From Reform to Reduction:
Reports on the Management of Navy and Department of Defense Laboratories in the Post-Cold War Era

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Contents

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Foreword

In September 2004, the Naval Research Laboratory (NRL) established an unclassified archive of materials on the post-Cold War management of the Department of the Navy scientific and engineering activities. The records complement the Research, Development, Testing, and Evaluation (RDT&E) Management Archive housed at the Naval Historical Center, Washington Navy Yard. These two collections are the sole, formal repositories for the Navy's materiel establishment.

The reports in the NRL collection – some published by high-level study groups, others circulated only within the Navy RDT&E community – form the basis for this book, which succeeds Rodney Carlisle's *Management of the U.S. Navy Research and Development Centers During the Cold War*. Carlisle's book is based on the laboratory reports collection at the Naval Historical Center.

As did the Department of Defense (DOD) in general, the Navy's technical centers faced tremendous pressure to downsize after the Cold War. However, concurrent organizational changes removed a number of high-level advocates for those centers. Reports on technology management reveal how such changes, along with institutional obstructions, meant that cost reduction plans almost always prevailed over those initiatives aimed at reform and effectiveness. For years, studies and reports offered remarkably similar proposals to achieve laboratory reform, the Navy and DOD established numerous demonstration programs, and Congress authorized various pilot programs. However, few of the efforts bore fruit, because outsourcing, staffing reductions, and other efficiency measures superseded them. While improved performance continued to receive cursory attention, the downsizing plans were followed through: between 1991 and 2005 the labs' workforces (including military) were reduced by 45 percent, even though their collective business base had increased. At the same time, they faced more than a dozen separate actions that restricted hiring.

Dr. Hazell's work is a clear, concise, and especially well-written history of the impact of the post-Cold War downturn in DOD's support of the Navy's in-house laboratories. The book presents vital information on some five dozen key reports issued during this period and includes descriptions of unique source material. As a superlative reference tool and candid appraisal, Dr. Hazell's work will serve the Navy's RDT&E community, similar government organizations, scholars, and the public as a basic source for years to come.

The views expressed here are Dr. Hazell's alone and do not necessarily reflect those of the Department of the Navy or any other agency of the U.S. Government.

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Preface

The Navy laboratory system has played a significant role in the technological superiority of the Navy and Marine Corps in peace and war in every era from today's Global War on Terrorism, back through the Cold War, Vietnam, Korea, WWII, and even to its very beginnings in the Civil War. This system has created Nobel laureates, fostered the creation of operational radar, sonar, and most of the fundamental capabilities found in space today. It has helped unlock some of the basic secrets of our natural environment, particularly in the oceans, atmosphere, and space. It has routinely been ranked in the very top tier in intellectual property productivity in the United States. The lab system has been involved from the conceptual development all the way to operational testing and fielding of every major weapons system our Marines and Sailors have used for generations. Often that delivery of practical technology has involved substantial partnerships with or transfers-for-production to the U.S. technical defense industry.

Certainly, what we call today a "Navy Corporate Laboratory and a set of RDT&E Warfare Centers" have created new knowledge, devices, techniques, and talent. They also collectively guarantee for the Department of the Navy and the Nation a smart buyer capability. They pursue technological advance when it has the potential to help the warfighter, even when such pursuit would not be interesting to profit-motivated industry. And they continue to deliver improved capabilities directly to the national security organizations that depend on them.

In the purported interest of good stewardship and self-scrutiny, various Navy and DOD managers have caused there to be many reviews of the Navy (and other DOD) laboratories and centers. Dr. Hazell, has done us a great service in this book by chronicling those many reviews and the resultant managerial evolution of the Navy laboratory system. He points out rather clearly an accelerating migration of RDT&E investment away from the in-house laboratories to private sector industry, especially since the 1990's.

The private sector has always been a critical component of the defense industrial base, as only industry can manufacture the products that DOD needs on a large scale. And no matter how critical the role of the in-house labs and centers may have been, most defense R&D has always been contracted out to academia and private-sector companies. However, the decisive change in the balance of work has led to its own set of problems, many of which stem from conflicts that in part necessitated in-house technical competence in the first place. These developments indicate that as we adapt to an ever-changing threat environment, Service technical organizations – which can identify what must be done, the best people to do it, and whether it has been done right – remain critical to national security.

Vice Admiral Paul G. Gaffney II, USN (Ret.)

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****Online availability limited**
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Introduction

Purpose and Scope

This book reviews approximately 65 of the significant reports issued on Department of Defense (DOD) and Department of the Navy (DON) management of research, development, test, and evaluation (RDT&E) from the end of the Cold War through the late 1990s. It is designed for two primary audiences: (1) DOD, congressional, and other government staff who need an accessible overview and quick reference and bibliographic guide to issues during that period; and (2) researchers and historians, especially those interested in available sources. These sources include not only major reports, but also a wealth of other, unpublished, often unique material housed in both the post-Cold War management archive at the Naval Research Laboratory (NRL) and the Navy laboratories collection at the Operational Archives of the Naval Historical Center (NHC), Washington Navy Yard.[1]

The book is organized both chronologically and thematically, and engages some of the principal arguments regarding management of defense research and development (R&D) in the 1990s. However, anyone interested only in which studies said what about which topics can simply search for key terms (http://www.nrl.navy.mil/content.php?P=LIBRARY).

As a work that condenses a large amount of material on major subjects, this survey presents a kind of index to the RDT&E management community's corporate memory. Users with considerable background and expertise and those with very little can both utilize the information. The book provides a user-friendly tool that facilitates research, planning, and response time. It also can help readers build on previous analyses and avoid "reinventing the wheel" each time recurring management issues arise. Study groups, commissions, or panels can use it as a reference guide to assist literature searches that give historical context, and any planner or staff member can use it to become familiar with reports on issues of perennial interest. Readers new to the subject will find many elements of a basic overview, including definitions of key terms and concepts.

Although the reports discussed here addressed most of the major concerns of the Navy and DOD RDT&E laboratory/center community from the late 1980s to the late 1990s, they did not address them all (a description of that community, including the question of what exactly constitutes a "laboratory" and a "center," is below). What has been discussed and what has been left out – the scope and focus – have been determined chiefly by the material in the NRL archive, which

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[1]See Appendix A for a description of those collections. The footnotes also provide many details about the source material.

generally reflects the Navy's efforts to facilitate coordination of science and technology (S&T) programs across the Services, and sometimes across DOD.[2]

This focus entails some significant omissions. For one, the archive does not contain every important report published during the decade (though many of those are abstracted here). More important is that some initiatives generated work eventually reflected in briefings, emails, and memos (often in the archive), but not formally documented in a report. An example is the Navy Re-Investment and Infrastructure (RII) effort, discussed in Chapter Three. Typically, efforts driven by budget decisions, Navy policy makers, or local management did not contain reporting requirements. Initiatives not discussed or only tangentially addressed here include the Competency Aligned Organization (CAO), Activity-Based Costing (ABC), Regionalization Initiatives, Navy-Marine Corps Intranet (NMCI), Customer Service Centers, Labor-Management Partnership Councils, Work Breakdown Databases, Quality Management Boards, Alternative Dispute Resolution, and Cost as Independent Variable, to name just a few.

On the other hand, the archive and other sources have allowed for an analysis that extends beyond a straightforward abstracting of major reports. For example, some studies discussed here, well researched and based on expert knowledge, did not circulate widely beyond the Navy technical community, and were not even officially published. Often the only copies are in the NRL or NHC archives. Further, this book adds considerable narrative thread to provide some context – in many cases extremely difficult to recreate – for the reports. Subject matter experts, who usually participated in groups responsible for either writing or responding to the reports, have reviewed the material for accuracy. They have combined collaborative memory with a review of unpublished personal and official records to provide information on developments that simply could not be reconstructed otherwise. Also, working papers, oral history interviews, and other material in the archives have provided insight and commentary not obtainable through published sources.

In sum, this survey provides much more information than can be gleaned from formal reports alone. The text sometimes reads like a story and offers a basic, broad overview of Navy laboratory management, but it is not a history of Navy RDT&E in the 1990s.

A final note on the reports: while many focused on the Navy's technical activities, many also dealt with Army and Air Force labs, other federal government labs, the Navy and DOD acquisition process as a whole, and/or national security strategy. The widest-ranging reports typically contained a section on DOD S&T or acquisition, and in such cases the discussion in this book deals largely with that section alone. Further, for those publications that discussed the laboratory systems of the three Services, the description here deals primarily with Navy

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[2]While it is often technically correct to write "the" before various acronyms – DOD, DON, etc. – the text here omits the article whenever possible. Likewise, DOD is sometimes written as DoD. The former is used here except in instances of quotation.

labs. Likewise, this presentation often gauges a report's assertions about the Service labs or DOD support infrastructure overall against evidence about the Navy RDT&E centers in particular.

Using this Book

In addition to the link to the PDF and Word files that enables electronic searches for key terms, the text itself is organized to facilitate skimming for desired information. Titles are listed in bold to signal the paragraph where discussion of a study begins. Studies discussed at length are summarized in that same opening paragraph – an abstract within an abstract. Also, the first sentence of each paragraph overviews the material therein to facilitate use as a desk reference.

Note on references: in addition to footnotes, page numbers are provided in parentheses after direct quotations. All numbers refer to the report being discussed.

Overview of the Navy "Laboratory" System[3]

The somewhat misleading term "Navy laboratories" encompasses a vast array of activities that together constitute something little resembling a traditional research facility. Each military Service owns and operates technical activities that support the acquisition, operation, and upgrade of weapons and weapons systems. Most of these facilities have evolved from their origins in WWII or WWI (or in some cases the 19th century) as small, specialized installations focused on a component or weapon, to warfare-oriented centers that perform work from RDT&E to in-service engineering to retirement of fielded systems – from concept to retirement, or, as some say, from "lust to rust."

Often generically called laboratories, or labs and centers, they have many different titles that more accurately reflect their work: warfare center, systems center, test and evaluation (T&E) center, engineering center, experiment station, research laboratory, research center, or research, development, and engineering center. They all employ scientists and engineers (S&Es), hence the general term laboratory. But as the names suggest, they all focus on different parts of the concept-to-retirement R&D or acquisition spectrum. They all receive RDT&E

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[3]For overviews, see Rodney Carlisle, *Management of the U.S. Navy Research and Development Centers During the Cold War: A Survey Guide to Reports* (1996) and "Navy RDT&E Planning in an Age of Transition: A Survey Guide to Contemporary Literature" (1997), Michael Marshall, "The Key to a 'World-Class' Science and Technology Enterprise: Hiring and Retaining the Best and Brightest Scientists and Engineers" (March 2001), Naval Research Advisory Committee (NRAC), "Science and Technology Community in Crisis" (May 2002), and Robert Kavetsky, Michael Marshall, and Davinder Anand, *From Science to Seapower: A Roadmap for S&T Revitalization* (2006). Also helpful are David K. Allison's "The Role of Navy Laboratories: A Historical Review" (December 1984), and "U.S. Navy Research and Development since World War II," in *Military Enterprise and Technological Change*, Merritt Roe Smith, ed. (1984), 290-328.

funding, designated as Defense Category 6. Category 6 funding is further broken down into various stages, the numbers and titles of which have changed over time. The first two stages – Basic Research and Applied Research (the latter formerly called Exploratory Development) – are generally considered the defense "technology base," which along with the third stage – Advanced Technology Development (formerly called Advanced Development) – constitute the defense S&T program.[4]

DOD considers all of these facilities RDT&E activities, often defining the term as any Service organization that devotes a minimum of 25 percent of the "in-house" manpower and/or 25 percent of its funding to work conducted in-house anywhere along the acquisition-support spectrum. More general definitions state that RDT&E activities are those that perform S&T, engineering development, systems engineering, and/or support of deployed material and modernization. In addition to the term laboratories, or technical centers, commentators also often use R&D generically to encompass all of these activities. This survey likewise refers to "the labs and centers," "technical centers," "technical activities," or sometimes "R&D centers." Distinctions are addressed when appropriate. For example, Chapter Two notes that in the Base Realignment and Closure (BRAC) rounds for 1993 and 1995, DOD cross-Service groups distinguished between labs and T&E centers, a division many people believed limited the effectiveness of those groups.

Variations among the technical centers have complicated cross-Service comparisons and congressional or DOD attempts to engage in reform efforts that would help the labs equally – a point many of the reports discussed here returned to regularly. In fact, defense labs resemble snowflakes in that no two are alike, even within Services. In addition to focusing on different subject areas, they devote different percentages of work to those areas, they contract out to private industry different percentages of that work, and they categorize activities as either RDT&E or "commercial" differently, to name just a few examples.

Significant differences also exist among each of the Services' funding processes. These too have caused many difficulties when, for example, Congress and DOD have attempted to compare costs across Services. One crucial difference, discussed in Chapter Five and Appendix B, is the Navy's industrial-type funding, called the Navy Working Capital Fund (WCF). Under the WCF, Navy labs recover most of their overhead costs by charging customers, just as industry does. Such "cost visibility" does not always exist with the Air Force technical centers – which are largely institutionally funded through congressional appropriations – or Army centers – which are funded through both direct appropria-

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[4]Congressional Research Service (John Moteff), "Defense Research: A Primer on the Department of Defense's Research, Development, Test and Evaluation (RDT&E) Program" (May 5, 1998), available online, provides a good, brief overview. Some commentators considered 6.1-6.3 as the technology base, especially when 6.3 was divided into 6.3A (Advanced Technology Development – Feasibility) and 6.3B (Advanced Development – System Application). 6.3A was the cutoff for the tech base.

The main site of the Naval Research Laboratory is located in Washington, D.C., on the East bank of the Potomac River. It was established in 1923 and serves as the Navy's Corporate Laboratory.

tions and customer funding with partial overhead reimbursement. This situation creates an "un-level" playing field, in that a subsidized bidder, such as an Air Force lab, can often underbid a WCF activity. Overall then, while a customer may get a better deal by working with the Army or Air Force, the taxpayer may not.

The Navy RDT&E community consists primarily of geographically dispersed warfare and systems centers, plus NRL, the Navy's corporate laboratory. The Naval Surface Warfare Center (NSWC), Naval Undersea Warfare Center (NUWC), Naval Air Warfare Center (NAWC) Aircraft and Weapons Divisions, and the Space and Naval Warfare Systems Command (SPAWAR) Systems Centers (SSCs) ultimately arose from the 1991 BRAC (discussed in Chapter One), which closed or realigned 36 RDT&E and In-Service Engineering (ISE) activities. The Navy envisioned that each of these new "full-spectrum" centers would maintain the in-house capability to support war-fighting systems throughout their life cycle. The Navy Laboratory/Center Coordinating Group (NLCCG), consisting of the military commanders and civilian directors of these activities, routinely met as a Navy Secretariat chartered forum to address issues and coordinate efforts affecting the Navy's largest technical community.

Several differences exist between the NRL and the warfare centers. One is size. Even the smallest warfare center has considerably more personnel and a much larger business base than NRL. Both the centers and NRL perform technical work across the spectrum. However, more than 80 percent of NRL's business

base is derived from RDT&E funding, and more than 50 percent from S&T, while in the centers, RDT&E funding accounts for less than 30 percent of the business base, and S&T funding accounts for less than 10 percent. Most of the funding for a warfare center, then, is directed from accounts such as procurement and operations and maintenance, or the latter stages of the acquisition process.

The overall defense technology base consists not only of in-house technical centers but also of industry and academic or not-for-profit organizations. DOD relies primarily on academia for basic research. It has agreements with several University Affiliated Research Centers (UARCs) and Federally Funded Research and Development Centers (FFRDCs). Also, DOD contracts with many private sector companies to manufacture, field, and develop the products it acquires. As mentioned, the percentages of work outsourced vary significantly across installations and even within each installation according to activity. Interestingly, most studies – and policy – aimed at improving the return on investment in Navy RDT&E have been directed at in-house organizations, but the majority of the work has always been contracted to others.

Many of the reports discussed in this book addressed the roles and missions of the Navy and DOD R&D centers. The basic reason for their existence is the need to bring technical understanding to military problems, to identify the best candidate for solving those problems, and to verify whether a problem has been solved technically. Stated another way, the centers are uniquely positioned to integrate work – done both in-house and in private industry – across the RDT&E spectrum to maximize military capability. Most analysts agree that this corporate technical continuity is the "inherently governmental function" of the centers. Widespread agreement has existed that those centers:

- Provide direct, rapid technical support to the warfighter
- Ensure that warfighter needs determine technology investment
- Maintain vital, unique capabilities and facilities not existing in the private sector
- Perform a "smart buyer" role (discussed in Chapter One)
- Maintain corporate memory

Themes and Conclusions

Since WWII, well over a hundred major reports and hundreds of smaller studies on the in-house laboratories have struggled with a number of recurring issues. Most prominent among these include:

1. Hiring and retaining highly capable scientists and engineers, and modifying the civil service system
2. Advocating for S&T at the highest levels of government
3. Maintaining state of the art facilities and equipment
4. Relying on "alternative" forms of management, such as government-owned, contractor-operated (GOCO) labs, which provide flexibilities (for instance in personnel management) unavailable in government-operated labs
5. Providing lab directors with sufficient authority and accountability

6. Relieving labs and centers of burdensome regulatory and bureaucratic encumbrances and contracting/procurement procedures
7. Supporting long-term research within a short-term budget system
8. Coordinating, consolidating, and/or closing RDT&E activities within the Services and across DOD to minimize duplication of effort and maximize efficiency and critical mass
9. Streamlining management
10. Finding the best ratio of contracting out work to performing it in-house
11. Measuring RDT&E return on investment

Of these eleven issues, the first seven deal primarily with improving lab *effectiveness*. The next two, although also concerned with effectiveness, deal primarily with *efficiency*. Also, in the period under consideration, study groups almost always discussed the tenth and eleventh issues in terms of efficiency. A dictionary definition of efficiency combines getting the job done (effectiveness) and doing so at a minimum cost. But in the 1990s, most reports on defense labs and centers clearly favored the latter at the expense of the former.

In fact, a review of the reports written between the mid-1980s and late 1990s, examining which recommendations were implemented, shows that downsizing and efficiency initiatives triumphed over reform and effectiveness programs. While report after report identified the same barriers to laboratory effectiveness and offered remarkably similar proposals to remove them, and while the Navy and DOD established numerous demonstration, pilot, and improvement programs, few of the measures envisioned came to fruition. Instead, outsourcing, staffing reductions, and other efficiency measures superseded those efforts. Study groups usually asserted that cutbacks carried out correctly would simultaneously improve performance. But they devoted many more pages to cost reduction and did not address the fact that effectiveness sometimes simply costs more.

Chapter One shows how the reports issued between the mid-1980s and the immediate post-Cold War era began to reflect the change in emphasis from reform to reduction and consolidation. From the 1983 White House Science Council's report on federal laboratories through the end of the decade, studies focused on the importance of the labs and ways to improve them. Such studies typically listed numerous crucial missions and roles, discussed the need for steady investment in and continuous, high-level support for long-term S&T, lamented hiring and retention problems, and noted the dilemma of local lab managers bereft of the authority to execute their missions. Recommendations also dealt primarily with effectiveness, advocating, for example, extension of demo or pilot projects that provided needed flexibilities.

By the end of the decade however, budget pressures led DOD to shift its attention toward savings, a development that gained relentless momentum when the Cold War ended. In early 1989 President George H.W. Bush urged full implementation of the recommendations from the 1986 Packard Report on Defense Management and the Goldwater-Nichols Defense Reorganization Act. This led

to Secretary of Defense Dick Cheney's *Defense Management Review* (DMR), which called for streamlining acquisition management. That report in turn led to a series of DMR Decisions (DMRDs). DMRD 922, forwarded in November of 1989, directed consolidation to reduce overlap in the RDT&E centers. A year and a half later, by which time the Cold War had officially ended, the first of three major rounds of BRAC subsumed the DMR efforts. For the Navy, BRAC 91 officially provided the means to establish the four warfare centers and corporate laboratory structure originally developed during the DMRD 922 process.

Even though post-Cold War reductions had begun to dominate DOD, many reports continued to focus on effectiveness. Concurrent with the BRAC process, Congress had established a Federal Advisory Commission to evaluate the entire defense laboratory system. The Commission's report, which described the virtues of consolidation, also discussed ways to improve the in-house labs. Meanwhile, as part of the FY 1990 National Defense Authorization Act (NDAA), Congress had established a Laboratory Demonstration Program (LDP) designed to alleviate some long-standing problems. Nonetheless, the tide had shifted toward anticipation of a post-Cold War peace dividend – in various conflicts between LDP-based effectiveness plans and DMR-based efficiency plans, the latter always triumphed.

Chapter Two summarizes the highest-level reports issued during BRAC 93 and BRAC 95. Because the two rounds consumed so much of DOD's effort in mid-decade, a survey of this scope cannot approach a comprehensive review of all significant reports (a search on the Government Accountability Office's (GAO) website alone for studies on "base closure" yields over 400 hits). Instead, this chapter synopsizes the 2,000-odd pages of the highest-level reports – the DON/DOD, GAO assessment, and BRAC Commission – for each of the two rounds. Primarily those publications explained the lengthy, complicated process of data collection and analysis and provided the justification for each closure or realignment.

Chapter Two also briefly discusses some of the unpublished sources at the NRL archive that deal with these events. A number of oral history interviews, for example, describe how the BRAC rounds affected personnel and capabilities at Navy R&D facilities. Unsurprisingly, many of those at disestablished activities considered the BRAC process faulty.

Chapter Three examines reports that advocated increased outsourcing (or contracting) of RDT&E and of the support infrastructure generally. Numerous studies picked examples from the private sector and within DOD to recommend outsourcing as a way not only to improve service but also to save money the Department could apply to lagging procurement and modernization budgets. Most reports emphasized outsourcing of "commercial activities," or those functions entrepreneurial in nature rather than "inherently governmental." Many suggested redefining those key terms to the point that only policy formulation and preservation of unique, indispensable facilities and capabilities would constitute inherently governmental activities. Influential, well-publicized, and often-quoted studies promised 20-30 percent savings for each job outsourced. Except for a few reports responding to President Clinton's directive to review the DOD,

Department of Energy (DOE), and NASA laboratories, these publications virtually ignored questions about the need for in-house RDT&E. They either skipped the matter of effectiveness or dispensed with it briefly. Instead, they scolded the community for its supposed outdated management style and lectured on the virtues of applying innovative private sector practices.

Chapter Four briefly discusses reports, most of them much less influential than those described in Chapter Three, which challenged the claims of outsourcing advocates. These reports argued that much of the private sector had already abandoned personnel downsizing by the mid-1990s because it hurt productivity and frequently cost more than it saved. They discussed DOD's own history to argue that widespread, increased contracting could not save as much as its advocates estimated and could often cost money and threaten capabilities. Other reports challenged the notion that DOD suffered from outdated management styles. And finally, a host of studies showed that public/private competitions, rather than outsourcing itself, created the best conditions for efficiency. Such competitions almost always generated real savings, regardless of whether the private or public sector performed the work.

Chapter Five discusses reports and plans that continued to focus on laboratory effectiveness. The LDP morphed into the Laboratory Quality Improvement Program (LQIP), soon subsumed under the Clinton Administration's National Performance Review and government "reinvention" efforts. An LQIP financial subpanel expended considerable effort trying to level the playing field for comparing the costs of doing business at the RDT&E centers across the Services. Legislation aimed at reform included Section 246 of the National Defense Authorization Act (NDAA) for FY 1999, which established a pilot program to provide laboratory and T&E center directors with more flexibility and authority to revitalize their organizations. Congress passed other similar legislation in subsequent years. While such efforts enabled moderate progress in a few areas, institutional and organizational barriers prevented all of them from reaching anywhere near their potential.

Meanwhile, downsizing and consolidation efforts continued apace. Between 1991 and 2005, while the centers and NRL workforces (including military) had been reduced by 45 percent, their collective business base, adjusted for inflation, had increased nine percent over the 1991 level. Part of that disparity arose from increased outsourcing and part of it from the conviction that the centers could do the same work with fewer people. At the same time, as a result of budget cuts or efforts to save money, the NLCCG community faced more than a dozen separate actions that restricted hiring. And in 2005, DOD carried out another BRAC round.

Predictably – even inevitably – the DOD today faces a recoil from this decade-plus era of extreme reliance on outsourcing. A spate of recent books, many focusing on the war in Iraq, discuss with growing alarm the problems that arise from contracting out more and more defense functions. These problems include conflicts of interest and scandals, the scale of which has led to concern about the potential damage to national security and even American democracy.

What makes this reaction so predictable is that something very similar has happened before. Anyone familiar with the history of the defense contracting could have seen it coming, and in fact many did (as discussed in Chapter Four). While this book is a work of history, with the period of analysis ending at the turn of the century, the Conclusion discusses how these difficulties with outsourcing may very well necessitate a revitalization of the Defense Department's in-house RDT&E activities.

Chapter One

Navy Laboratories at the End of the Cold War

On Christmas Day 1991, Boris Yeltsin dialed up President George H.W. Bush to say the Soviet Union had dissolved. The call not only officially ended the Cold War but also, at least somewhat coincidentally, punctuated the end of a DOD laboratory reform effort begun in earnest three years earlier. Studies of the laboratories and centers during the 1980s had addressed long-standing issues in the community. These included the ability to hire quality scientists and engineers, bureaucratic encumbrances, conversion to alternative forms of governance, aging facilities and equipment, lab director authority, independent or discretionary research, proper missions and functions, strategic coordination of and commitment to technology development, and stability for long-term programs. Reform received renewed emphasis in February 1989 when President Bush, before a Joint Session of Congress, urged improving DOD procurement through implementing the recommendations of the 1986 "Packard Report" and Goldwater-Nichols Defense Reorganization Act.

Responding to the President, Secretary of Defense Dick Cheney published the Defense Management Review (DMR), which in large part outlined plans for streamlining acquisition management. Soon after, DOD issued a series of DMR Decisions, of which one, DMRD 922, directed the consolidation of technical centers. The expansion, extension, and reorientation of the LDP, designed to improve both the efficiency and effectiveness of DOD labs, and the establishment of Project Reliance, a tri-Service effort to coordinate investments in S&T, were among the initiatives that grew from DMRD 922.

These efforts both responded to and anticipated severe budget pressures and then collided with the end of the Cold War, causing a fundamental shift in the focus of reports on laboratories. Whereas those written in the 1980s urged improvement to maintain U.S. technological superiority over the Soviet Union, those in the early 1990s focused on mandated personnel reductions and improved efficiency, the latter of which came to mean cutting costs. Although predictable and reasonable, this attention to a postwar "peace dividend" rather quickly overwhelmed all plans to improve the technical centers.

The first round of BRAC reinforced the shift from reform to reduction. The Navy used BRAC both to meet the cutback targets and to implement the options generated through DMRD 922, consolidating all of its RDT&E activities except

NRL into four warfare centers. These new commands officially opened for business eight days after Yeltsin's phone call.[5]

Starting Points – The Packard Commissions and the Defense Science Board on Technology Base Management

Somewhat ironically, the post-Cold War era of laboratory transformation began right about the time President Ronald Reagan designated the Soviet Union an empire of evil. In May 1983 the Federal Laboratory Review Panel's **Report of the White House Science Council** discussed a number of themes echoed in most reports on DOD labs issued over the next decade.[6] Led by David Packard, Chairman of the Board of Hewlett-Packard and former Deputy Secretary of Defense (DEPSECDEF), the panel reaffirmed, as did dozens of reports before and after, that the labs "are an essential part of the American institutions where R&D is performed and scientists and engineers receive training."(vii) However, "several serious deficiencies" limited their quality and cost effectiveness; although not new, the effects of these deficiencies "have increased to serious levels over the past decade."(1) The panel focused on five areas: mission, personnel, funding, management, and interaction with universities, industry, and users of research results.

First, the panel connected missions and outcomes: "the clearer a laboratory's missions are, the better its performances will be." Typically, when "a national need that justified the original mission…becomes of lower priority," a lab will diversify its work to maintain staff, the mission will thereby fragment, performance suffers, and money is wasted.(4) The panel recommended that labs redefine their missions specifically enough to measure accomplishments and determine proper size.

The Packard panel also discussed problems with resources. Both repeating and anticipating one of the most commonly uttered assertions in the history of such reports, it wrote that "The inability of many Federal laboratories…to attract, retain, and motivate qualified scientists and engineers is alarming."(6) It identified non-competitive pay and "recent personnel ceilings imposed strictly on a numerical basis without distinguishing among types of staff"(6) as the main causes of the problem. As with hiring and retention, the issue of arbitrary, non-strategic personnel ceilings remained critical in the DOD technical centers.

A third topic Packard discussed, and another that remained important for well over a decade, was the joint personnel demonstration project, begun in 1980

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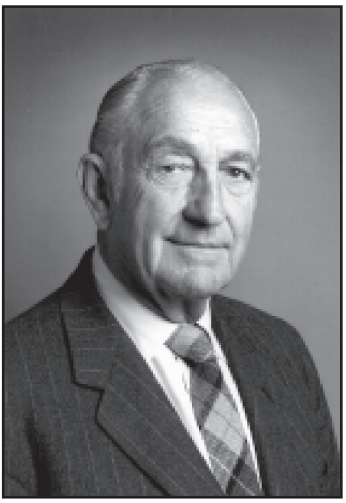
[5]For other works that cover this period, see Director of Navy Laboratories, "A Review of Studies Conducted From November 1989 to April 1990 on Restructuring the Navy RDT&E Community" (July 1990), Carlisle, *Management of the U.S. Navy Research and Development Centers* and *Navy RDT&E Planning in an Age of Transition*, and NRAC, "Science and Technology Community in Crisis."

[6]White House Science Council, Office of Science and Technology Policy (OSTP), "Report of the White House Science Council, Federal Laboratory Review Panel" (Packard Report) (May 1983).



Dr. David Packard was co-founder of Hewlett-Packard Company and served as Deputy Secretary of Defense from 1969 to 1971. In the 1980s he led a number of high-level studies on DOD's technical and acquisition communities. He was a member of the National Academy of Engineering and the President's Council of Advisors on Science and Technology.

at the Naval Weapons Center (NWC) at China Lake, California and the Naval Ocean Systems Center (NOSC) in San Diego. The 1978 Civil Service Reform Act had authorized establishing a limited number of demonstration projects to improve personnel management in the Federal Government. Among other things, such demos sought to streamline practices and increase the authority of agency directors to hire and reward well-qualified people, thereby boosting performance. The project's features included: 1) simplifying the classification system into broad pay bands, to overcome delays in recruitment and promotion and rigidity in administering resources; 2) linking pay and promotion to performance, and allowing flexibility in providing incentives to attract personnel; and 3) basing staff retention/reductions on performance. Most major reports issued during the next decade recommended extending the "China Lake demo" to additional laboratories or even across the DOD.[7]

The panel's recommendations on budgets involved yet another, related issue still central to management of laboratories: the authority of their technical directors. Packard argued that funding processes "impede rational planning and effective conduct of R&D activities."(8) Noting that directors had too little flexibility in planning projects and allocating their own funds, the panel urged that the Office of Management and Budget (OMB) fund "on a predictable multiyear basis,"(8) and that labs be able to carry leftover funding into the next fiscal year. It further suggested that between five and 10 percent of annual funding should support independent research and development at the directors' discretion. Again Packard mentioned performance measurement, suggesting development of a system for determining appropriate funding levels for this type of research at each lab. Later studies would connect the ability to hire and retain quality scientists and engineers (S&Es) to the opportunity for them to pursue such challenging

[7]See NRAC, "Science and Technology Community in Crisis," 20-21.

work (most commonly known as In-House Laboratory Independent Research, or ILIR).[8]

Packard also addressed management issues. "It is clear that excessively detailed direction of laboratory R&D activities from agency headquarters, known as micromanagement, has seriously impaired R&D performance…."(9) At the same time, however, agencies do not "hold the laboratories sufficiently accountable for output in terms of quality and productivity."(ix) The report advocated creating an external oversight committee for each lab, with university and industry representation, to advise the appropriate agency on budgeting and reducing micromanagement.

