberculosis are on the increase (including in Russia, one of Carter's A-List countries of concern). The devastating results for involved regions include millions of dead and disabled people who require countries to divert development money to health care. This "double whammy" of a weakened workforce and decreased development money could result in increased unrest and migration.

Health risks to U.S. military personnel during crisis response, over and above the chemical and biological threats that capture most of the headlines, will increase as a result of operations conducted in unsanitary conditions among unhealthy populations. If these interventions, as some predict, increase, then pre-crisis programs dealing with these health issues are a national security issue. That does not mean that the primary responsibility for conducting them belongs to the military, but the military should certainly be supportive of such programs.

Democratization

Since the end of the Cold War, U.S. foreign policy has rested in large part on the presumption that democracies do not fight one another. The logical conclusion of this hypothesis is that expanding the circle of democracies is good for the United States as well as for the world. Fukuyama asserts, however, that "it is liberalism more than democracy that is the true institutional basis for so-called democratic peace."[67] This distinction, if understood by senior service leaders, will help them achieve better results during their engagement activities with states whose systems we are hoping to transform. The importance of these military-to-military (or military-to-political) contacts should not be underestimated. Following the collapse of the Cold War, both military and political leaders were anxious to meet with senior U.S. military commanders.

The realpolitik school of international theory would never have predicted that Russia and its Warsaw Pact allies would have unilaterally disarmed (that is, reduced their forces) after 1989. As Fukuyama notes, they did this on "the basis of an *internal* change in regime type, rather than a change in the external balance of power."[68] Not only is there a strong correlation between peaceful relationships and democracy, but also there is a correlation between democracy and economic development, another important factor resulting in stability.

The onset of the Information Age almost guarantees that global democratization will continue. As Joseph Nye has noted, "Not all democracies are leaders in the information revolution, but many are. This is no accident. Their societies are familiar with the free exchange of information, and their systems of governance are not threatened by it."[69] States aspiring to global leadership (such as China and Russia) will discover that they have to transform themselves into more open societies or find themselves falling behind those that do. India, for example, is in a position to take advantage of the Information Revolution.

The largest down side to democracy comes from the concomitant concept of self-determination. The problem is that "the number of established, recognized states seems ready to grow at a dizzying rate."[70] Every ethnic group now sees its best hope for the future in establishing its own state. With "roughly 5,000 such groups on earth, it is easy to understand the baneful effects of an untrammeled application of the right of self-determination."[71] The distressing war in Chechnya amply demonstrates the devastation that can result when ethnic groups opt for secession rather than union. Of the A-List states that the United States should concern itself with, Russia is not alone facing the problems of breakaway regions. Indonesia will continue to face problems, as will India (Kashmir) and China (Tibet, Xinjiang, and Inner Mongolia).[72]

In support of U.S. foreign policy objectives, military engagement programs need to be structured to encourage the adoption of liberal principles within target states. This has been a primary focus of the Partnership for Peace program, especially in the area of civil-military relations. These programs should also continue to foster interoperability and military cooperation so that coalition building becomes easier in times of crisis. Michael O'Hanlon is correct when he points out that "these are the tools with which alliances are kept credible and cohesive, and potential adversaries are contained or deterred."[73]

Religion

Samuel Huntington's *The Clash of Civilizations* brought religion to the forefront of international security discussions.[74] Not everyone agreed with his assessment, and many felt it set back relations with the Muslim world; nonetheless, the debate it spawned was important. Two trends have appeared in almost all religions over the past 50 years. First, scientific materialism has caused most developed countries to become decreasingly religious. Second, countries that have tried to preserve their religious heritage (and denominations facing the same dilemma in more secular states) have turned increasingly fundamental. Often, this fundamentalist fervor has complemented growing nationalist movements.

The problem with the first trend, as described by E.O. Wilson, is that it leaves states with no ideological authority or clear transcendent alternative to guide their actions.[75] Some analysts note that this loss of belief has been accompanied by the sexual revolution and the breakdown of the traditional family. The problem with the second trend is that fundamentalism and nationalism are often the traveling companions of militarism. Zealots of any persuasion can be (and generally are) trouble.

