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Institutionalizing Innovation Objective or Oxymoron?

Captain Bradd C. Hayes, U.S. Navy

IN JUNE 1994, AT THE NAVAL WAR COLLEGE, the Secretary of the Navy gave an impassioned speech about the importance of the Navy being open to innovative ideas. He related Thomas Edison's experience during the First World War, when Edison offered the Navy about forty-five "perfectly good" inventions only to see them all "pigeonholed" by its bureaucracy. The Secretary concluded, "The bottom line is that our Navy today cannot afford to fail when it comes to innovation. We cannot afford to be viewed as a 'closed corporation' unresponsive to new inventions—both in new technology and in strategic thought."¹

Being open to new ideas is important because many people believe that the American military is on the verge of a revolution in military affairs (known as the RMA) that will dramatically alter the face of warfare.² Revolutions in military affairs occur when the artifacts of war become radically more technologically sophisticated *and* doctrines and organizations are changed to take full advantage of them.³

To say that the naval service should be open to innovative ideas is all well and good; but how is an institution to foster innovative technological, doctrinal, and organizational change? More to the point, can innovation be institutionalized at all?

Secretary Dalton reminded his audience that innovation is not dependent on the size of the budget—a fact Lord Rutherford recognized in the 1920s: "We

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The views contained in this article are the author's and do not necessarily reflect those of the U.S. government, the Department of Defense, or the U.S. Navy.

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are short of money, so we must start to think." The Secretary of the Navy, quoting Stephen Rosen, noted in his address that "rather than money, talented military *personnel*, *time*, and *information* have been the key resources for innovation."⁴ These three factors are this article's concerns—because they are elements (Congress controlling the budget) over which the Department of the Navy has the most influence.

One matter of vocabulary should be clarified at the outset. "Innovation" in isolation makes no more sense than, say, "beauty." That is, beauty, of itself, is meaningless; there are beautiful paintings, flowers, people, and so on, but except in connection with an object, the word "beauty" has no meaning whatsoever. The same is true for innovation; we must speak of technological innovation, doctrinal innovation, organizational innovation, etc. Even though we will be generalizing about innovation and innovators, it will be important to keep this distinction in mind.

An institution cannot successfully order a pedestrian thinker to be either creative or innovative. Author and media critic Edwin Diamond argues that organizations can only "provide the conditions where creativity flourishes. Such conditions include strong staff morale, the feeling that someone is listening and the conviction that good work will be rewarded."⁵ An institution can provide this kind of care for innovators only after identifying them as such. But, much like decorations for bravery or distinguished service, the label "innovator" is not usually awarded until the sequel is known, well after the fact. Those whose innovations are adopted (i.e., the winners) will be seen as intelligent and progressive; the "losers" will be placed in one of two categories. First there will be those who opposed what turned out to be successful innovations; they will normally be viewed as cautious, conservative, even reactionary (traits that many believe the military actively fosters). But in fact these individuals play a very important filtering role—unless one asserts the notion that all ideas have equal merit.⁶ The second sort of "losers" are those who proposed innovative ideas of their own but failed to gain acceptance for them. Even if their ideas were genuinely innovative, these people are more likely to be considered crackpots than innovators. Only winners are innovators.

Conventional wisdom says that the true innovator is to be found outside the military mainstream and is generally considered anathema by its hierarchy. Of course, this thought is neither new nor unique; Machiavelli wrote centuries ago that "there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do

well under the new.”⁷ For that very reason a solitary innovator rarely, if ever, succeeds.

Success comes, rather, from small but effective groups of like-minded people who together pursue innovative ideas. Therefore, one way to foster innovation is to create organizations in which small groups of individuals can freely and frankly exchange ideas and in which mechanisms exist to ensure that meritorious ideas come to the attention of policy makers. There are several organizational models for such environments.

The first is the “ad hoc” group, one that assembles to consider a specific problem. A recent naval example was the Naval Force Capabilities Planning Effort (NFCPE) working group, which convened in 1991 to help develop a vision of the future of the Navy and Marine Corps in the post-Cold War world.⁸ The group consisted of about twenty mid-grade officers (i.e., captains, colonels, commanders, and lieutenant colonels) and several civilian analysts, with a group of one and two-star flag officers providing oversight. The eventual product of its effort was the well known white paper “. . . From the Sea.”

