DOCUMENTED BRIEFING

RAND

Forks in the Road for the U.S. Navy

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Prepared for the United States Navy

National Defense Research Institute

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PREFACE

The U.S. Navy is, as always, seeking better ways to fulfill its Title 10 responsibilities. It faces an array of issues, ranging from replacement of ships and planes, improvement in readiness, retention of personnel, reductions in operating costs, and acquisition of new technology. To help clarify future choices, the Navy asked RAND to determine if there were "forks in the road" that it would or should face in the next few years. A fork in the road can be a future decision point for a specific acquisition program, a mission or operational concept, a new technology that may replace or enhance a current capability, or a doctrinal, cultural, or personnel policy that may require a significant change in direction for the service.

RAND began research on this project in September 2002 and provided the results of the analysis to the Navy in December 2002.

The research was based on a series of interviews with current and retired Navy officers and experienced personnel in the defense establishment.

This research and its documentation should interest members of the Office of the Secretary of Defense (OSD) and Navy policymakers and planners who face future decisions. The research reported here was carried out in the Acquisition and Technology Policy Center of the National Defense Research Institute, RAND's federally funded research and development center (FFRDC) supporting the Office of the Secretary of Defense, the joint staff, the combatant commanders, and the defense agencies.

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SUMMARY

The U.S. Navy has always had to deal with a changing national security environment. But the events of September 11 have made that environment much more fluid. It is clear that the Navy must address a range of issues in this new security environment that will require decisions. Equally clear is that some of these decisions have the potential to change the Navy significantly—even profoundly. Ideally, the Navy would identify likely decision points that could cause significant change well in advance of the time a decision needed to be made. Early identification would enable the Navy to analyze different courses of action.

To qualify as a key decision area—what we call a "fork in the road"—the decision area must have the following attributes:

- A decision is mandatory.
- Multiple paths are possible (i.e., not simply a binary decision).
- The decision sets (or may set) the long-term direction.
- It involves investment as well as operational decisions.
- Many naval communities could be involved.
- It usually involves significant resource decisions.
- It implies an opportunity to transform.

To assist the Navy with the task of identifying forks in the road, we interviewed a number of senior naval officers and people experienced in defense policy. From those interviews, we identified between 65 and 70 important decision points for the Navy. Not all seemed equally important, so we developed a simple methodology to identify those that offered the highest opportunity while posing the lowest risk.

FORKS IN THE ROAD

Based on the results of the interview process and the opportunity-risk analysis, nine forks were identified that the Navy should consider first. They are as follows:

Global Maritime Tracking and Homeland Defense. Interviewees believe that ultimately the U.S. Navy will be viewed as responsible for tracking merchant shipping to prevent an attack on the United States. The Navy today does not

hold this view, believing that the tracking of foreign ships entering U.S. ports is a task for the Coast Guard. Even though the Navy has developed a joint maritime intelligence center that supports both services, it is not clear that the Navy believes an attack on the United States from a seaborne platform is its responsibility.

Recognize the Navy's Joint Role. While not diminishing the Navy's support for the U.S. Marine Corps (USMC), the Navy needs to understand that its role is to support joint operations, including the Army, Air Force, and special operations as well as the Coast Guard or elements of the Department of Homeland Security.

Transitioning the Aircraft Carrier to a Joint Aviation Platform. Historically, aircraft carriers have been used to project power either with fixed-wing aircraft or, on occasion, helicopters. These aircraft have almost always been either Navy or Marine. Because of its size, speed, and longevity, the carrier needs to be thought of in terms of its support to special operations forces, the Army, and the Air Force, in sum, the joint force.

Modularity. As the cost and longevity of platforms increase, it becomes more important to design them in a modular fashion to more readily accept missions that will arise—missions not even on the drawing board today.

Sea Basing. With the U.S. Navy so completely dominant at sea, with no foreseeable threat arising in the near future, and with base access increasingly problematic, the concept of support to the U.S. Army, U.S. Air Force (USAF), U.S. Coast Guard, from a sea base, whether it is a Mobile Offshore Base or a large conventional ship, such as the one envisioned by the USMC in its Maritime Preposition Force (Future) becomes even more important for our war planners.

Follow-On to *Trident*. Our strategic force of 14 *Trident* submarines has a projected life of 42 years. Therefore, some of these ships will reach the end of their service lives in the next 15 years, and it is time to begin thinking about their replacement. It appears clear that the land-based intercontinental ballistic missile (ICBM) force will be retired and the nation will depend on the stealthy nature of the submarine to provide strategic deterrence.

Organizational Relocation Based on Information Technology (IT) Modernization. With the transference between IT 21 and the Navy–Marine Corps Internet and with the increased efficiency afforded by IT, interviewees noted that the Navy needed to look objectively and aggressively at the potential savings in personnel and the relocation of those personnel into the warfighting portions of the service. The private sector has reduced the number of people doing the more routine functions because of IT and has also reduced (flattened) the size of the chain of command because of the new communication tools afforded by the Internet. This could apply to the Navy as well.

Cost-Effective Electronic and Laser Weapons. Many of our interviewees believed that electronic and laser-type weapons were feasible within the next 15 years. They also believed that electric-powered carriers or gunships would be the power source for weapons at sea. Some opined that the power from the ship could be transmitted to a weapon in the air.

Increase Navy Role in the Development of the Small-Diameter Bomb. A logistics payoff could also come from a common bomb with the USAF. Carrier-based aircraft are heavier than their land-based counterparts and thus have a more limited range. The small-diameter bomb holds great promise, therefore, for the Navy. Common weapons with the Air Force also have a synergistic logistics reduction effect.

HIGH-RISK FORKS

Our approach was to identify the high-opportunity, low-risk forks. However, our interviews discovered two that seem to offer exceptionally high payoff even as they pose high risk. The payoff is such that we think they merit the Navy's attention.

Unmanned Combat Air Vehicles (UCAVs), Unmanned Aerial Vehicles (UAVs), Unmanned Underwater Vehicles (UUVs), Unmanned Ground Vehicles (UGVs)—Roles Missions, Functions, Concept of Operations. Interest in unmanned vehicles has increased since the Kosovo campaign, where the Predators enjoyed modest success. However, in Yemen (using Predator to kill an al Qaeda operative in an automobile) and Afghanistan, where the terrain was more favorable, it has become clear that unmanned vehicles hold great promise. Promising technologies also apply undersea, in the air, on the ocean, and on the ground. We are just beginning to understand how to use and build these vehicles. The concepts of operations are in their infancy, as is the technology. The Navy must think about how to exploit the unmanned concepts and integrate them into the manned operations.

Transposing Navy's Presence Function to Space (Implications of the Militarization of Space). Some believe that the nation will militarize space and that one of the implications is that the Navy's "presence" function could be supplanted by a space-based capability. The Navy needs to be involved in that thought process.

ACKNOWLEDGMENTS

The study was conducted over three months and greatly benefited from the assistance of many people in the Navy, at RAND, and elsewhere. We particularly express our thanks to the many retired officers and civilians who gave their time to be interviewed.

In particular, we are grateful to Admiral Frank Bowman, Director of Nuclear Propulsion, Admiral (ret.) Donald Pilling, Vice Admiral (ret.) Dennis McGinn, and Vice Admiral (ret.) Art Cebrowski for their insights and encouragement. We are also grateful to the RAND staff who gave us their perspective, time, and knowledge of other services' viewpoints.

Russ Shaver and John Schank provided thorough and thoughtful technical reviews, which are much appreciated.

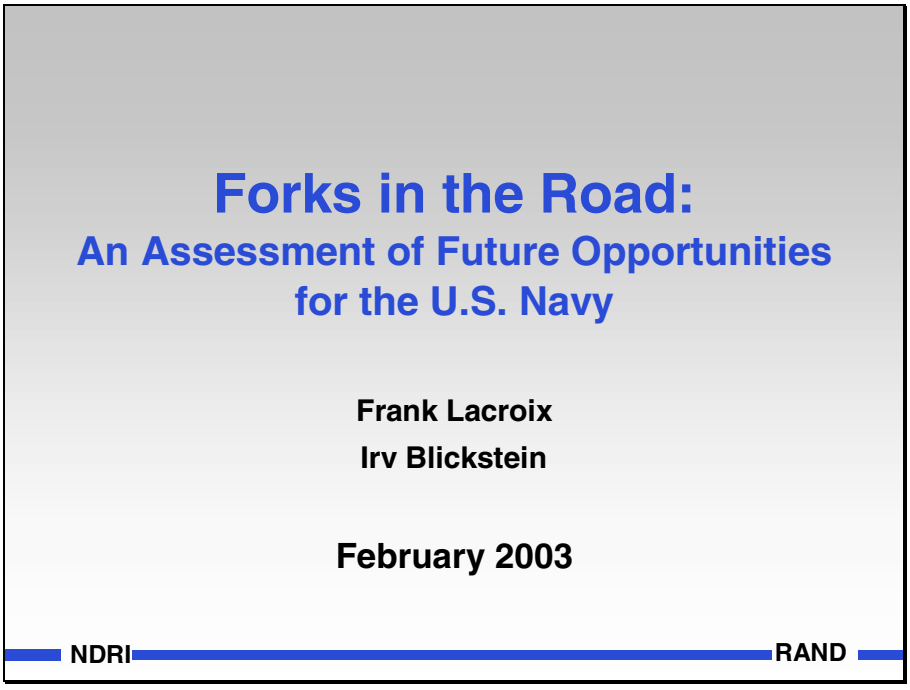
Of course, we alone are responsible for any errors.