Finally, the panel encouraged interaction among DOD labs, universities, industry, and users of research results. A cumbersome procurement system discouraged government-owned, government-operated (GOGO) labs from contracting with universities and industry, which in turn meant labs sometimes did work better performed elsewhere. GOGO labs, according to the panel, should encourage access to their facilities, engage in more collaborative projects, establish some oversight mechanism to insure fair competition, and simplify procurement procedures.

The panel's conclusions received renewed emphasis in August 1983 when President Reagan directed OMB and his Office of Science and Technology Policy, or OSTP (which issued the original report), to respond. The Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) monitored implementation of the recommendations, and the Laboratory Review Panel issued a **Progress Report** in July 1984.[9] This study observed that multiyear funding and separate S&T personnel systems constituted the most difficult proposals to implement. It also found that DOD labs unconstrained by personnel ceilings did not engage in unwarranted hiring. Regarding the Navy technical centers, it focused on the sharp decline in discretionary funding and commended efforts by the Director of Navy Laboratories (DNL) to reverse the trend. Meanwhile, the Office of Naval Research (ONR) planned "to maintain discretionary funds as a constant percentage of basic research funds (about 7%)…[and] the Office of Naval Technology [ONT] has agreed to increase the percentage of discretionary funds as part of applied research funds (from 2% to about 5%)."(13, Vol. 1) Finally, the report commented that two-year budgets proposed in the earlier OSTP report would ultimately provide little stability for RDT&E programs.

The significance of the Progress Report was not so much that it specified improvements or shortfalls in the time elapsed since the original report, but instead that it simply existed. The FCCSET wanted its charter extended "to allow continuation of periodic meetings" and to "continue the momentum estab-

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[8]Although the report used the term independent research and development while discussing in-house labs, typically IR&D or IRAD refers to independent research DOD contractors perform. In-House Laboratory Independent Research, or ILIR, typically refers to DOD labs.

[9]OSTP, "Progress Report on Implementing the Recommendations of the White House Science Council's Federal Laboratory Review Panel." Vol. 1, Summary Report. Vol. 2, Status Report by Agencies (July 1984).

lished…."(2, Vol. 2) In other words, it proposed setting up a stable, continuous, adequately resourced process for people in senior leadership positions to monitor and persistently support federal R&D in order to ensure that compelling recommendations advocated by capable study groups were acted upon. However, DOD did not adopt this recommendation.

The Second Packard Commission

Various steps the Laboratory Review Panel advocated became incorporated into a major and ultimately very influential report issued two years later – ***A Quest for Excellence***, produced by the President's Blue Ribbon Commission on Defense Management, also chaired by David Packard.[10] The Commission examined national security planning and budgeting, military organization and command, acquisition organization and procedures, and government-industry accountability. It framed the overriding issue as one of balancing centralized management with the "free expression of people's energy, enthusiasm, and creativity…."(xi) Stated another way, it advocated "strong centralized policies implemented through highly decentralized management structures…."(xii) The Commission called for creating "centers of management excellence," based on this idea that Congress should focus only on "overall defense posture and military performance." Likewise, management "responsibility and authority [should be] placed firmly in the hands of those at the working level, who have knowledge and enthusiasm for the tasks at hand."(xii) And perhaps most significantly, Packard proposed creating a streamlined chain of command extending from a Defense Acquisition Executive (DAE) to Service Acquisition Executives (SAEs) to Program Executive Officers (PEOs) to Program Managers (PMs).

Many findings sounded themes similar to Packard's earlier report on laboratory reform. The Commission argued that successful acquisition originated from a "stable environment" and discussed the "impressive" savings available "from eliminating the hidden costs" caused by the "chronic instability in top-line funding." It bemoaned labyrinthine procurement laws, fragmented, uncoordinated acquisition policies, and the "never-ending bureaucratic obligations for making reports and gaining approvals" – unnecessary obligations that wrest control of programs from the mangers responsible for them.(xxi-xxii)

Overall, the Packard Commission sought to purge bureaucratic nuisances by establishing acquisition executives that could simplify the chain of command. In theory, these top-level decision makers would provide overall direction and then remove every unnecessary position, office, or even agency between them and the people doing the actual work. To that end, the authors called for:

- creating an Undersecretary of Defense for Acquisition (USD(A)) as the DAE responsible for overall procurement and R&D policy
- managing the process through a Joint Requirements Management Board (JRMB), which would define overall requirements and select programs to develop

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[10]President's Blue Ribbon Commission on Defense Management, *A Quest for Excellence: Final Report to the President* (Packard Report) (June 1986).

- establishing for each Service a position comparable to the USD(A), or in other words an SAE. The SAEs, then, would appoint PEOs responsible for major, multi-component platform/weapons systems development. Individual PMs, in turn, would be responsible solely to the PEOs. The resulting personnel reductions and unambiguous, short, chains of authority would dramatically simplify acquisition, increasing accountability throughout the system while allowing people the freedom to apply their talents toward producing rather than complying.

The USD(A)-JRMB-SAE-PEO chain constituted the core of the Commission's recommendations, but it also offered various others. These included formulating a single, government-wide procurement statute, allowing for flexible personnel management policies such as those in the China Lake demo, expanding professional development opportunities for acquisition personnel, and increasing use of "off-the-shelf" materials and services (those available from commercial companies). It also recommended expanded prototyping.

The Navy laboratory system had undergone a significant reorganization just before the publication of the second Packard Report. In 1985 Secretary of the Navy John Lehman disestablished the Naval Material Command (NAVMAT), to which all the Navy RDT&E activities except NRL and the Naval Ocean Research and Development Activity (NORDA) had reported (the latter two activities reported to the Chief of Naval Research (CNR)). Both the DNL – who helped reduce duplication of effort and coordinate the activities among the RDT&E centers – and the laboratories themselves were eventually placed under the newly created Space and Naval Warfare Systems Command (SPAWAR), formerly the Naval Electronics Systems Command (NAVELEX). Part of the justification for this organizational placement was that SPAWAR's mission included the new function of Warfare Systems Architecture and Engineering (WSA&E), i.e., the integration of the various disparate sensor and weapons systems in each Navy ship, aircraft, and submarine. Occurring before the second Packard Report, Lehman's actions nonetheless corresponded with the report's emphasis on reducing bureaucratic management, although some argued that SPAWAR simply became another layer of management between the labs and the principal sponsors of their programs.[11]

The disestablishment of NAVMAT and new organizational placement of the DNL ultimately had major consequences for the Navy's technical centers. The Chief of Naval Material (CNM) had been a four-star admiral; the Commander of SPAWAR was a three-star admiral, as were the other Systems Command (SYSCOM) commanders. The Office of the DNL, by virtue of its orga-

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[11]For a fuller discussion of these events see Carlisle, *Management of the U.S. Navy Research and Development Centers* and *Navy RDT&E Planning in an Age of Transition*. Also, the RDT&E Management Archives at the Washington Navy Yard has 45 oral history interviews on the establishment of SPAWAR. These are part of a larger collection, abstracted in Joseph Marchese, ed., *Index of Oral Histories Relating to Navy Research, Development, Test, Evaluation, and Acquisition* (1992), available upon request.

nizational relationship with CNM, had in effect operated as a Deputy Assistant Secretary of the Navy (DASN). Now, it too was subsumed under a two-star command. In short, one principal, high-level advocate for the labs no longer existed, and another had been effectively "demoted."

The Defense Science Board on the Technology Base and Laboratory Demonstration Program

Like the two Packard Commission reports, the Defense Science Board's (DSB) 1987 publication on **Technology Base Management** affected the technical centers for over a decade.[12] (This report defined the technology base as budget categories 6.1 – Basic Research, 6.2 – Exploratory Development or Applied Research, and 6.3A – Advanced Technology Development.) As in other reports written during this time, the DSB noted the widespread concern about a shrinking gap between U.S. and Soviet military/technological capabilities, and the widespread perception that DOD received inadequate return on its R&D investment. The Board focused on what it considered OSD's overemphasis on systems development at the expense of S&T and also on the importance of Advanced Technology Transition Demonstrations (ATTDs). One of the more significant recommendations was the Board's advocacy of a laboratory demonstration program, including an expansion of the China Lake personnel demo.

The Board offered three principal findings.

1. OSD, which once "exerted a centralized point of unified leadership and budgetary authority and control" over 6.1 research, had become preoccupied with large development programs and left basic research to the Services. As a result, S&T had "been relegated to a position of second order of importance and lacks top management attention."
2. As the defense laboratories "are of supreme importance to DOD," any problems with technical competence must be addressed before they worsened.
3. Both DOD and industry "are seriously deficient in rapid technology transition from R&D to systems and products."(E-1, 2)

Much like the first Packard Commission, DSB emphasized the need for continuous, high-level attention to lab reform. It urged USD(A) to "delegate his Acquisition Executive leadership" to a staff member "vested with full authority and responsibility for the integration and execution of [the] 6.1 program as a corporate asset."(iii) Similarly, the Undersecretary should "explicitly reaffirm" the significance of basic research, accentuate its long-term nature, and "re-assert the corporate budget and managerial authority already resident within OSD."(E-3)

The extensive changes proposed in the Board's second set of recommendations similarly reflected what many analysts had long considered necessary for

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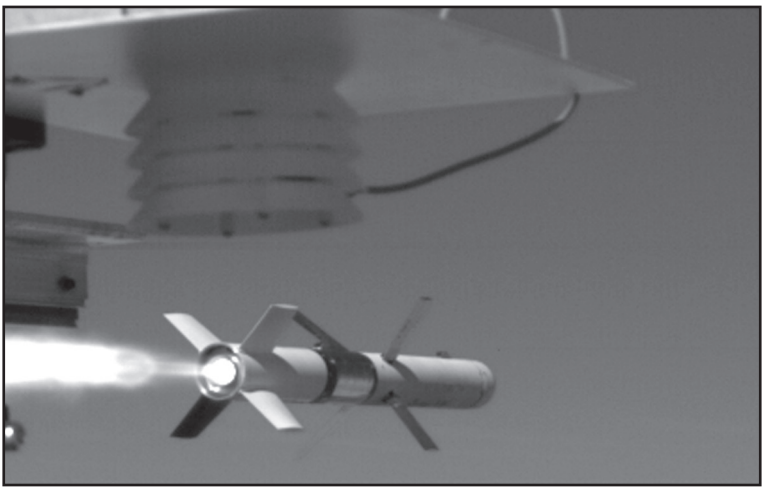
[12]Defense Science Board, "Report of the Defense Science Board 1987 Summer Study on Technology Base Management" (December 1987). The DSB is an Undersecretary for Defense-appointed committee that creates task forces consisting of Board members and other civilian consultants to study scientific and technical matters of interest to DOD.



At just 25 inches long and 5.3 pounds, Spike, developed at Naval Air Warfare Center Weapons Division China Lake, Calif., is the smallest guided missile in the world and the only missile using an electro-optical imaging strapped-down seeker. China Lake's Personnel Demonstration Project received high praise from both DOD and Congress in the late 1980s. U.S. Navy Photo (RELEASED)

improving the lab/center system. The Board advocated five-year appointments for technical directors and clear lines of authority and accountability from them to their senior superiors. It also called for an "experimental Senior Scientific Technical Acquisition Executive Program," consisting of up to 100 appointments, all aimed at "significantly strengthening critical technology skills, Technology Base management, and Defense Acquisition management."(E-4)

Most significantly, the report recommended expanding the NOSC/NWC China Lake personnel demonstration to all S&Es in all DOD labs and establishing a multi-faceted laboratory demonstration program in each Service. DSB believed the China Lake demo had simplified and improved the personnel classification and performance evaluation systems, allowed for performance-based awards and retention efforts, rewarded technical (as opposed to management) contributions, and offered to new S&Es salaries competitive with the private sector. The report recommended that each Service grant one laboratory the authority to test a variety of plans to attract and retain top-quality staff, improve contracting effectiveness and personnel management, and provide local laboratory management authority and accountability. Implementing such a proposal would require granting much greater authorities than those the China Lake demo conferred on NOSC and NWC.

The Board's final set of recommendations focused on launching ATTDs. Calling this idea a "logical extension" of the prototyping the second Packard Commission suggested, the Board reasoned that ATTDs could sharpen decisions about committing to full-scale engineering development of experimental systems.(25) To that end, it advocated directing half or more of 6.3A funding to ATTD projects.

Certain factors differentiated the impact of the DSB and two Packard reports from the "duly noted" responses to other similar missives. The DSB's recommendation for extending the China Lake demo was heeded, though not until 1995. Also, the proposal to create lab demo programs that addressed such issues as contracting effectiveness, technical director authority, and infrastructure renewal was also adopted, and later morphed into several time-consuming and expensive variants during the 1990s. As for the Packard reports, two Presidents specially sanctioned their proposals. Subsequent panels and commissions most often cited those studies' conclusions, which became explicitly designated as the standard against which reform should be measured. Between President Reagan's endorsement of the Packard Report on federal laboratories and President George H. W. Bush's endorsement of the second, broader Packard Report, a number of other reviews addressed management of the Technology Base and of R&D and acquisition in general. These also helped add momentum to laboratory reform efforts.

General Overviews of the Technology Base

One of those studies, the Institute for Defense Analyses' (IDA) report on **Improved Coordination of the DoD Science and Technology Programs**, reached essentially the same conclusions as the 1987 and 1988 DSB reports (the latter is discussed below).[13] This is unsurprising in that IDA prepared the report at the request of the Director, Defense Research and Engineering (DDR&E), chair of the DSB. IDA focused on three issues: the perceived decline in productivity among technical centers, an especially serious problem considering "the erosion of the formerly dominant position of technological superiority in war-fighting capabilities enjoyed by the United States"(ES-1); the need for a cross-Service S&T strategy; and the necessity of high-level, continuous support for long-term S&T.

Largely, IDA simply reaffirmed the importance of investing in long-term Science and Technology. "It is conventional wisdom that too much emphasis on near-term goals is dangerous in a rapidly changing technological environment."(ES-3) IDA emphasized that S&T investments supported high-risk projects and also helped DOD meet unique military requirements, exploit emerging technologies, and demonstrate military applications of technologies. The report cited success stories – including "stealth platforms, cruise missiles, lasers, microelectronics, and submarine and space advances"(II-4) – resulting from S&T investments focused on long-term payoff. Despite these successes however, "there is a widespread belief at the higher management levels that the productivity of the DoD laboratories needs improvement."(I-3)

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[13]Institute for Defense Analysis, "Report of the Task Force for Improved Coordination of the DoD Science and Technology Programs: Volume 1, Summary Report and Recommendations" (July 1988).

The study group recommended several measures designed to ensure support for S&T.

1. USD(A) should aggressively promote S&T through press releases and posture statements and among the Fleet, Congress, OSD, and appropriate agencies.
2. The "long term downward trend in S&T program investment…[should] be arrested and replaced by rational goals for future growth."
3. S&T should be treated as a necessary corporate investment rather than a luxury.
4. OSD should establish a set percentage of Total Obligation Authority (TOA) for S&T, protecting it "against disproportionate cuts during budget exercises" and ensuring it is not "subjected to trade-offs with other parts of the budget."(ES-7, 8, III-23)

As the title suggests, IDA's other recommendations centered on coordination and strategy for "the overall technical program of activities undertaken by the laboratory community."(I-5) The study defined strategic planning as a four-part system: guidance, which sets near- and long-term operational objectives; investment strategy, which establishes the technology goals and identifies the resources necessary to meet those goals; programming; and implementation, which allocates resources. Rather than advocating a particular approach, IDA argued for setting up a "permanent process" for developing and executing strategy.(I-6)

More specifically, the report recommended creating both a DOD-wide investment strategy and a DOD-wide coordination group. Noting that each Service prepared long-range S&T plans but that little coordination existed among Services, IDA suggested that USD(A), through the DDR&E, generate an "S&T Investment Strategy" document to guide the Services and DOD agencies. Second, because technical interchange occurred at working levels but was not coordinated at higher levels, the report proposed that a Department-wide coordination group set up panels for various technology "clusters."

DSB continued to sound the alarm about America's technological decline relative to the Soviet Union in its two-volume 1988 Summer Study on **The Defense Industrial and Technology Base**.[14] Defining the "principal problem [as] a significant difference between industry's capabilities and the tasks which na-

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[14]DSB, "Report of the Defense Science Board 1988 Summer Study on The Defense Industrial and Technology Base." Volume 1, October 1988. (Volume II, not discussed here, appeared in December). The DSB defined the technology base as "programs whose primary purpose is to improve scientific knowledge which can be adapted to military purposes. The 'research' and 'exploratory development' research categories are included in technology base budget activity." (E-4) The defense industrial base generally means those industries and companies that rely on DOD for most of their business. Examples might include the shipbuilding industry and a firm like General Dynamics. The term also sometimes includes companies that are a critical supplier of defense products but also do substantial business in the commercial sector (e.g. Boeing).

tional security plans assume it can perform," the study asserted that "America's technological superiority has diminished."(Cover memo, 1) The Board identified inadequate long-term investment as the cause of this decline; in turn, pressure on defense industries to produce quickly had caused the low investment. It claimed globalization[15] had rendered acquisition policy obsolete, yet that policy remained unresponsive to this growing "world-wide interdependence on resources"(2) and dependence on foreign technology. Also, specific policies led subcontractors and suppliers to segregate their dated technology into defense-based work or avoid such work altogether. DSB also found little Executive, Congressional, or any other high-level coordination of defense industrial and technology base programs.

Many of the Board's 10 principal recommendations involved high-level coordination. For example, it recommended either an Executive Order or a National Security Decision Directive for creating an Industrial Policy Committee to assess defense needs and industry capabilities. It recommended that the Secretary of Defense actively influence economic policies that affected national security and integration of industrial base efforts, and that the USD(A), through policy and incentives, encourage long-term investment.

Another significant proposal, and one still periodically considered in DOD, was converting many labs to Federally Funded Research and Development Centers (FFRDCs) or GOCO labs. Usually, FFRDCs (such as the RAND Corporation) are owned by universities or not-for-profit organizations and operated through long-term contracts with the Federal Government. GOCO labs (such as the Los Alamos National Laboratory) are owned by the government, but a contractor employs the staff. The basic idea is that these "alternative" forms of laboratory governance can utilize advantages enjoyed in the private sector, such as competitive pay offerings and simplified hiring/firing procedures. The DSB advocated conversion as a method of attracting and retaining high-quality S&Es.[16]

Two other recommendations, involving independent research and development (IR&D) and effectiveness versus efficiency, merit attention here. First, calling it the most effective mechanism "in developing and inserting technology into defense systems,"(40) DSB urged considering IR&D cost recovery in the long term, rather than basing it on specific budgets. And finally, it advised that procurement policies promote quality as well as cost, or in other words, not just efficiency but also effectiveness.

One of the most thorough and authoritative reports of the period and one many subsequent studies referenced was the congressional Office of Technol-

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[15]Most simply, globalization is the integration or exchange of economic, cultural, social, and political systems across geographic boundaries. In the DOD S&T community, it refers primarily to the development and availability of technology worldwide.

[16]See Bibliographic Note, Chapter 5, and also Timothy Coffey, Kenneth Lackie, and Michael Marshall, "Alternative Governance: A Tool for Military Laboratory Reform." *Defense Horizons* 34 (November 2003), 1-8.

ogy Assessment's (OTA) **Holding the Edge**.[17] Noting the portentous (if not yet life-threatening) decline of U.S. technological superiority, the study concentrated on three areas: strategic management of Technology Base and R&D programs, particularly the lack of coordination across DOD; technology transition (fielding new technology), particularly the numerous and conflicting acquisition laws preventing exploitation of civilian-developed technology; and dual-use technologies, particularly the challenges of globalization and industry resistance to defense work. Another major section of the report, and the one receiving most attention here, examined the necessity for and reforming of the DOD laboratory system.

Because OTA synthesized many previous studies, and because so many later reports cited OTA's arguments, it is worth discussing at some length its overview of the DOD technical centers. Commenting on three decades worth of lamentations, OTA suggested that "The mind-numbing array of specific issues that these earlier reports have raised" comes down to two issues: Does DOD have the type and quality of labs it needs? and Do management arrangements inhibit productivity?(22)

The study cogently summarized major problem areas. These included attracting, paying, and promoting personnel, administering contracts rather than tackling challenging work, and rewarding managerial rather than technical excellence. OTA agreed that technical directors had too little control over work done at their sites. Further, "delays in new construction are one of the major obstacles to lab performance,"(73) as facility modernization applications go into a single "pot" for consideration with all other military construction (MILCON) projects, and scientific requests receive low priority. Obsolete facilities, in turn, thwarted recruitment. Yet another problem was that, in the end, Congress funded GOCOs, Government-Owned, Contractor-Assisted (GOCA), or Contractor-Owned, Contractor-Operated (COCO) labs too. This meant that over time they became more like GOGOs, their personnel bemoaning endless navigation through a sea of red tape. OTA also challenged DSB's recommendations for changing legislation and regulations; instead, "a congressional decision to treat the laboratories differently from other government offices" might "facilitate the [required] changes."(25)

Inherently Governmental Functions

Such a wearisome assortment of seemingly intractable problems might suggest abolishing the system were it not for one issue: virtually every analysis ever done on the technical centers accepted their absolute necessity. The most fundamental reason for this conclusion, OTA noted, was that some functions are inherently governmental, meaning they should not be contracted out to the private sector. Quoting the seminal "Bell Report" of 1962, a comprehensive evalua-

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[17]U.S. Congress, Office of Technology Assessment, "Holding the Edge: Maintaining the Defense Technology Base" (April 1989). This was a follow-up report to OTA's " The Defense Technology Base: Introduction and Overview" (March 1988). OTA, established in 1972 to provide Congress information about technological developments, was abolished in 1995.

tion generally considered the most authoritative on contracting out federal R&D, OTA defined decisions that exemplified inherently governmental functions: what work to do, what objectives to set, what time and costs to expect, what measures to establish for "knowing whether the work has gone as it was supposed to go,"(64) and what steps to take for correcting mistakes.[18] These functions also included developing technical specifications for and supervising contractors, and sometimes insuring reliability regardless of cost.

In sum, "the decision-making process leading to materiel acquisition is inherently a governmental function." Selecting the best of various technical alternatives required an internal capability "of sufficient breadth, depth, and continuity to assure that the public interest is served."[19] According to OTA, the inherently governmental argument inevitably led to the conclusion that defense S&Es are a national asset whose importance extends beyond particular programs, that laboratories are continuing concerns rather than job shops, and that their staff must perform some hands-on work, even if only to maintain the expertise to supervise contractors.

Smart Buyer

OTA argued that a second crucial and related role for the tech centers was that of being a smart buyer. Briefly, smart buying is the ability to collaborate with contractors and assess the defense value of private sector technological developments. The inherently governmental function and smart buyer role intersect – assessing technology requires technical know-how. Smart buying includes working hands-on with technologies the private sector can also produce and advising program directors on the technical merits of proposals. It includes proving a concept that could generate a new technology. One particularly important smart-buyer role includes "deciding when work in a certain area has gone as far as it should,"(65) or in other words, ending an infeasible project before costs skyrocket. In numerous instances, losing the technical expertise needed to perform the smart buyer role has cost DOD dearly.[20]

The report listed other critical responsibilities of DOD labs and centers. They can respond immediately to problems in the field, and their missions, unlike those of contractors, align with their DOD agency. Further, basic research, supported through ILIR funding, can acquire unforeseen military applications, and the opportunity to do basic research that is not always directly tied to de-

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[18]Bureau of the Budget, "Report to the President on Government Contracting for Research and Development" (April 1962). For a discussion of this report, see Carlisle, *Management of the U.S. Navy Research and Development Centers*, 19-22.

[19]Office of the USDRE, Research Office, "Required In-House Capabilities for Department of Defense Research, Development, Test and Evaluation" (Perry Report) (October 1980), quoted in Federal Advisory Commission, "Federal Advisory Commission on Consolidation and Conversion of Defense Research and Development Laboratories (Adolph Report) (September 1991), 2-3. The Perry Report (discussed in Carlisle, *Management of the U.S. Navy Research and Development Centers*, 67-68) strongly advocated in-house laboratory capabilities.

[20]See Kavetsky et al., *From Science to Seapower*, esp. 37-42.

velopment can lure capable S&Es. In addition, labs can work in areas of little interest to industry – an aspect particularly important for the Navy, as there is much less industry interest in ship building than in, say, aircraft development. Such work can have a continuing, reciprocal impact, because it often leads to developments that eventually do interest industry. Technical centers can also readily perform classified work. Finally, they can provide user support, which often includes inserting new technologies into existing systems (again, this role especially affects the Navy, as its "full-spectrum" centers work across the entire acquisition cycle).

The OTA study also discussed personnel issues. It too praised the China Lake demo but noted continuing problems. For one, the increased pay flexibilities still trailed those in the private sector. Further, fixing personnel issues would not repair a total work environment that included mountainous paperwork, uncertain budgets, and ridiculously long lead times in obtaining equipment. Perhaps most inexplicably, the China Lake venture, operating for a decade to glowing reviews, had yet to be duplicated – apparently "a successful experiment that will have no ramifications."(70)

Finally, OTA identified other basic issues "that profoundly affect the welfare of the defense technology base."(9) The plethora of often conflicting laws governing acquisition delayed technology transition and prevented exploitation of civilian- developed technologies. Uncoordinated planning occurred across OSD and between the civilian and defense R&D sectors. The report claimed that such fragmentation within DOD derived either from lack of power or lack of will to control the Services, and from the fact that no office served as a focal point. Finally, although the Goldwater-Nichols Defense Reorganization Act of 1986 changed titles and players, it did not correct these underlying problems.

Goldwater-Nichols and the Defense Management Review (DMR)

The apprehension that America's technological advantage over its adversaries had declined, along with the parallel conviction that DOD R&D centers had reached a near-crisis point, created a powerful momentum for lab/center reform. Events throughout 1989 intensified this momentum. In his February address to Congress, President George H.W. Bush tasked DOD to apply fully the changes articulated in the second Packard Report and the Goldwater-Nichols Act.[21] In July, SECDEF Dick Cheney's **Defense Management** review responded to the President and called for reassessing defense acquisition entirely.[22] The DMR focused on three additional areas: personnel and organization, planning,

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[21]Public Law 99-433. To a large extent, the act shifted supervision of DOD field activities from military to civilian control. It also sought to eliminate unwarranted S&T program duplication among the Services through "Tri-Service Reliance." It abolished the position of the Undersecretary of Defense for Research and Engineering, replacing it with the Undersecretary of Defense for Acquisition. President Bush's direction to DOD was National Security Review 11.

[22]Dick Cheney, "Defense Management: Report to the President" (July 1989).

and government-industry accountability. It provided broad outlines of responsibilities for key officials and organizations and of methods for restructuring the lines of authority in the acquisition process. The report directed that the Services convey their plans for implementation by October.

The theme of streamlining dominated the DMR. While the second Packard Commission had advocated an acquisition system in which top-level officials provided overall direction and then excised as many links as possible between them and the people doing the actual work, the DMR explained how to accomplish this. Authority would flow from the USD(A) to an SAE in each Service, through middle managers (PEOs) to individual PMs. PEOs would manage only their assigned programs, and program managers would report only to the PEO or SAE. This arrangement "was intended to capture **all** cost, schedule and performance features of all major programs."(9, emphasis in original) Materiel and Systems Commands would have three main roles: logistical support, management of programs not under the PEO structure, and support services to PEOs and PMs without duplicating any management functions.

The DMR envisioned other sweeping changes. It promised better program stability through increased USD(A) and SAE involvement in budget initiatives. It called for a joint OSD/Services zero-based review of acquisition, procurement, and logistics regulations. It blessed the China Lake demo program but urged an even broader authority for changing personnel policies. It planned to increase the professionalism of the civilian workforce and to establish "a dedicated corps of officers in each Service who will make a full-time career as acquisition specialists."(14)

Cheney's report also emphasized cost reductions. He discussed methods such as improved prototyping and testing and increased buying of commercially available products. The "broader effort" included consolidating or eliminating "research, development and procurement-related functions that do not add clear value," and, even more vaguely, achieving "an overall improvement in the efficiency of DoD's acquisition management, logistics, distribution, and related maintenance activities." In all, Cheney targeted an annual savings of 15 percent, or $30 billion, by FY 1995.

Unlike most other reports' obligatory wave to thrift and efficiencies, this report's recommendations were heeded. Budget consequences from the Reagan-era military buildup had created pressure for reductions. And just as cost cutting began in earnest, the Cold War entered its final act – the Berlin Wall was razed in October 1989, only three months after the DMR appeared. The widespread impression that the time had arrived to solve problems long discussed in the RDT&E community merged with these changes to instigate a major restructuring among the Navy laboratories, not completed until the end of the first large round of base realignments and closures.

SECNAV set up a Management Review Task Force (MRTF) composed of six working groups, and the DOD Comptroller began issuing a series of Program Budget Decisions (PBDs) and DMRDs designed to reduce costs during the next five fiscal years. In November, the Department issued DMRD 922, "Consolidation of R&D Laboratories and Test Facilities." DEPSECDEF Donald Atwood

directed studies, due by May 1990, on how best to implement appropriate directives.[23]

What followed during the period from late 1989 to mid-1991 was the most intensive series of lab-related studies, programs, proposals, and general flailing about that anyone involved had ever witnessed. It quickly resolved itself into three parallel but partially related endeavors:

1. Navy reorganizations the DMR necessitated
2. Tri-Service lab/center consolidation studies that DMRD 922 triggered
3. Efforts to implement the lab-related reform recommendations of the Packard and the 1987 DSB studies

Although these three efforts occurred essentially simultaneously (and with many of the same players), they will be addressed separately here to the degree possible.

DMR Implementation

As Secretary Cheney instructed, the Navy (through the MRTF) responded to the DMR with **Plans for Initial Implementation of the Defense Management Report** and the **Program Executive Officer and Systems Command Reorganization Plan**.[24] The former delineated the streamlining of acquisition oversight at the Secretariat level. Both reports outlined the methods whereby:

- technology would be managed
- full-time PEOs would manage major acquisition programs and report directly to a Navy Acquisition Executive (NAE)
- a short span of control for assigned programs would be established for NAEs and PEOs
- authority for personnel, technical, and budget matters would increase at the levels where programs were executed
- only one review would exist between a PM and the approving official
- programs would receive focused management attention and would transition in or out of the PEO/SYSCOM organization according to the principles discussed in the DMR
- contract administrative services (CAS) would be consolidated under the new Defense Contract Management Agency
- and a 15 percent reduction in annual costs would by achieved by FY 1993

Conceptually, the plan followed Packard's recommendation for setting policy at the top and executing it at the bottom.

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[23]See DNL, "A Review of Studies," 1-5.

[24]Department of the Navy Management Review Task Force, "Program Executive Officer and Systems Command Reorganization Plan" (September 1989). Department of the Navy Management Review Task Force, "Plans for Initial Implementation of the Defense Management Report" (October 1, 1989). SECDEF approved the Navy plan in January 1990.