The concepts of that paper were first introduced to a large assemblage of three and four-star admirals and generals in a workshop at the Marine Corps Base in Quantico, Virginia. One admiral declared that he saw “no low-hanging fruit”—that is, no new, interesting, or innovative ideas—and another complained that “we did not have to go to Quantico to *not* have a vision.” Nevertheless, in the years since then, the ideas represented in “. . . From the Sea” (which was generally well received in its published form) have not been substantially furthered. In fact, its recent successor, “Forward . . . from the Sea,” offers little new thinking and appears actually to have abandoned some of the more innovative concepts of the original.⁹ That is, “. . . From the Sea” promised closer integration between the Navy and Marine Corps (especially in the area of fixed-wing aviation), implied that new command relations would be worked out, and suggested that new ways of deploying forces (e.g., naval expeditionary forces and naval expeditionary groups) would be developed. The changes have been slow in coming.

What does this experience say about support in the naval service for either innovators or their ideas? Certainly it shows the difficulty that large, hierarchical organizations have in changing past practices. One reason that “. . . From the Sea” has not brought about all the changes anticipated from it may be that it never really garnered the top-level support it needed. Although the NFCPE working group was visited by the Secretary of the Navy, the Chief of Naval Operations (CNO), and the Commandant of the Marine Corps, the Secretary and CNO were soon after embroiled in the Tailhook fiasco, which led to the resignation of the Secretary and consumed the remainder of the CNO’s term in office. When “. . . From the Sea” was eventually released, it was by a new

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Secretary who would himself shortly be swept from office with the Bush administration. His and the CNO's successors, then, had no "ownership" in the ideas of the white paper; therefore, no one should be surprised that the agenda it laid out was later altered.

The point is that without high-level support, ideas developed in the middle ranks by an ad hoc group risk being stillborn. One of the most successful such groups in the Navy was Project Sixty, established by Admiral Elmo R. Zumwalt, Jr., when he became CNO. Its charter was to organize a "brainstorming process addressing questions of 'What might be done? What can be done? What should be done? What will we do?'"¹⁰ Although Project Sixty represented only a part of Admiral Zumwalt's effort to institutionalize innovation, it was one of his more successful experiments. In general, however, the potential for innovation from this model is limited by the short life-span of such teams.

Another model is a more enduring version of the ad hoc group, best represented in the U.S. Navy by the CNO's Strategic Studies Group, or SSG. In 1981 Admiral Thomas B. Hayward, then CNO, became convinced that too many naval officers were concerned about "programmatics" (the quasi-political process of bringing weapon systems, especially, into service) and not enough were thinking about strategy. To remedy this situation, he selected a number of captains and commanders he believed had potential to become flag officers, sent them to the Naval War College, charged them to think broadly about strategy, and made sure their ideas were heard by the naval leadership. As a result, early SSGs contributed significantly to the Maritime Strategy. Later SSGs perceived that naval forces spend the majority of their time responding to crises; when the Berlin Wall fell, former members of those groups, many of them now in joint billets, were able to draw upon their studies, whose concepts eventually emerged in the Joint Staff's "flexible deterrent" options. Recent SSG members have been drawn not only from the Navy but also the Marine Corps and Coast Guard.

The SSG has several strengths as an exemplar for innovation. First and foremost, it selects exceptional personnel; to date, approximately forty of its members have been promoted to flag rank, including two four-star and six three-star officers.¹¹ Second, SSGs are given a substantial amount of time to be creative, one year (though still not long enough). Third, as currently structured, the program assures members access to a vast amount of information (which is one reason it was established in a university setting). Fourth, there is a deliberate effort to expose members to experts in many fields, both civilian and military. Finally, the group is able to test and "game" its concepts rigorously.

A third model is represented by the CNO Executive Panel. This standing group collects leading business figures and academics, as well as former flag officers, to provide the CNO a "different" view of where the Navy should be headed. The Executive Panel has been a superb source of independent thinking.

For example, the Tomahawk cruise missile was being developed strictly as a strategic nuclear weapon until the program was briefed to the Panel; Albert Wohlstetter, one of America's preeminent strategists and a member of the Panel, thereafter argued that the Navy should pursue a conventional variant and was able to convince the CNO.¹² Other programs either initiated or promoted by the Executive Panel include the basic idea for the Strategic Defense Initiative, naval satellite communications, and the Space and Electronic Warfare concept.¹³ The strength of such a panel lies in the quality and variety of its personnel as well as in its essentially permanent nature. Although members of the Executive Panel cannot devote full time to its efforts, their deadlines are generally self-imposed; they have a remarkable luxury of time. Also, the variety of backgrounds represented by its members makes available a corresponding diversity of information.