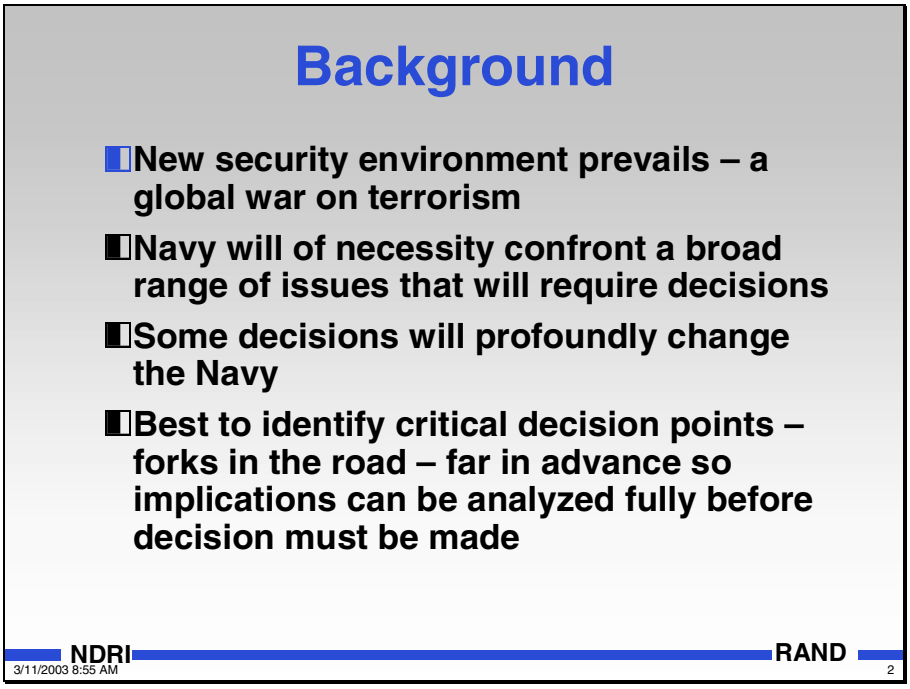
ACRONYMS

AEC	Atomic Energy Commission
ATC	American Tank Corps
CNO	Chief of Naval Operations
CONOP	Concept of Operations
DD (X)	Next-Generation Destroyer
DHS	Department of Homeland Security
DoD	Department of Defense
EMP	Electromagnetic pulse
FFRDC	Federally funded research and development center
GPS	Global Positioning System
ICBM	Intercontinental ballistic missile
IRBM	Intermediate-range ballistic missile
IT	Information technology
JANBC	Joint Army-Navy Ballistic Missile Committee
LCS	Littoral Combat Ship
MPF (Future)	Maritime Preposition Force (Future)
SOF	Special operations forces
SYSCOMs	Systems Commands
UAV	Unmanned aerial vehicle
UCAV	Unmanned combat air vehicle
UGV	Unmanned ground vehicle
UK	United Kingdom
USA	U.S. Army
USAF	U.S. Air Force
USMC	U.S. Marine Corps

USN	U.S. Navy
U.S. Northcom	U.S. Northern Command
USS	United States Ship
USV	Unmanned surface vehicle
UUV	Unmanned underwater vehicle
VSTOL	Vertical/Short Takeoff and Landing

FORKS IN THE ROAD FOR THE U.S. NAVY

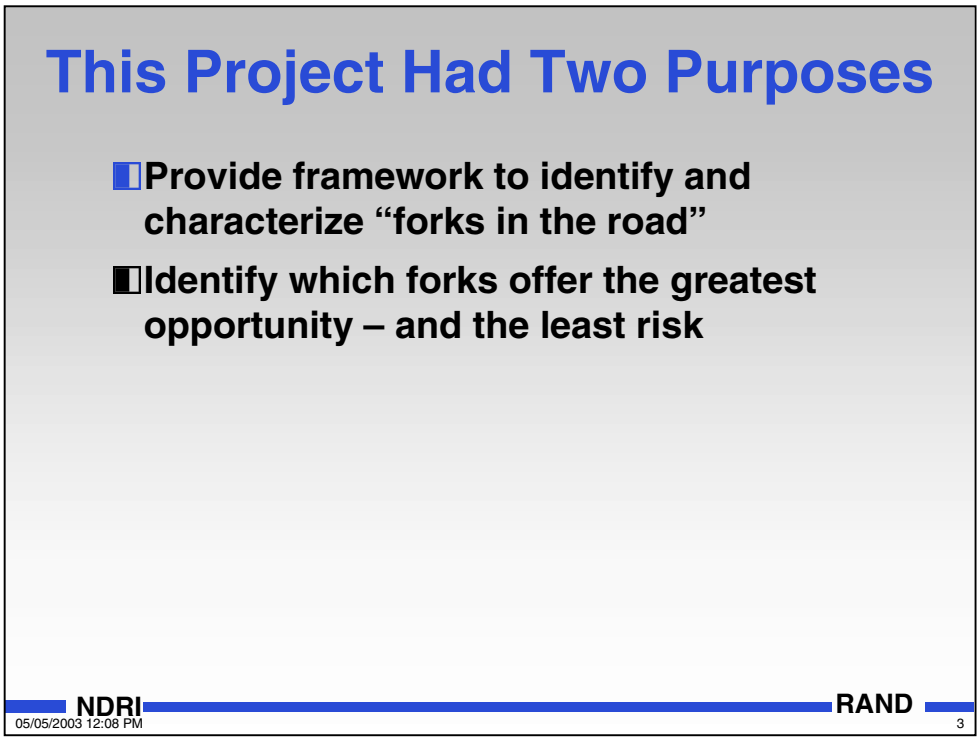




In fulfilling its Title 10 responsibilities, the Navy continually faces policy and program choices. These choices span the full range of its responsibilities, including replacing major combat systems, making personnel policy decisions, and defining the Navy position with respect to interservice and joint operational challenges. Some choices are obvious and can be made immediately. Others, however, may require careful analysis before committing the service to a path from which retreat will be difficult or problematic.

The Navy is operating in a new and challenging security environment. Without a systematic review of this environment, future choices can appear abruptly as inflection points (that is, moments of dramatic change, especially in the development of a company, industry, or market). Rather than chancing surprise and thus incomplete preparation, an alternative is to seek to manage these inflection points, or *forks in the road,* as natural transitions.

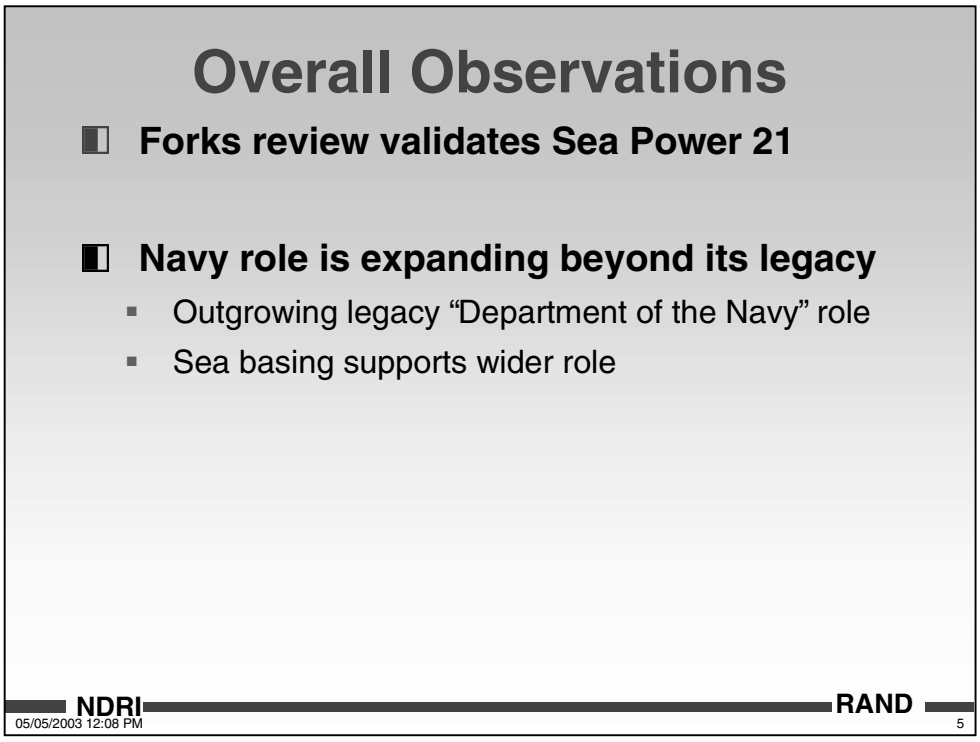
This documented briefing seeks to identify for the Navy those impending policy and programmatic decisions that will require thought, analysis, and possibly employment and operational concept changes as well. This research also provides a framework to assist senior Navy decisionmakers in identifying and characterizing possible "forks in the road." The research also provides examples of prior forks in the road faced by other organizations for the purposes of illustration. Most important, the framework prioritizes upcoming future decision points for Navy leadership. That prioritization stems from a source removed from the burdens of daily Navy management.



The project, then, sought to assist the Navy by identifying potential "forks in the road," or future decision points for the service. To accomplish this, the study establishes a framework and proposes a first-order methodology for assessing the Navy's comparative interest in proceeding down any of the paths leading out of potential forks in the road.

To achieve this task, first, we interviewed as many defense experts as time permitted, developing a candidate set of potential forks in the road. Next, we assessed the recommended forks against a set of criteria to determine which forks offered the greatest potential opportunity at the least risk.

We interviewed a number of admirals, both active and retired. We also interviewed a coterie of defense experts with experience across all services. Among them were many RAND colleagues who have worked on Air Force and Army programs in their analyses for Project AIR FORCE and the Arroyo Center. (See Appendix A for list of interviewees.) We categorized all the recommendations from the interviews and then rank-ordered them based on opportunity and risk, as will be shown later.



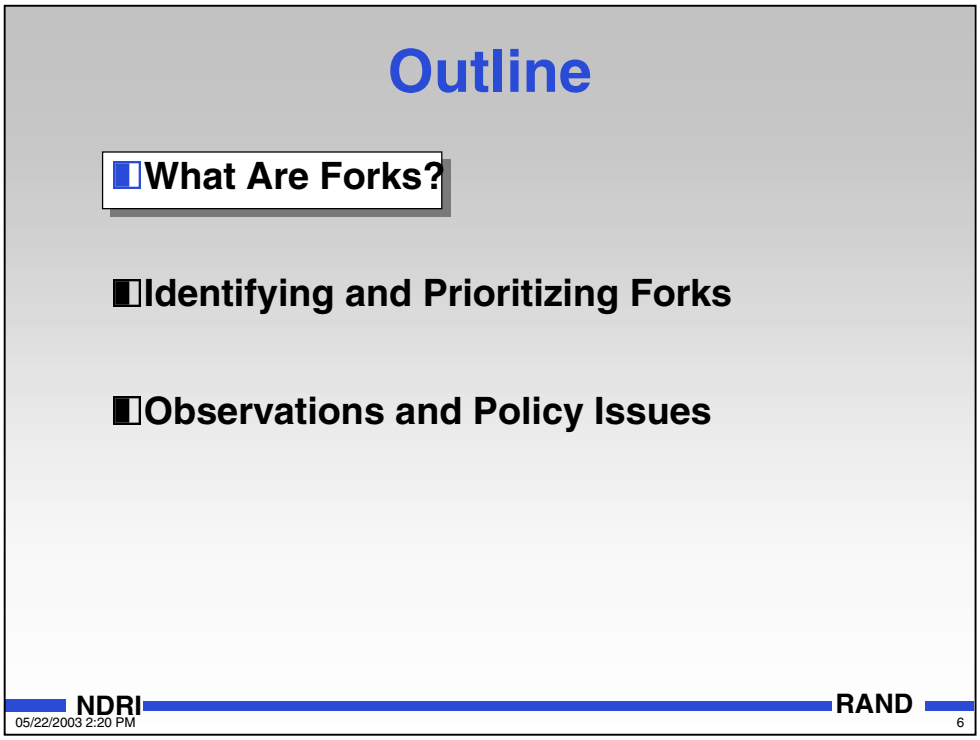
The interviewees did not offer a consensus on the strategic direction of the Navy or the capabilities required to support the future national security and derivative national military strategy. All were currently involved in national security analysis in support of the Department of Defense (DoD) or the services and as such provided a good joint input for our investigation. The chart summarizes their composite input.