The plan called for consolidating corporate investment in budget categories 6.1, 6.2, and 6.3A within the Office of the Chief of Naval Research (OCNR). This meant joining 6.3A management with the other two S&T categories, "resulting in an office more closely aligned with OSD S&T management structure." Because 6.3A work is corporate – it "covers a continuum of scientific disciplines and supports a continuum of DON needs" – management must act as an "honest broker," allocating resources where needed. The new arrangement would end the "artificial partitioning of 6.3A funding along set product lines," provide "a clearer transition path for Technology Base efforts," and promote stauncher support from DON and DOD.(25-26)

As mentioned, the "Plans for Initial Implementation" presented the streamlining of the Secretariat. To comply with the DMR instruction that a single Assistant Secretary be designated NAE, two ASN positions were disestablished – Research, Engineering and Systems (RE&S) and Shipbuilding and Logistics (S&L). The plan designated a new ASN for Research, Development and Acquisition (RDA) as the acquisition executive, and also established the ASN for Installations and Environment (I&E). The streamlined chain of command, then, went from ASN(RDA) to PEOs to PMs (in some instances SYSCOMs directly reported to ASN(RDA), as mentioned below). The plan also clarified the CNR responsibilities for 6.1 – 6.3A policy and oversight. Overall, these changes proposed reducing the Secretariat-level acquisition staff from 270 to 208 and eliminating 52 additional positions.

Both reports articulated the nature of the PEO. They defined the position as "an amalgam of selected duties previously held by members of the Secretariat, the SYSCOM Commanders and their functional staffs, and some duties previously held by PMs." They recommended that PEOs be assigned "all authorities which affect management of assigned programs."("Program Executive Officer," 4-5) As the link between Program Manager and NAE, the PEO would execute the latter's oversight authority while granting the former the flexibility to meet specific objectives. It would also help stabilize programs by protecting PMs against outside forces with different priorities.

Establishing the PEO position required significant reorganization in the Navy SYSCOMs.[25] Before the DMR, the SYSCOM commanders' "double-hatted" responsibilities included reporting to the Chief of Naval Operations (CNO) and also serving as PEOs who reported to the NAE. The Navy considered this arrangement congruent with the Packard recommendations in that before Pack-

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[25]All three military Services had systems commands responsible for developing, producing, upgrading, and supporting major platform/weapons systems. In the Navy at this time they were the Naval Sea Systems Command (ships, submarines, and associated sensor systems and weapons); Naval Air Systems Command (aircraft, airborne systems, air-launched weaponry, and aircraft-related carrier-based equipment); Space and Naval Warfare Systems Command (space-borne and undersea surveillance systems, command, control and communications systems, electronic and sensor system architecture, engineering, and integration); Naval Supply Systems Command (logistical support and supply services); and Naval Facilities Engineering Command (shore-based facility design, construction, and support).

ard, the SYSCOMs had reported to the NAE through the Naval Material Command (NAVMAT). The DMR, however, required that PEOs be separate from SYSCOMs and also report directly to the NAE. As a result, the SYSCOMs lost their most important acquisition responsibilities and therefore, most of the basis for their double-hatted relationship with the ASN(RDA). In the future, the PEOs would also resolve any PM/SYSCOM disagreements.

The plan also proffered specific program recommendations. It proposed that 21 Acquisition Category (ACAT) 1 programs "in mature, stable production," in other words those that had shifted "from acquisition to life cycle management and logistics support," ("Initial Implementation," 5, 11) stay in their respective SYSCOM, which would retain PEO responsibility and report directly to the NAE. 30 would transfer to a PEO. Further, interdependent programs would all be under one PEO, and PEOs would be aligned with their supporting SYSCOMs.

Both reports included other information and recommendations. They laid out guidelines for the PEO management structure, targeting 10-16 staff members as an ideal. They included the historical evolution of each SYSCOM and explained the MRTF's process for charting the reorganization. They also presented plans to increase the acquisition expertise of military officers and strengthen the Civilian Material Professional (CMP) program.

At the same time the Navy released these reorganization proposals, it responded to drafts of what eventually became **DOD Management of Technology Development**.[26] Limiting its scope to R&D categories 6.1 through 6.3A, the report focused on four areas: DOD-wide coordination, technology transition, long-term investment strategy, and productivity.

Much of the report discussed problems implementing the DMR in each of those areas. First, various factors impeded DOD-wide coordination of S&T. For example, all Services worked on certain technology areas, but each Service developed a different aspect of, say, gas-turbine blades. In addition, various elements of the overall S&T program reported to different levels in OSD. Further, the major consequences of even the smallest funding adjustments could impede program integration. In the second area, technology transition, risk-averse acquisition planning devalued S&T by funneling its dollars into prototyping and other areas beyond its scope. Similarly, technology transition demos were supposed to simply provide options, but users who paid for them needed solutions and therefore balked at committing to such demonstrations. In the third area, long-term S&T investment strategy, DOD's insufficient commitment rippled out to create a host of problems – piecemeal rationales for resource allocation, neglect of dual-use technologies, and indifference to the global changes in technology development.

In discussing laboratories, the report relied on previous studies. It mentioned the redundant management layers, funding uncertainties, and numerous administrative procedures that delayed equipment purchases, facility upgrades,

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[26]DOD, "DoD Management of Technology Development: Implementation of Recommendations of the Defense Management Review" (February 1990).

and contracting. It discussed the difficulties in hiring and retention and bemoaned a deteriorating infrastructure. And reflecting its partiality toward centralized coordination, it also argued that each Service's independent development of similar research led to overlap and also dispersed scarce people and facilities.

The task force maintained that as the first step in acquisition, S&T required more integration and coordination than later phases. Listing advantages and disadvantages of various options, it recommended the following: First, that the DDR&E (Research and Advanced Technology) develop a long-term S&T investment strategy; second, that an S&T executive in each Service have authority for programs and resources – to optimize DOD-wide integration and maintain only one reporting level between the lab directors and the S&T executive; third, that the Defense Acquisition Board (DAB) S&T committee review resource allocation. A fourth recommendation discussed the role of the OSD S&T executive at various milestones. Following the proposals of previous DSB studies, the task force also recommended establishing guidelines for ATTD management.

Asserting that the "climate is now right to begin a process of change," the report also discussed the "productivity of DOD laboratories." For years, "literally dozens of studies have resulted in many recommendations but little action," and in fact many "believe that the practical complications of achieving any significant improvement within today's government operating environment are insurmountable." The task force therefore urged more serious consideration of conversion to GOCO labs. For the moment however, it recommended consolidating and, vaguely, implementing "throughout the laboratory system personnel[,] administrative, and procurement procedural changes to enhance the research process." It also proposed that the new Laboratory Demonstration Program (LDP) "embrace bolder or more controversial changes."(17, 22)

Among the archived files related to this report are commentaries on draft versions – material typically discarded. Critiques from CNR, ASN(RE&S), SPAWAR, and the Joint Directors of Laboratories (JDL) pointed out exceptions, of which there were plenty, to the report's general statements. To give just two examples: SPAWAR noted that S&T was only one mission element of the Navy's full-spectrum centers. It also illustrated briefly how the Navy Industrial Fund (NIF) created issues unique to that Service.[27]

In February 1990 the Congressional Research Service (CRS) and the House Armed Services Committee Subcommittee on Research and Development published the results of their October workshop on **Challenges Confronting the DOD Laboratories**.[28] More than 30 representatives from OSD, the Service and DOE labs, and the private sector met to contend with problems they believed had to be solved soon, or "some of the laboratories may not be capable of assisting the Services in meeting their national security responsibilities."(19) Much of this

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[27]For an overview of the Navy's "industrial" funding, see Appendix B and Chapter 5.

[28]House Armed Services Committee, Subcommittee on Research and Development, "Challenges Confronting the DOD Laboratories" (February 22, 1990). The workshop was held in October of 1989.

publication summarized the panel's discussions covering three broad options: incremental changes to the system, conversion to GOCOs or FFRDCs, and closures/consolidations. Each of those options, in turn, was considered against six issues raised in the Packard, DSB, OTA, and other reports: laboratory missions, hiring/retention, obsolete facilities, unpredictable funding, onerous procurement regulations, and lab manager authority.

The group presumed a correlation between a strong federal laboratory system and national security as it dealt with the connections among those six issues. Unclear missions and the teeming multitude of budget, oversight, procurement, and management constraints caused "fragmented" and ineffective work. Indeed, the report noted that in 1970, Congress required 31 reports from DOD; in 1985 that number had leapt to 458. Legal provisions increased from 64 to 213, and congressional mandates requiring specific DOD obedience rose from 18 to 202. Rather than overseeing research, managers and branch heads plodded through these rules. Likewise, responsibility for many support elements resided not with the technical director but with others who reported elsewhere.[29] This disadvantage along with imbalanced MILCON competitions (as OTA had mentioned) obstructed facility modernization. Also, annual budgeting forced a short-term focus onto long-term S&T. All these problems in turn hampered hiring and retention, as did "revolving door" pre- and post-employment restrictions and conflict of interest legislation. Similarly, the "salary structure is a clear prescription for mediocrity…."(31)

The panel concurred on five proposals.

- Implement the China Lake personnel demo across DOD.
- Provide separate pay rates for top level managers and other S&Es.
- Grant center directors more authority to consolidate or reduce staff and to link pay with performance.
- Amend procurement regulations. The panel noted, for example, the absurdity of applying the same rules both to carrying out S&T and to buying F-14s.
- Have Congress appoint a commission for restructuring the labs – but only if it failed to implement the other four recommendations.

Three other features of this report should be mentioned. First, the group believed that GOCOs or FFRDCs provided a clear advantage over GOGOs only in terms of personnel, and not in any of the other six problem areas. Second, it emphasized that an overall RDT&E strategy must guide any closures and consolidations. A third note here is on the sources. Again, Navy RDT&E archives contain background papers, commentary, and correspondence generated in preparation for the workshop. This material includes several substantive critiques, by some of the most knowledgeable people in the Navy laboratory system, of various arguments circulating about DOD labs and centers (similar commentaries exist for many such Navy/DOD lab studies).

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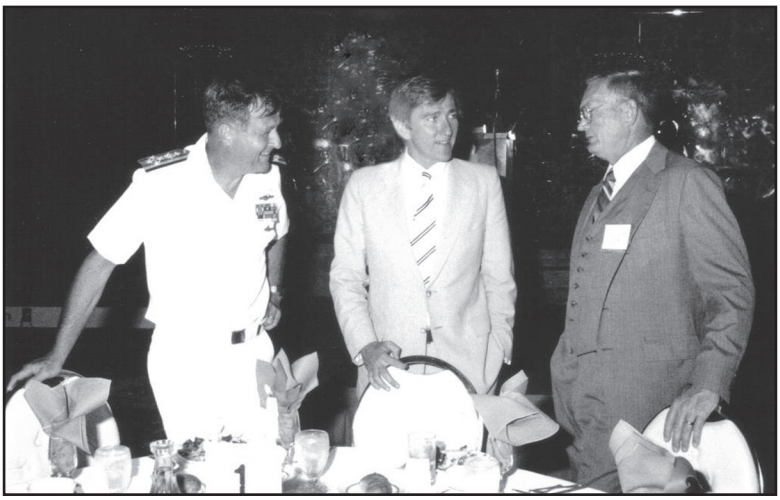
[29]The phenomenon, commonly known as "stove piping," is discussed later.



Dr. James Colvard with Admiral Steven White, Chief of Naval Material, at left, and Secretary of the Navy John Lehman, center.

In a brief but authoritative discussion, James Colvard argued that for the Navy, the most important management issues the DMR raised involved the R&D centers and technology base funding. In **Some Thoughts on the Navy's Organization Under the DMR**, Colvard, a former Navy laboratory Technical Director, Deputy Chief of Naval Material, and Deputy Director of the Office of Personnel Management, noted that the DMR created "fundamental and historical shifts in power and institutional roles." The most important of these was the change from a military to a civilian chain of command headed by a political appointee.[30] His paper traced the evolution of managing technology development to show how the DMR raised as many questions as it answered.

Colvard recommended that the Navy create a "technology PEO." With the ASN(RDA) performing the old NAVMAT "superordinate" oversight role and assuming the cradle-to-grave accountability previously held by the SYSCOMs, new questions arose: How would new programs be generated? When would they transition from the PEO to the SYSCOM? What shore establishments would the SYSCOMs require? Where would R&D centers be placed and how would their funds be managed? How would PEO/SYSCOM disputes be arbitrated? How would the ASN(RDA) insure technological integration? Because the R&D centers and university laboratories[31] housed the Navy's internal technical capabilities, answers to the first three questions all depended on the fourth question – situating the centers and managing their funds. Colvard discussed five alterna-

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[30]James Colvard, "Some Thoughts on the Navy's Organization Under the DMR" (February 20, 1990).

[31]Johns Hopkins University Applied Physics Laboratory; Applied Research Laboratory, Pennsylvania State University; Applied Research Laboratory, University of Texas; Applied Physics Laboratory, University of Washington.

tives, then proposed that the Office of Naval Technology (ONT) join the DNL to form a technology PEO.

One of the most informative and distinctive reports issued during this period – and also one of the least circulated – came from the Office of the DNL in July 1990. Rather than offering recommendations, **Restructuring the RDT&E Community** provided a narrative of the Navy's attempt to eliminate underutilized capacity, unnecessary overlap, and redundant effort as directed in the DMR.[32] Because study groups infrequently retain working material, their product is preserved but the process is generally lost. This review however, provided pertinent memos, a chronology of key events, bibliographies, Terms of Reference for smaller-scale studies, panel memberships, meeting agendas, internal commentaries, materials and formulae participants used, meeting notes, and records of debates. Overall, the report traced how three phases of study solidified the eventual restructuring of the Navy RDT&E community into four warfare centers and a corporate lab. The information in the following section is drawn from the DNL report.

Laboratory Consolidation Studies

DMRD 922 triggered the second significant effort of the 1989-91 period, and as noted, it directed studying laboratory consolidation on a very tight schedule. The directive focused on *efficiency*: saving money by both reducing infrastructure (people and facilities) and eliminating duplicative capability and unnecessary work. It outlined two alternatives: OSD takeover of some or all of the Service S&T funding and labs, or greatly increased inter-Service integration and consolidation of S&T programs, planning, and labs.

Instructed to report on relevant initiatives by March 1, 1990, acting ASN(RE&S) Richard Rumpf established an RDT&E Facilities Panel to examine the Navy's technical centers. This became known as the Phase I study. The nature of consolidation raised two particularly important issues: OSD had directed separate studies of R&D and T&E activities, a division seldom applicable to the Navy's existing, integrated RDT&E Centers. Second, OSD wanted inter-, as opposed to the intra-Service consolidation the Services had already begun. The Phase I study reported out in February 1990. Although it found some opportunities that merited further study, it basically concluded that little duplication or overlap existed in RDT&E activities.

In this first phase, the RDT&E group began using the term "megacenter," which soon evolved to warfare center. This denoted consolidation based on grouping activities according to warfare area, such as air, surface, undersea, hull

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[32]DNL, "A Review of Studies." The Navy carried out these consolidation studies at the same time as the OSD-level study responses to DMRD 922. In addition to the DNL report, see NLCCG, "A Historical Perspective on the Creation of the Navy Laboratory/Center Oversight Council and the Navy Laboratory/Center Coordinating Group" (September 1995). This pamphlet discusses key events in the oversight and coordination of Navy labs in the post-WWII era.

shapes (ships and subs), and Command, Control, Communications and Intelligence (C3I)/surveillance. The concept provided a broad schematic for organization based on function, which in turn would help delineate accountability, facilitate technology transition, foster cross-Service cooperation, reduce overhead, focus investments, develop core technologies, improve interactions with industry, and adopt "best practices" such as the China Lake demo. The group drew from a 1977 Navy report that had proposed a similar arrangement.[33]

Because Phase I identified few savings, Mr. Rumpf expanded the analysis to consider all research, development, acquisition, and Fleet support shore activities. With a deadline less than a month away, he set up a "tiger team" to perform an intensive, two-week Phase II study under the direction of DNL Gerald Schiefer. The team began with the list of essential megacenters, each with a core activity (for example, Naval Surface Warfare Center as the core activity for surface warfare), plus the expanded corporate research lab (NRL). It continued to focus on function, asking: What are the minimum number of necessary functions, given that the warfare, technical, economic, and acquisition environments have all changed? The group believed this functional aggregation would reduce duplication by minimizing detachments, purifying missions, and consolidating and closing a number of activities. It created a "consolidation reality test"(19) to guide recommendations and a "rough order of magnitude"(24) scale for the costs and savings of implementation.

Concerned that the Phase II report also identified insufficient reductions, and that the tiger team's members came primarily from the SYSCOMs, the Office of Naval Research (ONR), and their field activities, ASN(RDA) Gerald Cann – who succeeded Rumpf, the last ASN (RE&S) – directed a Phase III study, under the Center for Naval Analyses (CNA). CNA – an FFRDC that carries out research for the Navy and other government agencies – essentially confirmed the Phase II study's findings, which the Navy forwarded to the USD(A) in April.

The DNL report includes **DOD Test and Evaluation, Research and Development Facilities Paper**, the results of the Phase II and CNA studies. Dated April 12, 1990, the report constituted the Navy's response to DMRD 922, although Mr. Cann's cover letter emphasized that any implementation would wait until the conclusion of OSD studies. The paper described industrial funding, budget outlays, ratios of out-of-house to in-house work, the Service-unique aspects of many Navy facilities and Fleet support and engineering functions, and the megacenter or warfare center concept.

The study sketched Navy RDT&E and offered potential actions under the DMR. It illustrated types of activities, including corporate research labs, and RDT&E, engineering, and T&E centers – in other words, the full-spectrum

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[33]Office of the Chief of Naval Material, Ad Hoc Group on Functional Realignment, "A Functional Analysis of the Research and Development Process in the U.S. Navy" (December 15, 1977). For a discussion of this report, see Carlisle, *Management of U.S. Navy Research and Development Centers*, 64.

work ranging from threat analysis and basic research to systems development to test and evaluation to post-production Fleet support. It defined in-house labs as facilities that turned military requirement into products and as "interpreters" of Fleet needs to the private sector, and of technological potentials to the Fleet. The paper also listed recent instances in which the centers performed those roles, including "smart buying," technology base "push,"[34] quick reaction capabilities, systems design, and program trouble shooting. Finally, the paper listed recommended near-term and possible long-term consolidations and various tri-Service activities.

Oral history interviews offer additional insight into these developments. Gerald Schiefer discussed the people he chose to work with him on the Phase I study and how the group categorized the 70-some technical organizations according to warfare area. Schiefer said he advocated placing the labs within the SYSCOMs because of SYSCOM pressure and also because the mandate to downsize predestined this change anyway. The labs had always tended to resist placement under the SYSCOMs because of two related fears: becoming engineering "job shops" rather than research-based centers and losing independence as arbiters of development programs under their parent SYSCOM. Schiefer also asserted that the Navy's failure to consolidate to the extent envisioned at this time led to additional rounds of forced consolidations and closures in the mid 1990s.[35]

In a 1995 oral history interview, Gerald Cann similarly asserted that had Navy officials not instigated substantive consolidations and closures, then OSD would have done it for them. Discussing the first two study phases, Cann stated, "I had to sort of tell everybody they'd better get to it or they'd get their heads lopped off, literally….We had a tremendous amount of pressure from the OSD staff at the time to do something…."(23) With the warfare center plan, "We were able to prevent this wholesale dismemberment of the Navy laboratory system."(4)[36] Mr. Cann did not mention, but Navy personnel working on these plans clearly understood, that consolidating the S&T-oriented "lab" functions with the T&E- and acquisition support-oriented "center" functions made it virtually impossible to transfer control from the Navy into a "purple" laboratory owned by OSD. DDR&E was proposing this purple lab as an alternative method to achieve the savings identified in DMRD 922.

Having approved the warfare center/corporate lab system, Cann directed the Navy to engage with the Army and Air Force on a tri-Service approach to DMRD 922. Captain Paul Gaffney, then the Assistant CNR, led the Navy effort. The Services developed and briefed up through their chains of command a tri-Service response. DDR&E developed its alternate approach, and the issue

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[34]Technology push means expanding technology that offers new possibilities to the Fleet, as opposed to "pull," or responding to a requirement the Fleet generates.

[35]Gerald R. Schiefer, interview by Rodney Carlisle, March 23, 1995.

[36]Gerald A. Cann, interview by Rodney Carlisle, February 9, 1995.

became known as the Alt[ernative] 1/Alt[ernative] 2 decision. On August 22 both sides presented their proposals to DEPSECDEF Atwood, who endorsed the tri-Service arrangement. DMRD 922 was approved for implementation on November 18. It formed the basis for Navy actions during BRAC 91.

After receiving a tasker from SECNAV Lawrence Garrett on December 12 ("RDT&E Engineering and Fleet Support Activities Consolidation Plan"), the Navy began planning how exactly to carry out its consolidations. In April 1991 Garrett approved the proposals forwarded to him. However, by then BRAC had taken over all such planning, and Garrett's implementation memo became included in the Navy's response to the BRAC Commission.[37]

Laboratory Demonstration Program (LDP)

The third undertaking that affected the technical centers during this period focused on *effectiveness* more so than efficiency. It derived primarily from the 1987 DSB recommendation to expand the China Lake personnel demonstration project. The idea was to increase lab productivity by streamlining processes and eliminating bureaucratic impediments.

After the DSB study proposed that each Service establish a demo lab, OSD set up an LDP Working Group to study the four areas targeted for improvement – personnel management, laboratory management, contracting/procurement, and facilities modernization. The Services were tasked to estimate the cost of various options. They grouped recommendations according to whether OSD, executive, or congressional authority was required for implementation. In May of 1989 the working group sent a report to SECDEF. But just two months later Secretary Cheney published the DMR report. Then on November 20, DEPSECDEF Atwood issued three separate, complementary memos, one of which cited the 1987 DSB study and directed that each Service choose at least one lab for participation in an LDP (eventually however, the Navy approved the inclusion of NRL and all seven of the existing R&D Centers). DDR&E established an oversight working group and several subsidiary subpanels, and they spent the next three years attempting to implement various plans.

The problem was that many DMRD plans contradicted LDP plans. For example, one DMRD directed consolidation (at the DOD or Service level) or relocation of support functions such as finance and accounting, an action that opposed LDP initiatives to provide local managers the authority to run their own labs. In the end, the DMRDs prevailed.[38] After three years of drafting lengthy plans and proposals, the labs and centers providing most of the LDP manpower finally gave up and the program disappeared. It would reappear again under a new name in 1993.

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[37]See NLCCG, "A Historical Perspective," 14-15.

[38]Information is from Michael Marshall, "Discussion Paper: Management of Service Science and Technology (S&T)" (October 5, 1989). Also, NRAC, "Science and Technology Community in Crisis," 20-24.

Pre-BRAC Inter-Service Reorganization

As mentioned, DEPSECDEF Atwood had also called for inter-Service consolidation and coordination, and the S&T-based response was a major effort called "Tri-Service Reliance." The three Services developed Reliance as a part of their Alt 1 proposal to Mr. Atwood in August 1990. It expanded the role of the JDL, chartered in 1983 and including representatives from all three Services, to optimize the use of defense technology base resources. In an overview **White Paper**, the JDL explained its efforts to collocate, consolidate, and coordinate technology development. This endeavor involved grouping major technologies together under coordinating "Reliance panels."[39]

In October 1990, having received approval for the approach from Atwood, study groups considered three different strategy options for reaching the goals of a Tri-Service S&T program. Those goals included enhancing S&T, ensuring the availability of necessary resources, reducing redundancy and duplication, and preserving "mission-essential capabilities"(3) in each Service. Participants addressed basic research, 28 technology areas, and numerous sub-areas – 223 technologies in all. The Services agreed to expand the coordination that had always existed to include three types of arrangements: joint efforts, in which programs would be planned together but executed separately; collocation, in which in-house execution of an activity would be collocated in a single Service, with each Service funding its part separately; or consolidation, in which all funding to manage an activity would be transferred to a lead Service. Under this taxonomy, the activities planned jointly would increase from six to 71, those collocated from 13 to 105, and those consolidated from nine to 10. Proposals were presented to the SAEs in March 1991.

The Implementation Phase began in November. JDL set up 11 technology panels, in addition to Basic Research and Management Panels, to oversee the coordinated programs in 25 major technology areas. In accordance with DMRD 922, Reliance sought to "provide the foundation for OSD review of those activities, thereby streamlining…a formerly cumbersome S&T review process."(13) The White Paper also argued that budget planning, technology investment plans, and the Defense Critical Technologies Plan "are more effectively accounted for" in the Reliance process.(14) JDL listed recent accomplishments, such as creating a Software Technology Plan and Centers of Excellence for Artificial Intelligence, and stated that Reliance will "remain a cornerstone of the DOD S&T community's response to DMRD 922."(18)

Many agree Reliance was intended to ensure that consolidation remained the initiative of the Services rather than OSD (recall that IDA proposed a Department-wide coordination group to set up technology "cluster" panels). The language of the White Paper certainly suggests the JDL wanted to exhibit inter-Service transformation. The Reliance process, "one of the most comprehensive restructuring efforts involving the technology base in over forty

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[39]Joint Directors of Laboratories, "White Paper on Tri-Service Reliance in Science and Technology" (January 1992).

years,"(2) already had "a profound influence on…science and technology development…."(1) The paper claimed Reliance "has made enormous strides in a short time. It has fundamentally reshaped the management" of S&T and is "profoundly influencing specific programs, organizations, and management decisions…."(18) OSD did not find these arguments fully convincing, because in late 1992 the DDR&E recommended creating a single Defense S&T Program Objectives Memorandum (POM) to replace separate Service POMs.[40]

BRAC 91

In January 1991, a CRS report on **Defense Laboratories** discussed the numerous intertwined and overlapping restructuring and consolidation proposals emanating from various sources.[41] The FY 1990 National Defense Authorization Act (NDAA) had added a critical new element to the entire affair by mandating a 20 percent reduction in acquisition personnel (the act had also officially established the LDP). Earlier, in December 1988, a report of the SECDEF-established BRAC Commission (P.L. 100-526) recommended a study for improving and consolidating the labs and eliminating functions the private sector could do better. In part as a follow-up, the FY 1991 NDAA included the Base Closure and Realignment Act (P.L. 101-510), created to propose closures (including labs) for 1991, 1993, and 1995. The Army and Navy planned to use BRAC to endorse their recommendations formulated through the DMR process. The same act created, separately from the Base Closure program, a cross-Service, independent Federal Advisory Commission (FAC) on Consolidation and Closure of Defense Research Laboratories, also called the Adolph Commission after its Chairman Charles "Pete" Adolph, acting DDR&E. Congress could modify the Advisory Commission's recommendations but had to either accept or reject BRAC proposals as a whole. In addition, the FAC would evaluate DMR-based proposals, and also consider conversion to GOCOs and modification of missions and functions. Overlaid with these efforts were the DMR/LDP actions authorized for FY 1990. One wonders if when CRS set out to overview the Services' consolidation proposals and the convergence of all of these plans, it knew what it was getting into.

First, CRS expressed concern about the Services' planning methods. One concern involved scale – DOD had estimated one billion dollars in savings through FY 1997 and intended to close almost one third of the 76 labs and terminate thousands of jobs. Had the USD(A) and Services "worked together to develop a coherent strategy outlining the role of military R&D…in the acquisition process?"(Summary) Had they considered future S&T needs? Had they considered alternatives, such as OSD management of a few mega-centers? Could the Services use BRAC to elude the FAC's forthcoming independent, cross-Service analysis?

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[40]Michael Marshall, "Tri-Service Reliance: Just a Stop on the Road to a Purple POM?" Presentation to NSWC Board of Directors (October 6, 1993).

[41]CRS, "Defense Laboratories: Proposals for Closure and Consolidation" (January 24, 1991).

CRS discussed more specifically how the LDP, DMR, and BRAC were linked but separate. Restructuring and consolidation, for example, would not solve the management, procurement, facilities, and personnel problems the LDP sought to improve. Therefore, the efforts should be coordinated. The report did not point out, however, the conflicts between the LDP and DMR (discussed above) and the difficulty – perhaps impossibility – of coordinating conflicting initiatives.

In discussing the BRAC and Service proposals, the report focused on overall strategy. It explained the criteria for closures and the process by which SECDEF, the Services, Congress, the BRAC Commission, the President, and the public influenced the plan. CRS urged that DOD integrate all the concurrent lab-related efforts by pinpointing the proper role of tech centers and developing an overall acquisition strategy to guide consolidation and closure. Otherwise, economy (and not defense) would become the sole criterion for change. Further, if the Services worked independently, through BRAC, and ignored the FAC's analysis, changes would be "piecemeal" rather than coordinated across DOD.(34)

The overview of the labs repeated much of the material from the CRS report of a year earlier, which reveals something about the dialogue during the period. In both reports, CRS mentioned more than a dozen roles of the technical centers that DOD considered critical. Most reports provided similar lists, which after a while can appear to the reader as rote, obligatory recitations of the obvious. However, within just a few years, many if not most major studies dispensed with these lists and offered in their place rote recitations of private sector technological capabilities. The change reflected a larger transformation in the way the labs and centers were viewed throughout DOD.

Three months later, in April 1991, the DON released its **BRAC Report**.[42] It recommended 24 installation closures and 18 realignments, based on the Navy's Force Structure Plan and DOD's stated selection criteria. The report contains detailed justifications of the Navy's recommendations, impact estimates, and implementation plans and milestones. At this point, "excess capacity" began its ascendancy as the dominant theme regarding DOD technical centers, and one key element of assessing excess capacity involved personnel. In sum, the mandated 20 percent personnel reductions along with declining budgets and workloads shifted the discussion of laboratories from reform to reduction and began a process of downsizing that continued and accelerated through the decade.[43]

The Navy completed two phases of review. Much of the RDT&E work drew from the concurrent DMR-driven analyses. Briefly, the approach categorized shore activities, analyzed capacity to determine potential for realignment or closure, and then applied the DOD selection criteria. The Navy developed 28 categories based on function, mission, facility requirements, and geographic

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[42]Department of the Navy, "Base Closure and Realignment Recommendations, Detailed Analysis" (April 1991).

[43]See also Carlisle, *Management of the U.S. Navy Research and Development Centers*, 89-91.

factors. Next, it used capacity analysis within those categories to translate "projected force structure requirements into facility requirements…."(6) Third, it compared facility requirements to an inventory, and found excesses or deficiencies. Phase II then examined all facilities identified as potential closure/realignment candidates.

Finally, the Navy applied DOD's selection criteria to the closure/realignment scenarios and then projected implementation costs and savings. The first criterion, military value, included four elements (such as mission requirements and manpower implications). Other criteria were return on investment and impact (including economic, environmental, and community). The report also discussed the Cost of Base Realignment Actions (COBRA) computer model used for cost analysis. Overall, the Navy estimated implementation costs at $2.7 billion and environmental cleanup costs at $0.5 billion, and recurring savings of $568 million per year.

The report appendices consisted of meticulous descriptions of the steps involved for all decisions; Tab F (at 194 pages) discussed RDT&E and articulated the warfare center plan. The Navy would restructure the seven R&D centers and 29 engineering support and T&E activities into four megacenters with ten divisions, plus a corporate lab. Functional consolidation and "mission purification" within the centers would dictate doing all similar work at one place. The technical centers would maintain critical mass (the capability to perform an essential role independently) yet reduce overhead, duplication, and total modernization and maintenance requirements.

Tab F demonstrated a fundamental departure from the thrust of a decade's endeavors to improve the laboratory system. The overall effort originally sought to streamline operations. After the 1990 NDAA, it aimed at reaching imposed cutbacks. "In short," the report commented, "consolidation shifted from being the goal of the effort to being the means of preserving the Navy's core mission capability in spite of the mandated personnel reductions."(Tab F, 4)

In May the General Accounting Office (GAO) released **Military Bases**, its analysis of the DON and DOD recommendations.[44] It found that while the Air Force and Army "adequately supported"(3) their proposals, the Navy did not, nor did it develop any internal control plan to insure the accuracy of its data. The report gave a chronology of the BRAC process and details of pertinent memos and directives. It discussed each Service's analysis, including its use of the COBRA model, and provided cost and savings estimates for every recommendation. GAO believed the DOD plans would result in savings, but urged than in future BRACs, study groups have more time to collect and examine data, and more "adequate management controls over those tasks."(Cover letter).