A final model is the professional "think tank," represented within the Navy by such organizations as the Center for Naval Analyses (CNA), laboratories, test facilities, and institutions like the Center for Naval Warfare Studies (at the Naval War College), Strike University, and certain program development offices. (A good example of the last was the office that developed the truly revolutionary Polaris force;¹⁴ many of the lessons learned from the Polaris experience were incorporated by Rear Admiral Wayne Meyer in the similarly innovative Aegis combat system, which has forever changed the way navies fight.¹⁵) Many warfighting concepts, weapons, damage control designs, and so forth, have been developed at these institutions. The virtues of the think-tank model include the ability to attract bright people, who are given relatively unlimited time and access to extensive information.

None of these achieves the ideal; each has drawbacks. The primary weakness of the ad hoc working group model is, as noted earlier, its transitory nature. It is difficult, if not impossible, to pursue concepts developed by such groups, especially if they lack (or lose) a powerful senior advocate. Project Sixty is the perfect example, as Jeffrey Sands, an authority on the Zumwalt years, acknowledges: "With only a single four-year term in office, a CNO cannot institutionalize change on his watch alone. . . . But it is clear from the Zumwalt experience that the strategic agenda has to be vested both into the organizational structure and the process of decisionmaking."¹⁶

The drawback of the SSG model is its fixed one-year time frame. By the time participants get settled, receive their collective assignment, and familiarize themselves with the issues, they have little time actually to think and write before having to brief their results. Overcoming this shortcoming would require overlapping assignments of eighteen months or two years. The primary weakness of the Executive Panel model, which has been such a fruitful source of innovative ideas, is that it is, after all, an "outside" organization; its ideas are likely to confront

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considerable opposition from within the service. For example, it took nearly seven years to convince the Navy to invest heavily in satellite communications.¹⁷

Andrew Marshall, Director of Net Assessment for the Secretary of Defense, has commented that one weakness with the think-tank model is that it is too project-oriented; he recommends creating organizations "like RAND of the 1950's." That was a time when RAND analysts could congregate in the halls and hold impromptu brainstorming sessions.¹⁸ Today, at RAND as elsewhere, dollars now drive research agendas and the "bottom line" often discourages such non-directed thinking. Marshall believes that given the proper financial backing, RAND, CNA, and other think tanks could recreate this ambiance.

Organizations that fall under this model and have military personnel assigned (such as program development offices) can experience dramatic and generally negative effects on innovation from service rotation policies. Retired Rear Admiral Ronald Kurth, former President of the Naval War College, argues that by routinely rotating program leadership "the Navy incentive system exerts conservative control over innovation. Quantum-jump innovations, which may destabilize the organization, usually require a span of attention over a considerable length of time. . . . The length on the job for an innovative departure may be undesirable" for personal career development.¹⁹

What makes any of these models work is the ability to attract the right people. But, as it turns out, frequently the right people do not remain "right." Once an idea of theirs has succeeded, innovators (like revolutionaries) often become reactionaries. Admiral Hyman G. Rickover is probably the most celebrated case of an innovator-turned-reactionary: by the end of his career, he seemed as much an impediment to progress as he had once been a supporter of it. As a result, there is today an institutional reluctance to leave a program manager in charge very long. The legacy of this "Rickover Syndrome" on the naval service has been a stifling of innovation.

Successful and continuous innovation, then, is never easy to achieve; but there are techniques that innovators can employ to reduce opposition to their ideas. Kurth contends that "the politics of *incremental innovation* are comparatively free of conflict . . . [while] the politics of *innovative departure* are likely to be complex. . . . The problem is that more rapid acceptance of radical innovation would require a change in basic service values and attitudes or require easier access to political arbitration. The services resist dilution of their ethic, and the public and political leaders are disturbed by inter-service and intra-service conflicts. . . . There is a much more comfortable existence within the organization for those who make the existing system work better rather than attempt its displacement."²⁰ That is, practical visionaries have a better chance of selling their ideas if they move slowly.