Their input validated the new Navy strategic direction articulated by the Chief of Naval Operations (CNO) in 2002, including the importance of leveraging information technology (IT), broadening joint and national support, and leveraging our access to the sea.

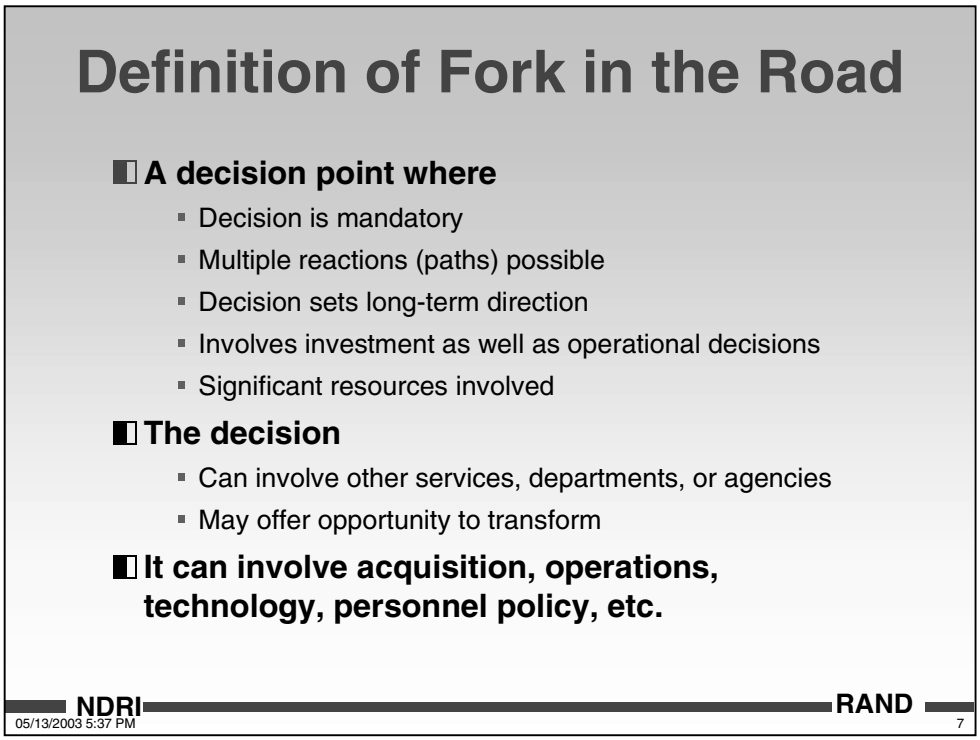
Perhaps, more important, however, is the second implication of the forks in the road that lie before the Navy. As will be seen, as a whole they appear to indicate that perhaps the Navy's traditional role of controlling the seas and projecting power with ships and aircraft is broadening. That is, the future is leading us toward a Navy that might be characterized more by electric weapons, unmanned combat air vehicles (UCAVs), and support of national interests closer to home in addition to power projection. Also, the future might require the Navy to balance its expeditionary and forward-presence focus of the past with the capabilities available from space. From a joint perspective, a clear message was the broad and as yet untapped potential that rests in the CNO's concept of Joint Sea Basing. Joint Sea Basing envisions a wide support of operations. These operations

include those of special operations forces (SOF), the Army and Air Force, as well as the Marine Corps operations the Navy has traditionally supported.

DEFINITION OF FORKS



The remainder of this briefing divides into three parts. The first provides a more complete description of forks in the road and offers some historical perspective. The second identifies and prioritizes the forks with respect to the opportunities they offer and the risks they pose. The final section offers some brief observations and raises some policy issues for the Navy.



The Navy has an opportunity to reexamine its culture, its premises about roles and missions, and whether it is organized to use its assets most effectively for future security needs. For the purposes of this study, we define a *fork* as a decision point having the following characteristics:

A Decision Is Mandatory. For example, capital equipment wears out and must be replaced. At issue is whether the replacement should be a similar system or a hybrid or combinatorial (i.e., one that combines characteristics of more than one) system. While the foregoing is a programmatic or system example, forks in the road can call for policy decisions as well. For example, as this study was under way, the creation of the Department of Homeland Security (DHS) appeared inevitable. It was eventually enacted by Congress in October 2002. This enactment placed certain decisions in the Navy's path.

Multiple Reactions or Paths Are Possible. For example, the characteristics of the replacement of certain flying platforms can be modified by how much we develop the use of unmanned aerial vehicles (UAVs). Similarly, some paths may be coupled to others, such as the development of bombers, bombs, and bomb sights.

The Decision Sets (or May Set) the Long-Term Direction. Broad organizational effects are sometimes involved. The choosing of a fork determines the long-term direction of a particular portion of the Navy (and even the defense establishment as a whole). For example, the decision to invest in aircraft carriers both

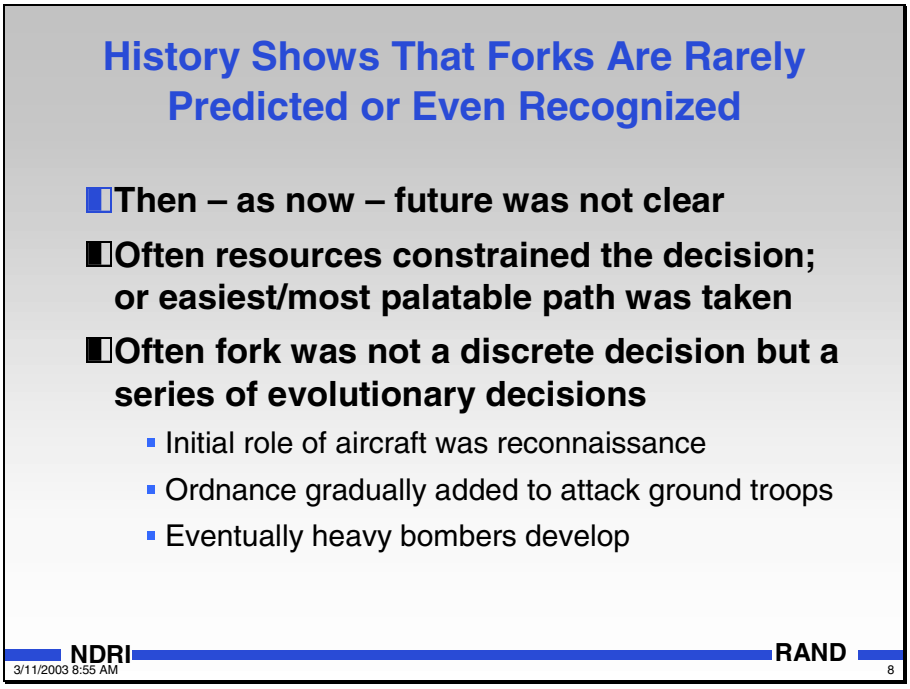
presumed and accelerated the demise of the battleship. Likewise, the decision to place intercontinental ballistic missiles (ICBMs) on submarines shaped the nation's strategic deterrent force.

Investments as well as Operational Decisions Are Involved. The UAV example above requires a thorough understanding of the manner in which the Navy would use the UAVs. It is not only investments that can cause a fork to occur. A technological event may also force a service to rethink its operational concept(s).

Many Naval Communities Could Be Involved. Forks usually involve more than just aviation, surface, submarine, or amphibious organizations within the Navy. Further, in many cases it is likely that other services (e.g., U.S. Army, U.S. Air Force, U.S. Coast Guard) as well as other governmental agencies (DHS, Customs, Border Patrol, etc.) will have a role in determining the selection of a fork.

Forks Usually Involve Significant Resource Decisions. The Navy is a large organization and is manpower-intensive as well as being hardware- and technology-intensive. As a result, any significant change in direction will likely have a significant budgetary implication.

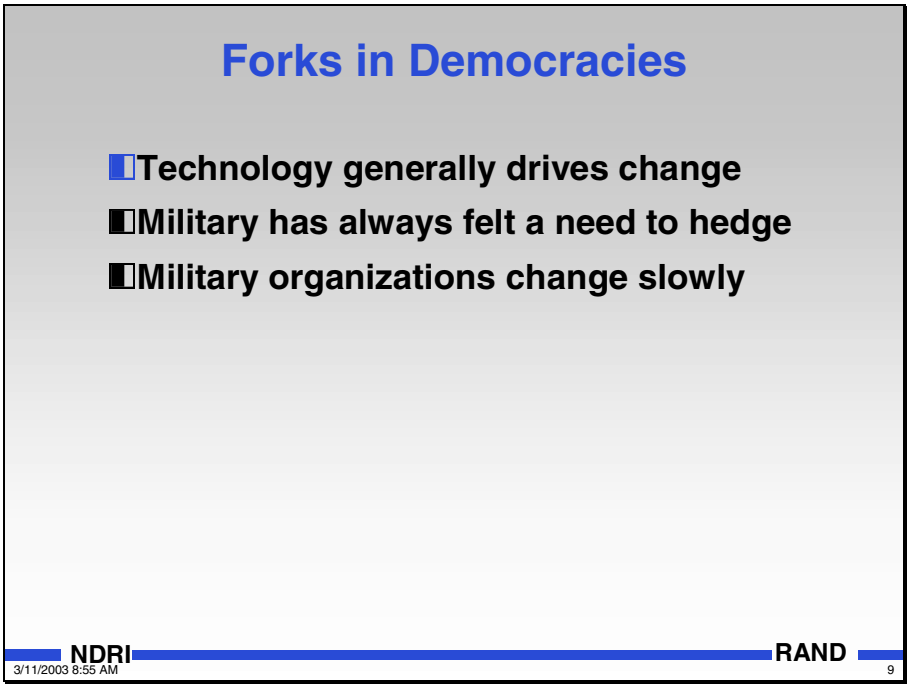
Forks Imply Opportunity to Transform. Many times, forks present an opportunity to transform—that is, to do business or execute operations in a more effective or efficient way. Also, improved technology can catalyze cultural or Concept of Operations (CONOP) changes while providing the basis for cost savings and mission consolidation. Forks are an opportunity to reexamine the premises underlying the Navy.



Discussions with a former Director of Naval History provided an interesting perspective. It is easier to identify the forks of yesterday than those of tomorrow. Today we can view the past with some clarity and can determine that forks in the road may have existed that the military services ignored or took a long time (say 75 to 100 years) to recognize. Our historian suggested that tanks replacing horses, missiles replacing guns, and carriers replacing battleships were not recognized as forks as clearly then as they are today.

And, of course, many decisions were resource driven, as they are today. In addition, in some cases forks arrive in clumps, rather than as discrete events. For example, the airplane began as a reconnaissance vehicle; then it dropped an occasional piece of ordnance; then, it fired on ground troop formations and other airplanes; then it developed the capability to drop great quantities of bombs; and so forth.