A robust foreign area officer program is required to prepare fighting forces for dealing with cultural problems, including religion. Navy chaplains also are being trained to understand how religious leaders and communities of faith can be used during crisis responses to promote a peaceful and lasting solution.[76]

Physical Environment

While some analysts are concerned that the Information Age will usher in a borderless (almost anarchic) world, others, such as Robert Kaplan and Joseph Nye, have asserted that geography will continue to play an important role in international relations. If true, the world's most prominent geographical feature—its oceans—should play a leading role. Following through on that logic, things maritime, including naval forces, should play a larger part in world affairs in the future.

Energy

Everyone knows that Americans are huge consumers of resources. The average global energy consumption per day per individual is about 31,000 calories. Those who live in the United States consume six times that much.[77] As a result, the United States is also the largest single producer of wealth in the world. The avowed policy of the United States—to help others achieve a sustainable level of development by engaging them in the global marketplace—takes energy, and lots of it. The United Nations has determined that the economies of developing countries need to be 5 to 10 times larger in order for them to rise to an acceptable standard of living. Thus, competition for all sources of energy will be a major salient in the future. Demand for energy in Asia alone is predicted to increase by 9 million barrels a day by 2010—equal to the current daily output of Saudi Arabia. Drafting and implementing, as well as helping others draft and implement, reasonable energy policies will become an important national priority.

There is an interesting hypothesis being investigated that, if proved correct, increases the incentive for the developed world to help the developing world improve its standard of living as quickly as possible. "Two Princeton University economists found that after a country reaches a per capita income of $8,000, further increases in income cause pollution to decline."[78] The data show that for specific pollutants, the required level of per capita income varies from around $2,000 to $12,000 before decreasing. When this observation is paired with the observation that "above a level of $6,000 per capita GDP in 1992 parity purchasing power, there is not a single historical instance of a democratic country reverting to authoritarianism,"[79] the importance of promoting sustainable development becomes obvious.

Security threats are anticipated to rise as competition for resources increases and as detrimental environmental effects, caused by a doubling of carbon-based fuel consumption in the developing world, affect the lifestyle and health of neighboring states. The military will undoubtedly find itself embroiled in such tensions.

As the availability of oil diminishes (later in the coming decades) and energy costs increase, the naval services will be confronted with a real dilemma. For surface ships, nuclear power offers one possible, if currently unattractive, option. Alternatives for aircraft propulsion are not as obvious. How do you fly when the oil is gone? Two potential sources of energy are being touted as future solutions for most energy needs—hydrogen and ethanol. Hydrogen is the most abundant element in the universe, while ethanol is derived from plants and is renewable. The drawback to hydrogen/oxygen systems is that producing pure hydrogen is expensive. Platinum-coated membranes are needed to separate hydrogen into the protons and electrons necessary to produce electrical energy. As discussed later, platinum is a strategic metal not readily abundant in the United States. Hydrogen/oxygen systems might prove useful in powering surface ships, but not aircraft. Ethanol appears to be a more promising solution. If biotechnology continues to progress as quickly as predicted, plant genomes may be "engineered in a way that enable[s] their starches to be transformed into alcohol at higher volumes," allowing oil companies to "produce economically attractive gasoline substitutes."[80] The down side to ethanol production is that with the world's population continuing to increase, growing crops for fuel, instead of food, may create new challenges. For this reason, recent research has focused on producing bioethanol from waste products.[81]

The greatest near-term impact on the military will be a sharp increase in oil prices that eats up increasingly large segments of the budget and sharply reduces at-sea time and flying hours. The Coast Guard found itself with just such a dilemma in mid-2000 and had to curtail some of its activities. High oil prices are inevitable, as is the decreasing availability of oil. The longer term problem will be to develop propulsion systems that are not reliant on fossil fuel. Other complementary actions should be pursued, such as procuring smaller ships, developing drag-reducing hull materials, supporting research involving fuel-efficient engines, and exploring crew rotation schemes that could reduce fuel-consuming transits while maintaining more of the force structure forward to conduct engagement operations.