Herein lies a dilemma, however. One scholar in this field asserts that attempting to avoid rivalries may actually discourage innovation. He believes that innovation is fostered by ideological struggles within and among the services.²¹ The full implication of this hypothesis should not be missed by those who encourage ever more jointness in doctrine, budgets, and organizations: in such areas as professional education, research and development, and war gaming, allowing the individual services to explore different (often competing) concepts is the best way to encourage innovative thought. This assertion, appearing as it does in a war college journal and coming from a member of a war college faculty, could be taken as both parochial and self-serving—but others share this belief. Paul Bracken, a highly respected defense analyst and commentator, considers that some types of organizations (represented by the models previously discussed) within the Defense Department bureaucracy—specifically, national laboratories, test centers, and war colleges—are more likely than others to have an atmosphere conducive to innovation. Andrew Marshall agrees and recommends that the services' best and brightest officers "spend more time at war colleges . . . in wargaming and in research programs" and be given "credit for this in their careers; it has to be a way to the top for them."²²

There are signs that those very institutions may be weakening. These indications include consolidation of national laboratories, war college budget cuts, and the fact that more military officers staffing the war colleges retire than are promoted—just the opposite of what Marshall recommends. Bracken asserts that "these centers need support and protection from immediate pressures" and that steps need to be taken "to strengthen independence and tolerance for diversity" within them.²³

Conspicuously, but not surprisingly, absent from the list of organizations that promote innovation are the doctrine commands. Bracken believes these organizations and the doctrines they promote are more "likely to perpetuate current concepts . . . than explore fundamentally new ways of doing things."²⁴ Robert S. Wood, Dean of Naval Warfare Studies at the Naval War College, concurs, because, as he observes, doctrine is made up of fixed principles that border on dogma—whereas innovation represents just the opposite.²⁵ Asking the doctrine commands to promote established doctrine while simultaneously trying to change it places them in an untenable situation akin to the biblical image of a kingdom divided against itself.²⁶ This problem is made even more difficult by widespread naval suspicion of anything labelled "doctrine." Indeed, Wayne Hughes of the Naval Postgraduate School (and author of the well known *Fleet Tactics*) has argued that a principal responsibility of the Naval Doctrine Command should be to consolidate the numerous existing expressions of doctrine into a few coherent publications.²⁷ While this recommendation

undoubtedly has merit, it would mean that the Naval Doctrine Command could not be a source of much innovative thought.

Yet somehow *new* doctrine must be developed. As Marshall urges, "The most important thing that we can focus on in the next several years is the investigation of, and experimentation with, novel concepts of operation and new organizations to exploit the technologies available now and likely to be available in the next 20 years."²⁸ We have the time—"we are not sure how warfare will change";²⁹ until we do, we need to "search for insights as to appropriate longer term changes in doctrine, concepts of operation, and organizational change."³⁰

Wohlstetter asserts that any institution's role in this process is to protect people with "wayward" thoughts from being penalized. They can be so protected only if the institution establishes, supports, and properly staffs settings in which innovative thought may take place. Even then, these groupings can be successful only if they are small and informal; are beholden to no overarching program, hierarchy, or doctrine; work purposefully, not expecting random thoughts to produce anything of value;³¹ and give their creative people access to outside thinking. As long as insiders talk only to insiders, they will tend to ask traditional questions and come up with traditional answers.

The present post-Cold War "interregnum" marks a moment in history during which the nation should take advantage of newly available "time and resources for experimentation." Because no peer competitor looms, "this is the period of least risk if wrong choices are made."³² We should not delude ourselves into thinking that no wrong choices will be made—some will. But fewer mistakes will occur if more possibilities are considered and proper deliberation precedes decisions. Of all the country's alternatives, funding *ideas* is the most affordable and fruitful option.

We should also keep in mind that ideas are not generated by organizational arrangements. Ideas come from people. If innovation is to flourish, the naval service must invest in the right people and then promote—or at least protect—those willing to advocate unorthodox but promising ideas.³³ As Kurth contends, it would not be wise to establish a separate "career track" in which officers could spend their entire service in the pursuit of innovative endeavors. Doing so would create a powerful internal elite, which would redistribute internal political influence but ultimately do little to foster innovation.