Simply stated, it was just as difficult to identify forks in the past as it is today.



Our historian also offered the following observations.

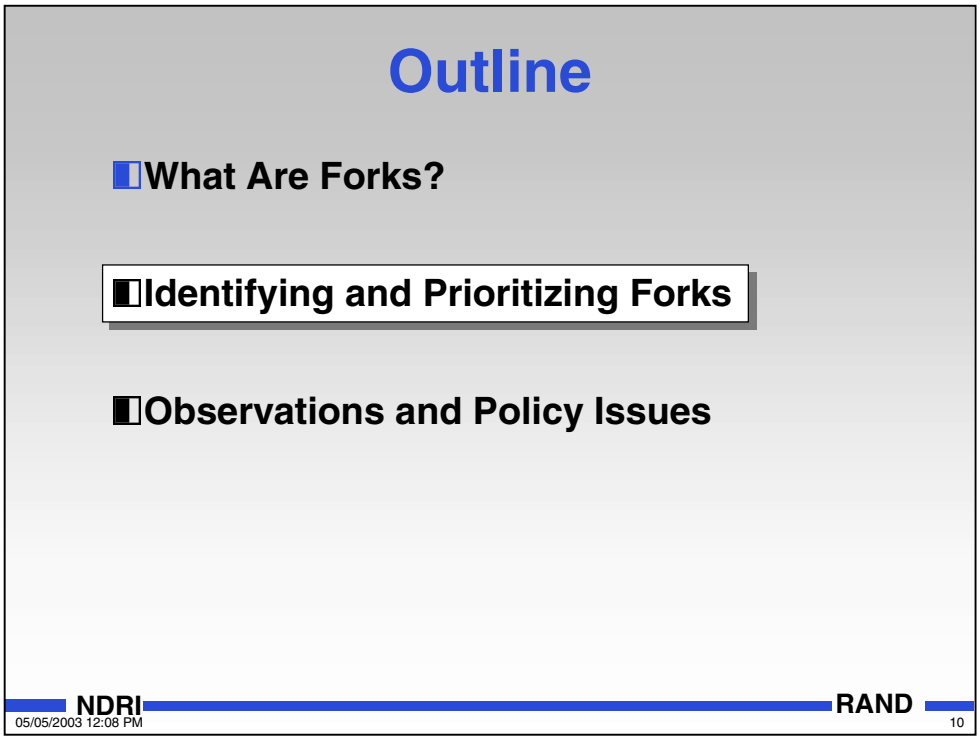
Change has generally flowed from new technology. It follows that military organizations on the one hand embrace technology, while on the other hand are loath to make rapid changes that result from the new technology. Examples abound. He discussed two examples in depth: the replacement of horse cavalry by armored vehicles and the introduction of ICBM on submarines.

The replacement of horse cavalry with armor is a tale of institutional intransigence in the face of technological progress, battles over turf, and the sudden obsolescence of those who failed to see the obvious.

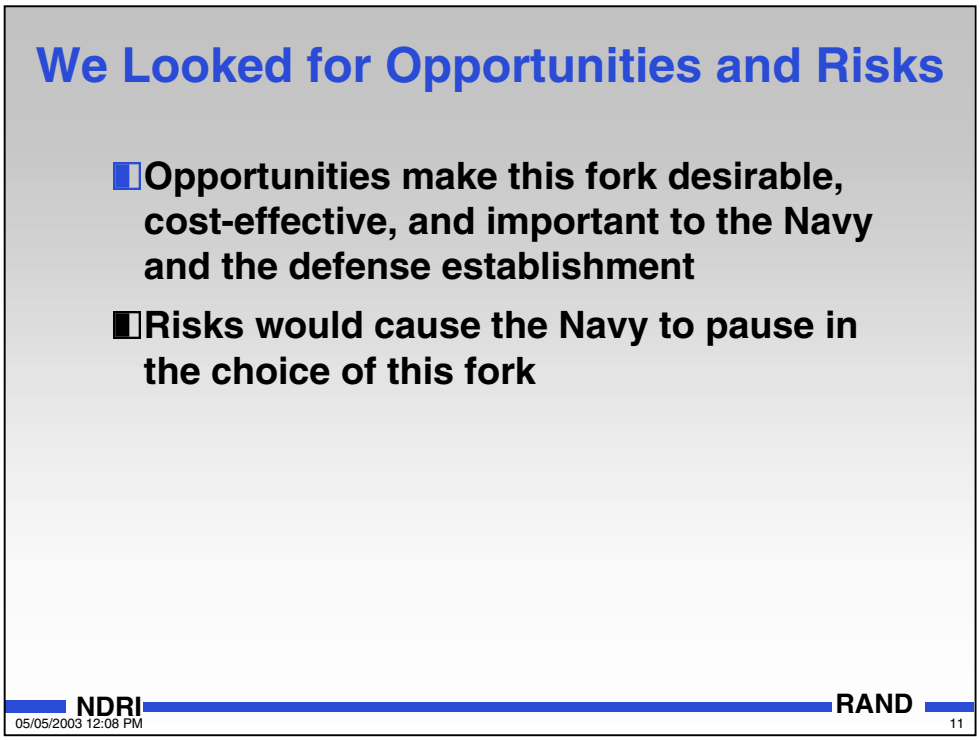
Contrarily, the history of the introduction of the ICBM into submarines presents a view of the opportunity provided by technology when it is focused on emerging national needs. It also highlights the benefit of close military-civilian relations.

Appendix B provides a detailed chronology of both events.

IDENTIFYING AND PRIORITIZING FORKS



We turn next to the process of identifying and prioritizing the forks we identified in our interviews.



Our interviews yielded a substantial number candidate of forks—65 to be precise. Early in the study it became evident that a series of characteristics for each potential fork would be helpful in evaluating the opportunities the fork might provide to the Navy as well as the potential dangers that might occur if that fork was pursued. *Opportunities* would in general make the fork desirable and cost-effective for the Navy, while *risks* could deter the Navy from selecting a particular path.

Having developed the characteristics of both opportunities and risks, we graded each of the proposed forks in the road that were gleaned during the interview process.

To provide for consistency in evaluating the opportunities associated with potential forks in the road, we further defined opportunities as having the following characteristics:

Affects National Policy. This characteristic was associated with a future decision, which, if taken, was deemed to be likely to provide an opportunity to benefit or support future national policy and strategy needs.

Qualifies as Transformational. A fork or decision path available to the Navy was considered transformational to the extent that it supported one or more of the new directions in the Quadrennial Defense Review specified by Department of the Secretary of Defense Paul Wolfowitz in February 2002.

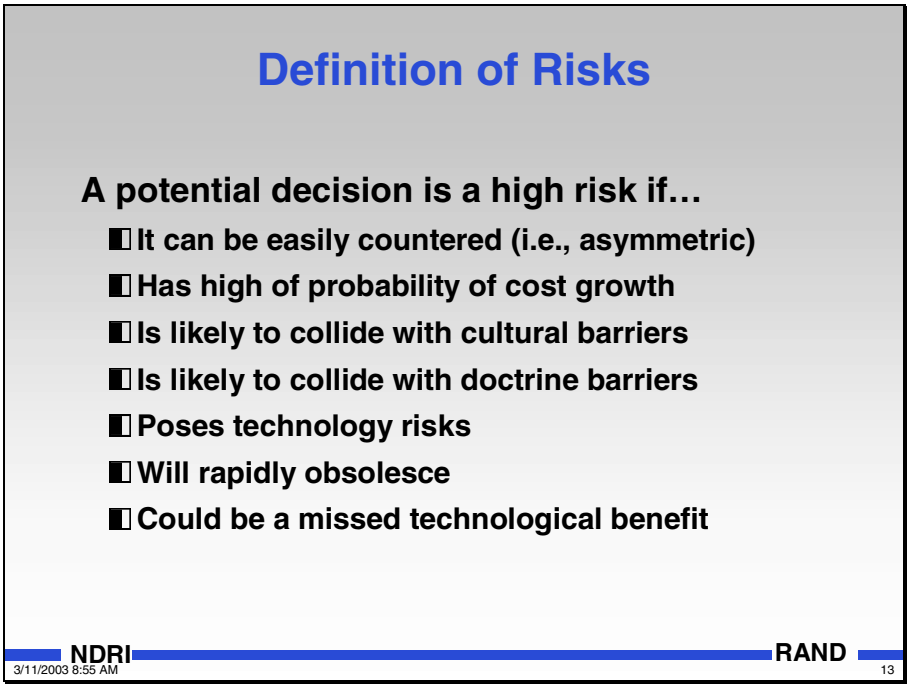
Better Use of People. Similarly, a fork was associated with this opportunity if taking the decision would promote or lead to ways to reduce personnel costs or manning or save personnel or use them in a more productive mode.

Promotes Efficiency. If a proposed path apparently either would reduce operating costs or produce a more efficient way to fight the enemy, it was considered a fork that, if taken, would promote efficiency.

Improves Warfighting Effects. If a fork was likely to measurably improve combat outcomes, it was considered to be an opportunity.

Uses Future Technology. A fork that best used future technology advances to improve future warfighting capability was considered opportunistic.

Enables Jointness. Making a choice that promoted or supported the use of combined/joint forces to solve a military problem was considered an opportunity within the context of this study.



Similarly, if taken, certain decision paths or forks could involve risks for the service as well as opportunities. We have selected a few for comparative purposes as shown below:

High Risk of Asymmetry. The risk that our adversary will find a cheap and easy method to negate our newly developed capability.

High Likelihood of Cost Growth. If the fork taken involves the decision to acquire a certain capability, there is a risk that this capability will cost more than expected or proposed. Also, new technology usually engenders a risk that the system to be developed will not be priced properly. Generally, the further the technology leap, the greater the cost risk.