Water and Land

Today, "20 percent of the world's population lacks access to potable water, and fights over water divide many regions,"[82] including regions in the United States. There is hardly a region in the world that is not worried about having access to sufficient water. Water problems go beyond access, however, to infrastructure. Eighteen of the world's 21 megacities suffer from "leaky water systems which … hemorrhage as much as half their precious freshwater reserves."[83] International conflicts over water rights will increase in the years ahead.

Conflicts over arable land will likely erupt over the coming decades, as will claims over ethnic territories. Revanchist claims will continue to be sources of ten-

sion (for example, in the South China Sea). One overlooked source of conflict, however, is strategic minerals. Robert Mandel noted that "of all types of resources . . . nonfuel minerals are the least publicized and the least widely understood." He goes on to note that "the industrialized Western nations are far more heavily dependent on foreign sources for a number of nonfuel minerals than for crude oil."[84] The military's particular concern has been with so-called strategic minerals (those required to build modern weapon systems).[85]

Tensions over access to water and land, like rising competition for fuel, will continue to engage the military in the future. Aside from strategic minerals, the challenge with nonfuel minerals is one of distribution, not availability, and virtually all minerals are shipped by sea. Currently, no open ocean threat to shipping exists, but the importance of the shipping lanes to the economic well-being of the United States cannot be overstated. Ensuring that threats to those lanes do not emerge will remain an ongoing mission for naval forces. A growing concern is the vulnerability of distribution at the superports (or megahubs) that are used to load and offload ships (particularly large container ships). This is another reason that a sea-based missile defense system should be pursued.

Changing Weather Patterns

With all the talk of global warning and *el niño* effects, people are starting to understand that it is not only the Cassandras who are raising an alarm. Environmentalists look at direct manifestations of widespread and long-term warming trends such as heat waves and periods of unusually warm weather, sea-level rise and coastal flooding, glacial melting, and Arctic and Antarctic warming. They also track events that they believe are directly related to and foreshadow the impacts of global warming. These events include spreading disease, earlier arrival of spring, plant and animal range shifts and population declines, coral reef bleaching, downpours, heavy snowfalls, floods, droughts, and fires.

Catastrophic changes in weather can affect the military in two ways. First, bad weather in the United States could result in a dramatic economic downturn. Such a downturn could halt any modernization plans under way by the military and drastically affect readiness as well. Bad weather overseas could increase the demand for military humanitarian disaster response (the consequences of famines and floods, for example), which could accelerate the wear and tear on aging equipment and divert scarce resources to pay for the operations. Analysis should be undertaken to determine how the services could best prepare for this eventuality so that its effects can be minimized.

If the Navy develops a strategy that relies on increased transit speeds to meet mission requirements, global severe weather could have some impact if speeds had to be reduced to cope with extreme conditions.

Resolving the problem of global warming is certainly not a military responsibility. The military can, however, behave as a responsible global citizen and support others in their efforts to understand and counter this phenomenon.

Conclusions

This *tour d'horizon* has looked at a few future trends associated with globalization and has surmised how they might affect the military. The trends are fairly accurate, their effects on the military less so. Nevertheless, there is much food for thought.

For the naval services to avoid becoming "hangar queens," they should limit their hedging force infrastructure to nuclear deterrent forces and deliberately concentrate on developing force structure and doctrine for responding to missions in Carter's B- and C-Lists. The sea services should concede the heavy lifting hedge forces to the Army and the Air Force. Building a large hedging force that is capable of meeting a threat from a peer competitor (that is, a country that has opted to match U.S. might) is, at any rate, more a matter of political will than of military planning. Focusing on B- and C-List missions will require a reevaluation of the warrior ethos that drives so much of the planning and rhetoric in the military (that is, the attitude that the only good fight to plan for is one against somebody your own size). No respectable war fighter wants to police the world, keep the peace, or be known primarily as a tree hugger or a humanitarian. Nonetheless, in light of the global trends discussed earlier, a slight reorientation in that direction will prove both prudent and productive.