GAO especially objected to the Navy's approach, arguing it was undocumented and the accuracy of its data unverified. The Navy Committee did not fully explain its process until May 7, one week before GAO's report deadline.

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[44]General Accounting Office, "Military Bases: Observations on the Analyses Supporting Proposed Closures and Realignments" (May 1991) On July 7, 2004, the GAO became the Government Accountability Office.

Even then, some members commented that numerous decisions transpired in closed executive sessions. Further, the Committee provided many briefings but still no explanation of supporting data and no minutes of deliberations (again, the Office of the DNL's "Restructuring the RDT&E Community" does contain notes, not released at the time, of the deliberations about the technical centers).

Much of the report discussed the Services' misuse of COBRA, the model used to estimate both one-time and annual costs/savings of recommended actions. Sometimes the Services used inaccurate data, sometimes they disregarded certain costs, and sometimes they flouted DOD's directive to use FY 1991 dollars for a baseline. Further, according to GAO, the Navy and Air Force computed the scale of overhead reduction based on the smaller, post-BRAC force structures, thereby exaggerating cost reductions. In general, DOD did not "oversee the process by which the military services chose their proposals…and we found that policy guidance published by DOD was applied inconsistently among the services."(66)

Another problem with COBRA involved payback projections. Because the 1988 BRAC had severely underestimated implementation costs, GAO performed a sensitivity analysis on the Services' 1991 COBRA calculations based on the possibility of similarly optimistic estimates. By positing 50 and 100 percent increases to one-time costs, it found little change to the estimated payback periods in many instances, not so little in others. With a 50 percent increase, the payback for closing the Naval Air Development Center (NADC) in Warminster, Pa. and the Naval Coastal Systems Center in Panama City, Fla. both went from nine to 100 years; NSWC in White Oak, Md. went from 12 to 100. These numbers show the strong degree to which estimates of BRAC savings are dependent on planning assumptions. Nonetheless, GAO concluded that generally, the Navy's BRAC proposals "offer an opportunity for substantial savings."(60)[45]

On July 1, the Defense Base Closure and Realignment Commission submitted its **Report to the President**.[46] As it would in BRAC 1993 and 1995, the process followed these steps: Each Service offered recommendations to SECDEF, who in turn offered recommendations to the Commission,[47] who reviewed them according to the force structure plan and the eight selection criteria for closure. Overall, the Commission proposed 36 closures and 43 realignments and estimated a yearly savings of $1.5 billion. As had the DON/DOD reports, this one explained the selection process and discussed in detail each affected facility.

Much of that process involved trying to improve the methods for and preclude partisan manipulation of closure decisions. A 1988 internal DOD

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[45]A good overview of the Navy BRAC 91 process and recommendations, especially in terms of personnel implications, is GAO's "Navy Laboratories: Plans for Consolidation and Progress Towards Implementation" (June 1993).

[46]Defense Base Closure and Realignment Commission, "Report to the President" (July 1, 1991).

[47]DOD, "DOD Base Closure and Realignment Report" (April 1991).

BRAC Commission had closed 86 and realigned 59 facilities. In 1990 however, responding to continued budget cuts, SECDEF Cheney proposed 35 additional closures and 20 additional realignments. Critics argued that a remarkable correlation between suggested closures and Democratic districts seemed beyond the realm of coincidence. To prevent similar charges of unfairness, the 1991 Commission – in addition to assessing rather than generating proposals and having GAO review the data – carried out its study publicly. It held 15 hearings in Washington, D.C. and 14 regional and site hearings, visited the facilities recommended for closure, examined the Services' processes for generating recommendations, fielded 143,000 letters, and answered more than 100 phone calls per day.[48]

The overlap between BRAC and the congressionally-mandated FAC inadvertently underscored the difficulties of integrating DOD laboratory programs – not even the studies themselves could be coordinated. The BRAC Commission noted the FAC study, but "determined that its [BRAC] jurisdiction did include authority to recommend realignment and closure" on its own. It did however suggest delaying implementation until after publication of the FAC report.(5-19, 20) In the Navy RDT&E community, BRAC recommended closing 10 activities, realigning 16, and inaugurating the four warfare centers. It also suggested the FAC report help curtail the turbulence. "Clearly, the challenge of undertaking such a comprehensive reorganization will require the careful development and execution of personnel management plans to minimize the disruption of critical research and development activities in the Navy laboratory system."(5--44)

The Adolph Commission

Finally, on September 30, 1991 the FAC submitted its report on **Consolidation and Conversion of Defense Research and Development Laboratories**, also known as the Adolph Report.[49] The Commission consisted of six representatives from the Federal Government – including a lab director from each Service – and six from the private sector. It heard more than 60 briefings or testimonies, visited one lab from each Service, and examined three primary options: conversion to GOCOs, mission or function modification, and consolidation or closure. Defining a laboratory as an activity that performed at least 10 percent of its work in S&T and at least 50 percent in all RDT&E, the report offered 15 major findings, primarily about the purpose and attributes of an effective lab system. It urged a continuous, vigorous, high-level, DOD-wide commitment to the centers and that each Service appoint an S&T advocate. FAC argued that Project Reliance "offers considerable potential for strengthening the effectiveness, productivity, and cohesiveness" of DOD S&T.(ES-3) It asserted that the technical centers produced quality work, that some mission overlap existed, that aging facilities, low pay, and hiring policies hampered recruitment, and that the LDP

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[48]These issues are all discussed in Chapter 2.

[49]Federal Advisory Commission, "Commission on Consolidation and Conversion." See also Charles "Pete" Adolph, interview by Rodney Carlisle, January 26, 1995.

should be extended to all labs.[50] For the Navy, the Commission recommended segregating the R&D function within each warfare center.

As had other analysts, FAC noted that past studies "have been remarkably uniform in their findings" concerning the DOD laboratories. The report cited former SECDEF William Perry's assertion that certain key acquisition decisions are government functions that require in-house technical expertise. Similarly, the labs "are necessary to ensure the technical integrity of the DOD acquisition process." More specifically, FAC listed ten primary functions of the centers:

1. To "Infuse the art of the possible into military planning."
2. To maintain the defense technology base.
3. To prevent technology surprise and insure innovation.
4. To support acquisition.
5. To maintain facilities not available in the private sector.
6. To respond rapidly in a crisis.
7. To sustain sufficient expertise to advise DOD.
8. To support users in applying technology.
9. To "translate" user needs to industry.
10. To provide S&T training for both civilian and military acquisition personnel.(2, 3)

FAC stated that none of those ten roles necessitated a DOD lab system. Instead, such a system must be able to perform them if it was to execute the essential, overall mission of facilitating the Services' ability to be smart buyers and users of weapons systems. In short, "dedicated organizations free from commercial pressures are required to provide these functions."(4)

In addition to this chief conclusion, the FAC offered others. For example, it stated that because work ranged from S&T to engineering, a single lab model was neither necessary nor possible. Also, although conversion to GOCO might sometimes be best, "organic" solutions were preferable, or in other words, solving problems within the GOGO context.

Appendix D's fine overview of the attributes of an effective laboratory expressed puzzlement over the continued existence of difficulties identified long ago. Borrowing from the first Packard Report and others, the study commented that the centers "must be allowed to operate as unfettered entities, in a similar fashion to the successful contractor-operated laboratories." The fact that so many problems had continued unsolved reflected a "widespread lack of appreciation for the special nature of DOD laboratories."(D-1)

The appendix listed nine characteristics of a successful lab, noting "None…would be viewed as exotic criteria…in private industry."(D-1,2) These included a "critical mass of assigned work," defined as exceeding "some threshold of size to be a viable, separate entity that is able to support the full range of support functions and command widespread recognition for its contributions."(D-2) Other characteristics included a clear mission, a "strong

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[50]For a contemporary report on facilities modernization, see IDA, "Long-Term Modernization of Research, Development, Test and Evaluation (RDT&E) Facilities" (1991).

foundation in research with a balance of effort in development and engineering," managerial authority to direct programs and support functions, and links to university, industry, and government technology organizations. The list of other characteristics – such as a competent and dedicated work force, an inspired and qualified leadership, a good relationship with customers, and state of the art facilities – seemed to dwell on the obvious, but the report aimed to provide a stand-alone overview for an audience that consisted of many people unfamiliar with the terrain. The Commission asserted that technical centers required budget stability and that directors should be able to pursue risky but potentially high payoff ventures, free from budget concerns, through ILIR.

The report also recommended improving personnel management and expanding technical director responsibilities by extending the LDP to all labs. It proposed that directors' terms be extended to at least four years and that they have the authorities provided in the Federal Employees Pay Comparability Act (FEPCA)[51] and authority over basic resources and management functions. It recommended that discretionary funding be set at 10 percent of total R&D funding (the first Packard Report had recommended five to 10 percent), that labs be allowed "liberal allocations" of senior-level technologist and Senior Executive Service (SES) positions, that small purchase limitations be raised "substantially," that thresholds for construction approval be increased to "realistic levels," and that DOD-wide coordination of external reviews replace "time-consuming, overlapping reviews and audits by multiple agencies."(24-25)

The Commission generally supported the Navy's functional consolidation plan. Dismissing concerns in the RDT&E community about improving while simultaneously cutting back, it argued that the very definition of restructuring meant saving money by reducing duplication and overhead while improving critical mass and value. The study acknowledged the turbulence certain to result from relocating some 4,800 positions (about 2,800 S&Es), and recommended using "all possible incentives," such as retention bonuses and relocation services, to minimize the disruption to "critical" programs.(16)

However, the Navy leadership and FAC disagreed in one significant aspect. The latter believed "There is the risk that the research and development elements of the warfare centers will lose their identity as laboratories…." Therefore, the Navy should "modify the plan to identify…[those] elements within each warfare center as Navy Research, Development, and Engineering Laboratories. These activities will be DOD laboratories…[and] led by a scientist or engineer with stature as a…technical manager." They should also receive "their own organic support."(15-16)

In his rebuttal, ASN(RDA) Cann argued that a singular strength of the Navy's plan was "the integration of all aspects of research and development in full spectrum warfare centers." This delivered the customer relations, connectivity between labs and the rest of acquisition, and research/development/engineering balance of work the Commission advocated. Supporting laboratory elements

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[51]The FEPCA provided for annual raises, locality-based pay, and pay-based recruitment and retention measures.

separately "will prevent us from implementing a fully integrated system [and] result in significant decreases to the cost savings forecast for RDT&E consolidation under DMRD 922."(Accompanying memo)

The FAC concern that the S&T activities in the warfare centers would "lose their identity" turned out prophetic. In answer to the Commission's proposal that each Service designate an official accountable for lab effectiveness, the Navy stated that the ASN(RDA) would chair a new group, the Navy Laboratory/Center Oversight Council (NLCOC), committed to S&T effectiveness. The NLCOC would also include the Vice Chief of Naval Operations, Assistant Commandant of the Marine Corps, SYSCOM commanders, and others. Further, the new Navy Laboratory/Center Coordinating Group (NLCCG), composed of the civilian directors and military commanders of the warfare centers and NRL, would help coordinate RDT&E, a function the now disestablished Office of the DNL had performed. However, the NLCOC met only a few times. Cann, who had assured the labs he would act as their DNL-type advocate, left office after the next presidential election. Now without a DNL or four-star CNM, the labs had only the CNR to act directly on their behalf.[52]

In November 1991, DEPSECDEF Atwood requested that DDR&E coordinate development of a cross-Service plan, due in a month and a half, for implementing the FAC recommendations. Yet again, the Services scrambled to respond. However, unable to devise a plan acceptable to all the Services, DDR&E never formally answered the Atwood tasker. The Services did separately address some of the FAC proposals, with the Navy, for example, designating CNR as its S&T executive.[53]

On January 2, 1992 the Navy officially established the Naval Surface Warfare Center (NSWC), Naval Undersea Warfare Center (NUWC), Naval Air Warfare Center (NAWC), and Naval Command, Control, and Ocean Surveillance Center (NCCOSC). A streamlined NRL was to serve as the Navy's corporate research laboratory. In concept, each center's mission would encompass all technical capabilities needed to support systems throughout their life cycle. Each aligned organizationally with a systems command: NAWC with the Naval Air Systems Command (NAVAIR); NSWC and NUWC with Naval Sea Systems Command (NAVSEA); and NCCOSC in San Diego with SPAWAR. NRL would continue to report through the CNR to SECNAV. As mentioned, the NLCOC met only a few times, but the NLCCG continued through 2003, meeting quarterly for a number of years and then less frequently afterwards.[54]

The NLCCG community was designed for streamlined execution of the functions long deemed essential to DOD technical centers. They could respond rapidly and exclusively to warfighter needs. They could maintain unique facilities and corporate memory and, immune from pressures for profit, perform their smart buyer role.[55] In sum, the warfare center concept represented a creative and

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[52]See Conclusion and Cann interview, 11.

[53]See NLCCG, "A Historical Perspective," 16-20.

[54]See Kavetsky et al., *From Science to Seapower*, 10-13.

[55]Ibid.

The Naval Surface Warfare Center was one of the four major warfare centers that emerged from BRAC 91. Here, naval reservists, scientists and engineers work in the Dahlgren Division's Integrated Command Environment (ICE) Human Performance laboratory. The ICE lab focuses on human systems integration (HSI) and features common consoles, displays, and knowledge management features that Fleet Sailors helped design. U.S. Navy photo (RELEASED)

Dr. William C. Miller (retired Rear Admiral) was NRL's Commanding Officer from 1986 to 1987 and served as the Chief of Naval Research from 1990 to 1993. Dr. Miller is currently Academic Dean and Provost of the U.S. Naval Academy.

resourceful culmination to the Packard-Goldwater/Nichols-DMR-BRAC efforts to increase both efficiency and effectiveness while cutting costs. A long-standing drive for reform, mandates for major reductions in personnel, budget, and installations, and numerous yet often conflicting directives converged to apply tremendous pressure on the laboratory community not only to help operational forces fight better but to do so while sustaining injury and, simultaneously, while responding to a technological globalization and superpower collapse that together necessitated the most momentous changes to defense strategy in almost 50 years. In the Navy, realignment along functional lines sought to reduce duplication of effort and overhead costs, streamline management, and directly connect each step of the acquisition process, all within a unified command structure coordinated across the Service and with its partners in private industry.

Chronology of Navy Warfare Centers/Corporate Lab Standup

February 1989	President George H.W. Bush addresses Joint Session of Congress, urges improved procurement process for DOD and full implementation of Packard Report/Goldwater-Nichols Defense Reorganization Act.
July 13, 1989	SECDEF releases DMR, which requires Services to submit plans to implement Packard/Goldwater by October 1. SECNAV sets up DON MRTF, consisting of six working groups.
October 1, 1989	MRTF forwards "Plans for Initial Implementation of the Defense Management Report."
November 9, 1989	DEPSECDEF Atwood issues DMRD 922, calling for new management approach to increase efficiency and reduce overlap in RDT&E.
November 20, 1989	Atwood memo on implementation plan for LDP, each Service to select at least one demo lab.
November 1989	Berlin Wall comes down.
December 22, 1989	USD(A) memo "Strengthening and Improving Technology Management" tasks Services to recommend consolidations/restructuring options.
December 1989	OSD R&D and T&E consolidation studies.
January 11, 1990	SECDEF approves Navy MRTF "Plans for Initial Implementation of the Defense Management Review."
April 12, 1990	Navy forwards to Atwood its response to DMRD 922, "RDT&E Facilities Paper."

June 1990	One OSD R&D/T&E option includes managing Service S&T efforts through an OSD-level "purple" agency.
August 22, 1990	Atwood selects tri-Service approach to DMRD 922, rejecting DDR&E-proposed "purple" option. Approved alternative also includes establishment of Tri-Service Reliance approach to S&T management.
August 1990	SECNAV forms RDT&E Facilities Consolidation Working Group.
October 12, 1990	Tri-Service S&T Reliance study begins.
November 5, 1990	P.L. 101-510, "Defense Base Closure and Realignment Act of 1990," approved.
November 18, 1990	Atwood approves the Tri-Service response to DMRD 922. Among other provisions, it adopts Reliance.
December 12, 1990	SECNAV Garrett tasker, "RDT&E Engineering and Fleet Support Activities Consolidation Plan," gives 120 days for prospective warfare center Commanders to submit plan.
December 1990	Joint Logistics Commanders (JLC) approve expansion of JDL role to support Reliance.
FY 1990	NDAA establishes LDP, also mandates 20 percent reduction in civilian acquisition workforce.
FY 1991	NDAA creates Advisory Commission on Consolidation and Conversion of Defense Research and Development Laboratories. Separate from 1991 BRAC law.
April 1991	SECNAV Garrett approves Warfare Center/BRAC plan resulting from December 12, 1990 tasker. DDR&E approves Reliance, DON forwards BRAC recommendations.
July 1, 1991	BRAC Commission Report to the President.
October 11, 1991	SAEs approve Reliance process with JDL management.
November 9, 1991	Atwood directs Services to forward plans for implementing Adolph Commission recommendations within 45 days (action not completed).
December 25, 1991	Gorbachev resigns, Yeltsin calls President Bush to announce the end of Cold War.
January 2, 1992	Navy officially establishes four Warfare Centers, with NRL as the Corporate Laboratory.

Chapter Two

BRAC 1993 and 1995

The remarkable collapse of the Soviet Union meant that closure, realignment, and consolidation continued to dominate the Navy's laboratory community for years after the creation of the warfare centers. As mentioned, P.L. 101-510, enacted November 5, 1990, included BRAC rounds for 1991, 1993, and 1995 (the 1993 round had the smallest impact on the technical centers). The law required SECDEF to submit a Force Structure Plan for FY 1994-1999. This plan would drive reductions and also establish the criteria for determining excess capacity.[56] Because of concerns arising from BRAC 91, Congress amended the law to say DOD had to certify its data. The Navy complied with a vengeance, creating hundreds of cubic feet of documentation. By the end of 1995, DOD had slated 98 major military bases for closure and 63 for realignment, and estimated eventual savings of over six billion dollars annually.

This chapter synopsizes the six major reports relevant to BRAC 93 and 95 and briefly discusses the closing of the Naval Surface Warfare Center in White Oak, Maryland.[57] The reporting process stayed the same in both rounds: the Navy generated its recommendations, which became incorporated, sometimes with a few changes, into the DOD report published in March. A month later GAO published its critique, and then the BRAC Commission forwarded its final recommendations to the President in July. The DON, DOD, and Commission reports primarily explained the decision processes and justified each verdict. Each analysis estimated costs and savings, both overall and for every proposal. Each

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[56]The three categories of selection criteria (eight criteria in all) were as follows: 1. Military Value (given priority consideration), consisting of readiness, facilities, mobilization capabilities, and manpower implications. 2. Return on investment. 3. Impacts, consisting of environmental, infrastructure, and economic effect on communities.

[57]The literature generated on base closures and realignments is vast. Provided here is only the broadest overview of the main themes developed at length (some 2,000 pages) in the final reports issued by the DON, DOD, GAO, and BRAC Commission. All these are available online. In addition to the overall analysis of DOD's recommendations for each BRAC, GAO has also published many other reports gauging the progress of BRAC implementations. These too are available online. Other relevant sources not readily available elsewhere include 18 oral histories (many of which discuss the DON's successes and shortcomings in relocating personnel) and 5 cubic feet of material (meetings, briefings, correspondence, organizational charts, alternative scenarios). The White Oak closure is discussed here more so than the equally significant NADC closure solely because of the sources.

The Naval Surface Warfare Center (formerly Naval Ordnance Laboratory), White Oak, Maryland.

also discussed the selection criteria, the COBRA model, environmental cleanup, economic impact, amendments to P.L. 101-510, and previous BRACs. The Commission reports also provided relevant memoranda.

Many believe factors other than data often drove closure decisions, and the reports, at least in the case of White Oak, certainly would not have convinced them otherwise. NSWC White Oak, originally called the Naval Ordnance Laboratory and located at the Washington Navy Yard as a mine research facility, moved to suburban Maryland in 1946. It evolved into a full-spectrum center responsible for mines, explosives, underwater warheads, strategic reentry systems, nuclear weapons effects, and directed energy systems. It had been one of the Navy's principal R&D centers throughout the Cold War era. BRAC 91 realigned the facility, transferring about half of its functions to NSWC Dahlgren; BRAC 95 disestablished it. Oral histories indicate that many believed BRAC was inevitable and the Navy managed the process effectively to maintain many key core competencies. They objected not to the closure of White Oak per se but to the insistence that it occurred based on impartial analysis of hard data.

Background

From the early 1960s to the end of the Vietnam War, DOD closed hundreds of military bases, including about 60 major installations. Gradually, and to protect constituencies, Congress inserted itself more aggressively into the process. In 1977 it passed a law (Title 10, United States Code, Section 2687) that essentially prevented base closures by mandating time-consuming environmental impact studies. By the late 1980s, the base structure had remained the same size despite the decline in the force structure. Ever scarcer defense dollars continued to support these bases at the expense of ensuring operational readiness.

In October 1988, under increasing pressure from the rising national debt and from the public to end the stalemate with the Executive Branch over reducing defense spending, Congress passed P.L. 100-526, which established a SECDEF BRAC Commission. The group recommended 86 closures and 59 realignments (mostly smaller bases), all of which Congress accepted. As mentioned, in 1990, after that Commission's charter expired, SECDEF Cheney recommended additional closures. Many in Congress considered these politically motivated.

Congress therefore passed P.L. 101-510, establishing a five-year independent BRAC Commission and ending any actions based on the 1990 list. While the 1988 OSD Commission provided no guidance to the Services, P.L. 101-510 established specific procedures and timetables for the President, DOD, GAO, and the independent Commission. The law also required the Services to compare bases equally according to specific criteria and the Force Structure Plan. It mandated public hearings on any planned changes and open access to the Commission's records. And this time, rather than SECDEF offering proposals to the President, the Commission would review both DOD's recommendations and GAO's analysis of those recommendations before submitting its own proposals to the President. The three rounds of closures – 1991, 1993, and 1995 – were timed purposely for non-election years. The entire process had two primary purposes: to close obsolete or duplicative installations and to do it fairly.

BRAC 93

The Navy offered its 1993 **Base Closure and Realignment Report** recommendations in March.[58] Directed to eliminate "as much excess capacity as possible in the infrastructure,"[59] it proposed more than 100 closures and realignments (some 25 percent were Naval Reserve Centers), with estimated costs of $1 billion and savings of $3 billion between FY 1997-1999 plus an additional $1.6 billion afterwards. Conceding that targeted installations possessed military value, the report asserted that budget cuts left "no other choice….We have proposed seemingly dramatic steps today to preclude even more draconian actions several years hence…."(1-3) The most striking element of the report is its response to criticisms received after BRAC 91. The entire 46-page overview is a meticulous, almost impenetrable explanation of the process by which the Navy's Base Structure Evaluation Committee (BSEC) collected and evaluated data.

The text focused on how the Navy "sought to insure that the…procedures for this examination avoid the criticisms leveled at the Department's BRAC 91 process, relating to real or perceived shortcomings in several areas."(2) The BSEC, assisted by the Base Structure Analysis Team (BSAT), "deployed throughout the naval establishment" 200 people from the Naval Audit Service to

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[58]Department of the Navy, "DOD Base Closure and Realignment Report to the Commission, Department of the Navy Analyses and Recommendations (Volume IV) (March 1993).

[59]SECNAV Note 11000, February 12, 1992.

verify both the data and the process by which it was evaluated.(2) Both groups received continual input from experts involved in each step, were granted ready access to information, and presented results to senior leadership in both the operational and shore establishments for review. They preserved 90 cubic feet of records for anyone in the BRAC Commission, GAO, Congress, or public who cared to wade through it. They sent out 10,000 requests for data and "methodically analyzed" the responses "in approximately fifty deliberative sessions,"(2) all recorded. In short, the BSEC endeavored at every step "to frustrate imposition of preconceived ideas."(2)

The two major phases included generating/validating data and then evaluating it.[60] The BSAT developed the data calls and an Internal Control Plan (ICP) to corroborate methodologies, ensure they were used, and to confirm the accuracy of both data collection and analysis. The DOD Inspector General, Comptroller, and Assistant Secretaries all reviewed the ICP. The ICP even established a process for documenting the process, the most significant aspect of which was a written record for every BSEC meeting. The BSAT also created a "bottom to top" data certification method, whereby the first person responsible for generating data would "execute the statutory certification"(8) of it, a procedure repeated at each step up the chain of command.

The report scrupulously detailed each element of the analysis, which mirrored that done in 1991. The BSEC designated personnel, materials, and forces as the three main categories of activities and further divided these into subcategories. To determine excess capacity for each subcategory, it sent data calls to 1,027 installations. Then, using a matrix with points assigned to various priorities, it scored infrastructure according to military value (readiness, facilities, mobilization capabilities, and cost and manpower implications). Next, in configuration analysis, "Closure/realignment scenarios were developed with…a computer model utilizing mixed integer linear programming,"(13) explained in some 1,500 words. COBRA analysis was then applied. Finally, various other formulae estimated economic and environmental impacts. The appendices and attachments gave similar or sometimes verbatim justification, return on investment, and impact summaries (including job losses) for each of the resulting recommendations.

To show exactly how it carried out evaluations, the BSEC gave the example of the subcategory of naval bases. The section runs 28 pages and has some 7,000 pieces of data. "What is undeniable," the report stated with justified assurance, "is that the Department of the Navy has completed a comprehensive review of the more than 1000 Navy and Marine Corps installations not closed in either the 1988 or 1991 rounds."(45) Overall, the recommendations mean "the remaining infrastructure is free of excess capacity to the maximum extent practicable with due regard given to military operational requirements."(46) The report's overriding emphasis on data certification and formula application was almost certain to preempt any qualms at GAO and keep the accountants there gleefully occupied for the duration.

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[60]The process is set out step by step in the discussion of BRAC 95.

The Navy recommended 11 technical centers for closure or realignment. These included consolidating the Naval Electronics Systems Engineering Centers (NESEC) in St. Inigoes, Maryland, Charleston, S.C., and Washington, D.C. into NESEC Portsmouth, Virginia, and relocating the Annapolis Detachment of NSWC to Carderock, Maryland. The BRAC Commission changed both of these recommendations.

SECNAV also slated NSWC White Oak for closure. In the previous BRAC round, the lab had been realigned as part of the creation of the warfare centers – "The necessary capabilities resident in the unique facilities that remain at NAVSWC White Oak will be preserved and personnel necessary to conduct RDT&E in these areas and to utilize these facilities will remain at the location."(F-75)[61] About 49 percent of both personnel (some 900) and functions would relocate to Dahlgren, Virginia, 31 percent (550 personnel) would stay, and 20 percent of jobs would be eliminated. Altogether, 1,255 jobs would be transferred or eliminated. Six major unique facilities would be retained – the hypervelocity wind tunnel, hydroballistics tank, nuclear weapons effects and simulation lab, undersea weapons tank, long-pulse accelerator, and magnetic silencing complex. Other "non-duplicative" mission areas, such as advanced explosives, underwater warheads, and strategic systems re-entry RDT&E, would be relocated to Dahlgren. The idea was to enhance full spectrum capabilities: the changes would improve systems engineering, because RDT&E "will proceed from a more highly integrated and collocated workforce of scientists and engineers."(F-80)

The 1993 report proposed that all remaining personnel, functions, and equipment transfer to Dahlgren but that certain facilities remain to house NAVSEA headquarters. The stated justification for this decision was the same as for every technical center – essentially, a declining budgeted workload had created significant excess capacity. "As the work declines, the excess capacity increases thereby requiring a reduction in facilities and personnel."(K-23)

The Navy analysis was abridged and incorporated in DOD's **Base Closure and Realignment Report** to the BRAC Commission.[62] As with all BRAC reports, this one clarified the roles of the Commission, Congress, GAO, and the President, provided the selection criteria and an unclassified Force Structure Plan, and explained the variety of efforts designed to ensure fairness. It also described the readjustment plans for communities and employees. The bulk of the report listed the Services' justification for and economic and environmental impact of each recommendation. Comparing BRAC to corporate downsizing, DOD recommended 31 major bases for closure and 12 for realignment, plus 122 smaller base reductions, and estimated a net savings of $4 billion by FY 1999 and of $3 billion per year afterwards. Two appendices summarized the three BRAC rounds to that point and showed impacts by state.

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[61]DON, "Base Closure and Realignment Recommendations," 1991.

[62]DOD, "Base Closure and Realignment Report" (March 1993).

The introductory remarks explained efforts to ease the pain of closures and consolidations. DOD focused reductions on overseas bases, for example. In his accompanying cover letter, SECDEF Les Aspin emphasized the "taxpayer dollars" saved from BRAC rounds, and declared that as in the past, the private sector would develop the assets – people, real estate, and facilities – freed up from closures. In fact, the report noted, studies demonstrated that communities typically expanded economically after a short recovery time. One chapter discussed the special BRAC account to pay for upfront costs (such as environmental restoration) and the homeowner assistance programs, incentives for private sector expansion, and other efforts to help communities and outgoing employees.

As the next step in the process, on April 15 GAO published **Military Bases**, finding DOD's recommendations "generally sound."(3)[63] It projected that the 20-year savings, although substantial, would be about $948 million less than the $12.8 billion DOD had estimated. GAO criticized OSD for not exercising sufficient oversight of the Services, especially regarding the potential for cross-Service depot maintenance, and took issue with the Department's economic impact analysis and its unwillingness to include other affected government agencies in cost estimates. Further, GAO believed the Navy had in some instances unduly emphasized capacity over military value and acted based on unproven assumptions. Overall however, problems with the Navy's proposals or DOD's in general "were not severe enough to question the recommendations."(54)

Although much more positive about the Navy's process for 1993 than for 1991, GAO still found problems. It deemed the recommendations generally sound and the data validated, "with the exception of the information gathered in the final phases of the selection process." However, the Navy "also relied heavily on the acceptance of certain assumptions and military judgments."(4, 20) Each time GAO mentioned the term military judgment it did so with a cautionary connotation, but it also pointed out the necessity of using it in such a complex task. Most important, GAO believed, the Navy had focused too narrowly on excess capacity – in some instances bases slated for closure possessed more military value than those that would remain open.

As the final step in the report process, the BRAC Commission submitted its **Report to the President** on July 1.[64] Humbly labeling its efforts "a model of open government…absent political or partisan influence,"(vii) the Commission visited 125 sites, held 17 regional public hearings and seven investigative hearings in Washington, D.C., heard testimony from hundreds of members of Congress, and fielded hundreds of thousands of letters. It proposed 45 realignments and 130 closures, and estimated a net savings of $3.8 billion by FY 1999 and $2.3 billion annually afterwards. It acknowledged the difficulties in affected communities but cited an Office of Economic Adjustment study calculating that

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[63]GAO, "Military Bases: Analysis of DOD's Recommendations and Selection Process for Closures and Realignments" (April 1993).

[64]Defense Base Closure and Realignment Commission, "Report to the President" (July 1, 1993).

closures between 1961 and 1992 had ended 93,000 jobs while creating 158,000. It also assured communities that applying the same energy toward the future as had been applied to saving bases would expedite recovery. Most of the report explained the Commission's agreements or disagreements with each DOD recommendation (all amendments were justified on the basis of the selection criteria) and summarized each affected community's concerns.

Following GAO's suggestions, the Commission altered a few Navy proposals, some of them important for the lab community. Agreeing that the Navy had in some instances overemphasized excess capacity at the expense of military value, the Commission proposed that the Annapolis Detachment of the NSWC Carderock Division remain open. It also recommended that NESEC Charleston remain open and become the East Coast lead facility, which meant most other NESEC facilities would close and move there rather than to Portsmouth, Virginia as SECDEF had proposed.