Since people can neither be ordered to be creative nor organized in such a way that they will assuredly be creative, innovation will emerge only in fits and starts, as innovators reveal themselves and successfully advocate their positions. Because this is a long-term proposition, a stable base of civilian analysts must remain in place—though even that "stable base" needs a certain amount of change if it is not to become stagnant. Innovation follows a pattern: "The

visionary comes along and it takes him about a generation to convince everybody that his vision is plausible. You recognize that [stage] when you start calling it reform instead of revolution. Then the second generation comes along, understands the vision, carries it out, and perpetuates it for about a generation. Finally, the third generation comes along and [sees the innovation as the normal way of doing things]. . . . Then you are ripe for the next visionaries."³⁴ Wohlstetter labelled those three stages in a slightly different way: "That's an outrageous idea," "That's an interesting idea," and "That's what I always thought."³⁵

Here, then, as Shakespeare put it, is the rub—organizing to promote innovation is easier said than done. Vice Admiral J. D. Williams, USN, Retired, takes the extreme view and insists that "you can't design an organization for advocacy and innovation because bureaucracy will stomp it out every time."³⁶ Others hold the more optimistic position that while good people can overcome bad arrangements, certain organizational arrangements can be instituted to foster and reward creative, productive activity. Certainly, one feature of the ideal situation for the innovator is to be allowed to work unencumbered by bureaucracy. An institution should let the innovator "assemble his own team and attack the problem. Give him responsibility and discretion. Free him insofar as possible of bureaucratic layers of oversight authority. So long as he produces, let him alone to do so."³⁷

For innovators, their work is often its own reward; the best an institution can do is make it easier for them to do it. Kurth fears, however, that "attempting to systematize the work of such men may destroy the circumstances under which they dedicate themselves to innovative endeavors. . . . [and could create] a myth that innovation is institutionalized by an organizational design. It is doubtful that the innovative function can be bureaucratized."³⁸ The other extreme, doing nothing, is also to be avoided. The naval service can do much to reduce the obstacles faced by innovators and to cultivate their efforts. Specifically, if the service is genuinely committed to promoting innovation, it can do four kinds of things.

It can sustain centers of excellence where ideas are openly discussed and analyzed. New organizations are probably not needed, though as suggested earlier, some existing organizations could benefit from minor changes. For example, SSG members should have longer, overlapping tours; CNA, test centers, and laboratories should be allowed more freedom to pursue unsponsored research; and the Naval War College should be more selectively staffed.

It can make risk-taking much more acceptable. This means, among other things, allowing people to fail. Not all innovative ideas work, and when they do not, those proposing them should not be penalized for having tried them. Risk-taking also involves willingness to invest in technologies that have potentially high

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payoffs but are uncertain. In an era of restricted budgets, this strategy takes enormous courage (which may be one reason that we seldom skip a technological generation in established programs). The time has come for the military to borrow a page from the automobile industry and start investing in some "concept cars" of its own. The single, inescapable fact is that innovation entails risk; if people are punished for trying something new that does not succeed, very little that is new will be tried.

It can accommodate true innovators without fearing an uncontrollable cadre of Rickovers. The Admiral's power base came from his personal relationships with members of Congress. Today, with the exponential growth of their staffs, congressmen are so insulated that it is nearly impossible to build the kind of support structure Rickover enjoyed. Rickover was *sui generis*; the drawbacks of his influence need not be generalized by the Navy.

It can open itself to ideas beyond the scope of typical military experience. As the Secretary of the Navy recalled (in remarks cited at the beginning of this article), the military has not always been open to new, outside ideas. While it has come a long way since 1917, like many large organizations the Navy is susceptible to the "not invented here" syndrome. When it has opened itself, it has often benefited (e.g., in nuclear submarines, conventional cruise missiles, satellite communications, etc.). Outside the formal defense establishment, research universities have been a fruitful source of innovation; Congress, however, threatens to decrease defense research funding for colleges. It has been argued that such cuts "would rob the military of its technology leadership while doing little to solve the defense budget problem."³⁹ Anita Jones, Director of Defense Research and Engineering, has predicted that "this reduction in defense research would have very dire results. . . . You will not see them immediately, but over the long term they would be severe."⁴⁰

We have argued that, although the Navy can do much to help matters, there is no such thing as an organizational "greenhouse" in which creativity can be cultivated like an exotic plant expected to bloom on demand. It would seem that, after all, "institutionalizing innovation" is an oxymoron. Where does that leave us, especially as battles over the budget continue? The naval service would do well to remember one analyst's words relating "things" to the thinking that binds them to purposes: "He who dies with the most toys simply dies, he does not win. Technology will only be valuable to the extent it is integrated into an effective overall force structure."⁴¹

Innovation—whether in technology, doctrine, or organization—is an imperative for the naval service; every leader recognizes this. The challenge for leadership is to direct the institution continually to foster, recognize, incorporate, and reward change that enhances mission accomplishment. This cannot be done without cost, risk, and thought; nor can it be done purely procedurally, by fiat,

or by a one-time rearrangement. Rather, it requires commitment, courage, trust, and unceasing support. To the degree that leaders have the wisdom to treat these words as real responsibilities, the naval service will continue contributing to national security.