This change in thinking is not as controversial as it may at first appear. Many of the decisions made by the naval services have been moving them in this direction since the introduction of *Forward . . . from the Sea*. That document clearly indicated that the naval services should plan for dealing with B- and C-List challenges. Tomorrow's security environment will require that more attention be focused on peacetime missions such as engagement, humanitarian assistance, and coalition operations. The aim of peacetime engagement activities should be to help target states build institutional capacities and foster peaceful change. This is not mission creep, but essential mission. We need to reinstill pride in being a soldier-statesperson.

The naval services should focus on assimilating information technologies in ways that increase connectivity, reduce decision time, permit workforce reductions, enhance sustainability, and improve maintenance practices. This will require changing the leadership culture of the services into one that is comfortable with greater decentralization and autonomy of their forces. The naval services will also have to reevaluate their personnel policies. Working with Congress, they should eliminate "up-or-out" policies and restrictions on length of service. They should examine ways of permitting lateral hires and flexible retirement packages that permit some military personnel to change jobs as frequently as their private sector counterparts. A small cadre of "career" military officers and enlisted personnel are probably all that is required. The Marine Corps is well along this path; 75 percent of its enlisted personnel are short-term hires.

This refocusing of the Navy and the Marine Corps effort helps them move together strategically into the future with a plan that is affordable, understandable, and supportable.

Notes

[1] Francis Fukuyama, "Second Thoughts: The Last Man in the Bottle," *The National Interest* 56 (Summer 1999), 17.

[2] William E. Halal, "The Top 10 Emerging Technologies," *The Futurist, Special Report* (July/August 2000), 2.

[3] "Is Major War Obsolete? An Exchange," *Survival* 41, no. 2 (Summer 1999), 139–152; Hans Binnendijk and Alan Henrikson, "Back to Bipolarity?" *Strategic Forum*, no. 161 (May 1999), 1.

[4] Binnendijk and Henrikson, 2.

[5] "Is Major War Obsolete?" 139.

[6] Donald Kagan, "History is Full of Surprises," *Survival* 41, no. 2 (Summer 1999), 140.

[7] Thomas P.M. Barnett, "Life After DODth or: How the Evernet Changes Everything," U.S. Naval Institute *Proceedings* (May 2000), 48–53.

[8] Donald C.F. Daniel and Bradd C. Hayes, *The Future of U.S. Sea Power* (Carlisle Barracks, PA: Strategic Studies Institute, 1993).

[9] Ashton B. Carter, "Adapting U.S. Defence to Future Needs," *Survival* 41, no. 4 (Winter 1999/2000), 101–123.

[10] Ibid., 105.

[11] "The Ostrich's View of the World," *The Economist* (December 19, 1998), 70.

[12] Bradd C. Hayes, *International Game '99: Crisis in South Asia,* DSD Research Report 99–1, and Paul D. Taylor and Andres Vaart, *Economic Security Exercise: South Asia Proliferation Project,* DSD Research Report 99–2 (Newport, RI: Center for Naval Warfare Studies, 1999).

[13] John F. Hillen, Jr., "Superpowers Don't Do Windows," *Orbis* (Spring 1997).

[14] Chester A. Crocker, "How to Think about Ethnic Conflict," 1999 Perlmutter Lecture on Ethnic Conflict, Foreign Policy Research Institute, *Wire* (September 1999).

[15] Council on Foreign Relations, *Policy Impact Panel on U.S. Defense Priorities*, October 27, 1995, 8, <http://www.foreignrelations.org/studies/transcripts/951027.html>. A *hangar queen* is an aircraft that never flies but is kept in the hangar and cannibalized for spare parts.

[16] Bradd C. Hayes and Jeffrey I. Sands, *Doing Windows: Non-Traditional Military Responses to Complex Emergencies*, DSD Research Report 97–1 (Washington, DC: C^4ISR Cooperative Research Program, 1998).