Although NSWC White Oak lab was further realigned (rather than closed), it is not possible to determine that fact based solely on the information in the major reports. As mentioned, SECNAV selected the facility for closure, and the *main section* of the DOD report – the "statutory recommendations…transmitted to the Commission"(i) – reprinted that recommendation. However, the *introduction* in the DOD report listed White Oak under a section titled "Major Base Realignments."(27) GAO also noted that White Oak would realign.

Likewise, the list of actions in the introduction of the Commission report designated White Oak for realignment, but again, the body of the report recommended disestablishment. It said SECDEF "suggested a revision"(1-50) whereby disestablishment would occur, but some functions would be transferred to NSWC facilities in Panama City, Florida, Indian Head, Maryland, and Dahlgren. The report further asserted that the original plan deviated from the first selection criterion (military value), and the Commission would therefore adopt SECDEF's revision and recommend retaining the property and facilities for NAVSEA headquarters. Not until the BRAC 95 recommendations two years later is it clear that in 1993, realignment rather than disestablishment did indeed occur, leaving only the Hypervelocity Wind Tunnel, Nuclear Weapons Effects Facility, Ship Magnetic Signature Control R&D Complex, and reentry body dynamics R&D at the lab.

BRAC 95

In February 1995, during the final round of base closures, consolidations, and realignments under the existing BRAC enabling legislation, the DON submitted its **Base Closure and Realignment Report** for OSD review.[65] In this round the labs and centers took their hardest hit, ultimately constituting a third of the 62 activities recommended for closure or realignment. Calling the lab-based recommendations a culmination of the process begun in 1991, the Navy sought "to ensure that the Department can fully sustain uniquely naval technological

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[65]Department of the Navy, "DOD Base Closure and Realignment Report to the Commission, Department of the Navy Analysis and Recommendations" (Volume IV) (March 1995).

efforts without unnecessarily burdening itself with infrastructure…. [W]e have thus eliminated as much redundancy as we safely can."(i) As in 1993, the text described the steps in the Navy's analysis and provided justifications for the proposals.

Responding to reactions from the previous round, SECDEF had directed the Services to seek cross-Service consolidation, which included three particular efforts: retaining in only one Service a unique military capability that two or more Services used; consolidating workloads to reduce capacity; and assigning operational units from different Services to only one base.

The Navy followed the same method of analysis as two years earlier, admitting the difficulties in applying it to technology efforts. "These are very complex activities whose direct link to the force structure is often difficult to quantify, and 'right-sizing' them has been a task…."(2) The BSEC, BSAT, and Naval Audit Service again followed an ICP, maintained a comprehensive Base Structure Data Base, followed "bottom to top" data certification, and recorded key meetings. Responding to GAO's report from two years earlier, the BSEC deliberated more openly and frequently with senior-level Navy officials and participated in eight Joint Cross-Service Groups (JCSGs), including one for both lab and T&E activities. This time the BSEC allowed every installation under review to submit information about the military principles underlying their activities, or in other words to provide context for their data. The BSEC grouped these statements into seven major themes, one of which was "the ability to pursue and sustain essential technological effort…."(12)

With a couple changes, the Navy's procedure remained the same nine-step process, based on the same DOD selection criteria, as in BRAC 93.[66] The BSEC:

1. Developed categories of activities, this time using five rather than three – operational support, industrial support, technical centers/labs, education/training, and personnel support/other. It subdivided these into 27 subcategories (labs and centers remained undivided) and within those reviewed 83 installations or activities.
2. Sent out data calls tailored to each subcategory and entered the responses into a Base Structure Data Base, the "sole basis for BSEC determination."(DON, 5-42)
3. Used capacity analysis to compare, for each subcategory, the existing base structure figures to the future force structure needs. Any subcategory with identified excess (19 in this round) proceeded to the next stage.
4. Carried out a quantitative military value analysis, entering information from military value data calls onto a matrix and scoring each installation against others in the same subcategory. As mentioned, GAO had criticized the Navy in 1993 for acting on "certain assumptions and military judgments" here, but the Service replied: "The military value analysis, then, is a process which translated mature, military judgment into a military value score which was a useful 'quantifier.'"(DON, 25) In other

[66]Quotations are from both the Navy and DOD reports.

words, the Navy remained unapologetic about applying the judgment of its leadership.

5. Combined both capacity and military value analyses into a configuration analysis (the "mixed-integer linear programming solver"(DON, 25)). "The purpose of configuration analysis was to identify, for each subcategory of installations, sets of installations that best meet the needs of the Navy and Marine Corps, in light of future requirements, while eliminating the most excess capacity."(DOD, 5-43). Various combinations of closures and realignments were sampled within each subcategory to determine the optimum arrangement.
6. Applied military judgment – again unapologetically – to those various configurations, developing potential scenarios for investment analysis. This step included iterative input from Fleet and SYSCOM commanders and the civilian leadership.
7. Conducted COBRA analyses on all 174 potential scenarios. Installations had at least twice as long to respond to these as they had in BRAC 93.
8. Calculated the impact for local economies.
9. Performed environmental analyses.

The Navy report claimed that significant excess capacity in the labs and centers – 27 percent and 19,000 work years – indicated they had not endured closings commensurate with other activities. It therefore expanded the COBRA model, which "provided a more detailed and precise view of the Navy's Technical Centers' and Laboratories' workload and capacity…[and] provided a more accurate description of the military worth of the site."(X-4) Measuring capacity in budgeted work years rather than other possible methods (such as square feet), the BSEC developed a Technical Workload Matrix to improve (from BRAC 93) methods for determining exactly what type of and how much work the technical centers performed. In the military value analysis the BSEC scored the centers' answers to 195 questions and then used configuration analysis to prepare a "footprint" of technical capabilities performed across the Navy. In all, the scenarios developed showed that while a number of activities would be reduced, no function would be eliminated.

Again, the recommendation to close NSWC White Oak contained an apparent idiosyncrasy. The BSEC chose to apply the particular configuration analysis that eliminated the most excess capacity and accordingly issued closure data calls to a number of installations. However, five additional data calls were also issued. The report provides the reason for each of those – except White Oak.

A complete list of the recommendations concerning the labs and centers, along with justifications and saving estimates, are in Appendix X (the justifications are very general and essentially the same for each recommendation).

As in 1993, the Navy's recommendations became part of the larger DOD **Base Closure and Realignment** report submitted to the BRAC Commission.[67]

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[67]DOD, "Department of Defense Base Closure and Realignment Report" (March 1995).

With defense spending down 40 percent between 1985 and 1997, the Department recommended closing or realigning 146 installations and estimated savings of $18.4 billion over 20 years (see Tables). It asserted this process contained the lowest upfront costs of any BRAC round. Again, the bulk of the report explained each recommendation, and again, the justifications concerning the technical centers are practically the same for each one. The appendices include P. L. 101-510 as amended, the relevant policy memoranda, a brief history of base closures, and impacts by state. In the Navy, half of the 10 major bases recommended for closure (NAWC Indianapolis, Lakehurst, NJ, and Warminster, Pa., and NSWC Louisville and White Oak) were in the laboratory community.

DOD also responded to GAO's and others' comments about BRAC 93. First, the Department declined to include other federal agencies in its cost estimates, as GAO had suggested, because the calculations were too difficult to specify and the costs too insignificant to include. And second, the report stated that the BRAC Review Group, BRAC Steering Group, and six JCSGs clearly revealed OSD's oversight and coordination efforts. The JCSGs considered five functional areas, including both T&E centers and laboratories, and the Services incorporated these groups' conclusions into the report forwarded to SECDEF.

Tables 1-3 provide various Navy/DOD BRAC savings estimates and closure summaries.

In April GAO's **Military Bases** called DOD's process "generally sound and well documented and [one that] should result in substantial savings."(4)[68] However, it disagreed with DOD's assertions about cross-Service coordination, arguing that many opportunities had been missed, especially for depot maintenance and laboratories. GAO also criticized the Air Force for being overly subjective and providing insufficient documentation. In addition, it noted that OSD, the Services, and the JCSGs all acknowledged that the four BRAC rounds would reduce infrastructure by only 21 percent (seven of a targeted 15 percent for 1995), while the overall budget had declined by 40 percent and military and civilian personnel by about 32 percent. Nonetheless, GAO's assessment found that DOD could count on a 20-year cost reduction of $17.3 billion.[69]

GAO labeled the Navy's recommendations "generally sound and well documented,"(87) but focused much of its critique on the technical centers. It observed that SECNAV changed the BSEC's suggestions in California based on the overall economic impact on the state but retained proposals that would have three times the effect on Mississippi. It also noted the Navy's difficulties

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[68]GAO, "Military Bases: Analysis of DOD's 1995 Process and Recommendations for Closure and Realignment" (April 1995). This report contains a succinct summary of the four BRAC rounds, including each Service's process for generating recommendations, the COBRA model, the key changes from one round to the next, and the overall picture regarding closure, realignment, costs, and savings.

[69]The report includes a detailed section on how DOD calculated its estimates and discusses the comparability of COBRA data, Implementing Budget Estimates, discount rates, and environmental cleanup.

Table 1: DOD BRAC 95 Estimated 20-year Savings from Selected Closures (Rounded to Nearest Million Dollars)

NSWC Carderock Division Detachment, Annapolis	$175M
NAWC Aircraft Division, Indianapolis*	$640M
NAWC Aircraft Division, Lakehurst, NJ**	$359M
NSWC Crane Division Detachment, Louisville*	$640M
NUWC Newport Division Detachment New London, CT	$91M
NCCOSC In-Service Engineering West Coast Division, San Diego	$60M
NRL Underwater Sound Reference Detachment, Orlando, FL	$30M
NAWC Aircraft Division, Warminster, PA	$105M

*Facility closed but workload, facilities, equipment transferred to private sector
**Ultimately not closed as proposed

Table 2: BRAC Estimated Costs and Savings (Billions of FY96 Dollars) From DOD BRAC 95 Report

	BRAC Actions	Closure Costs	Six-Year Net Savings	Recurring Annual Savings	Total Savings
BRAC 88	145	$2.2	$0.3	$0.7	$6.8
BRAC 91	82	$4.0	$2.4	$1.6	$15.8
BRAC 93	175	$6.9	$0.4	$1.9	$15.7
BRAC 95*	146	$3.8	$4.0	$1.8	$18.4
Total	548	$16.9	$7.1	$6.0	$56.7

*Prior to BRAC Commission modifications

Table 3: Summary of BRAC Reductions Major Domestic Closures From DOD BRAC 95 Report

	Major U.S. Bases	BRAC 88	BRAC 91	BRAC 93	BRAC 95*	Major Bases Remaining	Reduction in Facility Capacity
Army	109	-7	-4	-1	-12 (10)	85	22%
Navy/ Marine Corps	168	-4	-9	-20	-10 (8)	125	26%
Air Force	206	-5	-13	-6	-9 (6)	173	16%
Defense Agencies	12	0	0	-1	-2 (4)	9	25%
Total	495	-16	-26	-28	-33 (28)	392	21%

*Parentheses denote post-BRAC Commission recommendations

in consolidating the technical community proportionately to other subcategories while enhancing full-spectrum capabilities. For example, the Service not only examined 29 functional categories but had to do so across four phases of work – general, R&D, acquisition, and lifetime support.

Other complications involved the COBRA data calls in general and again, the White Oak lab in particular. The BSEC had questioned the accuracy of some of the (certified) COBRA data because the labs generated it after they knew they had been slated for possible closure. In some instances then, the group made "substantial changes to original estimates."(100) GAO said that those changes it had time to double check did appear reasonable. Regarding White Oak, the Chairman of the Joint Chiefs of Staff (JCS) had testified before the BRAC Commission that DOD (and other organizations such as NASA) still needed the Hypervelocity Wind Tunnel. Nevertheless, the Navy continued to consider it excess.

GAO claimed that most cross-Service efforts had failed, especially for the technical centers: "The cross-service groups for test and evaluation and laboratories had little impact on the services' recommendations."(45) And overall, OSD's proposals "would move very little work from one service's facilities to another."(40)

The failure occurred for a number of reasons. Part of the problem was timing. The JCSGs sent out data calls later than the Services and forwarded their proposals to OSD later as well. Better timing "would have avoided needless work on the part of the responding activities."(41) Also, the split into two groups – one for T&E and one for labs – erected an artificial barrier between the functions each could consider. Further, the Services agreed only to consider the cross-Service groups' proposals. In addition, the JCSGs broke down work into very small units or specific functions, often suggesting transfers the Services considered infeasible or sub-optimal, especially for the Navy's full-spectrum centers. Sometimes the JCSGs suggested much larger realignments, including consolidation of Command, Control, Communications, Computing and Intelligence (C4I) at Ft. Monmouth, N.J., and of air launched weapons RDT&E and air propellants at NAWC China Lake. Instead, the DOD plan contained only intra-Service consolidations in these subcategories. In sum, "reliance on service decision-making and consensus; insufficient time; and in some cases a narrow analytical approach"(40) left just the labs themselves with some 4,300 work years of excess capacity.[70]

Finally, GAO changed positions somewhat regarding military judgment. The organization had not criticized military judgment per se in its 1993 report, but did use the term disapprovingly, commenting, for example, that where it was cited the most, documentation was provided the least. The 1995 report grudgingly devoted a short section to the matter, giving a few examples and noting that the Services sometimes had to apply it and that operational requirements and policy imperatives helped drive it.

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[70]Chapter 3 also briefly discusses the JCSG efforts.

After inspecting the DOD and GAO reports, the BRAC Commission submitted its **Report to the President** on July 1.[71] Again commending itself for being a "model of open government"(x) absent of political or partisan influence, the Commission recommended 132 installations for closure or realignment and estimated savings of $19.3 billion over 20 years. The major section consists of verbatim recommendations and justifications from the DOD report, summaries of community concerns, and explanations of the Commission's changes. Other sections commended privatization initiatives, described how federal, state, and local governments and the private sector might speed economic recovery in affected communities, and discussed the Services' varying use of the COBRA model. Appendices included actions by state and Service, hearings held, and bases visited for each BRAC round.

Most but not all affected laboratory communities failed to convince the Commission their facilities should remain open. The New London detachment of NUWC argued that faulty cost/savings estimations from 1991 realignment had set the payback date to 100 years. The Commission disagreed, saying closure would complete the consolidation of undersea warfare begun in 1991. The NRL Underwater Sound Reference Detachment in Orlando argued that moving the facility to Newport, R.I. (as SECNAV had recommended) would be too costly and that a nearby test lake contained unique properties not easily duplicated. Again, the Commission agreed with SECNAV, stating that new technology precluded the need for that particular lake.

Testimony of the Chairman of the JCS and other factors notwithstanding, NSWC White Oak also failed to keep its doors open. In addition to the Hypervelocity Wind Tunnel, many considered the Nuclear Weapons Effects Test Facility – which organizations outside of NSWC used – a unique national asset. They argued that the costs of moving or continuing to operate the two facilities would negate any savings gained through closure. Further, while SECDEF claimed the facilities were not critical, the Commission found "ample data that pointed to a continuing need." However, the Commission could not "identify a potential DOD user willing to take over the facilities." The wording – "*identify* a potential DOD user" – at least implies no organizations were actually asked. Although apparently some were, the point here is the vagueness in the report's phrasing.

Finally, the closure decision – "The Commission found the facilities were excess to the Department's needs" – was not stated as a logical conclusion deriving from the failed attempt to "identify a potential user" or from any other premise. Indeed, the conclusion seems to contradict the data that suggested a continuing need. White Oak closed anyway.(all quotations from 1-64)[72]

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[71]Defense Base Closure and Realignment Commission, "Report to the President" (July 1, 1995).

[72]See also William B. Anspacher et al., *The Legacy of the White Oak Laboratory* (2000), esp. 365-367.

Other communities fared better, some of them because of innovative privatization initiatives. Asserting that OSD had underestimated military value by proposing to relocate interdependent functions, the Commission recommended that NAWC Lakehurst remain open. Both NAWC Indianapolis and NSWC Louisville challenged the assessment of their military value and also proposed public-private partnerships that allowed the bases to close but then be bought by redevelopment groups who could offer the facilities and employees to private companies for use in bid proposals. Under such arrangements the Navy would reduce infrastructure and the closure would only minimally affect the local economy. Downright effusive about such efforts, the Commission argued that privatizing commercial and industrial activities in general would reduce operating costs and strengthen the Services by freeing personnel to perform exclusively defense-related tasks.

Table 4 summarizes the major base closures and realignments from BRACs 1988, 1991, 1993, and 1995.

Many in the laboratory community remain convinced that, regardless of whether certain closures helped the Navy, neither the COBRA model estimates nor any other data drove the decisions. Guy Dilworth, a former NADC Technical Director and Deputy Commander of NAWC's Weapons Division, believed the decision to close NADC occurred well before any data calls were received and was based on considerations the COBRA model could not address. James Proctor, Deputy Technical Director of NSWC Dahlgren from 1988-91 and then head of the Research Department at White Oak, held similar views. Like Dilworth, Proctor believed BRAC allowed the Navy to maintain some key core competencies but that certain closure decisions were unrelated to savings.[73]

In fact, some believe plans to disestablish the labs at White Oak, Warminster, and New London had been set since well before BRAC 91.[74] White Oak and Warminster did in fact show up, at least as early as the February 1990 Phase II Study, on a list of three possible closures.[75] Bernard DeSavage, former Deputy Research Department Head and then Acting Department Head at White Oak during the early 1990s, asserts that the three facilities were slated for closure from the moment the Navy began discussing significant restructuring. In the BRAC process, when costs/savings data from White Oak did not support disestablishment, two things happened: one, the data were reexamined; two, the decision

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[73]Guy Dilworth, interview by Howard Law, November 12, 1997. James F. Proctor, interview by Howard Law, September 24, 1997.

[74]The Naval Air Development Center at Warminster. Pa. and the Naval Underwater Sound Laboratory (later the Naval Underwater Systems Center, or NUSC) at New London, Connecticut. In terms of downsizing, the four largest realignments from BRAC 91 were those at Warminster, White Oak, New London, and Annapolis. NADC had become part of the Naval Air Warfare Center, Aircraft Division, and NUSC had become the New London detachment of the Newport Division of the Naval Undersea Warfare Center. NADC was closed and NUSC disestablished after BRAC 95. Some functions, personnel, and facilities relocated to Patuxent River, Maryland and Newport R.I., respectively.

[75]See DNL, "A Review of Studies," 23.

Table 4 — Major Base Closures and Realignments, BRAC 88-95 (From 1995 BRAC Commission Report)

	Closures	Realignments
BRAC 88	16	11
BRAC 91	26	19
BRAC 93	28	13
BRAC 95	28	20
Total	98	63

was made to close the lab in stages, transferring only those functions that could be moved within the parameters of the payback requirements.[76]

This background is not intended to imply deceit on the part of the Navy, DOD, or BRAC Commission but instead to demonstrate that sources exist for examining issues at which the major reports only hint. Again, while these reports offer cogent explanations of the final product, material in the Navy RDT&E management archives offers insight into processes. And while the Base Structure Data Base – even the name strongly suggests impenetrability – with its hundreds of cubic feet of data bits, formula integers, and matrix redactions, allows thorough perusal from anyone like the GAO with a legion of accountants at its disposal, oral history interviews, briefings, and correspondence provide a more manageable and sometimes personal set of documents.[77]

In addition, the reports do not convincingly demonstrate their claims (which is not to argue the claims were false). It may have been impossible to convince affected communities and facilities that objective analysis of the data showed them to be excess. However, the Navy reports called the Base Structure Data Base "the sole basis for BSEC determination." The BRAC Commission claimed total objectivity, citing its own "model of open government…absent political or partisan influence." The GAO's and Services' half a dozen paragraphs on military judgment might have been used to moderate that claim even slightly – as *absent as possible* of partisan influence. But the thousands of pages on COBRA analyses and discount rates and computer models and audit trails were taken to justify a declaration of an utterly impartial analysis. As a result, a lack of rhetorical clarity about a specific closure such as the White Oak lab ironically only helped open the door to charges of arbitrariness the Commission sought so assiduously to avoid.

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[76]Bernard DeSavage, interview by Howard Law, November 4, 1997. DeSavage phone conversation with author, January 17, 2007.

[77]Two examples of the types of sources mentioned in Fn. 57 are Dr. Craig Dorman's paper "BRAC 95 Lessons Learned: A Laboratory Perspective," and his speech "Parting Shots," presented at a DOD laboratory workshop in June 1995. Dorman was Deputy DDR&E (Lab Management) at the time.

Chapter Three

The Triumph of Efficiency

Background

Throughout the rest of the 1990s, studies continued to address infrastructure reduction in the technical centers and in the "support" (as opposed to operational) structure in general. Many believed the BRACs had not gone far enough, and a variety of mandates were passed that directed significant additional personnel reductions. For example, the FY 1992 Defense Planning Guidance mandated a 35 percent reduction of the RDT&E workforce by 2001. The FY 1996 NDAA directed DOD to cut its acquisition workforce (a term undefined until late in the decade) by 15,000 that year and by a total of 25 percent by 2000. Section 912 of the FY 1998 NDAA similarly mandated reductions of 10,000 to 25,000 personnel. Both Congress and the Administration imposed additional reductions on the acquisition workforce, headquarters personnel, overhead costs (including overhead personnel), and all Navy and Marine Corps civilian personnel. Although it remained unclear which directives overlapped and to what extent, the net effect reduced the Navy RDT&E establishment by at least four percent per year over the entire FY 1991-2002 decade. Some recommended much greater reductions.[78]

Studies discussed these measures as part of a larger "revolution in business affairs" (RBA) designed to accommodate the "revolution in military affairs." Briefly, four developments compelled the revolution in military affairs:

1. The collapse of the Soviet Union reduced overall security threats.
2. Smaller threats from "rogue" nations had increased.
3. The military more often engaged in small deterrence/policing actions
4. DOD now led technological developments in only a few areas.

The poet Robert Browning famously exclaimed that "a man's reach should exceed his grasp," but even his optimism might have been curbed by the stated goals of the RBA. The revolution sought to reform the acquisition process to accommodate fundamentally altered yet still evolving military modernization requirements. In fact, budget cuts had already forced postponement of modernization for too long. At the same time, DOD would need to stay abreast of global shifts in technology development while significantly curtailing its new hires.

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[78]See Michael Marshall, "Reducing Defense Infrastructure: Workforce vs. Workload Trends" (unfinished paper, April 1997).

And, unlike every other revolution in history, the Department was supposed to accomplish this one at greatly reduced cost.

The interrelationships among these national security, economic, and technological changes shaped the RBA. Economic globalization centered on technology development – especially in such areas as information technology (IT) – which in turn diminished the significance of national borders and affected national security considerations. As a technology "follower," especially in IT,[79] DOD had to depend on the private sector more than in the past to gain access to current technology. Meanwhile, the private sector changed. Companies partnered more frequently, often with foreign entities. Many increased outsourcing, both to reduce costs and to focus on core competencies. Many also cut back on long-term research and restricted the focus of near-term development.

Because of these developments, and perhaps because of frustration with the failure of previous reform efforts to solve long-standing problems, the technical centers faced increasing pressure to outsource much of their work. It sounded perfect: by shifting work to the private sector and reducing personnel levels, DOD could divest itself of costly and obsolete infrastructure and exploit the "best practices" of cutting edge commercial companies. The support structure would not just get smaller – a change that in itself could threaten national security – it would "reengineer" to get better, providing improved products and services at lower costs. Thus the concept of efficiency supplied DOD with the necessary justification for repeated reductions.

Ultimately, a revival of outsourcing enthusiasm swept through DOD in the 1990s, promising salvation for lapsed modernization efforts by funding them through the savings that the resulting efficiency seemed certain to produce. A host of high-level study groups saw the light and joined the chorus. However, the message got somewhat distorted, at least as it became translated for the technical centers. The term efficiency contains two key elements – producing the desired effect and doing so with minimum waste. While publications about the labs and centers all mentioned the former, they clearly emphasized the latter, in effect equating efficiency with less work.

Overview of the Studies

The reports discussed in this chapter all examined, to varying degrees, ways to increase outsourcing and continue reducing infrastructure. Typically, outsourcing in DOD means the work shifts to the private sector but facilities remain in the public sector. While outsourcing generally means the same as contracting, in the 1990s it typically meant *increased* contracting. Many studies also advocated privatization, or the transfer of government facilities to the private sector. "Privatization-in-place" transfers facilities, equipment, and people, which means former government employees become contractors. Other similar initiatives include public/private ventures or partnerships (PPVs, sometimes called

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[79]See Fn. 103 for a discussion of whether DOD really lagged behind the private sector in IT.

partial privatizations), employee stock ownership plans (ESOPs), and even GOCOs.

The Defense Science Board's (DSB) 1994 "Laboratory Management" was one of the first major studies of the labs in the post-Cold War period to advocate avidly for outsourcing. The Institute for Defense Analyses (IDA) used that report in its Laboratory Infrastructure Capabilities (LIC) Study, which in turn formed the basis for the Clinton Administration's broad interagency review of the DOD, DOE, and NASA laboratory systems. Meanwhile, a commission established by Congress did a sweeping assessment of the missions and functions of the Armed Forces and enthusiastically advocated outsourcing, especially of "commercial activities." All these activities occurred while the Services were engaged in BRAC 95.

Then in the latter half of the decade, the Center for Naval Analyses (CNA) promoted outsourcing in a number of studies. DSB issued study after study, carried out almost exclusively by representatives from the private sector, which offered increasingly unqualified praise of any outsourcing initiative. The Naval Outsourcing and Privatization Programs Division of the Office of the CNO (responding to OSD savings initiatives) even attempted to categorize virtually all technical center programs and personnel as eligible for outsourcing. And finally, SECDEF Cohen requested (unsuccessfully) an additional BRAC round as the means for carrying out reductions outlined in his Defense Reform Initiative (DRI).

In essence, outsourcing advocates went postmodern. For example, the Office of Management and Budget (OMB) Circular A-76 dictated that "inherently governmental functions" could not be contracted out but RDT&E "support" could. Certain groups therefore concluded that such terms represented no concrete reality but instead existed solely as managerial constructs, which meant managers could construct them however they chose. And those who promoted outsourcing as a solution for modernization problems inclined toward defining nothing as inherently governmental and almost anything as support.

The DSB on Laboratory Management

Calling **Defense Laboratory Management** "an obsolescent artifact from the Cold War,"(Cover Letter) the DSB issued its report on the subject in April 1994.[80] John Deutch, USD for Acquisition and Technology (A&T), tasked the Board to recommend ways for improving quality, modernizing, and assisting in BRAC 95. Rather than an extended analysis based on documented research or the work of panels, the report is simply a small task force's litany of assertions and recommendations, some breathtaking in their banality, some more substantive. DSB offered five general proposals:

- Resize and restructure, including a 24 percent reduction in personnel.
- "[P]ursue a vigorous program of outsourcing of defense laboratory activities"(Cover Letter), and require that lab directors justify all

[80]DSB, "Defense Laboratory Management" (April 1994).

decisions to work in-house. Shifting work to the private sector would provide DOD with the best technology available and save money with which to fund modernization.
- Extend DDR&E oversight, including external reviews from the private sector, customer reviews from DDR&E surveys, and an OSD management review.
- Begin the modernizing plans described in the report.
- Issue the report's criteria for judging modernization.

The first modernization section focused on management, suggesting that DDR&E could not insure that the labs facilitated force readiness or supported Reliance, could not adequately assess the Service Program Objective Memorandums (POMs) or Military Construction (MILCON) requests, and could not evaluate outsourcing efforts. Therefore, the 1993 Government Performance and Results Act (GPRA) provisions should be extended to all labs, and all labs should maintain an open Management Information System (MIS) on personnel, capabilities, facilities, funding, and projects. The report stated that this MIS would obviate the need for the annual DOD In-House RDT&E Activities Report, although it did not distinguish between the two.

The second modernization section focused on quality, particularly review mechanisms and S&E/lab outreach and interaction. The Board's recommendations included:
- establishing a Defense Senior Scientists Council to help formulate policy, encourage interaction among S&Es, and facilitate cross-Service exchanges
- an external performance audit, in addition to the GPRA assessment, to evaluate outsourcing initiatives and personnel
- regular meetings to increase DOD/lab/industry interactions and sharing of facilities – especially targeted to industries not already in defense work – and that each Service review for DDR&E all MILCON projects, maintenance and repair schedules, and equipment
- DDR&E participation in interagency initiatives that would increase outsourcing

Importantly, the Board also proposed that Reliance expand and DDR&E assume responsibility for it and that the Laboratory Demonstration Program (LDP) be re-chartered as the Laboratory Quality Improvement Program, or LQIP.[81]

The report suggested various criteria for evaluating modernization within the categories of quality, outreach, and size. In relation to quality, DSB discussed the GPRA's requirement for strategic plans. S&T plans were to include specifics for work with others (such as industry and other agencies), clear missions, technology insertion, and a "focus on a limited number of closely related key disci-

[81]LQIP is discussed in Chapter 5.

plines, for each of which it has a specified critical mass of funds and people."(2-1) Conversely, Acquisition and Modernization (A&M) strategic plans were to emphasize technologies and concepts outside of principal competencies.

Regarding leadership quality, the report perhaps perfected the banal claim. Managers were to improve their facilities, understand modern equipment, and possess a knack for quality, skills suited to the job, and the ability to direct researchers and recruit talent. They were supposed to exploit every flexibility to pay and promote based on merit, especially technical rather than administrative. They were expected to have "reasonable control"(2-3) over support functions. Finally, DSB argued that the labs would not likely ever be able to allot five to 10 percent of their funding to ILIR, as was ideal. Therefore, they "must urge customers to support ILIR projects, or contract for such research."(3)

Regarding "outreach," DSB strongly recommended outsourcing or similar methods. The Board stated that DOD should maintain capabilities only in areas in which industry did not meet a need; where DOD "followed," it needed only to remain informed and maintain access to critical technologies. To some extent analysts had always agreed with this view, if for no other reason than the labs had always contracted out most of their work. The question was how much in-house, hands-on work S&Es needed to remain informed. In other words, despite its claim, the Board really offered no criteria here but instead reasserted a long-standing premise.[82]

DSB eagerly embraced outsourcing as the most important form of outreach. With force reductions, procurement constraints, and readiness and modernization needs "better served by a basically commercial infrastructure,"(3-3) outsourcing appeared an attractive option. Further, the Cold War past still saddled labs with "dysfunctional undertakings" such as administering detailed specifications, supporting obsolete materiel, and using outdated technology. The report set targets of in-house/contracting ratios at 20/80 percent for S&T and 30/70 percent for A&M. "In-house expenditures should be restricted to work that is inherently governmental, that compensates for industrial under-investment, that provides non-procurable support to approved facilities, and that provides performance, cost and schedule assessments…." Similarly, lab directors "must justify all decisions to conduct work in-house…and demonstrate an aggressive program for seeking defense-relevant technology support from the civil sector."(3-4)

The report briefly addressed other outreach topics. These included professional interactions, "intellectual openness" (for example interaction between S&Es and the Fleet), and cooperative agreements among the Services. The Board also commented on technology transfer – enabled through such initiatives as Cooperative Research and Development Agreements (CRADAs) – and on facilitating cooperation rather than competition with academia and industry. Along these lines, DSB asserted that a lab director should be required to explicitly justify the need for resources not shared with industry, academia, and other agency

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[82]See for example James Colvard, interview by Rodney Carlisle, May 13, 1994.

labs. It also extolled "federated" labs and model contracts, or cooperative efforts to integrate the defense and industrial technology bases. In such arrangements, a DOD employee would work at a contractor site for an extended period, and this "federated" team would "spin up" rather than transfer new technology.