Notes

1. The Honorable John H. Dalton, Secretary of the Navy, "Remarks Prepared for the Current Strategy Forum," Naval War College, Newport, R.I., 14 June 1994, pp. 7-8.
2. "Revolutions in military affairs" have also properly been referred to as "military-technical revolutions." The former name deemphasizes the technical aspects of warfare and stresses doctrinal and organizational aspects.
3. Stephen Peter Rosen, "New Ways of War: Understanding Military Innovation," *International Security*, Summer 1988, p. 134.
4. *Ibid.*, emphasis added.
5. Telephone interview with Edwin Diamond, New York: 6 March 1995.
6. This notion is discussed in Vincent Davis, *The Politics of Innovation: Patterns in Navy Cases* (Colorado: Univ. of Denver, 1967), p. 5, note 3.
7. Niccolò Machiavelli, *The Prince*, trans. W.K. Marriott (London: J.M. Dent & Sons, 1968), p. 29.
8. See Edward A. Smith, Jr., "What '... From the Sea' Didn't Say," *Naval War College Review*, Winter 1995; and Bradd C. Hayes, "Keeping the Naval Service Relevant," U.S. Naval Institute *Proceedings*, October 1993.
9. Whereas "... From the Sea" implied that new command arrangements were required to meet tomorrow's challenges, "Forward ... From the Sea" insists that "our basic presence 'building blocks' remain *Aircraft Carrier Battle Groups*—with versatile, multipurpose, naval tactical aviation wings—and *Amphibious Ready Groups*—with special operations—capable Marine Expeditionary Units." The Honorable John H. Dalton, Admiral J.M. Boorda, and General Carl E. Mundy, Jr., "Forward ... From the Sea" (Washington: Department of the Navy, 1994), p. 4 (emphasis original).
10. Jeffrey I. Sands, *On His Watch: Admiral Zumwalt's Efforts to Institutionalize Strategic Change* (Alexandria, Va.: Center for Naval Analyses, 1993), p. 24.
11. One reason the SSG is able to attract extremely capable individuals is the remarkable number of flag officers who have been members. To date the list includes:
Navy (active duty): Admiral William A. Owens, (SSG I), Admiral Leighton W. Smith, Jr. (SSG V), Vice Admiral Timothy W. Wright (SSG VI), Vice Admiral John B. LaPlante (SSG V), Vice Admiral William A. Earner, Jr. (SSG VII), Vice Admiral Jay L. Johnson (SSG IX), Vice Admiral Arthur K. Cebrowski (SSG I), Vice Admiral Frank L. Bowman (SSG VI), Rear Admiral Byron E. Tobin, Jr. (SSG VI), Rear Admiral Irve C. Lemoyne (SSG V), Rear Admiral Thomas D. Ryan (SSG VII), Rear Admiral Thomas F. Hall (SSG VII), Rear Admiral Larry R. Marsh (SSG III), Rear Admiral Jon S. Coleman (SSG VIII), Rear Admiral Michael A. McDevitt (SSG II), Rear Admiral Dennis C. Blair (SSG VI), Rear Admiral Mack C. Gaston (SSG VIII), Rear Admiral William H. Wright IV (SSG X), Rear Admiral Raymond C. Smith, Jr. (SSG XI), Rear Admiral Albert H. Konetzni, Jr. (SSG IX), Rear Admiral Dennis V. McGinn (SSG X), Rear Admiral Patricia A. Tracey (SSG XII), Rear Admiral Stanley W. Bryant (SSG XI), Rear Admiral Edmund P. Giambastiani (SSG X), Rear Admiral Richard K. Kirkland (SSG IX), Rear Admiral Barbara E. McGann (SSG XIII), Rear Admiral William L. Putnam (SSG VII), and Rear Admiral Thomas R. Richards (SSG XIII).
Marine Corps (active duty): Lieutenant General Anthony C. Zinni (SSG VI) and Major General Bertie D. Lynch (SSG V).
Fiscal Year 1996 Navy Selectees: Captain Robert T. Ziemer (SSG XIV), Captain Steve Loeffler (SSG XII), and Captain Steve Johnson (SSG VIII).
Retired: Vice Admiral Jerry L. Unruh (SSG VI), Rear Admiral Edwin K. Anderson (SSG II), Rear Admiral Clarence E. Armstrong, Jr. (SSG II), Rear Admiral Don R. Baird (SSG VIII), Rear Admiral Alvaro R. Gomez (SSG VI), Rear Admiral Jesse J. Hernandez (SSG IV), and Rear Admiral Daniel J. Wolkenstorfer (SSG I).
12. See Bradd C. Hayes and Douglas V. Smith, eds., *The Politics of Naval Innovation*, Research Report 4-94 (Newport, R.I.: Naval War College Strategic Research Department, 1994), p. 29. The briefing was given by Captain (later Rear Admiral) Walter Roche, who remained the program manager until his retirement.
13. Telephone interview with Dr. Tom Evans, Johns Hopkins Applied Physics Laboratory, Laurel, Md.: 1 February 1995. Dr. Evans has served on the Executive Panel since its inception.