[17] At the start of the crisis, the USS *Eisenhower* and USS *Independence* were the first carriers to respond. As plans for offensive operations proceeded, additional carriers were deployed to the theater. They were USS *Midway*, USS *Ranger*, USS *Theodore R. Roosevelt*, USS *John F. Kennedy*, USS *Saratoga*, and USS *America*.

[18] Ehud Sprinzak, "The Great Superterrorism Scare," *Foreign Policy* (Fall 1998), 121.

[19] Andrew J. Bacevich, "Policing Utopia: The Military Imperatives of Globalization," *The National Interest* (Summer 1999), 7.

[20] Council on Foreign Relations, *Policy Impact Panel*, 21.

[21] For example, Hugh De Santis laments, "From the Bush administration's vacuous 'new world order' rhetoric to the 'engagement and enlargement' effluvia of the Clinton administration, the United States has substituted slogans for strategy." Hugh De Santis, "Mutualism: An American Strategy for the Next Century," *Strategic Forum*, no. 162 (May 1999), 1.

[22] Ibid., 2.

[23] Robert D. Kaplan, "Could This Be the New World?" *The New York Times*, December 27, 1999, A23.

[24] Bacevich, "Policing Utopia," 5.

[25] Stephen J. Kobrin, "The MAI and the Clash of Globalizations," *Foreign Policy* (Fall 1998), 99.

[26] Kobrin, "The MAI and the Clash of Globalizations," 100.

[27] Henry Wai-chung Yeung, "Capital, State and Space: Contesting the Borderless World," *Transactions of the Institute of British Geographers* 23, no. 3 (1998), 291–301.

[28] Fukuyama, "Second Thoughts," 22.

[29] Council on Foreign Relations, *Policy Impact Panel*, 5–6, <http://www.foreignrelations.org/studies/transcripts/951027.html>.

[30] Sinologists are quick to note that, with the exception of Tibet, China does not have an expansionist history.

[31] Daniel Gouré and Jeffrey M. Randy, *Averting the Defense Train Wreck in the New Millennium* (Washington, DC: The Center for Strategic and International Studies Press, 1999).

[32] Porter, "Clusters and the New Economics of Competition."

[33] World Resources Institute, *World Resources 1996–97: A Guide to the Global Environment*, August 19, 1998, <www.wri.org/wri/wr-96-97/ei_txt4.html>.

[34] Porter, "Clusters and the New Economics of Competition," 86.

[35] Michael E. O'Hanlon, *Technological Change and the Future of Warfare* (Washington, DC: The Brookings Institution Press, 2000), 171–172.

[36] Joseph S. Nye, Jr., "Responses to Fukuyama," *The National Interest* 56 (Summer 1999), 43.

[37] Nye, "Responses to Fukuyama," 44.

[38] Cisco@speed, *The Economist*, June 26, 1999, survey on "Business and the Internet," 12.

[39] Fukuyama, "Second Thoughts," 27.

[40] Halal, "The Top 10 Emerging Technologies," 9.

[41] O'Hanlon, *Technological Change*, 52.

[42] Halal, "The Top 10 Emerging Technologies," 4.

[43] Colin J. Campbell and Jean H. Laherrère, "The End of Cheap Oil," *Scientific American* (March 1998), 78–83.

[44] "Automated Warships," *The Futurist* (July/August 2000), 13.

[45] Halal, "The Top 10 Emerging Technologies," 4.

[46] Barnett, "Life after DODth."

[47] Halal, "The Top 10 Emerging Technologies," 5.

[48] O'Hanlon, *Technological Change*, 67.

[49] Juan Enriquez and Ray A. Goldberg, "Transforming Life, Transforming Business: The Life-Science Revolution," *Harvard Business Review* (March/April 2000), 97.

[50] Fukuyama, "Second Thoughts," 28.

[51] Stephen S. Hall, "Racing Toward Immortality," *The New York Times Magazine* (January 20, 2000), 32–35, 46, 74–79.

[52] Halal, "The Top 10 Emerging Technologies," 9.

[53] Fukuyama, "Second Thoughts," 28.