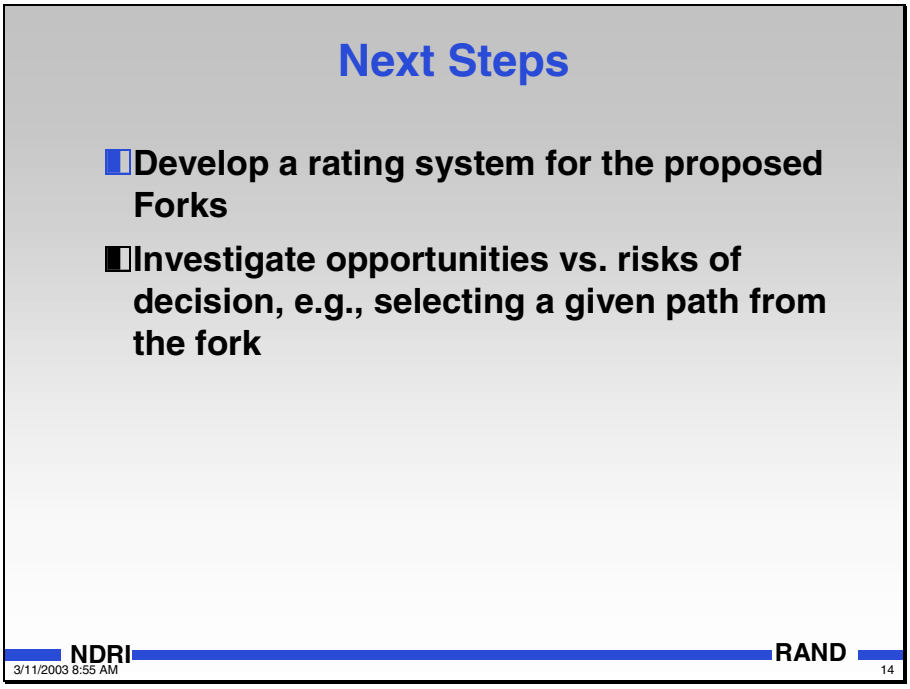
High Cultural Barrier. Risk that the Navy will react negatively because of cultural barriers—e.g., allowing Air Force aircraft to land on aircraft carriers, expanded use of unmanned vehicles of all types.

High Doctrinal Barriers. Risk that the Navy will react negatively because the operation violates generally accepted Navy doctrine or custom developed over a long period. For example, allowing SOF leadership to control the movement of aircraft carriers, surface combatants, and submarines.

High Technology Risks. Risk that what is being proposed cannot be accomplished with existing or projected technology. For example, some doubt still exists about the Navy's ability to attack an incoming missile during its ascent phase.

High Risk of Obsolescence. Risk that the concept, technology, or idea will be overcome quickly by some new concept, technology, or idea.

High Risk of Missed Technological Benefit. Risk that if the technology or path that had perceived military utility is not pursued, we will have missed a chance to gain a significant technological advantage.



Having characterized opportunities and risks, a system was devised to identify which forks offered the greatest opportunity while posing the least risk. These forks would be the ones the Navy should pursue first.

Rather than simply rank-order the ratio of opportunities to risks, the following methodology was chosen.

First, the 65 forks identified in the interviews were placed into nine categories. (See Appendix C for the complete list of forks.)

Second, all the forks were rated for their potential opportunities. Those forks offering the highest opportunity were then selected (those scoring in the top 30 percent of our assessment).

Third, the potential downside associated with those high-opportunity forks were examined—that is, the risks associated with those high-opportunity forks.

Finally, *only* those potentially high-opportunity forks with the low potential *risks* for further examination. The following figures describe this process in more detail.

The interviews with our experts have suggested that the potential forks be grouped into a series of categories. This was done to ease the evaluation process for the decisionmakers. The next figure presents these groupings and briefly summarizes forks in the road suggested by the interview process. For clarity and as an aid to decisionmakers, the potential forks were prioritized so that only those forks with high opportunity scores and low risk scores were selected to reduce from 65 to 18 those that may interest the Navy. All forks are eventually presented in the course of the documented briefing and are listed in Appendix C.

Basing. The basing decision revolved around three main issues: the post–Cold War redistribution of U.S. force structure from Europe, which is still in progress; the extent to which the Navy might opt to use basing to compensate for decreased force level (as in Guam); and the opportunity for joint basing and expanding the use of sea basing where that appears to make sense.

Business-Related. Increased uses of the private sector were identified as possible forks, including increased civilian involvement in military operations where feasible and private-sector support of depots as well as the privatization of systems commands.

Information Operations. Information operations offered a myriad of potential forks, and they spanned the range from those dealing with more aggressive consideration of combined military and civilian IT opportunities to concerns over the extent to which the Navy was vulnerable to cryptographic equipment compromise and whether the Navy understood its Global Positioning System (GPS) and electromagnetic pulse (EMP) vulnerability as well. Best exploitation of IT was in keeping with the Future Command Control Communications Network (ForceNet)—the concept of netting all naval forces into a single network theme. In addition, the Navy's role in homeland security despite the Coast Guard's assigned role was considered indisputable and foremost. The Navy's role in space and its vulnerability to space platforms in the future was also raised as a central issue.

Operational. These are decisions seen as those to be faced where the Navy would have to think beyond traditional Department of the Navy boundaries; specifically, they again highlighted the Navy's importance in homeland defense. As expected, future forks would likely also require challenging CONOPs, force structure, and roles and missions reconsiderations in light of both homeland security needs and the increasing potential reliance of joint forces upon the Navy in the future.

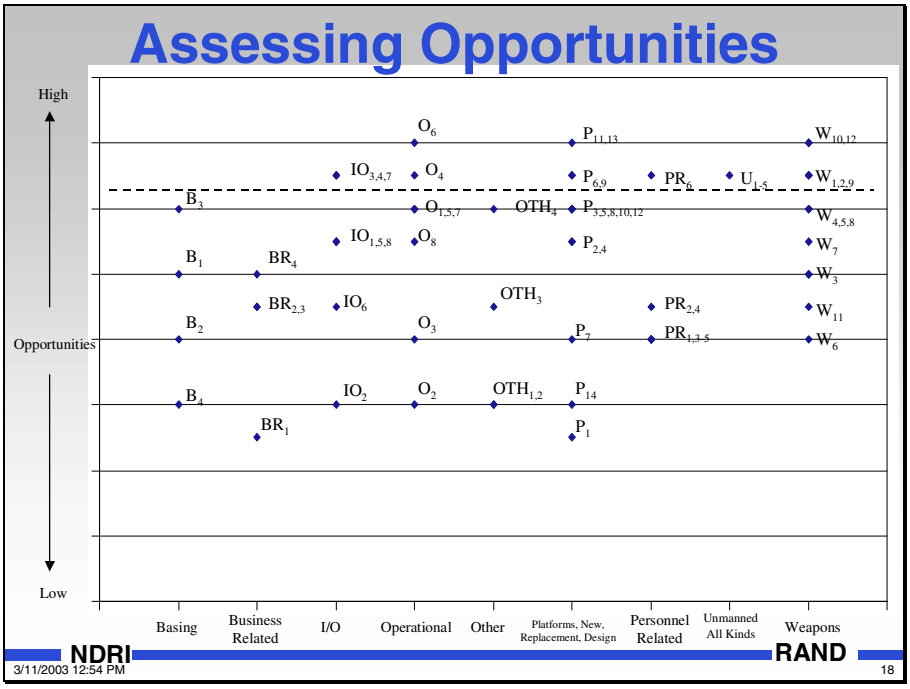
Other. A miscellaneous category grouped issues that in general again highlighted the possible increased expectations of the Navy after September 11, 2001, as well as the challenges the Navy could face in the future operational environment.

Platforms. Platform forks generally focused on the future of the carrier, the opportunities that the Navy would seek to exploit through modular concepts, and the importance of the sea-basing concept becoming joint when fully developed.

Personnel-Related. Personnel issues focused on the forks that would confront the Navy as a result of national demographic trends, the need to support an increasingly higher level of technological capability afloat, and the personnel-related opportunity afforded by the best application of IT.

Unmanned Operations. Almost all experts discussed the advantages of and need to develop unmanned systems. These were seen as a path to both risk and cost (personnel-related) reduction.

Weapons. Weapons-related forks pointed to the increased potential being presented by directed energy weapons to the perceived importance of jointness, Navy theater missile defense capability, Navy decisions with regard to space, and improved Navy afloat weapons-replenishment capability.



Next, we developed a rating system for comparing the relative opportunities and risks associated with the various forks. Each potential fork was graded on a binary scale receiving either a 0 or a 1 (i.e., the opportunity or risk factor either applied or did not apply). Simple arithmetic totals obtained from the two researchers were averaged to obtain the total score plotted. A "perfect" opportunity meant that the potential fork received a score of seven. The scores are shown on this chart. The letters indicate the groups (e.g., B = basing, BR = business-related), and the subscript number the individual fork. They are arrayed in columns over their group, based on their opportunity score.

This figure depicts the rankings of the forks obtained, and they are described individually below. The dotted line is drawn at roughly 30 percent of the total number of potential forks.

Those indicating the highest are as follows:

Information Ops (I/O)

3. *Upgrading of Communications Security*. There was an expressed concern that our cryptologic capability had been compromised, that the state of the art in computer technology in the private sector now matched that in the public sector, and that the Navy needed to develop a method to protect this capability.

4. *Using Increased Reachback Potential of IT*. This fork involved implications for combining business/operational systems and how this combination affects the need for fewer personnel stemming from automation. The processes in the Navy–Marine Corps Internet and IT 21 (the Navy's acronym for its

modernization of afloat IT) are similar and tend to become seamless. As this occurs, an opportunity arises to move personnel, both civilian and military, from "paper" jobs to other Navy jobs. Interviewees noted little apparent evidence of Department of the Navy leadership pressing for this to occur.

7. *Global Maritime Tracking.* The interviewees believed that it will ultimately be viewed as the Navy's job to track merchant shipping to preclude an attack on the United States. It is not clear that the Navy shares this view. It regards the tracking of foreign ships entering U.S. ports as a task for the Coast Guard, even though the Navy has developed a joint maritime intelligence center that supports both services.

Operations

4. *Recognizing That the Navy Supports All Services.* This must be done without diminishing the Navy's support for the USMC. The Navy thinks of itself as both a blue-water force and a supporting force for the USMC. Interviewees pointed out that the Navy needs to understand that its role is to support joint operations or elements of the Department of Homeland Security.

6. *Accepting the Navy's Role in Homeland Defense.* This is similar to the Global Maritime Tracking fork. At issue is whether it is the Coast Guard's job to preclude an attack from the sea, the Navy's, or a joint responsibility. Some suggested that the role of U.S. Northern Command (U.S. Northcom) would increase the likelihood of this mission moving toward the Navy. Interviewees *unanimously* subscribed to the *perception* of Navy responsibility regardless of assigned responsibility.

Platforms

6. *Transitioning the Aircraft Carrier to a Joint Aviation Platform* (similar to the United Kingdom [UK] concept). The historical use of an aircraft carrier has been to project power either from a fixed-wing aircraft or, on occasion, from a helicopter. These aircraft have almost always been either Navy or Marine. Because of its size, speed, and longevity, the carrier needs to be thought of as supporting SOF, the Army, and the Air Force—i.e., the joint force.

9. *Modularity.* As it applies to the joint aviation platform, the Next-Generation Destroyer (DD [X]), and the Littoral Combat Ship (LCS). As the cost and longevity of platforms increase, designing them in a modular fashion becomes more important to more readily accept missions that will arise in the future—missions not even on the drawing board today.

11. *Follow-On to* Trident. Our strategic force of 14 *Trident* submarines has a projected life of 42 years. Therefore, some of these ships will reach the end of their service lives in the next 15 years, and it is time to begin thinking about their

replacement. It appears clear that the land-based IBCM force will be retired and the nation will depend on the stealthy nature of the submarine to provide strategic deterrence.