National Science and Technology Council Interagency Review of Federal Laboratories

The Laboratory Infrastructure Capabilities Study

IDA often referenced the DSB study while writing a major report on DOD **Laboratory Infrastructure Capabilities**, or LIC.[83] The report responded to the National Science and Technology Council Presidential Review Directive (NSTC/PRD) #1 of May 5, 1994, which called for an interagency review of the three largest federal laboratory systems – the DOE weapons, NASA, and DOD labs. Each agency carried out its own study and integrated their responses into a final report issued the following year. The DOD's response itself consisted of three parts: an interim report, main report, and BRAC 95 addendum. The Department completed the LIC study, directed by Dr. Craig Dorman, Deputy DDR&E for Laboratory Management and a former admiral, to provide a basis for its final conclusions.[84]

The LIC study brought together more than 300 representatives from both government and private industry to examine the roles and missions of the DOD labs, the extent of their collaboration with industry and academia, and the potential for increased outsourcing. Panels outlined 12 product/technology areas and some two dozen roles to provide an agenda for addressing key structural, management, and policy issues. Although the study addressed key roles the labs performed, it focused not on improving execution of those roles but rather on how many DOD could outsource.

IDA noted the difficulties in generating findings applicable to all the extremely diverse activities in the labs and centers. For example, the technology/product areas did not correlate with labs, and neither lab nor area worked as a discrete unit of analysis. Focusing on a lab prevented assessing the numerous technology areas it supported. On the other hand, focusing on a technology area prevented assessing various cost issues associated with a lab, such as the interactions among its functions. Further, accounting and management information systems varied across labs, between labs and other government agencies, and between government and industry labs (a problem discussed in Chapter Five). These differences foiled attempts to determine even how much work labs out-

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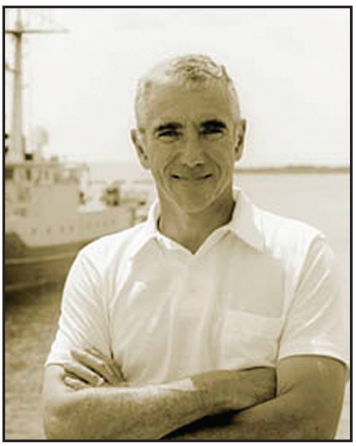
[83]Institute for Defense Analyses, "Laboratory Infrastructure Capabilities Study: Phase I Report" (November 1994).

[84]The NSTC, a cabinet-level council and "virtual" agency to coordinate science, space, and technology policies, was established on November 23, 1993 by executive order. It was part of the Office of Science and Technology Policy (OSTP), which advises the President on S&T policy/budget issues and articulates the President's S&T principles.



Dr. Craig Dorman (retired Rear Admiral), Chair of the Laboratory Infrastructure Capabilities Study and former Deputy DDR&E for Laboratory Management. Dr. Dorman later served as the Director of the Woods Hole Oceanographic Institution and is currently Vice President for Academic Affairs and Research at the University of Alaska.

sourced in the first place. The full-spectrum range of functions presented another issue. Organization, roles, relationships with industry and academia, and justifications for keeping work in-house varied among the Services and within each Service among different functions.

As Table 5 shows, study participants identified 23 roles the labs performed and grouped those into four categories. Categories included advisor/corporate memory (including for example smart buying and technology integration); unique capabilities (including quick response); acquisition and policy agent ("a legal representative in…weapons acquisition"); and institutional liaison ("a technology nexus for the modernization ideas coming from military leaders, the intelligence community, industry, and academia"[ES-1]). Overall, no other kind of organization provided the "breadth of perspective and continuity of involvement" across these categories.(12)

Following the DOD's Science and Technology Plan, panels also grouped activities into 12 technology or product areas. These included: Human Systems; Environment and Civil Engineering; Nuclear-Biological-Chemical (NBC) Counterproliferation; Materials and Processes, Structures, and Manufacturing; Electronics and Sensors; Computers, Software, Modeling, and Simulation; C3I and Electronic Warfare; Weapons; Space; Air Vehicles; Ground Vehicles; Ships and Watercraft.

All participants agreed the labs performed crucial roles – but questioned whether the labs *must* perform them. In other words, how much of a product area could be outsourced? (The panelists acknowledged but did not address the inverse issue of the required "critical mass" of in-house capabilities.) For example, neither the C3I panel nor the Clothing, Textiles, and Food subpanel believed labs acted as smart buyers in those areas. Accordingly, participants gauged technical and non-technical restraints on outsourcing, the percentage of total S&T and engineering work that was inherently governmental, what work DOD might outsource easily, and what it might outsource with some difficulty.

This thrust further signified the shift in emphasis from effectiveness to cost-cutting. Recall that in 1989 the Office of Technology Assessment's (OTA)

Table 5: Roles of DOD Laboratories
(From IDA Infrastructure Capabilities Study)

Advisor and Repository of Corporate Memory	Source of Unique Capabilities	Acquisition and Policy Agent	Institutional Liaison
Source of corporate memory and stability – nurturer of technology Expert on defense-unique research Smart buyer – non-proprietary advisor or broker Technology integrator Requirements translator – link user to technology Smart user support for fielded systems Repository of knowledge of legacy systems	Low-cost owner of unique facilities Provider of guaranteed access to unique facilities Repository of unique military expertise Ready supporter of deployed combat troops Trusted repository for export-sensitive & proprietary information	Source selection agent Acquisition agent for contractual oversight and budgeting Legally responsible agent for regulatory responsibilities & safety Legally responsible agent for physical security Legal representative in standards groups Legal representative in international government-to-government dealings	Liaison between technology community and fielded forces – mission over profits Link between engineering and testing communities Liaison between technology and intelligence communities Broker for Service interoperability concerns Technology training ground for military leaders

"Holding the Edge" attempted a similarly comprehensive overview of the labs. This report had commented that "The mind-numbing array" of issues could be grouped under two questions: whether DOD had the type and quality of labs it needed, and whether management arrangements inhibited productivity. For the DDR&E/IDA report, that question had become, how can DOD outsource the highest possible percentage of work not within its required in-house capabilities?

Panelists then identified areas for potential structural (consolidation) or outsourcing changes. At the time, labs received about 25 percent of all DOD RDT&E funding, and already outsourced about half of that. Of course, significant differences existed among the technology areas. For example, about 46 percent of Air Vehicles RDT&E was outsourced, compared to 86 percent of Computers, Modeling, Software and Simulation RDT&E. And again, differences existed between S&T and engineering. The report suggested that "A comparative 'benchmarking' analysis of the different approaches used by the various activities might reveal the 'best practices' in various functional areas."(9)

The study recommended consolidation in four of the 12 technology areas and both outsourcing and consolidation for an additional five areas. Those recommended for consolidation – driven by excess capacity and duplication of effort and open for consideration in BRAC 95 – included Electronics and Sensors, C3I and Electronic Warfare, Weapons, and Space. Those recommended for both included NBC Counterproliferation, Human Systems, Environment and Civil Engineering, Air Vehicles, and Ships and Watercraft (tables provided specific proposals for each area). Unsurprisingly, non-government participants recommended much higher increases in outsourcing than did government participants. In the Air Technology area for example: the government panel suggested an increase up to 79 percent of total S&T, 21 percent of engineering development, and 64 percent of in-service engineering; the non-government panels recommended 90, 55 and 93 percent, respectively.

Other issues IDA addressed included management, procurement regulations, missions, and S&T planning. The report joined the chorus of those advising that lab directors have flexibility to manage rather than simply obey and that burdensome procurement regulations be eased. All panelists agreed on the need for better strategic management, for clearly defined missions, and for rightsizing based on a DOD clarification of necessary S&T and engineering functions. Regarding the planning process, the report stated that to succeed fully Tri-Service Reliance should expand to include engineering and other agencies such as NASA and the DOE labs. Similarly, although panelists considered the DDR&E S&T planning process successful, they disliked its separation from engineering.[85]

Finally, the study groups offered a few additional recommendations. They proposed examining exactly how the agencies' varying methods of calculating

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[85]The JDL never did expand to include engineering planning or other S&T agencies such as DARPA. Despite its efforts then, Congress continued to call for a more comprehensive cross-Service planning process. Dr. Anita Jones, DDR&E from 1993-1997, took over the Reliance process but ultimately had little more success than the JDL, at least in part because BRACs overwhelmed such initiatives.

costs determined outsourcing decisions. They recommended pilot programs for improving collaboration among government, industry, and academia, and urged fuller exploration of dual-use technologies. They recommended developing metrics, for example through best practices analyses, to gauge lab successes. And finally, noting the "mixed results" of previous efforts, they recommended pilot programs for reforming lab management.

The Interim Response

Interestingly, DOD's final four reports responding to the interagency review of laboratories backed off from advocating outsourcing and highlighted lab capabilities. Based on the LIC study, the DDR&E published a memo **Interim Response** to the PRD on September 12, 1994.[86] Postponing specific recommendations until the completion of BRAC 95, the memo discussed labs in relation to the five "Areas of National Need" and nine "Issues to Consider" the PRD had identified. It argued that "the DOD laboratories' characteristics are tightly conditioned by their very clear National Security missions,"(1) that they were integral to technology development and acquisition, and that they would become increasingly significant to post-Cold War security. The Interim Response rephrased the central issue of the LIC study. Rather than seeking simply to outsource, it sought to determine the best organizational arrangements considering that labs had to consolidate and downsize while still fulfilling dual roles of performer (in-house) and purchaser (contracting) of RDT&E.[87]

As had the LIC study, the Interim Response mentioned the wide array of activities, management arrangements, and coordination mechanisms. Funded by DOD managers, labs are "directed performers…rather than free agents,"(4) yet they also purchase RDT&E. This dual role required the added capability of balancing in-house and out-of-house work. Another complicating aspect was that program managers used labs selectively for different roles and in different parts of the life cycle. And as the labs responded to BRAC by, for example, creating lab/other agency amalgams, it would become increasingly difficult even to draw a boundary around what constituted the "laboratory." Instead, DOD would evolve "a spectrum of 'laboratory-like' approaches… [that] optimize the use of the national S&T and product development talent and infrastructure base wherever it is…."(6) Coordinating mechanisms included Reliance and the DDR&E Technology Area Plans (TAPs), which provided the basis for Service POMs.

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[86]DDR&E, Memorandum for Assistant to the President for Science and Technology, "Department of Defense Interim Response to NSTC/PRD #1, Presidential Review Directive on an Interagency Review of Federal Laboratories" (September 12, 1994).

[87]Noting the need for full life cycle support, which includes upgrading and determining the military use of off the shelf products, the report defined a lab as a DOD activity "that performs predominately S&T, Engineering Development, and/or ISE [in-service engineering] work."(2) The definition was adopted from DSB's report on lab management and also used by the JCSG for labs in BRAC 95.

Overall then, the labs' directed, dual role of purchaser and performer "makes them uniquely effective" in planning and coordination.(6)

The memo also discussed the five "Areas of National Need" PRD #1 had identified.

- Fundamental Science – universities conducted most basic research for the DOD, and the Office of Naval Research (ONR), Air Force Office of Scientific Research (AFOSR), and Army Research Office (ARO) managed most of the funds.
- National Security – labs supported the full range of military needs, including areas not provocative or lucrative enough to interest academia or industry.
- Technologies that Contribute to Competitive Performance – technology transfer offices at all technical centers offered one example of developing dual-use or spin-off potential from the earliest stages of RDT&E.[88] Also, in certain business sectors – civil engineering, aeronautics, shipbuilding – the labs directly contributed to the national economy.
- Environmental Protection and Cleanup – labs now considered social, economic, and environmental impacts from the earliest stages of applied research.
- Space Exploration – one example of interagency coordination included the NASA/DOD Space Technology Integration Group (STIG).

Of the nine "Issues to Consider" identified in PRD #1 (Comparative Advantages, Methods of Selecting Performers, Missions, Methods for Selecting and Re-orienting Research Areas, Quality and Performance Evaluation, Restructuring Opportunities, Alternative Management and Funding Options, Relations Between Parent Agencies and Laboratories, Work for Others), the memo relegated eight to a subset of the third: missions. "All DOD labs have very clearly stated national security missions….Decisions on their size, facilities, tasks, and funding are based solely on these missions. Other laboratory activities are secondary." Therefore the response addressed national security at length, and then briefly discussed "the comparative advantages [in the other issues to consider] that result from…national security work."(13)

The report also noted the fiscal and cultural changes in the three years since the Federal Advisory Commission's (FAC) study of defense labs. Appropriations for S&T were expected to decline, and industrial IR&D had decreased about 80 percent from its late 1980s peak. These reductions, combined with new environmental and economic responsibilities, signaled a cut of up to 50 percent (by FY 1997) of S&T funding that directly supported warfighting. Likewise, acquisition reform, personnel reductions, and BRACs compelled the labs to remodel their business practices, yet regulatory constraints hampered their flexibility to do so.

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[88]Dual-use or spin-off means something originally developed for military use that acquires commercial/civilian applications.

Nonetheless, the report emphasized, DOD needed a laboratory system for many reasons. The Interim Response cited the LIC study but phrased the justifications differently:

- Translation – "technological expertise and the ability to translate (in both directions) between warfighters' needs and technological opportunity is an essential in-house skill. This translation is a life's work that must be nurtured with facilities, intellectual challenge, and opportunity for reward and advancement."(15)
- Integration – across myriad technologies, across the life cycle, across numerous types of equipment, and across many performers and contractors. Although Program Offices might be able to do all this through contracts, the labs "are a convenient way to organize and provide facilities for this talent base."(16).
- Rapid Response
- Non-competitive interchange (honest broker)
- Safety and surety
- Support to acquisition – acquisition managers typically have sparse technical staffs.
- Supplementary capacity – including surge/supply requirements, physical security, special facilities, and environmental or safety risks industry will not take.

Of the other eight Issues to Consider, the Interim Response focused most on the Comparative Advantages (and disadvantages) of in-house labs, industry, academia, Federally Funded Research and Development Centers (FFRDCs), and other agency labs. It commented that from a purely technical standpoint, most work could be outsourced. The labs' primary competitive advantage, then, was identification with the customer and warfighter – a characteristic that also justified having Service rather than "purple" (DOD) labs. Other advantages included corporate memory, special facilities, full-spectrum capabilities – which helped streamline management because fewer organizations became involved – and "willingness and ability to perform long term, low payoff but nonetheless military essential R&D."(18). Disadvantages included: burdensome regulations; limits on directors' authority, which would worsen with the severe hiring restrictions; difficulties in abandoning facilities and programs and a potential bias toward in-house solutions, both of which mitigated the honest broker/smart buyer roles.

Industry, academia, FFRDCs, and other agency labs carried their own competitive advantages. The report listed 14 for industry, including a willingness to complete projects, a motivation to invest in products with dual-use potential, and an ability to provide technology and products sometimes far ahead of government capabilities. One advantage of academia (well understood by basement-dwelling graduate students) was that "Universities are an excellent source of cheap smart labor with new ideas (i.e., students), who make the latest knowledge readily accessible to DOD."(20). FFRDCs could perform inherently governmen-

tal functions but enjoyed more personnel flexibilities than GOGOs, and other agency labs possessed unique skills and facilities.

Finally, the memo spent less time on the other eight Issues to Consider but did address a number of salient points. Regarding evaluation, DDR&E planned to implement the GPRA for all labs via a pilot program by the end of FY 1995. As for alternative management, each Service had determined that restrictions and conversion costs rendered conversion to GOCOs infeasible. Also, each Service was trying to eliminate "managerial hierarchies."(27) At the far end of that spectrum, the Naval Air Systems Command (NAVAIR) "wipes out the individual laboratory commands and integrates their personnel directly into a competency-aligned parent organization."(27)

The DOD Response

In February 1995 DDR&E published the main body of its final report, the **DOD Response to NSTC PRD#1**. Noting that DOD would be implementing proposals from BRAC 95, the DSB study on lab management, and the upcoming report by the Commission on Roles and Missions of the Armed Forces, DDR&E published a descriptive survey rather than a set of recommendations. At over 500 pages, the report focused on S&T modernization, organization, and management. Along with the LIC study, Interim Response, BRAC 95 addendum, and also a CNA report issued a few months earlier, the survey provided a comprehensive overview of DOD laboratory management in the immediate post-Cold War era.[89]

Although the report did not use the term "revolution in business affairs," it did phrase the labs' challenges similarly: they must nurture the ability to exploit commercial technologies and remain smart buyers while downsizing, reducing budgets, and helping reform acquisition. As "more and more of the critical technology…is derived by exploiting marketplace driven commercial advances," the labs "basically act as interpreters and integrators [as opposed to producers]. They connect technology to need under the direction of acquisition managers, and help those managers make smart decisions." The report described current reform efforts: integrating operations through the conjunction of S&T, T&E, and logistics; increasing Cross-Service planning and local lab director authority; instituting a SECDEF "full court press" to "eliminate debilitating directives and specifications;" beginning "Extensive experimentation" in modernization; increasing cooperation with academia and industry; and revising the Civil Service system for "reinvention" labs.(4-5)[90]

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[89]DDR&E, "DOD Response to NSTC/PRD #1, Presidential Review Directive on an Interagency Review of Federal Laboratories" (February 1995). Most of those 500 pages are appendices. The main text is 75 (single-spaced) pages. Center for Naval Analyses, "Historical Trends in Navy RDT&E, Tech Centers, and Warfare Centers" (October 1994).

[90]Reinvention laboratories are discussed briefly Chapter 5.

Paul G. Gaffney II (retired Vice Admiral) served as NRL's Commanding Officer from 1991 to 1994, as the Chief of Naval Research from 1996 to 2000, and as President of the National Defense University. He is currently the President of Monmouth University.

One major section described S&T organization and management. Each Service followed four basic management principles: organizing infrastructure with a systems approach to product lines (meaning that labs and T&E and logistics centers were subordinate to and often collocated with associated product elements of materiel commands); and attempting to minimize infrastructure, adapt best management practices to each product line, and provide sufficient authority for directors. This section also overviewed the 31 Reliance technology taxonomies, the FFRDCs and University labs, the Planning, Programming and Budgeting System (PPBS)/POM process for planning and selecting performers, and the Joint Mission Area/Support Area (JMA/SA) process for establishing requirements. It explained ONR's management of funds in relation to the SYSCOMs, Program Executive Officers (PEOs), Navy Science Assistance Program (NSAP),[91] and ILIR. ILIR explores "topics of exceptional promise" and "develop[s] a cadre of experienced researchers that will be available to the Navy for making intelligent decisions about future research ends."(22)[92] While NRL carried out most of its 6.1 research in house, the warfare centers were the "key execution agents"(22) of 6.2 and also key players in 6.3.

This section also discussed evaluation and planning/coordination. It mentioned the Research Advisory board under the National Research Council (NRC) for each Service, the Naval Research Advisory Committee, and ONR's

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[91]The Navy RDT&E Management Archives at the Naval Historical Center has the complete records (approximately 50 cubic feet) of the Vietnam Laboratory Assistance/Navy Science Assistance Program (VLAP/NSAP).

[92]See Kavetsky et al., *From Science to Seapower*, 28-36.

Integrated Program Reviews and Technical Reviews. In 1994 DDR&E began issuing the Defense Technology Plan (DTP) and Technology Area Plans (TAPs).[93] Designed for "completeness, or sharpened skills across the full range of military operations," these plans sought to connect S&T to overall acquisition. DTPs promulgated "what" S&T to pursue; TAPs developed strategy, or "how" to pursue it. "Each TAP extrapolates from current state of the art and provides a roadmap of quantifiable and achievable objectives vs. time." Technology Area Reviews and Assessments (TARAs) then used TAPs to determine resource allocation. The third element – the "where" to invest – involved the in-house-versus-contracting decision. Overall, this DDR&E-led process would replace the Service-specific steps for developing the S&T elements of POMs.(37-38)

A second major section of DOD's final response to NSTC PRD#1 reviewed modernization. Four premises directed these efforts:

- the labs had well defined, unaltered missions and functions
- they must remain within their respective Services
- the infrastructure – people, facilities, and equipment – must be of the highest quality
- investments must focus on core capabilities and maximize the abilities of partners.

The report discussed how the Services had consolidated along product lines and across life-cycle functions. It also reviewed recent GOCO studies, the "notoriously difficult"(44) efforts to establish metrics for R&D, and the plan to follow DSB's recommendation for implementing the GPRA.

Other important modernization issues included personnel reductions, the LDP, and outsourcing partnerships. First, although personnel reductions remained necessary, regulations prevented hiring young people, and further, "quality plays no real role in the process."(46) Second, the legislative plans for the LDP had never reached fruition, and DMRD-based consolidation of support functions eroded much of the authority directors had gained (DOD attempted to solve these problems through President Clinton's "Reinvention Laboratory" initiative and LQIP, discussed in Chapter Five). Finally, the survey discussed developing cooperative relationships with industry and academia. Traditionally, the labs considered themselves "in the technically and managerially dominant position."(50) Their desire to insure proper oversight, combined with restrictive regulations, created a competitive environment. In CRADAs, one of various efforts to change this, lab directors partnered with industry to develop a technology. Industry would commercialize the results, and, along with the labs, retain some royalties.

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[93]As mentioned, the RDT&E Management Archives at the Naval Historical Center houses approximately 50 cubic feet of JDL records, including edited drafts, correspondence, and other material related to generating the DTPs, TARAs, and TAPs.

Some of the many instructive appendices in the report include: RDT&E budget category performers, funding by category, outsourcing ratios, and lab organizational structures; FFRDCs; Service modernization efforts; Architecture/ Engineering and Construction (A/E&C) Industry R&D Partnership; laboratory basic research examples; environmental quality capabilities; military aeronautics; consolidation/realignment lessons learned; NAVAIR's competency-aligned organization; ARL Federated Lab; GPRA guidelines for lab criteria; lab personnel levels; and LQIP.

The BRAC 95 Addendum

As the final step in DOD's response to NSTC/PRD #1, DDR&E issued its brief **BRAC 95 Addendum** on April 3.[94] The report explained the Laboratory Joint Cross Service Group's (LJCSG) use of "common support functions" (CSFs) as an analytical rubric. DDR&E agreed with GAO's assessment (issued two weeks later) of BRAC 95, admitting that the LJCSG recommendations "will achieve little toward the goal of cross-servicing."(10) Appendices provided CSF definitions, detailed explanations of LJCSG recommendations, workload and budget trends, and changes in the acquisition structure of each Service during the last decade.

About half of the report explained the workings of the LCSG. The group identified 29 CSFs, or "lab functions important to and performed by at least two of the three Military Departments."(3) It divided these into "Pervasive" (S&T only) and "Product" CSFs. "The assumption was that the output of this [pervasive] work flowed into ED [exploratory development] and ISE [in-service engineering] in Product CSFs."(3) The group analyzed data calls based on a computer program that scored results according to functional capacity (maximum workload capacity), functional requirements (actual workload), and functional value.

The second half of the report basically explained why the process failed. For one, regardless of how many instructions respondents received, they still construed the data calls to their advantage. The CSF approach caused more problems, because it reviewed 90 percent of Air Force activities, but only 70 percent of the Army's and 40 percent of the Navy's. Similarly, the approach captured only portions of many activities. As would GAO, the report concluded that breaking down work into small units or specific functions "cut much too fine, and led to recommendations for work shifts that were well below the level required to support closure or even major realignment decisions."(8) Finally, the Military Departments simply considered the LJCSG recommendations costly and unsupportive of their objectives. The report did note, however, the successful formation of the tri-Service Armed Forces Medical Research and Development Agency.[95]

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[94]DDR&E, "BRAC 95 Addendum to Department of Defense Response to NSTC/PRD #1" (April 3, 1995).

[95]See also Dorman, "BRAC 95 Lessons Learned."

The Office of Science and Technology Policy (OSTP) Final Report

On May 15, 1995, as the last step in responding to NSTC PRD#1, the OSTP released the **Interagency Federal Laboratory Review**.[96] Ironically, for an effort touting inter-Service and interagency coordination, the report essentially cut and pasted DOE's, NASA's, and DOD's separate conclusions into a single document. It also explained some of the more intransigent barriers to reform. The Cover Letter from President Clinton highlighted four guidelines for reform: rescinding unnecessary instructions, regulations, and oversight mechanisms; reducing redundancy by restructuring and clarifying missions; streamlining management and then eliminating programs of lower priority; and increasing interagency and inter-Service coordination.

The review listed many difficulties impeding laboratory reform. These included agency-level management flaws, environmental cleanup costs, a continuing need for downsizing and restructuring, and inflexible Civil Service rules that exacerbated the problem of maintaining staff quality while downsizing. Other barriers included insufficient joint planning across agencies and insufficient cross-Service integration.

OSTP offered recommendations in management/redundancy, modernization, basic and applied research, and environment. Although it deemed DOD lab management "generally effective,"(9) the review noted missed opportunities for cross-Service integration in biomedical R&D, energetics, C4I, and aircraft, air-to-air, and air-to-ground weapons. And, as staff cuts continued, meeting mission requirements might very well hinge on the efficiencies created through integration. To deal with this experience drain, Congress had removed time limits on China Lake-type demos. Certain labs had planned on developing flexible personnel management plans and also basing Reductions in Force (RIFs) on performance rather than seniority. Recommendations for modernization dealt primarily with DOE and nuclear capabilities. Finally, regarding basic and applied research, the review proposed eliminating any programs the agencies could not support after streamlining management.[97]

Defense Conversion

Another, related initiative received considerable attention during this time but will not be discussed at length here: defense conversion. Briefly, defense conversion means transitioning personnel (both public and private) and resources to non-defense-related work. Part of the post-Cold War drawdown and peace dividend, it applied particularly to the third of the Five Areas of National Need outlined in PRD #1 – Technologies that Contribute to Competitive Performance. This push to advance industrial competitiveness by redirecting R&D to civilian or dual-use purposes fit with the efforts to reduce infrastructure through

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[96]OSTP, "Interagency Federal Laboratory Review Final Report" (May 15, 1995).

[97]See also, OSTP, "Status of Federal Laboratory Reforms: The Report of the Executive Office of the President Working Group on the Implementation of Presidential Decision Directive PDD/NSTC-5, *Guidelines for Federal Laboratory Reform*" (March 1997).

commercialization. The endeavor produced a multitude of studies and reports. OTA's **After the Cold War** and **Defense Conversion**, and the Naval Research Advisory Committee's **Defense Conversion** provide good overviews. Also, Jacques Gansler, USD for Acquisition, Technology, and Logistics during President Clinton's second term, published ***Defense Conversion: Transforming the Arsenal of Democracy***.

The Commission on Roles and Missions of the Armed Forces (CORM)

The push for outsourcing R&D regained momentum with the major report **Directions for Defense**, by the Commission on Roles and Missions of the Armed Forces (CORM).[98] Established by Congress, the 10-member Commission gathered information from Service, DOD, government, industry, and intelligentsia representatives. Its "central message" was that "every DOD element must focus on supporting the operations of the Unified Commanders in Chief (CINCs)."(ES-1) "Military operations," the report continued, "are planned and conducted by joint forces under the direction of the CINCs, not by the Military Services, defense agencies, or Pentagon staffs."(ES-2) In fact, the Commission believed most DOD problems stemmed from this underlying lack of focus. It grouped recommendations into three categories: Unified Military Operations, Productive and Responsive Support, and Improved Management and Direction. Of the five general goals, the most important in relation to the labs was the desire to "reduce the cost of the support infrastructure through increased outsourcing and better management."(ES-3)

Asserting that "there are major opportunities to reduce the cost of DOD's infrastructure while enhancing its effectiveness,"(3-1) the Commission discussed outsourcing and "reengineering" and expressed the central argument for shifting more work to the private sector. This argument derived from two related assumptions. One was the belief that in general, a private sector responsive to competitive market forces simply worked more effectively. Since the 1950s, this assertion has periodically motivated increased contracting in the lab community and is discussed in the next chapter. The second assumption interpreted recent American business practices as a dynamic restructuring to create a cost-effective and agile infrastructure. Proponents of outsourcing defense R&D argued that archaic laws, regulations, and even habits accumulated during the Cold War era weighed down the technical centers, causing them to lag behind the private sector in both technology development and management techniques. Divesting them of work and adopting new management principles for the tasks that remained would alleviate these problems.

The Commission offered numerous proposals on reengineering the activities that would remain in-house. It recommended adopting private sector practices such as activity-based cost accounting, and asked Congress to provide legislative relief from relevant impediments. Specific proposals focused on aircraft

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[98]Commission on Roles and Missions of the Armed Forces, "Directions for Defense" (May 24, 1995).

support, contract audit and oversight functions, personnel restrictions, collocation and inter-Service consolidation, Federal Acquisition Regulations (FARs), and consolidation of the Defense Contract Management Command (DCMC) and Defense Contract Audit Agency (DCAA).

CORM and Outsourcing Commercial Activities

Along with many other studies written during this time, the Commission's recommendations for outsourcing focused largely on commercial activities, or CA. Most simply, commercial activities provide goods or services generally available from the private sector. In early 1995 DOD had noted that some 250,000 of its civilian employees performed such work.[99] CA categories include education/training; social, installation, and health services; data processing; equipment, base, and real property maintenance; product manufacturing; and, most important for the discussion here, RDT&E "support."

OMB Circular A-76 contains the basic rules that govern CA contracting.[100] The first version appeared in 1966, modifying guidelines from the Bureau of the Budget (OMB's predecessor). The Bureau's policy, based on the principle that the government should not compete with the private sector in providing goods and services, had directed agencies to use commercial sources of supply. A-76 introduced competition into the process, directing that agencies perform public/private comparisons in situations in which savings might result from the government providing for its own needs. In other words, OMB sought to generate savings by granting a mechanism for government agencies to compete on a relatively level playing field for CA work. The Circular was modified in 1967, 1976, 1977, and 1979, and the last revision included a detailed cost-comparison handbook for implementing competitions. It explicitly focused on routine work that could be specified in advance and for which performance criteria could be established.

A-76 specifically exempted R&D. First, much R&D work, especially in DOD, is considered "inherently governmental" and cannot be contracted out by any means. Further, A-76 in particular exempted R&D because, unlike most commercial activities, it cannot be captured in a set of circumscribed specifications and criteria, and it requires high-level, specialized training.

Over time however, modifications changed the exemption. The 1979 revision proposed subjecting "non-core" R&D to competition and exempting inherently governmental, "core" R&D. Several agencies, and especially DOD and Congress, objected. In its report on the FY 1979 NDAA, the House Armed Services Committee wrote that "the present industry/government arrangement allows the laboratories to determine the percentage…to be contracted out and

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[99]DOD, "Report on the Performance of DOD Commercial Activities" (January 1995).

[100]The following discussion derives from Michael Marshall, "Outsourcing Commercial Activities as a Source of Infrastructure Savings: Are the Savings Claims Justified?" (January 1996), discussed in the next chapter, and Marshall, "Exemption of R&D from Application of OMB Circular A-76: A Historical Perspective" (February 7, 1997; updated September 15, 2000).

is working well." R&D therefore should not "be procured in the same manner as commercial and industrial type functions." Nonetheless, OMB continued to push for incorporating some R&D within the scope of A-76, and in the FY 1980 NDAA, Congress allowed that "those [R&D] support activities…more structured in nature, such as facility and equipment maintenance," could be included. Clearly, Congress meant routine, continuing work easily described in a contract (or "performance work statement" in the Circular's jargon).[101] This language formed the basis for the subsequent "RDT&E support" category OMB incorporated into A-76.