[54] Robert J. Samuelson, "Responses to Fukuyama," *The National Interest* (Summer 1999), 42.

[55] Bradd C. Hayes, Lawrence Modisett, Donald C.F. Daniel, and Hank Kamradt, *Transforming the Navy: A Strategy for the Secretary of the Navy*, DSD Report 00–3 (Newport, RI: Center for Naval Warfare Studies, 2000).

[56] Clayton and Overdorf, *Harvard Business Review*, 68.

[57] Bill McKibben, "A Special Moment in History," *The Atlantic Monthly* (May 1998), 56. He does note, however, that "new demographic evidence shows that it is at least possible that a child born today will live long enough to see the peak of human population."

[58] Doug Beazley, "A Bleak Look into the Distant Future," *The Edmonton Sun*, Opinion, 11. [Lexis/Nexis]

[59] Lawrence Solomon, "Six Billion Reasons for Hope," *Financial Post,* October 5, 1999, C7. [Lexis/Nexis]

[60] United Kingdom Department for International Development, "Clare Short Sets the Challenge to Improve the Lives of the Urban Poor around the World," January 26, 2000 [Lexis/Nexis].

[61] Damien McElroy, "China to Resettle 300 Million," *The Ottawa Citizen,* November 14, 1999, A1. [Lexis/Nexis]

[62] Mitch Potter, "Water Fight Looms for Megacities," *The Toronto Star,* March 20, 2000. [Lexis/Nexis]

[63] Roger Highfield, "Mega-Cities Form 'Isles of Heat' around World," *The Daily Telegraph* (London), February 23, 2000, 12. [Lexis/Nexis]

[64] Solomon, "Six Billion Reasons for Hope."

[65] Myron Weiner, *The Global Migration Crisis: Challenge to States and to Human Rights* (New York: HarperCollins College Publishers, 1995).

[66] Hayes and Sands, *Doing Windows*, 88.

[67] Fukuyama, "Second Thoughts," 18.

[68] Ibid.

[69] Nye, "Responses to Fukuyama," 43.

[70] Pascal Boniface, "The Proliferation of States," *The Washington Quarterly* 21, no. 3 (Summer 1998), 111.

[71] Ibid., 112.

[72] "The Ostrich's View of the World," 67.

[73] O'Hanlon, *Technological Change*, 171.

[74] Samuel P. Huntington, *The Clash of Civilizations and the Remaking of World Order* (New York: Simon and Schuster, 1996).

[75] E.O. Wilson, "Responses to Fukuyama," *The National Interest* (Summer 1999), 35.

[76] Douglas Johnston, "Religion and Foreign Policy," in *Managing Instability: A Pre-Crisis Approach*, DSD Research Report 00–4 (Newport, RI: Center for Naval Warfare Studies, 2000), 23–33.

[77] McKibben, "A Special Moment in History," 57.

[78] National Center for Policy Analysis, "Third World Pollution," 1996, <http://www.ncpa.org/ea/easo94/easo94m.html>.

[79] Fukuyama, "Second Thoughts," 18.

[80] Enriquez and Goldberg, "Transforming Life," 101.

[81] Stanley R. Bull and Lynn L. Billman, "Renewable Energy: Ready to Meet Its Promise," *The Washington Quarterly* (Winter 2000), 234. According to the authors, jet fuel is closer to kerosene than gasoline, but a bioenergy source more closely matching current jet fuels is possible. Diesel fuel, a step closer to jet fuel, "is being produced in limited quantities from soybeans. Research has shown that diesel fuel can also be produced from less costly and more abundant sources, such as natural oils occurring in algae and the pryolysis of biomass. A diesel substitute, dimethyl ether, also can be produced from biomass."

[82] McKibben, "A Special Moment in History," 60.

[83] Potter, "Water Fight Looms for Megacities."

[84] Robert Mandel, *Conflict Over the World's Resources* (New York: Greenwood Press, 1988), 75.

[85] Historically, the four most important groups of strategic minerals have been chromium, cobalt, manganese, and platinum, a majority of which comes from Africa.