13. *Sea Basing.* With the U.S. Navy so completely dominant at sea and with no foreseeable threat arising, the concept of support to the Army, the Air Force, and the Coast Guard from a sea base, whether it is a Mobile Offshore Base or a large conventional ship, such as that envisioned by the USMC in its Maritime Preposition Force (MPF) (Future) becomes even more important for our war planners.

Personnel-Related

6. *Organizational Relocation Based on IT Modernization*. With the transference between IT 21 and the Navy–Marine Corps Internet and with the increased efficiency afforded by IT, interviewees noted that the Navy needed to look objectively and aggressively at the potential savings in personnel and the relocation of those personnel into the warfighting portions of the service. The private sector has both reduced the number of people doing the more routine functions because of IT and reduced (flattened) the size of the chain of command because of the new communication tools afforded by the Internet. This could apply to the Navy as well.

Unmanned Operations

1–5. *UCAVs, UAVs, Unmanned Underwater Vehicles (UUVs), Unmanned Ground Vehicles (UGVs), Unmanned Surface Vehicles (USVs) Roles, Missions, Functions, CONOP.* Interest in unmanned vehicles has increased since the Kosovo campaign during which Predators were used with some modest success. However, in Yemen and Afghanistan, where the terrain was most favorable, it became clear that unmanned vehicles hold great promise. However, promising technologies apply undersea, in the air, on the ocean, and on the ground. We are just beginning to understand how to use and build these vehicles. The CONOPs are in their infancy as is the technology. The Navy must think about how to exploit the unmanned concepts and integrate them into the manned operations.

Weapons

1, 2. *Cost-Effective Electronic and Laser Weapons*. Many of our interviewees envisioned the use of electronic and laser-type weapons within the next 15 years. They also believed that the power that would emanate from an electric-powered carrier or gunship would be the power source for weapons at sea. Some opined that the power from the ship could be transmitted to a weapon in the air.

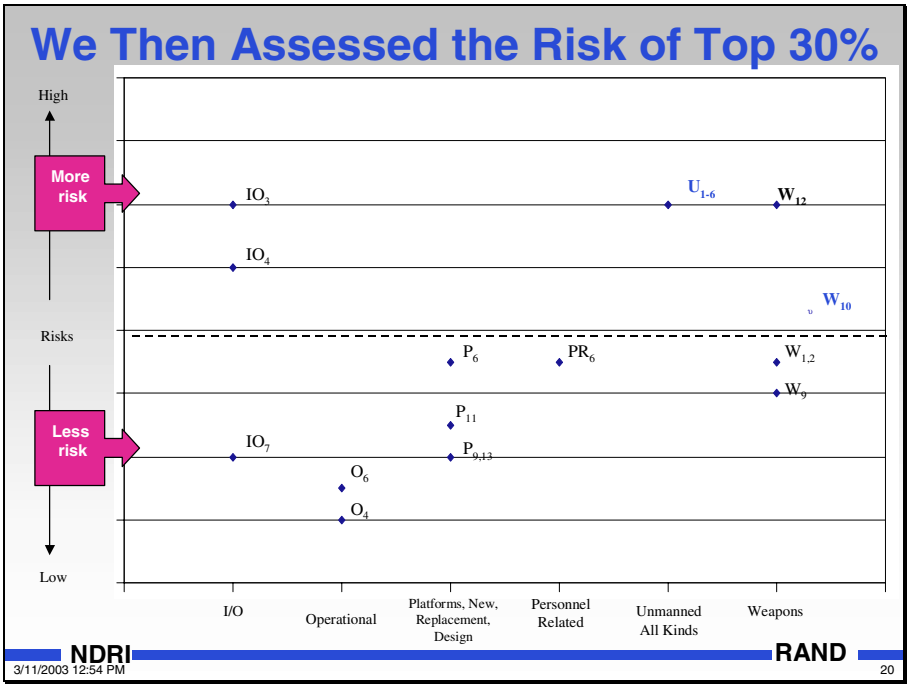
9. *Increase the Navy's Role in the Development of the Small-Diameter Bomb*. The carrier-based aircraft is heavier than its land-based counterpart and thus has a more limited range. The small-diameter bomb holds great promise, therefore, for the Navy. Common weapons with the Air Force also have a synergistic logistics-reduction effect.

10. *Transposing the Navy's Presence Function to Space.* This involves implications of the militarization of space. Some believe that the nation will militarize space and that one of the implications is that the Navy's "presence" function could be supplanted by a space capability. The Navy needs to be involved in that thought process.

12. *Weapons in Space.* This involves implications for afloat naval forces. Some also believe that naval surface vessels can be targeted by weapons in space held by our potential enemies. Countermeasures need to be considered. Therefore, the Navy must have an officer corps who understand the benefits and the threats that arise from what the military does in space.

This figure is the duplicate of the previous highest-opportunities figure but shows only those potential forks above the dotted 30 percent line. That is, it highlights only those forks that have the highest opportunities.

As noted earlier, this allows quick focus on forks of highest apparent future Navy interest. Next the risks or dangers of those forks with the highest opportunities are considered.



We now focus on the risks associated with those forks that have shown to have the highest opportunities. The same methodology was used. The risk score also had a maximum risk of seven.

The high-opportunity forks with low risk include the following.

Information Operations

Global Maritime Tracking and Homeland Defense. According to interviewees, it will be viewed as ultimately the U.S. Navy's task to track merchant shipping to prevent an attack on the United States. The Navy views the tracking of foreign ships entering U.S. ports as a task for the Coast Guard. Even though the Navy has developed a joint maritime intelligence center that supports both services, it is not clear that the Navy believes that an attack on the United States from a seaborne platform is the Navy's responsibility.

Operations

Recognizing That the Navy Supports All Services. The operational Navy supports all services—that is, beyond the USMC, in such missions as sea basing.

The Operational Navy's Role in Homeland Defense. This involves the need for the Navy to take a major role in the tracking of merchant ships that could be a threat to the U.S. mainland.

Platforms

Sea Basing. This involves a concept of providing afloat basing for the U.S. Army, USAF, and the Department of Homeland Security.

Follow-On to *Trident.* This is a result of the upcoming Nuclear Posture Review.

Transitioning the Aircraft Carrier to a Joint Aviation Platform. This will occur in a manner similar to the UK concept and involve multiple service/SOF support, UAVs, etc.

Modularity. This applies to such platforms as the joint aviation platform, the LCS, the DD (X), and future amphibious and sea-based platforms.

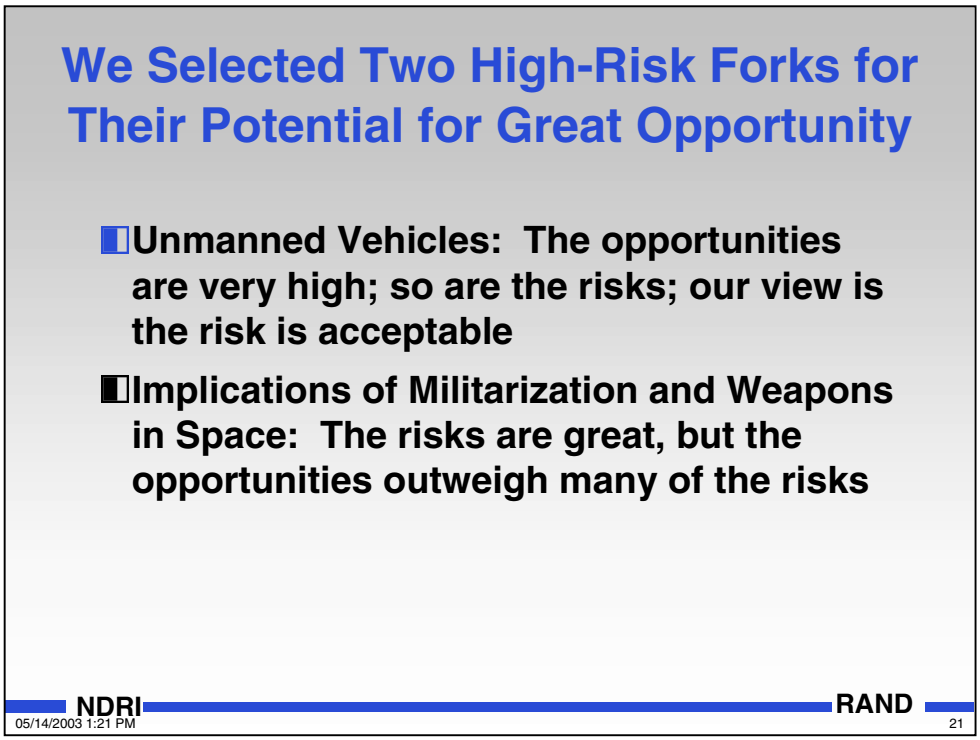
Personnel-Related

Organizational Restructuring Based on IT modernization. The private sector has been able to reduce touch labor because of IT modernization, but the military services have yet to harvest such savings.

Weapons

Cost-Effective Electronic and Laser Weapons. Much research is going on in these areas, and the Navy should be heavily involved. This is also an area where an asymmetric threat could exist in the future.

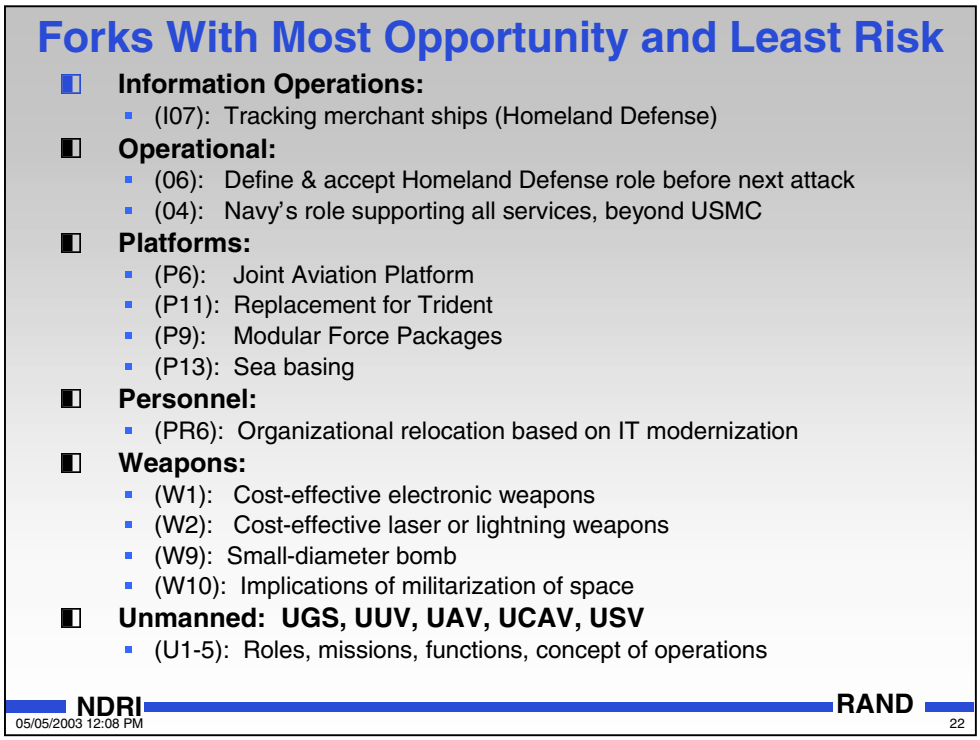
The Increased Navy Role in the Development of the Small-Diameter Bomb. This should result in increased payload for carrier aviation, which is important for the future.