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For a brief summary of Space and Electronic Warfare, see Dan Struble, "What Is Command and Control Warfare?", *Naval War College Review*, Summer 1995, esp. pp. 95-7.

14. For an excellent discussion of the Polaris program, see Ronald J. Kurth, *The Politics of Technological Innovation in the United States Navy*, unpublished doctoral dissertation (Cambridge: Harvard Univ., 1970).

15. See Hayes and Smith.

16. *Ibid.*, pp. 83-4.

17. Evans interview.

18. The author served in 1988 and 1989 as a Federal Executive Fellow at RAND.

19. Kurth, p. 84.

20. *Ibid.*, pp. 4, 45, 71 (emphasis added).

21. Rosen, p. 141.

22. Andrew Marshall, memorandum for the record, "Some Thoughts on Military Revolutions—Second Version," 23 August 1993, p. 6.

23. Paul Bracken, "The Military after Next," *The Washington Quarterly*, Autumn 1993, p. 171.

24. *Ibid.*, p. 159.

25. Interview with Dr. Robert S. Wood, Dean of Naval Warfare Studies, Newport, R.I.: 8 August 1994.

26. Matthew 12:26.

27. Wayne P. Hughes, Jr. (Capt., USN, Ret.), "The Power in Doctrine," *Naval War College Review*, Summer 1995, p. 27. For the contrasting view of a senior analyst at the Naval Doctrine Command, see James J. Tritton, "Naval Perspectives on Military Doctrine," *Naval War College Review*, Spring 1995, esp. pp. 22-3.

28. Marshall, p. 2.

29. *Ibid.*, p. 3.

30. *Ibid.*, p. 5.

31. This does not contradict the earlier point that more "non-directed" thinking be allowed. Non-directed thinking means allowing analysts to pursue research topics they believe are important but for which they have no sponsor. This is quite a different notion than random thinking.

32. I am indebted to James R. FitzSimonds and Jan M. van Tol for this insight. See their "Revolutions in Military Affairs," *Joint Force Quarterly*, Spring 1994, p. 27.

33. A recent RAND study directed by Dr. Henry J. Thie entitled "Future Career Management Systems for U.S. Military Officers" recommends maintaining the "up or out" system only for junior officers, allowing much longer careers. Such a system would, among other things, benefit recognized innovators in program offices, laboratories, gaming centers, etc.

34. Interview with Mr. Marion Oliver, Special Assistant for Science and Technology on the Navy Staff (N8T), conducted by Cdr. Greg Engel, USN, Washington, D.C.: 9 September 1993.

35. Interview with Dr. Albert Wohlstetter, Los Angeles, Calif.: 18 September 1993.

36. Quoted in Hayes and Smith, p. 94.

37. Kurth, p. 388.

38. *Ibid.*

39. Ralph Vartabedian, "Colleges Fear Research Cuts by Pentagon," *Los Angeles Times*, Washington edition, 22 July 1994, p. 1.

40. *Ibid.*

41. Anthony Cordesman, "Compensating for Smaller Forces: Adjusting Ways and Means Through Technology," *Strategy and Technology* (Carlisle Barracks, Penna.: Strategic Studies Institute, 1992), p. 8.



[The] reasonable right of the amateur to do what he can with the facts which the specialists provide.

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