Ultimately, the ambiguity that resulted from trying to settle this question led to continued efforts either to throw out the R&D exemption or to expand the concept of "non-core" or "R&D support."[102] The technological changes driving the Revolution in Business Affairs (RBA) helped initiate this impetus. For example, while CAs typically refer to low skill-level work, they also describe any work for which a significant commercial industry exists. IT, therefore, could be considered a commercial activity. And by the mid-1990s it at least appeared that DOD clearly lagged behind the private sector in this key area.[103]

CORM and others believed such developments justified expanding the category of RDT&E support – some would argue well beyond its intended purposes – or even doing away with A-76. The Commission argued that the "primary path to more efficient support is through 'meaningful competition,' which typically lowers costs by 20 percent for the types of commercial activities that DOD routinely reports to Congress…."(3-2)[104] These savings amounted to about $3 billion per year to spend on priorities such as modernization. Acknowledging that DOD managers typically disagree with such estimates, the Commission pointed to "the continuing growth of outsourcing in the private sector."(3-5). It also claimed that "the results of academic studies provide clear evidence that such concerns are usually misplaced."(3-5) No studies were cited.[105]

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[101]House Conference Report No. 96-546, October 23, 1979. See also Mike Marshall and Eric Hazell, "Contracting Out: A Cycling of Attitudes" (unpublished paper, October 1997), 10.

[102]For a discussion of applying the concept of core competence to S&T corporate strategy, and a discussion of the implementation of core competency methodology at Sandia National Laboratories, see Mike Marshall and Dean Snyder, "Core Competence: A Basis for Corporate Strategy in a Changing Defense Environment" (briefing, October 27, 1993).

[103]Analysts often cite Information Technology to illustrate how DOD has become a technology "follower." Certainly, the private sector leads in *developing* and *producing* advanced IT products. But this "mining" stage the electronics industry exploits has in part been driven by a prior "prospecting" – or *research* – stage. Some DOD organizations, such as NRL, perform the high-risk, long-term IT prospecting that does not interest the private sector. Both types of work are typically referred to as "research." A policy maker unaware of the distinctions could easily assume the government's IT "research" is pedestrian compared to industry's "research." See Timothy Coffey et al., "The S&T Innovation Conundrum" (August 2005).

[104]"Meaningful competition" means a market situation that includes a significant number of buyers and sellers.

[105]Savings claims regarding outsourcing are discussed in Chapter 4.

The Commission mentioned other objections to outsourcing. One was an asserted right of government employees to compete for government work. This unfortunately had "evolved into a rigid requirement for detailed and lengthy cost-based justification before outsourcing," was "inconsistent with the basic policy preference for private enterprise," and stifled both initiative and streamlining efforts.(3-5) As discussed in the next chapter, other analysts also noted the cumbersome A-76 competitive process but believed it better than other feasible alternatives. CORM mentioned a second objection to outsourcing. Some managers considered contract support unreliable, but "our research" suggested otherwise.

The Commission therefore asserted that "The Secretary should direct outsourcing of existing commercial-type support activities and all new support requirements…."(3-5) OMB should withdraw Circular A-76, and Congress should repeal all laws preventing commercial firms from providing logistics support to new weapons systems. Finally, DOD should privatize all depot maintenance, wholesale-level warehousing and distribution, property control, medical care, family housing, finance and accounting, data center operations, and education and training.

The Center for Naval Analyses on Outsourcing

The CNA also advocated outsourcing – sort of – in a late 1994 **Examination of Tech Centers** briefing to a Navy Steering Committee and in a more formal study published in April 1996.[106] The briefing addressed size and efficiency. It concluded that the technical centers had in fact shrunk, meaning their workload and employment levels had decreased relative to their business base more quickly than in past drawdowns. Next, acknowledging the difficulties – indeed the virtual impossibility – of answering such questions, CNA nevertheless also sought to determine whether the centers' efficiency had changed over time and whether outsourcing and other initiatives might help.

After attempting to gauge efficiency, CNA in effect threw up its hands: because output cannot be measured, "The truth is that it is hard to tell if the centers are efficient."(27) The competitive process of the Defense Business Operations Fund (DBOF), whereby customers chose whether any of various tech centers or private companies performed a given task, "promotes efficiencies and product quality."(27) A recent decline in expenditures per employee also indicated efficiency. However, certain problems existed. DBOF, for example, promoted inefficiency by failing both to offer incentives for saving money and to calculate the true costs of work.[107] And facilitization, or the amount of facilities needed to do work, posed a seemingly larger problem, as it had apparently increased.

CNA's brief set of recommendations focused on DBOF, outsourcing, and consolidation. It proposed that the Navy either change cost calculations or

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[106]Center for Naval Analyses, "CNA's Examination of Tech Centers" (October 1994), and "Outsourcing Opportunities for the Navy" (April 1996).

[107]An overview of the Navy's industrial funding system is in Appendix B and Chapter 5.

remove the tech centers from DBOF. Second, acknowledging a lack of data, it guessed that further consolidation could save about 10 percent. And finally, it recommended increased outsourcing, noting that although all direct evidence addressed only non-technical staff, indirect evidence suggested savings would result from outsourcing technical staff as well.

The Center more forcefully advocated outsourcing – again, sort of – in its April 1996 report on **Outsourcing Opportunities**. On one hand the report encouraged increasing contracting in both commercial activities and military functions, as well as redefining certain RDT&E or inherently governmental functions as commercial activities. On the other hand, it acknowledged that competition itself, and not outsourcing per se, actually generated savings. In fact, in-house organizations "won" competitions about half the time (although on average saved less than the private sector). Examining Naval Undersea Warfare Center (NUWC) Keyport, Washington as a case study, CNA concluded that willingness to outsource in large part determined the extent of opportunity.

Primarily, the study described the potential savings derived from competition, especially regarding commercial activities. Competition told customers exactly what they paid, and offered more alternatives, flexibility, and access to new technologies and managerial innovations. The report noted that RDT&E outsourcing had already increased from 30 percent in 1970 to 50 percent in the mid-1990s but then acknowledged that currently, DOD used the term primarily in relation to CAs. And although the Navy outsourced, to varying degrees at various facilities, all CA categories, CNA claimed the Service could save up to an additional $3 billion per year if all such activities "were competed entirely."(2) Analyzing the 900 competitions conducted in the Navy since 1978, the report determined that costs were reduced by an average of 30 – 40 percent when commercial firms performed the work and by 20 percent when the work remained in-house.

CNA also discussed lessons learned from outsourcing at NUWC Keyport. NUWC had grown from its origins as a torpedo design and test facility to include testing and evaluation of undersea warfare weapons, life-cycle support for Fleet-deployed systems, and support for materiel readiness. As an RDT&E facility, NUWC was not a commercial activity. However, CNA called RDT&E a "soft," or vaguely defined, category, which meant managers could often choose whether to classify work as commercial or governmental. In short, CNA argued that willingness to reinterpret rules rather than the rules themselves determined the level of outsourcing.

A second, related issue arose: managers, happy to contract for functions such as public works or temporary technical work, resisted outsourcing long-term RDT&E. For one, NUWC considered many such functions "integral to its technological leadership."(47) Also, technical work often developed in unforeseen directions, meaning it did not always lend itself to contract specifications. Likewise, NUWC already did outsource short-term, specialized RDT&E when the task could be captured in a contract. It did so precisely because the outsourcing saved money. To adapt to these and other concerns about further decreasing in-house work, CNA recommended allowing retention of some of the money

An NUWC Keyport Range employee brings an ADCAP Mark 48 Torpedo on deck after test firing at the Northwest Range Complex Dabob Bay Range. Photo courtesy of NUWC, Keyport.

saved from outsourcing, ensuring standardized procedures for writing enforceable contracts, and permitting consideration of past performance when dealing with high-risk bidders.

Again, part of the debate here arose from the A-76 exemption of R&D. In 1979, in trying to distinguish core from non-core R&D, OMB had proposed that criteria be developed for defining commercial versus governmental. A subsequent study by the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) recommended that R&D activities prepare management plans designed to differentiate. DOD disagreed, arguing, as mentioned, that all R&D should be exempted from A-76 cost studies, which in fact happened. The CNA report illustrates how outsourcing advocates in the 1990s turned to narrowing the definition of RDT&E while broadening that of commercial RDT&E or RDT&E support.[108]

Although CNA stated that competition rather than outsourcing itself facilitated efficiency, and although it did not advocate outsourcing as a panacea for inefficiency, it nonetheless clearly favored contracting. For one, it rejected the claim that some sensitive (e.g. cryptology) or military (e.g. recruiting) activities must remain in-house. Further, it commented that every revision to OMB A-76 had hindered rather than facilitated outsourcing. It also recommended reconsidering all functions deemed inherently governmental. And its argument that the terms "RDT&E" and "commercial" depended chiefly on tactics of definition meant the Navy could define almost anything as commercial, which in turn meant a technical center could outsource almost anything it wanted.

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[108]Carlisle, *Management of the U.S. Navy Research and Development Centers*, 66, and Marshall, "Outsourcing Commercial Activities."

The DSB's Unqualified Advocacy of Outsourcing

After its 1994 report on lab management, DSB intensified its advocacy of contracting in a series of statements beginning with its 1996 report on **Outsourcing and Privatization**.[109] Chaired by Philip O'Deen of BDM International and composed primarily of members from the private sector, the task force unsurprisingly urged "a broader, more aggressive outsourcing effort," estimating that DOD could save 30 to 40 percent in specific tasks and $10 billion per year overall by 2002. Arguing that outsourcing improved service and responsiveness, access to technology, and focus on core competencies, the group recommended that "all DOD support functions should be contracted out to private vendors except those functions that are inherently governmental, are directly involved in warfighting, or for which no adequate private sector capability exists or can be expected to be established."(Cover memo)

As had various other reports, DSB explained the basic argument for increased contracting. While procurement/modernization spending had plummeted, infrastructure spending remained huge. Outsourcing would help redress the imbalance by "rightsizing" the support structure. The Board also noted the principle that the government should not compete for work with citizens.

DSB described the many benefits the private sector had gained from outsourcing. First utilized to reduce costs, the practice had become a key competitive strategy, allowing companies to focus on core competencies, providing them access to a wider variety of technologies and innovative practices, and improving responsiveness and quality. DOD could utilize the many service companies that had arisen in response to this trend. Interestingly, the report cited a survey concerning IT, the largest outsourcing market. DSB glowingly noted that no company considered contracting for IT a failure: 38 percent considered it successful and 29 percent reported mixed results (the other 30 percent had not had time to evaluate). However, extrapolating the survey answers indicates that some 43 percent would have reported mixed results, and this in an area of outsourcing's greatest success.

The Board also examined lessons learned from private sector outsourcing in business logistics, business services, and commercial airline maintenance.

1. Top-level management must aggressively pursue efforts, because mid-level managers tend to resist.
2. Contracting should focus on broad functions rather than narrow tasks.
3. The process requires a small, skilled oversight cadre who cooperate rather than compete with vendors.
4. Task descriptions should emphasize performance standards rather than product specifications.
5. Because disagreements between firms and providers most often arise over the scope of work, both parties, the report noted sagely, need to avoid any misunderstanding.

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[109]DSB, "Outsourcing and Privatization" (August 1996). Despite its title, the report focused on outsourcing.

The task force believed hundreds of thousands of DOD employees engaged in work more appropriate for the private sector. At a minimum, 850,000 full-time equivalents (FTEs) performed commercial activities, including only 210,000 contractors. Despite this relatively small percentage of contractors and various problems encountered with attempting to outsource, since 1978 DOD had saved some $1.5 billion a year when it subjected tasks to public/private competition under the rules of A-76. In 2,000 such competitions, the private sector won half but accounted for 78 percent of the savings. Outsourcing functions that military personnel traditionally performed saved 50 percent on average.

The report lamented the impediments preventing DOD from exploiting these opportunities. A-76 especially caused problems. Time consuming and biased toward the government, it required "exhaustive public/private cost comparisons before outsourcing…."(12A) In practice, the Board stated, A-76 meant the government should perform work absent a compelling reason not to. These and other statutory impediments indicated increasing congressional micromanagement. Further, poor government cost data prevented accurate estimates on government bids. Also, DOD or the Services had arbitrarily restricted the percentage of work contracted out in certain functions considered "core support." And base commanders wanted to keep their staff, doubted that savings would ultimately fund modernization, and believed the whole buzz was simply the latest fad.

DSB therefore offered a host of recommendations to overcome these obstructions. Many involved easing the process of contracting. For example, it proposed that DOD end the "stovepipe" approach to base support contracting and consolidate all installation support functions into single contracts, a practice called bundling.[110] It recommended activity-based costing to provide more accurate estimates of in-house work. It suggested logistical changes in Materiel Management, Depot Maintenance, and Sustaining Engineering, and increased contracting for commissaries, data centers, finance/accounting, training, and health care. It also recommended establishing a high-level "Tiger Team" to find methods for improving contracting procedures.

Primarily, the task force broadly recommended shifting work to the private sector whenever possible. It urged the following: OSD should reiterate the preference for private sector performance and limit the definition of inherently governmental to formulating policy, generating requirements, managing contracts, planning, and preparing budgets. Executives should reverse the bias in A-76, meaning DOD would have to provide a compelling reason to perform a function in house. Officials should exercise every available waiver in order to avoid extensive, unfair competitions. SECDEF should prioritize removing all statutory

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[110]In the DSB report, stove piping referred to hiring a range of contractors to perform narrow jobs, such as lawn maintenance. This required inordinate attention to contract management oversight and coordination. Discussed in Chapter 5, stove piping also refers to a situation in which a large activity (such as RDT&E at a Warfare Center) manages its own primary mission functions, but separate commands or activities centrally manage and/or provide the individual support functions.

impediments and establish a top-level position devoted to outsourcing. DOD should institute "top-down" policies to remove the government completely from certain businesses or functions (such as warehousing or distribution). Activities should get to keep some of the savings they realize from contracting, and DOD must apply the rest to modernization.

In other reports issued during the next few years, DSB reiterated its message of funding modernization with the money saved through outsourcing. In **Achieving an Innovative Support Structure for 21st Century Military Superiority**, for example, it virtually recommended that DOD no longer maintain a laboratory system.[111] The Board asserted that outsourcing and privatization would focus DOD on warfighting and policy, and the private sector on commercial type support. Expressed in the trendy terms of the day, this meant each community would be "leveraging its core competencies" while DOD utilized the "best practices" of industry. (Cover memos) The Board offered two general recommendations, estimated to save $30 billion per year: that DOD restructure its support system, using modern IT and business management principles and maximizing use of the private sector; and that it institute a planning and budgeting process more directly involving the CINCs and thereby better aligning resources with mission requirements.

In effect, DSB rejected every major report ever issued on DOD RDT&E and proposed discontinuing the system. The Services had developed plans for improving the T&E infrastructure and cutting its work force by 39 percent, but, the Board asserted, changes such as privatizing-in-place and increased modeling and simulation could yield more improvements. DSB believed similar process changes could improve the labs as well, even though Section 277 of the FY 1996 NDAA (discussed below) called for a five-year plan to cut infrastructure by 20 percent in addition to BRAC 95, and even though DOD planned an additional 16 percent civilian personnel reduction. The study recommended outsourcing all 6.1 work to universities and the majority of 6.2 and 6.3 work to industry, and privatizing any remaining facilities. It suggested that DOD consider simply privatizing all labs, as NAWC Indianapolis had done while maintaining a world-class facility.

In **Defense Science and Technology Base for the 21st Century**, DSB advocated short-term hiring of academic, non-profit, and industry S&Es to improve laboratory performance.[112] This task force – composed exclusively of representatives from industry, academia, and FFRDCs – proposed that the Services "staff a majority of their S&T…positions with individuals provided from the private sector…."(Cover memo). Specifically, the Board addressed "revolutionary" (long-term) programs, funding, management, execution, and hiring and retention.

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[111]DSB, "Achieving an Innovative Support Structure for 21st Century Military Superiority: Higher Performance at Lower Costs" (November 1996).

[112]DSB, "Defense Science and Technology Base for the 21st Century" (June 30, 1998).

The report pointed out how recent developments had created problems for defense S&T. For one, industry had shifted toward short-term, incremental market advances, meaning DOD would have to compensate by focusing on long-term 6.2 and 6.3 development. Further, globalization "leaked" private sector technology advances to other countries, and therefore "the primary investment applicable to providing unique U.S. military future capabilities must come from the DOD S&T component."(15) In addition, research funding had decreased while its importance had increased, and every member of the task force and every company, university, and agency consulted agreed on the importance of funding stability. In sum, "Lower levels of funding could threaten future (20 years and beyond) dominance of U.S. military forces."(22) The Board recommended increasing S&T funding from $7.4 billion per year to at least $8 billion.

DSB also discussed problems in managing S&T. The numerous, complicated lines of authority contrasted with industry's streamlined management. The cancellation of Public Law 313 in 1978 (with the establishment of the Civil Service Reform Act) meant R&D organizations could no longer recruit outstanding personnel from the private sector for limited terms. Service S&T budgets had shrunk while OSD's and Defense agencies' had increased, a trend that signaled two particular difficulties: budgets had decreased in part because of a shift in emphasis to short-term development, and a transition difficulty had arisen because, while a clear line from research to acquisition existed in the Services, it did not in OSD or in, say, DARPA. To remedy these problems, DSB recommended that Congress reinstate P.L. 313, that the Services devote one-third of Technology Base efforts to long-term programs, that they follow ONR's integration of S&T management structures, and that DDR&E increase its responsibility for transition by assuming more oversight of 6.4 and 6.5.

Finally, the task force examined the reasons for dissatisfaction with DOD's in-house laboratories. While competitive salaries, the ability to fire poor performers, modern facilities, adequate support staff, and collocation of similar work enabled success at private sector or university labs, DOD labs, conversely, suffered from an inflexible personnel system, outdated facilities, and poor support, and were geographically dispersed. Downsizing had exacerbated these problems – executed in a way that prevented new hires and prioritized seniority, it "aged" the labs.[113]

DSB proposed two general solutions. One, already mentioned, was to reestablish P. L. 313. Second, the Board considered three alternatives – amending the personnel system, converting to GOCOs, or establishing "mixed" organizations headed by the government but staffed by private sector employees who would rotate every five years or so. It recommended the third option, or using contractors and Intergovernmental Personnel Act (IPA) hires to staff at least 50 percent of the labs. The Board did not address the possible effect of all this rotation on the long-term (10- to 20-year), "revolutionary" technology it advocated.

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[113]For a thorough discussion of personnel hiring and retention problems in the DOD labs, see Kavetsky et al., *From Science to Seapower* and Marshall, "Best and Brightest."

DSB used the same approach to submit similar recommendations in **Technology Capabilities of Non-DOD Providers**.[114] Part of a response to a congressional instruction to streamline S&T and acquisition organizations,[115] the task force – again composed primarily of people from private industry and without a single GOGO representative – urged increased utilization of the private sector. Its four overall recommendations included the following:

1. The USD for Advanced Technology and Logistics (AT&L) should establish an Office of Global Technology Acquisition
2. 50 percent of labs' staff should come from the private sector
3. The Services should increase by 30 percent the funding to universities for long-term research
4. SECDEF and the JCS should initiate a high-level "Packard"-type commission to establish "an integrated requirements/acquisition process."(vi)

The report asserted that non-DOD entities performed much better S&T than DOD labs and discussed the impediments to transferring additional work to those entities.

DSB's conclusion that DOD would automatically improve by relying increasingly on the private sector stemmed from the premise that in-house labs possessed inferior talent. For example, the task force used membership in National Science and Engineering Academies to argue that "The Country's Intellectual Horsepower is Concentrated in Universities and Selected Industries and Not in Government Laboratories"(11, title of Figure 2). Although DSB mentioned that there were exceptions to this assertion, it offered nothing specific. Instead, one must refer to Appendix G, which showed NRL and NASA Langley tied for first place among government laboratories with six members each (the rest of the Navy Department had only five). The Army Corps of Engineers also had three members. NRL was also the only government laboratory on the list of leaders in patent citations. Regardless, DSB's reasoning contained a major flaw – a number of obstacles, especially performance of classified work, often prevent defense S&Es from equal access to academy membership.[116]

Nonetheless, having asserted its potential benefits, the task force next discussed impediments to contracting. Cuts in 6.1 funding had limited work by universities, and Congress had limited staff levels at FFRDCs and University Affiliated Research Centers (UARCs). Industry often shied away from defense work because of statutory limits on profits or a reluctance to share intellectual property. Perhaps most important, the "intrusive" FAR inspection system had created an antagonistic DOD-industry relationship.

In sum, the various DSB reports reflected a complete shift in the prevailing approach to laboratory reform. In fact, by the turn of the century many analysts

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[114]DSB, "Technology Capabilities of Non-DOD Providers" (June 2000).

[115]Section 912, FY 1998 NDAA.

[116]See *From Science to Seapower*, 99-100.

Dr. Timothy Coffey was NRL's Director of Research from 1982 to 2001. He received the Presidential Rank of Distinguished Executive (on two occasions), the Delmer S. Fahrney Medal, the Defense Distinguished Civilian Service Award, and the Executive Excellence Award for Distinguished Executive Service. He is currently the Thomas A. Edison Chair at the Center for Technology and National Security Policy.

had abandoned reform and simply sought efficiency by improving the methods for acquiring technology, i.e., outsourcing. DSB virtually ignored the issue of needed in-house capability. In part it did so out of necessity – funding and personnel cutbacks that disproportionately affected new talent threatened DOD's ability to sustain technical proficiency, which meant the Department had to turn elsewhere. Also, DSB and others may have ignored reform because they tacitly believed DOD would never muster the will to follow through on improving the in-house labs. Nonetheless, rather than acknowledge dozens of studies' findings about preserving internal competence, the DSB engaged representatives from industry who offered blanket assertions about poor defense laboratory performance and the money to be saved by shifting work their way.

Re-Investment and Infrastructure

Another major plan involving A-76 competitions temporarily swept through the Navy during this time. No one published a significant report on the venture, eventually named Re-Investment and Infrastructure (RII), after the group that created counter-proposals. This RII counter-initiative was informal and its operation strictly ad hoc. It exerted influence through briefings to the CNO and Navy Secretariat. The archive at NRL houses more than three cubic feet of relevant material, from which this discussion was drawn.

In 1997, as a result of three OSD-imposed "savings wedges" totaling some $7.5 billion, the Navy sought to meet mandates for infrastructure reduction and outsourcing (to be executed from FY 1999 – 2005) by reinvigorating and formalizing its commercial activities outsourcing program. The Naval Outsourcing and Privatization Programs Division in the Office of the CNO established specific targets for the number of government positions each major command should compete under A-76 procedures and identified all positions eligible for

competition.[117] It established these by applying a single simple rule: only those classes of positions prohibited by statute or regulation from being competed would be declared inherently governmental. All others could be competed.

This simplistic either/or rule disregarded numerous complexities. For one, it ignored the many complicating factors identified in a host of earlier blue-ribbon studies. And it failed to acknowledge that senior Navy management deliberated at length before deciding whether to execute a particular piece of RDT&E work in industry, academia, or at an in-house lab.[118] Regardless, the rule dictated that virtually all of the S&Es and most support personnel be identified as compete-able.

Here are examples of the Navy's 1997 A-76 targets:
NRL Washington: 2584 of 2701 positions (96%)
NAWC China Lake: 3429 of 3669 positions (93%)
NAWC Patuxent River: 4014 of 4271 positions (94%)
NCCOSC San Diego: 1360 of 1462 positions (93%)
NSWC Crane: 2993 of 3166 positions (95%)
NSWC Carderock: 1651 of 1735 positions (95%)
NSWC Dahlgren: 3011 of 3130 positions (96%)
NSWC Port Hueneme: 2157 of 2198 positions (98%)
NUWC Keyport: 1478 of 1540 positions (96%)
NUWC Newport: 2859 of 2938 positions (97%)

The RDT&E community scrambled both to comply with and resist this effort. In early 1998 the ASN(RDA) established a special process action team that developed definitions and templates for determining which positions in ONR, the Systems Commands, and their subordinate labs and warfare centers were inherently governmental.[119] He also set up a Commercial Activities Working Group to identify compete-able positions.[120] That summer, the SYSCOM commanders and the Chief of Naval Research (CNR) met with the Vice Chief of Naval Operations (VCNO) to point out the progress already made through downsizing and consolidation and that they already outsourced more than 75 percent of RDT&E funds. Ultimately, Navy management did not consider any ASN(RDA) working group proposal a satisfactory answer to the budget wedge problem.

Operational commands also resisted competing most of their civilian positions. In early 1999 Admiral A.R. Clemins, Commander in Chief, Pacific Fleet, orchestrated several meetings with the admirals who commanded each of the Navy claimants (major commands) to discuss satisfying the budget wedges and

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[117]CNO, N471F email with attachments, November 14-15, 1997, and CNO Outsourcing and Privatization Division memo Ser N47/7U597 180 of November 21, 1997.

[118]See the brief discussion in Chapter 4 of the S&T investment process.

[119]ASN(RDA) memo of February 4, 1998.

[120]Commercial Activities Working Group, "Navy Infrastructure Business Plan," December 17, 1998, distributed by Deputy CNO (Logistics) memo Ser N47/8U587856 of December 22, 1998.

Admiral Archie Clemins, former Commander-in-Chief, Pacific Fleet, initiated the Re-Investment and Infrastructure group.

A-76 mandates without destroying the morale and disrupting the productivity of every command in the Navy.[121] These admirals, whose meetings sometimes included the VCNO, were named the Re-Investment and Infrastructure group and quickly instigated a forceful opposition. The concise message they transmitted to the office of the CNO: "Do you want us to execute our missions, or do you want us to execute the outsourcing strategy? Because we can't do both."[122]

After a few meetings, representation at the RII devolved to each command's senior civilian, who generated alternatives that eventually prompted the Navy to liquidate the savings wedges through a combination of strategic sourcing, contracting savings, business process reengineering, and regionalization of some support functions, rather than through the mandated A-76 competitions. Strategic sourcing, for example, meant evaluating each command's functions to determine which could be eliminated, contracted out, privatized, or competed, and which should be kept in house. Similarly, each command identified its "core equities" – functions it had to perform under all circumstances. The group decided to keep management of these functions in-house, and in many cases execution too, whether the associated positions met the definition of inherently governmental or not. Because of the influence the admirals wielded, the Navy ultimately had no choice but to accept the RII's recommendations.

Competition of positions under A-76 continued, but at only a pittance compared to what the Navy proposed in 1997. The RII continued to meet for

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[121]Admiral Clemins email of January 24, 1999, and CINCPACFLT memo for the VCNO of January 26, 1999.

[122]Those present at the meeting agree that this statement, from one of the admirals, was essentially a direct quote with which the other admirals all agreed.

several years and took on other controversial issues, such as the Navy Marine Corps Intranet (NMCI), regionalization of civilian human resources services, and recruitment and retention of civilian personnel. However, it never again had an impact comparable to its resistance against the plan to outsource most of the Navy's civilian positions.

Infrastructure Reduction

Because many believed significant excess capacity remained even after four rounds of BRAC, DOD increased outsourcing in tandem with related efforts to further reduce the support infrastructure. The OSTP/NSTC final report of May 1995 had directed that DOD submit a plan for additional downsizing and cross-Service integration by February of 1996. But in the interim, in Section 277 of the FY 1996 NDAA, Congress directed SECDEF to develop a five-year plan to consolidate and restructure the labs and centers, and asked for a report by May 1, 1996.[123] That report, known as **Vision 21**, combined DOD's response to the NSTC and Congress.[124] It aimed to reduce infrastructure costs 20 percent by 2005.

Although DOD called it "The Plan for 21st Century," it was actually a plan to produce a plan, which included conducting a BRAC-like analysis to determine potential for cutbacks. DOD claimed "The plan will rest on [the] three implementing and integrating pillars"(i) of reduction, restructuring, and revitalization, and will pursue those equally and simultaneously. However, the report focused overwhelmingly on the first two, primarily regarding costs, and devoted only half a page to the third. It briefly surveyed ongoing consolidation and coordination efforts at the Service and DOD levels and set a schedule for implementation.

In concept, the planning would begin where BRACs left off and mimic the process. DOD would collect and analyze data to "determine the minimum essential set of capabilities, facilities, and installations necessary,"(i) compare that set to the existing infrastructure to identify duplication and determine consolidation, downsizing, and reengineering alternatives, and hire an independent accounting firm to develop cost analyses. Another element would include "sustaining that vision by creating a standing organization for the laboratories…"(6) along the lines of the Board of Directors for the T&E centers. Once again a report endorsed some sort of continuous, high-level, institutional attention to S&T.

The four basic premises Vision 21 said would guide the plan corresponded to the prevailing assumptions governing the RBA. First (and most trite), excellence required continuous improvement. Second, reengineering in industry "offers a rare opportunity to shed many of the old constraints that reduce…productivity and efficiency."(1) Third, a "bold restructuring plan" could meet the

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[123]See GAO, "Defense Acquisition Infrastructure: Changes in RDT&E Laboratories and Centers" (September 1996).

[124]DOD, "Vision 21: The Plan for 21st Century Laboratories and Test and Evaluation Centers of the Department of Defense" (April 30, 1996).

presidential and congressional downsizing requirements, which had already moved the labs and centers "toward more efficient operations."(ii) Fourth, implementing the proposals would require legislative changes.

Vision 21 intended separate but coordinated plans for the labs and T&E centers. It briefly explained the goals of the LDP/LQIP – in addition to the long-standing aims of streamlining personnel and contract management and increasing minor construction thresholds, the program now sought a financial management approach for comparing costs across Services (discussed in Chapter Five). But "More advances are needed."(ii) Vision 21 called the Major Range and Test Facility Base (MRTFB) "a national asset comprised of the 21 principal T&E centers, including ranges."(19) Standardized management and pricing (established in 1971) fostered joint use and eliminated duplication, Congress had recently directed increased accessibility for commercial users, and, because users paid for services, work force size "is self-regulating."(19) The system had excess capacity though, which Vision 21 would seek to redress.

Neither Vision 21 nor similar plans resulted in actions other than reviews and studies. Many grew concerned that requesting the enabling legislation Vision 21 required would prejudice Congress against additional actions for broader consolidations (such as another BRAC round). DOD therefore never submitted follow-on plans. It did, however, expend considerable effort to further consolidate, close, and streamline the labs and centers and the support infrastructure. Secretary of Defense William Cohen's "Defense Reform Initiative" and Section 912 of the FY 1998 NDAA, for example, both stated goals for reducing excess capacity and improving management. For various reasons these failed, at least in the short term, until BRAC 2005 began the next major round of consolidation and closure.

Secretary Cohen published his **Defense Reform Initiative** in May 1997, which yet again encouraged the Department to institute the "management techniques and business practices that have restored American corporations to leadership in the marketplace."(i) The report formed one element of the defense strategy promulgated in the Quadrennial Defense Review (QDR).[125] The Defense Reform Initiative (DRI) lamented the usual suspects – Cold War management techniques and other habits that lagged at least a generation behind American business practices. Secretary Cohen had established the Defense Management Council to ensure sustained commitment to change. His report discussed best business practices, organizational change, streamlining through competition, and reducing infrastructure, all in the context of seven principles for reform:

- Focusing on a unifying vision
- Leadership committed to change
- Focusing on core competencies

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[125]William S. Cohen, "Defense Reform Initiative Report" (November 1997), and "Report of the Quadrennial Defense Review" (May 1997). See also DOD, "Quadrennial Defense Review: Acquisition Infrastructure Task Force Report" (February 20, 1997).

- Streamlining to increase agility
- Investing in people
- Exploiting IT
- Removing barriers between organizations.

Perhaps most notably, the report said nothing directly about savings through outsourcing but instead focused on competition. In fact, every section except for the one on competition sounded the same as the many other studies circulating at the time. Although the Secretary directed reevaluating all support functions to increase the number categorized as commercial activities, "We do not seek to replace government workers with private sector contractors….We fully expect…that the government sector will win a significant portion of these competitions."(27) In the past, "Regardless of who won [competitions], the results have been positive."(29) Potential candidates for competition included civilian pay, military retiree and annuitant pay, personnel services, national stockpile sales, management of leased property, and drug testing.

Secretary Cohen devoted a chapter to eliminating infrastructure. He noted that DOD planned to ask for additional BRAC rounds in 2001 and 2005. He also discussed plans to consolidate, restructure, and regionalize many support activities, and to privatize family housing construction and most utility systems.