Our methodology did not permit those high-opportunity but high-risk potential forks to be included in the final list. However, we chose to override this proviso and add these two forks because, although their risks are great, we believe the opportunities are worth the risk.

Unmanned Vehicles. The technology and cost risks are great, but the potential is high to eventually reduce manpower costs and risks to U.S. service personnel and improve our position on the battlefield. The developmental burden can in some areas be shared with other OSD organizations. This fork is one we recommend the Navy investigate further.

Responding to the Militarization of Space and Introducing Weapons into Space. Clearly this has many technological and cost risks. However, the risk of not being prepared to respond to our adversaries' offensive and defensive capabilities is higher.



These are the forks we recommend the Navy to consider further. All have been discussed previously. There is an interrelationship between the arrays of forks selected.

The first two, Information Operations and Operational, both relate to the need for the Navy to see itself in the larger role of homeland defense. This is in addition to the Navy's traditional role of taking the fight to the enemy. In many ways, it is an extension of the concept of *Sea Shield* that the CNO described in his series of Naval Institute *Proceedings* articles. An attack on the United States would be considered catastrophic if it came from the sea and the Navy were unprepared to protect against it, and both the Information Operations forks and the Operational forks seek the Navy's action to prevent, forestall, or ameliorate such an attack. It is not sufficient to say that the homeland defense mission belongs to the U.S. Coast Guard. The Navy has a major role as well. A corollary to this fork exists. It means that the Navy, while continuing to focus its support on the Marine Corps, must also be able to provide required support to the Army, Air Force, Coast Guard, other federal agencies, and even allies.

The third set of forks, the Platforms forks, is relatively straightforward. Eventually, the replacement of a carrier will involve thoughts that go beyond the launching of fixed-wing aircraft. Vertical/Short Takeoff and Landing (VSTOL)—even USAF VSTOL—unmanned vehicles of all types, and high-speed vessels may come into play with a future-generation Joint Aviation Platform. *Trident*

submarines are reaching the end of their 42-year life span and something must be done to replace them.

The Navy is and must continue to consider the modular forces packages for its future designed platforms. The LCS is already heading down this road. Others must follow. Modular force package flexibility and cost control will allow spreading Navy capability across a larger number of platforms and will be important in the future.

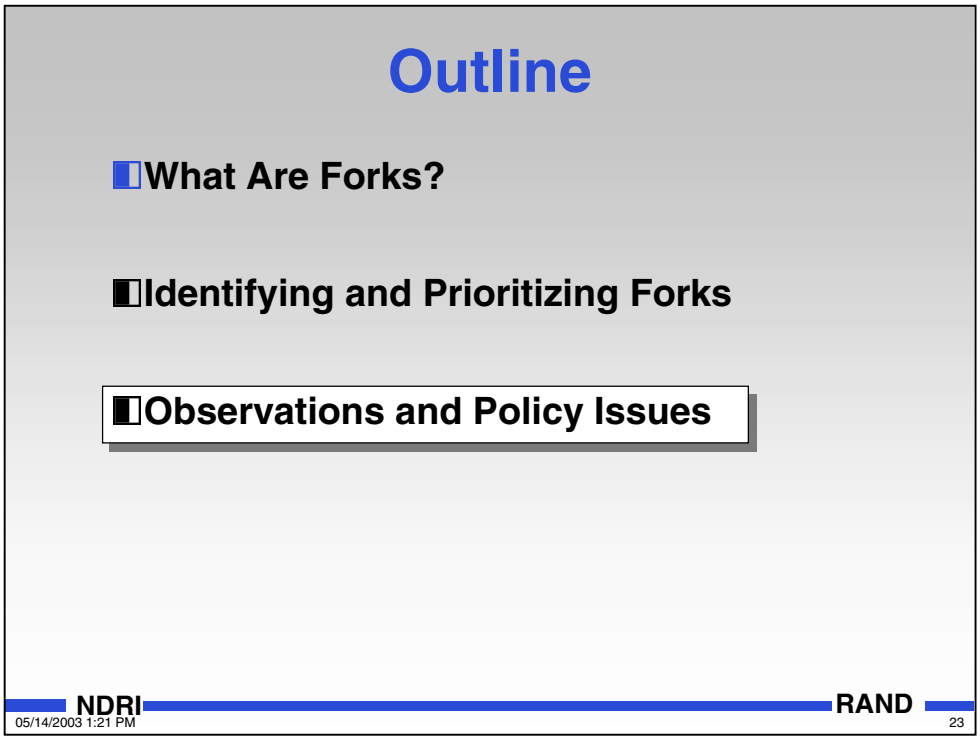
Finally, Sea Basing, as an adjunct to the application of power by the President, will, of necessity, come into play in the future as the United States is denied basing rights in many countries. Support for services on the sea base in addition to support for the Marine Corps will increase and become more important.

The Personnel fork will evolve as automation and the increased use of IT continue. It will be incumbent on the Navy to consider how this will reduce the burgeoning cost of manpower. The "smart" ship, squadron, and base activities ought to increase with some urgency. Top leadership must be behind these initiatives. This fork can actually save money.

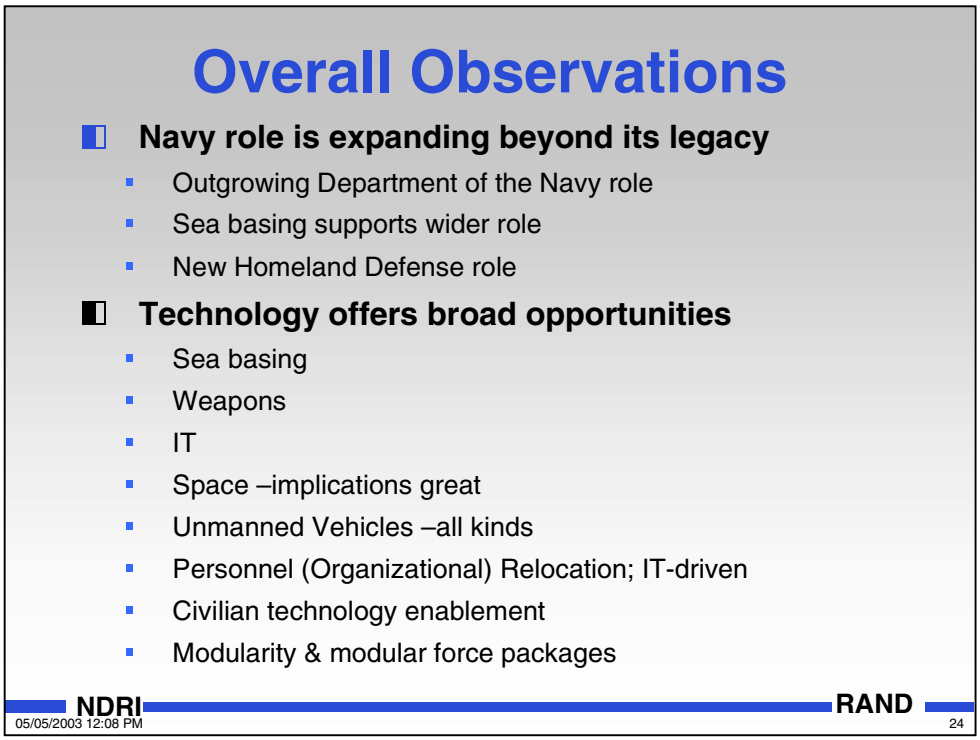
In the Weapons set, electronic and laser weapons and small bombs all serve to increase the lethality and accuracy of naval forces. The Navy can also no longer ignore space as a warfighting tool, if only to protect itself against an aggressor using space against the Navy in the future.

Finally, there is great opportunity and gain to be made in the unmanned world. An advocate for these may be needed organizationally because the resistance is likely to be great.

OBSERVATIONS AND POLICY ISSUES



We conclude with some overall observations and identification of policy issues.

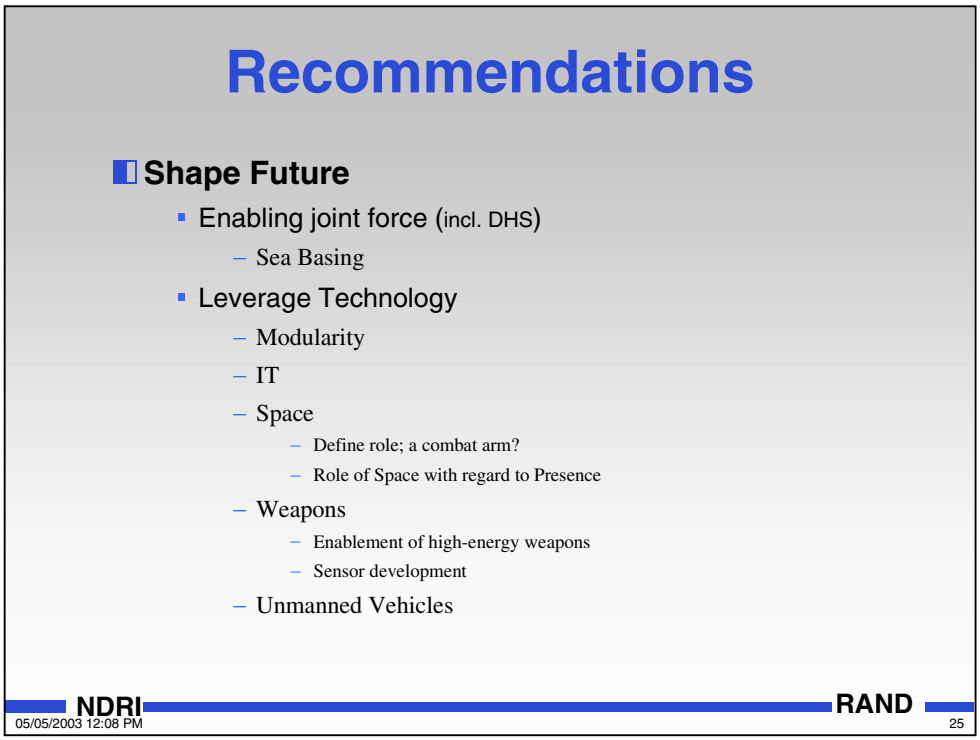


The review suggests that the Navy's role is expanding beyond its traditional sea and Marine role into that of homeland defense.

The technology thrusts of the forks are not surprising because our view of history implied that many would be found there. We found forks in unmanned vehicles, space, modularity, and modular force packages. The weapons world offers electronic, laser, lightning, and small-diameter bomb opportunities.

Sea basing can be a technology challenge, particularly at higher-sea states. The marriage of high-speed vessels to the conceptual MPF (Future) in a high-sea state has not yet been provided.

Increase use of IT and of civilian technology will be a challenge to future military establishments.



Two overarching policy issues dominated the short study with regard to Navy forks in the road. These were, first, both defining and the Navy's acceptance of its new role in homeland security and, second, the role of the Navy in space. This study did not seek to resolve, come to terms with, or illuminate either issue. It simply sought to identify them.

In summary, however, interviewees noted that the decisions the Navy would make in each of these areas would indeed meet the criteria laid out early in this documented briefing.

Most important, from the Homeland Security perspective, they recommended thinking about decisions concerning the Navy's role, or which "fork" to take, from the viewpoint of the CNO testifying before Congress "the Day After" a major homeland security catastrophe had occurred "from the Sea." In this sense, some offered that while the Navy must indeed maintain its primary warfighting capability, it must also not be reluctant to accept homeland security responsibilities in a national security construct.

Space also meets the criteria noted on p. 3. For example, many different options are available to the Navy, and the position the Navy takes in the near term can preordain long-term direction of both the Navy and OSD. Clearly, the Navy's position will have resource implications. While only the Navy can decide the final path, interviewees' inputs ranged from the Navy ceding the space role to an

executive agent Air Force to the Navy having such important capabilities that space merited designation as a combat arm of the Navy.

APPENDIX A: INTERVIEWEES

For the study, we interviewed the following people:

Don Pilling, Admiral, USN (Ret.) President, LMI

Joe Dyer, Vice Admiral, USN, Commander, Naval Air Systems Command

Art Cebrowski, Vice Admiral, USN (Ret.), Director, OSD Office of Transformation

Frank Bowman, Admiral, USN, Deputy Commander, Nuclear Propulsion Directorate

Alan Vick, RAND, Senior Researcher, Deputy Director, Project AIR FORCE

Laurie Zeman, RAND, Senior Researcher, Program Director, Arroyo Center

Stan Szemborski, Rear Admiral, USN, Deputy Director, Resources and Requirements

Doug Crowder, Rear Admiral, USN, Director, Project Deep Blue

Bernie Rostker, RAND, Senior Researcher, former Under Secretary of the Navy, Under Secretary of the Army

Frank Camm, RAND, Senior Researcher

Harry Thie, RAND, Senior Researcher

Natalie Crawford, RAND, Director, Project AIR FORCE

James Dewar, RAND, Senior Researcher

Dennis McGinn, Vice Admiral, USN (Ret.)

Glenn Kent, Lieutenant General, USAF (Ret.)

Ronald H. Spector, Professor of History, George Washington University (former Director of Naval History)

APPENDIX B: CHRONOLOGY OF FORKS

REPLACEMENT OF HORSE CAVALRY WITH ARMOR

1918 (January 26): American Tank Corps (ATC) created.

1918–1920: ATC advocates independent role for tanks as an instrument to achieve decisive breakthrough, pursuit, and exploitation.

1920: National Defense Act assigns tanks to control of the Infantry.

Step recommended by General John J. Pershing (viewed tanks as offensive weapons not fitting in with larger military strategy of homeland defense).

1921 (May 23): Tank program approved by Chief of Ordnance, but in limited numbers and with limited weight.

1922: War Department study suggests tanks will only be used in supporting role for infantry.

Consonant with British views (Basil Henry Liddell Hart in particular) that hold that antitank weaponry will favor the defense.

Places emphasis on faster, lighter—and cheaper!—tanks.

Late 1920s: U.S. Army to develop unit similar to British Experimental Mechanized Force.

1927: After visit to London, Secretary of War Dwight Davis orders the addition of a small number of tanks and antitank weapons to the existing cavalry division.

1928: Experimental Mechanized Force created under Cavalry.

Follow-on report suggests large, independent Mechanized Force.

1929–1930: Economic crash forces Army to downsize envisioned Mechanized Force.

1931: Assistant Chief of Staff General Douglas MacArthur directs all combatant arms branches to adapt mechanization and motorization.

Fixed mechanized forces in supporting role; retarded conceptual and doctrinal development.

Separate mechanized force disbanded, placed as regiment in cavalry.

1931–1936: Growing acceptance of role of mechanized forces in cavalry.

1934: Fort Riley, Kansas, maneuvers/exercises validate the concept of coordinated mech/horse cavalry.

By 1936, the decision was made to expand mech forces to brigade.

1936–1940: "Thermidorian" backlash against mechanized forces brought on by plans to expand mechanized cavalry at the expense of horse cavalry.

Colonel Charles Scott: "[I am] getting damned well fed up on those bright boys in Washington that can sit in a chair in Washington and figure things out on paper better than anyone can do it here by practical work."

1939: Major General Kerr, opposing further development of mechanized forces at equine expense, strongly resists further mechanization of cavalry.

1940: Louisiana maneuvers offer view of mechanized potential, exposes limits of horse cavalry.

1940 (June 10–12): Andrews meeting (shuts out cavalry, infantry branches).

Subsequent establishment of the "Armored Force" establishes armor in its own right and effectively makes peripheral the role of cavalry.

INTRODUCTION OF ICBMS INTO SUBMARINES

1948: Key West Agreement.

Air Force role: intercontinental ballistic missile (ICBMs).

Army role: intermediate-range ballistic missiles (IRBMs).

Navy: no assigned role.

1954: Atlas, Titan ICBMs in development; Jupiter, Thor IRBMs in development.

U.S. ICBM programs—propulsion, guidance, and reentry are problematic.

Increasing concern over Soviet ICBM capability.

1955: Eisenhower commissions Killian study (MIT).

1955 (summer): Commission report conclusions: develop 1,500 nm IRBM concurrently with operational ICBM force.

Consider both land and sea basing (Navy gains strategic role).

1955 (September 7): Secretary of Defense Charles Wilson establishes Joint Army-Navy Ballistic Missile Committee (JANBC).

Army "owns" the missile, Navy "owns" ship launching system.

1956 (March): DoD approves requirement of solid propellant for Jupiter missile.

1956 (summer): CNO requests Atomic Energy Commission (AEC) certify solid propellant for Navy missile.

1956 (September): AEC unconditionally certifies Polaris.

1956 (December 8): Defense Secretary authorizes Polaris.

Liquid-propellant Jupiter terminated.

JANBC terminated.

1956: Eisenhower questions large bomber deterrent role.

1957 (August 1): First Soviet ICBM launched.

1957 (fall): First two Sputniks launched.

1957: Army Chief of Staff directs China Lake study (Project Budapest).

Implications: Navy to provide valuable national deterrent so long as cost affordable.

1957 (November 4): Gaither committee reports:

By 1959, Soviet missile strike could catch SAC missiles on ground.

Unlikely that U.S. first strike would cripple Soviet bombers.

Supports Polaris as only invulnerable U.S. strategic system.

1957 (November 6): Secretary of the Navy requests CNO to accelerate Regulus II; CNO demurs.

1957: Decision to insert missile compartment into Scorpion.

1957: Keel laid, USS *George Washington.*

1958 (December): Regulus II cruise missile program terminated to free funding for the Polaris program.

1959 (December 30): USS *George Washington* commissioned.

1960: First Polaris missile launched successfully.

APPENDIX C: FORKS IDENTIFIED DURING INTERVIEWS

BASING

1. Joint basing forward and then to the littoral in crises.

2. Common forward basing of spares and munitions (e.g., Joint Strike Fighter).

3. Army and Air Force leaving Europe will require more prepositioning in Pacific theater.

4. Overseas basing as option to compensate for decreasing force level.

BUSINESS-RELATED

1. Leverage technology to increase shift to private sector for depot support.
2. Civilian support of military operations (e.g., UAV controller).
3. Transition to privatized Systems Commands (SYSCOMs).
4. Increase use of leasing for military support (e.g., C-17s, strategic sealift, basing).

INFORMATION OPERATIONS

1. Military opportunities of combined military-civilian IT.
2. Reduce GPS vulnerability.
3. Upgrading communications security.
4. Using increased reachback potential of IT.
5. USAF control of space function.
6. Communications vulnerability to EMP.
7. Global maritime tracking: homeland defense.
8. Anti–commercial satellites.

OPERATIONS

1. Joint trained forward strike controllers.

2. Exploit options to increase forward pressure.
3. Increase carrier on-station time.
4. Operational Navy's role supporting all services, beyond USMC.
5. Shed S-3 aircraft?
6. Navy's role in homeland defense.
7. Integrate SOF into naval operations.
8. Defense against CONUS-directed seaborne terrorism.

OTHER

1. Antisubmarine warfare.
2. Foreign submarine attack on U.S. homeland.
3. High-speed threats to surface vessels (known as swarming boats).
4. Swiftly defeat the enemy.

PLATFORMS: NEW, REPLACEMENT, DESIGN

1. Big versus small carrier.
2. New platform-related communities.
3. Other missions for guided-missile submarines (SSGNs)?
4. Explore technology to expand VSTOL capability.
5. EA-6B replacement; Joint Strike Fighter?
6. Transition carrier to joint aviation platform (UK).
7. Upgrade versus replacement.
8. Options for *Kitty Hawk* replacement.
9. Modularity for LCS and DD (X).
10. Wither sea basing?
11. Follow-on to *Trident.*
12. Preservation of ship design capability.
13. Sea basing; USA/USAF support.
14. Shed the current antisubmarine mission of the S-3 aircraft

PERSONNEL-RELATED

1. Attract community college graduates.
2. Hispanic recruitment.
3. Closing civilian-military societal gap.
4. Recruit and retain those with technical skills.
5. Minority recruitment and retention.
6. Organization flattening based on IT modernization.

UNMANNED CAPABILITIES

1–5. UCAVs, UAVs, UUVs, UGVs, USVs—roles, missions, functions, CONOPs.

1. Unmanned combat air vehicles.
2. Unmanned aerial vehicles.
3. Unmanned underwater vehicles.
4. Unmanned ground vehicles.
5. Unmanned surface vehicles.

WEAPONS

1. Cost-effective electronic weapons.
2. Cost-effective laser and lightning weapons.
3. Protect against double-digit surface-to-air missiles.
4. Accelerate electric-powered ships.
5. Accelerate kinetic and high-powered weapons.
6. Inability to protect surface ships from cruise missile.
7. Pursuit of sea-based national missile defense.
8. Precision versus cost-effectiveness.
9. Increased Navy role in small-diameter bomb, logistics payoff.
10. Transposing Navy's presence function to space (implications of militarization of space)
11. Develop Tomahawk replenishment at sea.
12. Weapons in Space: naval implications.