Various Defense Reform Initiative Directives (DRIDs) and S.912 set off another flurry of activity in the technical centers. S.912 called for cutting acquisition personnel numbers by 10,000 to 25,000, and for a report on reductions to that point since FY 1989. It also directed a review of the support infrastructure for redundancy and excess, and for opportunities in streamlining acquisition processes, facilitating emphasis on core competencies, coordinating and consolidating at the cross-Service level, and improving the Civil Service system. Finally, it called for a report to Congress, along with requested changes in legislation, by April 1, 1998.[126]

Ultimately, what DOD requested were additional BRACs. In a 1998 report that offered nothing but fulsome praise for past closures, SECDEF Cohen asserted "We must have two more BRAC rounds if tomorrow's forces are to be able to carry out their mission."[127](Cover Letter) The report argued that too much excess capacity still existed, and that further BRACs would yield $20 billion with which to fund modernization as outlined in the DRI. The report also responded to Section 2824 of the FY 1998 NDAA, which requested a financial overview of previous BRACs.

Ignoring the maxim that something which sounds too good to be true probably is, the report essentially argued that two more BRAC rounds would markedly improve every effort in all key aspects of national security strategy without

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[126]Chapter 5 discusses DOD's S.912 report.

[127]DOD, "The Report of the Department of Defense on Base Realignment and Closure" (April 1998).

any substantial or even minor drawbacks. First, it defined closures as strategic maneuvers rather than simply reduction measures: reengineering, adopting best practices, and focusing on core competencies would enable the streamlined support and technological advances the Revolution in Military Affairs required. Likewise, these same efforts would enable the RBA. "In sum, congressional authorization of more BRAC rounds is a key component of the Department's plans for defense reform."(11)

The report also claimed that previous BRAC rounds had exceeded their goals and therefore provided the best model for future actions. After devoting a chapter to demonstrating that 23 percent excess capacity still existed, the Secretary estimated DOD could save about $3 billion per year. The "absence of new BRAC authority," however, "would likely force the Department to decide whether to postpone needed modernization, delay quality of life programs, or reduce force structure….None of these are acceptable alternatives."(22) Later chapters argued that prior BRAC rounds had cost less to implement and saved more than originally estimated, benefited affected communities in the long term, and improved military capabilities.

In sum, by the end of the decade most reports on DOD and Navy labs had all but completely shifted emphasis from effectiveness to efficiency. Most still offered a token section on improving performance, and different organizations advocated outsourcing and personnel cutbacks with different degrees of enthusiasm. Nonetheless, the prevailing doctrine claimed that smaller, reengineered R&D activities, dedicated to effective contract administration more than S&T work, would improve innovation and help fund modernization. However, some in DOD questioned the new orthodoxy. The next chapter discusses their arguments.

Chapter Four

Outsourcing and its Discontents

Introduction

While many reports, especially high-level ones such as those the DSB and CORM published, passionately advocated outsourcing and generated a lot of quotable material in doing so, a swarm of other studies presented a more careful interpretation of the evidence. All these latter studies agreed that contracting could sometimes save money and provide better service and that emulating innovative private sector management principles could benefit DOD. But few if any of them argued that outsourcing would automatically save billions of dollars per year.

This chapter focuses on reports which, taken together, showed that widespread downsizing and outsourcing could often cost rather than save money and even jeopardize an organization's ability to carry out its mission. By the mid-1990s, a host of literature had shown that few private companies got better while getting smaller. Other studies, and DOD's own experience in the 1950s and 1960s, both illustrated the limited benefits of contracting. And some reports simply disproved the notion that the public sector or DOD was riddled with outmoded management styles and incapable of producing good products or offering good services at competitive prices. Some studies concluded this almost against their will. The CNA report that examined contracting at NUWC Keyport, for example, did its best to point out missed opportunities but discovered that management already outsourced – and performed work in-house – to maximize both savings and effectiveness. Finally, those that promoted outsourcing either did not understand the compound intricacies of the S&T investment process or at least did not concede the difficulties those intricacies would present.

Overall, most studies – from CNA, GAO, the Navy Laboratory/Center Coordinating Group (NLCCG), and other government and non-government sources – examining the private sector, city and state governments, and DOD, did not conclude that outsourcing provided the best conditions for efficiency. Evidence from the 2,100 public/private competitions under OMB Circular A-76 occurring between 1978 and 1994 showed that although the process needed improving, it saved money regardless of which entity "won." Evidence from the city of Indianapolis (which DSB cited as a prime example of the virtues of outsourcing), likewise clearly showed that the impressive results the city generated derived from competition. In sum, while everyone understood that outsourcing could help DOD maintain capability while shrinking, the reports that touted huge sav-

ings across the board based their conclusions on limited, inconclusive evidence and played down the widespread findings about the benefits of competition.

Smaller Equals Better?

In addition to acknowledging that shrinking budgets forced reductions, most reports discussed in the previous chapter asserted that DOD would get better as it got smaller. In fact, this belief grew into a reflexive assumption: applying already identified, modern American business practices would, as it had in the private sector, provide access to better service while simultaneously sharpening support installations' focus on their core competencies. In a typical expression of this sentiment, the NSTC final report commented that downsizing and consolidation "could be done in ways that preserve or improve [the labs'] service to the Nation, through better management, clear definition of missions for individual labs, and elimination of needless redundancies."(7) And the Vision 21 report simply connected, *prima facie*, RDT&E personnel reductions to "more efficient operations."(ii)

By the mid 1990s however, a sizeable and growing literature on downsizing in the private sector suggested otherwise, or at least indicated mixed results. Various studies did contend that downsizing sometimes benefited companies in the short term. But many researchers found that it often created more problems than it solved and rarely achieved a company's financial objectives.[128]

In fact, study after study concluded that downsizing negatively affected the remaining employees in an organization and eroded their loyalty. Morale, job satisfaction, commitment, and productivity among surviving employees typically decreased, while tardiness, absenteeism, long-term sick leave, and even theft increased. Fear, frustration, and unease pervaded downsized organizations. Numerous analyses had demonstrated both a general decline in employee commitment and the corresponding costs of high turnover rates – both consequences, in part, of downsizing.

Studies also documented the damage downsizing wrought on valuable corporate memory. Corporate memory comprises the experience, specialized knowledge, networking skills, and familiarity with company culture employees bring to an organization over time. Companies that lose corporate memory through downsizing often end up "reinventing the wheel," or reproducing and then fixing problems experienced employees solved long ago. Noting the correlation between informal collaborative networks and innovation, researchers emphatically linked corporate memory to productivity in R&D organizations.

Most important, the evidence showed that downsizing in the private sector generally cost money. Companies suffered direct costs from processing unemployment claims and other related paper work, experiencing temporary production drops, recruiting and training new personnel, and paying overtime to

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[128]For a fuller overview of the literature discussed here, see Michael Marshall and Eric Hazell, "Private Sector Downsizing: Implications for DOD," *Acquisition Review Quarterly* (now *Defense AR Journal*) Vol. 7 No. 2 (Spring 2000): 143-159.

employees left to take up the slack. They suffered indirect costs from increased apathy, product delays, workloads among rebuilding teams, and manager stress. In fact, by the middle and late 1990s, downsizing seemed almost archaic. Truly applying cutting edge business practices in the DOD would have entailed focusing on employee retention and organizational stability, which a growing number of companies had begun to consider key competitive strategies.

Further, the DOD R&D community could not sustain the connection among downsizing, outsourcing, and core competencies sought in the private sector. The theorists who developed the idea of core competence never equated it with reduction. Instead, they argued that resources provided should be as many or as few as needed for an organization to perform its basic mission.[129] In DOD, that approach often transformed into the idea of an "irreducible core," or the minimum of employees needed to engage in inherently governmental work only. Further complicating the application of core competence were the Civil Service rules that prevented the Department from targeting workforce reductions, which meant key employees were just as likely to leave as truly redundant ones.

The smaller-equals-better argument overlooked other considerations. For one, although DOD conceded that BRAC savings estimates stemmed from assumptions, it did not test those assumptions despite having years to do so. No systematic follow-up case studies compared before and after costs, for either shifting the work to a contractor or to a different in-house lab. Also, cost avoidance does not necessarily equal cost savings, particularly when the costs must ultimately be absorbed, often at a higher price. Some worried that cost avoidance measures, scored as BRAC savings, contributed to underfunded budgets (but the absence of follow-up studies meant there could be no lessons learned on what was and was not simply a cost "deferral"). And finally, opportunity costs were never even mentioned. The premise underlying "excess capacity" in the technical centers implicitly argued that departing employees would not have contributed to national security had they stayed. In other words, the BRAC process did not sufficiently value intellectual capital, a major concern for technical organizations.

Contracts Equal Efficiency?

A second problematic premise – that increased reliance on private-sector performance automatically improved performance – also underlay arguments to outsource. While even the most resolute advocates of outsourcing believed DOD needed some smart-buyer capability, their reports left unanswered the question of how much internal technical competence was needed to perform this role. Further, the premise derived from misrepresented or at least misapplied savings estimates, and it disregarded lessons learned from prior, similar pushes to outsource defense R&D.

The previous chapter's discussion of the DSB report on lab management mentioned the dilemma associated with the claim that DOD should sustain inter-

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[129]See Marshall and Snyder, "Core Competence."

nal technical competence only when industry did not meet a need and to maintain knowledge of and access to critical technologies. In an oral history interview, Dr. James Colvard, a former Navy laboratory Technical Director, Deputy CNM, and Deputy Director of the Office of Personnel Management, noted how such an assertion begged rather than answered a question:[130]

> The thing that you always have to own in the public sector is the knowledge of what the hell you want to do. The inherent governmental function of determining what you want, determining from whom you will get it, determining that you got it requires you to be knowledgeable internally. *The argument is how much do you have to do in terms of actual execution of research and development in order to maintain that capability.* Currency…is not an abstract thing, you must actually be working in the field to be vital…and literate.(8) [emphasis added]

Colvard further argued that with procurement budgets down, technical centers would need to maintain competence by modifying, upgrading, and supporting existing systems rather than buying new ones. They "can play that inherently governmental role of being the honest broker among the component suppliers…." The private sector cannot perform all systems engineering "because it still involves the inherently governmental decision of what do we want?"(8)

In addition to skipping over this problem of required internal technical capability, reports that touted outsourcing as a method to save 20 percent to 30 percent across the board also misrepresented, or at least applied too broadly, the findings of the studies they cited (what those studies actually did find is discussed at length below). In a brief discussion of the most relevant research, the NLCCG's **Another Perspective on Outsourcing** pointed out a number of problems with the arguments underpinning the savings claims.[131]

The NLCCG paper showed that in general, the research the DSB, CORM, and CNA cited was outdated and based on inadequate samples. For example, investigations of outsourcing commercial activities occurred prior to the many post-Cold War efficiency measures – DOD no longer had that same "low-hanging fruit" to pick, a fact outsourcing advocates ignored. Also, many installations had already cut back (e.g., libraries) or terminated many functions (e.g., on-site stores). These along with ongoing personnel cuts meant many potential outsourcing targets had already disappeared. Further, the CNA study on commercial activities, which proponents of outsourcing almost always cited, had fully examined only nine of 77 categories, all for work requiring unskilled labor and low capital investment with straightforward requirements. There was simply no evidence from large-scale, high-skill work. And finally, most employees in the 1970s and 1980s whose work was outsourced found other government jobs or

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[130]From Colvard interview.

[131]NLCCG, "Another Perspective on Outsourcing: Beyond the Sound-Bites" (May 1997).

Dr. James Colvard, former Technical Director of the Naval Weapons Laboratory in Dahlgren, Virginia, Deputy Chief of Naval Material, and Deputy Director of the Office of Personnel Management.

worked for the contractor who won the A-76 competition. But personnel drawdowns would preclude such adjustments in the 1990s, which meant that costs from severance pay and retraining and relocation programs would erode some of the savings.

An article on **Outsourcing R&D**, from the NLCCG staff and published in the Naval Institute *Proceedings*, showed that vocal advocates of outsourcing also overlooked DOD's past experience.[132] The belief that the private sector, responsive to competitive pressures, worked more efficiently than the public sector had also motivated a drive to contract out defense work in the 1950s. The second Hoover Commission, established in 1953 to suggest ways to increase efficiency in the Federal Government, followed the pro-business sentiment of the decade and advocated reliance on the private sector. The Commission recommended that whoever could do the work most efficiently should execute defense R&D. But it assumed this meant DOD would contract much more, which in fact happened.[133]

This raises an important question: Is the private sector more efficient than the government? A CNA report (discussed further below) that drew upon a considerable literature noted, "While there is great intuitive appeal to the idea that the private sector inherently makes more efficient use of resources, the evidence is actually quite mixed."(7)[134] In R&D especially, the government sometimes simply performs better, particularly because firms tend to under invest in research. While contracting has its advantages, "Most surveys of empirical literature cannot prove that the public sector is inherently less efficient than the private sector."(12)

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[132]Michael Marshall and Eric Hazell, "Panacea or Pipe Dream? Outsourcing R&D," Naval Institute *Proceedings* (October 2000): 86-89.

[133]On the Hoover Commission report, see Robert Mindak, "Management Studies and Their Effect on Navy R&D" (November 1, 1974), 32-34.

[134]CNA, "A Privatization Primer: Issues and Evidence" (January 1997).

The *Proceedings* article showed that by the end of the 1950s DOD had learned that the increased contracting out for R&D spurred by the Hoover Commission did not markedly improve efficiency. As President Eisenhower's own Science Advisory Committee noted just a few years after the Hoover report, extreme reliance on contracts damaged "the morale and vitality of needed government laboratories."(87) Also, it exacerbated the problems typically associated with contracting: an inability to pursue unexpected, exciting possibilities not specified in the contract, termination dates that impeded long-term planning, a job rather than mission focus, amplified administrative hassles, labyrinthine salary structures, and more.

By 1958 many analysts agreed with a House of Representatives R&D Committee's conclusions that "contracting methods…have been carried over by brute force and sheer awkwardness into the area of scientific research contracting, in which they protect adequately the interests neither of the government or the contractor." Then in 1961, SECDEF McNamara decided "in-house laboratories shall be used as a primary means of carrying out Defense Department [R&D] programs." The following year the Bureau of the Budget asserted, "No matter how heavily the Government relies on private contracting, it should never lose a strong, internal competence in R&D."(87-88)

This swinging of the pendulum toward a preference for in-house performance of R&D actually represented a return to DOD's position in the immediate post-WWII era. But after the Vietnam War the pendulum again swung back the other way, as the apostles of outsourcing dusted off their sandals and again began carrying the message to a new generation of potential converts. Although that new round of evangelistic fervor had also waned by the mid 1980s, the return of the pendulum – as evidenced by the widespread sense of urgency about reforming the in-house laboratories – got interrupted by the post-Cold War defense drawdown.

Again, by the mid-1990s considerable evidence from the private sector already indicated mixed results from increased contracting. A CNA report (discussed below) on "rightsourcing" in the private sector, while generally positive about outsourcing, noted that companies had problems with cost creep, controlling access to sensitive material, and selecting the cheapest rather than best provider.[135] While a Coopers and Lybrand report found fairly positive results from outsourcing – half the companies reviewed had saved money, 29 percent broke even, and only four percent lost money – a survey of 1,500 Chief Information Officers found that 69 percent were dissatisfied with the results. The IT sector, often touted as the most fertile ground for contracting, had also regularly reported disappointment.[136]

Also, while the CORM report at least acknowledged that DOD managers disagreed with the 20 percent to 30 percent savings estimates, it weakly refuted

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[135]CNA, "Rightsourcing Lessons Learned" (May 1997).

[136]Marshall and Hazell, "Panacea or Pipe Dream?" 87.

their objection. Employing faulty *ad populum* logic – so many people cannot be wrong – the report pointed to "the continuing growth of outsourcing in the private sector,"(3-5). It also asserted that "the results of academic studies provide clear evidence that such concerns are usually misplaced."(3-5). The Commission cited no sources, and as just shown, those studies in fact indicated mixed results.

The reports staunchly advocating outsourcing used other faulty logic. They often "cherry-picked" best-case scenarios from industry to compare either to DOD as a whole or even to DOD worst-case scenarios. These straw man-versus-straw man analyses misrepresented both sectors. Sometimes proposals verged on self-contradiction. The DSB report on the S&T base, for example, recommended that 50 percent of lab personnel come from IPAs and contractors who would rotate every five years, yet it also advocated increased attention to long-term (10 to 20 years) research. How would a lab maintain continuity in a 20-year effort when half its personnel left on four separate occasions? Also, DSB's report on outsourcing asserted that top-level management must aggressively pursue such efforts because mid-level managers tended to resist. Yet at the same time DOD was supposed to emulate modern business management principles – one wonders which principle advocated top-down imposition of policy over the objections of subordinates. And finally, like a hopeful undergraduate, that same report listed a whopping 175 sources in the bibliography – while citing only about 18 in the text.

Defense Department Equals Obsolescent?

Many reports that urged outsourcing lamented DOD's outdated management, claiming it lagged at least a generation behind the private sector. Vision 21 said its plan "leaves behind the remnants of the Cold War,"(1) and DSB called lab management an "obsolescent artifact" of the Cold War. But reports offered little specificity regarding what this meant. It appears that such comments really reflected frustration with bureaucracy. Leaving aside the issue of whether, for example, the remarkably successful Admirals and civilian directors of the Navy Warfare Centers were mired in archaic management techniques, and leaving aside the issue of what exactly constituted a "Cold War" style, it is still worthwhile to address the evidence the reports did offer.

As noted in the previous chapter, CNA's **Examination of Tech Centers** concluded "it is hard to tell if the centers are efficient."(27) Although hardly a ringing endorsement, the assessment found nothing to indicate a hopelessly outdated system. CNA commented that the competitive environment in which the Navy labs had to attract customers, and the fact that only 25 percent of total RDT&E funding supported in-house technical work, both suggested efficiency. The report complained that the DBOF system of financing and accounting promoted inefficiency but then noted that the tech centers were among the best DBOF activities. Specifically, CNA's assessment of expenditures per employee, outsourcing, and facilitization concluded that the first indicated increased efficiency, while the second and third possibly suggested increased inefficiency and deserved further study. Overall however, the Navy R&D process promoted resourcefulness.

A sample view from the Collaborative Test and Evaluation Center (CTEC) Theater at NUWC Keyport. Completed in 2006, this state of the art facility will provide real time feedback for exercises conducted at remote locations. Photo courtesy of NUWC, Keyport.

In its report on **Outsourcing Opportunities for the Navy**, CNA tried to prove that many such prospects existed for NUWC Keyport, but a close read of the case study suggests management there knew exactly how to maximize efficiency – and promote effectiveness – with the tools at its disposal.[137] First, the Center disliked outsourcing RDT&E work for which it historically had trouble enforcing contracts. This problem was not unique to Keyport, as the DSB had noted that disagreement with contractors about the scope of work routinely embittered private-sector companies that outsourced much of their work.[138] Second, CNA argued that NUWC could outsource even technically sophisticated work "if the processes are not likely to change and if the functions are well-documented."(47) However, the Center pointed out that, as an R&D organization, it *wanted* to change processes as needed. An environment that allowed flexible, creative responses to unexpected opportunities fostered, and was in fact essential to, innovation.

The text of the report clearly – again if inadvertently – indicated that NUWC managers made sensible in-house/contracting-out decisions. They outsourced 82 percent of their public works dollars because the processes were standardized and contracts for labor-intensive, low-capitalization functions easy to write. Even for specialized, complex work they outsourced in "areas with transitory demand,"(47) a method that had proven more efficient than permanently maintaining the skills in-house. NUWC favored multifunctional

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[137]CNA, "Outsourcing Opportunities for the Navy."

[138]DSB, "Outsourcing and Privatization," 23.

(or omnibus) contracts, because they allowed flexibility and reduced administrative oversight. It used a variety of contract types (i.e. fixed price/fixed fee, cost plus/award fee, etc.). When CNA recommended award fees, the Center conceded that such incentives motivated contractors, but experience had shown that fixed fees significantly lowered administrative costs and resulted in higher efficiency overall. In the end, CNA's recommendations focused more on giving NUWC the flexibility to do what it wanted to do rather than on dragging the Center out of some Cold War mentality.

The S&T Investment Process

The language of reports that advocated outsourcing sometimes suggested a one-dimensional misunderstanding of the process by which performers of R&D work are chosen. Rather than taking money out of one pile and putting it into another, investing in a particular performer in a particular scientific area is a multi-dimensional problem that requires balancing widely varying factors. Each Service's S&T Executive continually trades off among four general types of categories, which contain a number of elements that intersect.

1. Performers
    - In-house labs and centers
    - Academia
    - Industry
    - UARCs
    - FFRDCs

2. Areas (that themselves require trade offs)
    - Between 6.1 disciplines (chemistry, physics, math, oceanography, etc.)
    - Between 6.1 and applied areas (IT, materials, optics, electronics, etc.)
    - Among 6.1, applied areas, and warfare-related areas (space, electronic warfare, anti-submarine warfare, sensors, energetics, armor, etc.)
    - Among different Budget Activities

3. Continuing, broad-spectrum, discipline-related programs (e.g., chemistry) and multi-disciplinary efforts typically focused on transitioning technology(ies) into prototype platforms or systems (e.g. all-electric ship)

4. Conflicting requirements to respond to specific needs
    - Supporting areas with military but no commercial application
    - Funding new performers that have promising ideas
    - Funding the best performer in every area
    - Funding center-industry collaborations that transition technologies into new or existing systems
    - Maintaining smart-buyer capabilities for areas in which DOD follows rather than leads technology development
    - Maintaining some S&T base in centers focused on applied work, to help recruit new staff and generate new ideas

In addition, DDR&E attempts to gauge all of the above factors in a way that ensures the appropriate investment among the three Military Departments and the OSD components.[139] Only the Laboratory Infrastructure Capabilities (LIC) report, and to some extent the DOD response to NSTC/PRD#1, expressed any consideration of such complexities.

Efficiency and Competition

While many high-level, well-publicized reports on R&D and acquisition management equated downsizing with improvement, categorically touted the virtues of contracting, and compared DOD unfavorably to the private sector, many others argued differently. In fact, overall the studies of the time demonstrated a remarkable consensus about the relationship among contracting out work, performing it in house, and improving efficiency. That consensus can be summarized in one word: competition.

In a paper on **Outsourcing Commercial Activities**, Michael Marshall, the NLCCG's Executive Secretary and former head of the DNL Corporate Projects Office, more or less demolished the generalizations circulating about how outsourcing commercial activities would automatically produce savings.[140] The report, citing a great deal of the relevant research, briefly traced the history of OMB Circular A-76 competitions and examined the anecdotal and otherwise extremely limited nature of the evidence outsourcing advocates used. Marshall also identified what the data did indicate: that efficiency resulted from "maintaining a competitive environment in which market-place forces will drive efficiencies whether work is done in-house or on contract."(2)

The paper discussed at length the shaky evidence outsourcing advocates typically cited in their claims that contracting for commercial activities saved 30 percent or more. This was particularly important because, as Marshall discovered, studies frequently referenced the same research, or even more indirectly, the conclusions of another study that had used that same research. In other words, much of the enthusiasm for contracting stemmed from the classic logical fallacy of begging the question, or circular reasoning. In such instances, the "evidence" used to support a claim is ultimately the same as the claim itself.

One study frequently cited to support outsourcing, OMB's "Enhancing Government Productivity Through Competition," had not actually advocated contracting, but as the title indicates recommended evaluation and competition to determine which organizations should perform work.[141] It noted that in-house groups won about 40 percent of the A-76 competitions and typically saved 20 percent, while private companies typically saved 40 percent – but it provided no sources for these claims. The OMB paper also warned that contractors usually

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[139]Information is from Kenneth Lackie point paper, Fall 2006. See also DDR&E "Interim Response," esp. 16.

[140]Marshall, "Outsourcing Commercial Activities."

[141]OMB, "Enhancing Government Productivity Through Competition: A New Way of Doing Business" (August 1988).

Michael L. Marshall, former head of the DNL Corporate Projects Office, NLCCG Executive Secretary, and Assistant to the Director of the Applied Research Laboratory at The Pennsylvania State University.

won competitions by offering to do the function with fewer, less well paid employees than the government bidder, a situation that caused employee turnover.

Marshall showed that an article about Great Britain's Ministry of Defence (MOD) and a CNA study on depot maintenance – two other studies outsourcing advocates frequently mentioned – contained similarly limited conclusions.[142] Like the OMB study, the MOD article identified competition rather than outsourcing as the key factor. In addition, it emphasized the anecdotal nature of the evidence and that outsourcing for professional services would likely cost more than for ancillary functions. CNA also connected competition and efficiency. And when it did discuss the virtues of outsourcing, it cited the OMB report that offered no data, the MOD study, a 1976 study (written before standardization of the public-private A-76 competitions), and two RAND reports, one on motor vehicle maintenance in the Air Force and another on base support at two undergraduate pilot training bases.

Other reports and evidence provided yet additional reasons for skepticism about savings claims.[143] Perhaps most amazing was GAO's discovery that DOD's statistics on contracting commercial activities reported *projected* rather than actual results and that even the projections derived from assumptions rather than data. In a study of commercial activities, CNA noted it had insufficient data for 86 percent of the categories of functions contracted out, and most of the data it did have related to small-scale, relatively inexpensive, low-skill work. Other issues Marshall pointed out included the price of cost comparison studies and contract administration, neither of which were included in savings estimates. And certainly the price of contract administration would rise if DOD followed

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[142]CNA, "Issues Concerning Public and Private Provision of Depot Maintenance" (April 1994). Matthew Uttley, "Competition in the Provision of Defense Support Services: The U.K. Experience." *Defense Analysis*, Vol. 9, No. 3 (1993): 271-288.

[143]Marshall cited a host of such sources.

CORM's recommendation to outsource complex, multi-function commercial activities. Another GAO study found that activities reported general dissatisfaction with contractor performance 28 percent of the time.

Finally, Marshall poked yet another hole in the DSB/CORM approach – the Navy's RDT&E activities, operating under DBOF, had already done much to create the competitive environment essential to promoting efficiency.[144] Recall that DBOF charged customers (such as a Program Executive Officer, or PEO) for work and also allowed them to choose who did what, which meant that to continue working, DBOF activities such as the labs had to offer competitive prices (see Appendix B). RDT&E centers had therefore instituted initiatives to reduce infrastructure and other costs. These included contracting out any commercial activity or other function the private sector could perform more efficiently. Indeed, the Navy SYSCOMs already outsourced about 70 percent of their work.

CNA published reports on outsourcing and privatization in addition to those already discussed, and these also demonstrated how the limited evidence Marshall revealed was often alchemized into conventional wisdom. Although sometimes CNA provided well-researched and nuanced interpretations, sometimes it did not, and some of its studies contradicted themselves. However, much more than any other point, the think tank's reports showed that competition, not outsourcing or privatization itself, produced results.

Responding to an ASN(RDA) direction, CNA examined **Rightsourcing** strategies in the private sector to provide lessons learned for DOD.[145] While the report distinguished rightsourcing – finding the best source to perform a function – from outsourcing – finding the cheapest source – it nonetheless dealt primarily with the ASN(RDA) guidance to find ways to reduce Total Operational Cost. CNA's survey of companies, including Lockheed Martin, Unisys, Northrop Grumman, Hughes Electronics, Commonwealth Edison, and Ameritech, found that by far, cost reduction most frequently motivated outsourcing. To support its claims here, CNA cited the DSB report on outsourcing. Other important reasons for private sector outsourcing included access to better facilities and freedom to use internal resources for other purposes. In a finding particularly relevant to labs, the survey noted that outsourcing had increased for "mature" technologies – those for which an in-house capability was no longer unique – but had remained low for new technologies. "The most consistently cited lesson learned is the need to accurately identify the in-house costs for any product or function to be outsourced."(26) This conclusion corresponded with Marshall's point that decisions should be based on a case by case economic analysis.

CNA's December 1996 report on **Privatization and Outsourcing** examined case studies that had generated savings.[146] It asserted that although some in DOD believed privatization and outsourcing actually cost more, "experience argues the opposite."(5) However, the experience report cited was in fact

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[144]As noted above, CNA's "Examination of Tech Centers" had reached the same conclusion.

[145]CNA, "Rightsourcing."

[146]CNA, "A Survey of Privatization and Outsourcing Initiatives" (December 1996).

quite limited. Four of the 12 references included other CNA studies, and two others were the CORM and DSB reports. Nonetheless, the report showed how outsourcing and privatization saved the Army's Logistics Civil Augmentation Program $140 million, the Public Service Electric and Gas Company in New Jersey a half million a year, and the city of Chicago, which outsourced car towing, $1.2 million. As did many other studies, it also cited NAWC Indianapolis as a success story in privatization (it is worth noting that many in the Navy laboratory community believed the Indianapolis plan worked so well not because of privatization per se, but because of the preexisting, robust business base). Most important, it drew from GAO analyses to show that neither outsourcing nor privatization saved as expected when carried out without competition. CNA therefore concluded that "Competition appears to be the key element for success in most of these ventures."(17)

During this time CNA also examined **A-76 Competitions**, again relying on very few sources, but again emphasizing the benefits of competition, such as cost visibility and alternative providers.[147] Although A-76 competitions remained disruptive, cumbersome, and time-consuming, "it's important to remember that the existing process has yielded real and permanent savings."(2) CNA believed that allowing in-house managers to keep even a fraction of the savings gained through competing work would do as much to improve the process as anything else it could recommend. As it had in other reports, the organization again commented on the ambiguity between an inherently governmental and commercial activity and between RDT&E and RDT&E support, noting that different managers often defined the same functions differently. CNA recommended that DOD either remove or clarify the distinctions and offered other proposals for speeding up or standardizing the competitive process.

In an extensively researched study called **A Privatization Primer**, CNA once again found that privatization and outsourcing saved money only in competitive situations.[148] The study concluded that neither contractors nor privatized facilities increased efficiency when they were the sole provider available. It also discussed a number of privatization projects (again, including NAWC Indianapolis). And as briefly mentioned above, it presented an unexpected twist to one of the country's most widely accepted assumptions: that the private sector works more efficiently than the government.

Drawing from considerable research, the primer showed that "While there is great intuitive appeal to the idea that the private sector inherently makes more efficient use of resources, the evidence is actually quite mixed."(7) In R&D especially, "market failures" create situations in which the government simply performs better. For example, firms tend to under invest in research, because despite patents they still cannot insure exclusive use of their findings. The government therefore intervenes, funding and performing additional research. Contracting clearly has advantages: it can save money, enable a strategic decision to

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[147]CNA, "Implementing A-76 Competitions" (May 1996).

[148]CNA, "A Privatization Primer."

discontinue a certain type of activity, and provide a politically feasible method of downsizing. But generally, "Most surveys of empirical literature cannot prove that the public sector is inherently less efficient than the private sector."(12)

Most important, CNA found that the so-called outsourcing initiatives (among which was the NAWC plan) in the city of Indianapolis so often cited as reengineering feats worth emulating in DOD were really competition initiatives. Large-scale competition began with the election of Stephen Goldsmith as mayor in 1991. Goldsmith initially favored outsourcing, but then agreed to let city workers compete for work. He also agreed to cut the bureaucracy (so the city could better compete) without any RIFs and to let city organizations retain some of their savings. Afterwards, city workers won 80 percent of the competitions. A key element of success, and one CNA stressed in many of its reports, was that after winning a competition, public sector entities signed an MOU that delineated performance standards and penalties for non-performance.

DSB's report on outsourcing also discussed Indianapolis, and while not misrepresenting the results, it spun them to imply that outsourcing alone – rather than as one option within a competitive environment – had catapulted the city to financial deliverance. DSB allowed that improved services and $80 million in reductions stemmed from public/private competitions, but it thereafter equated competition to outsourcing, or even substituted the latter for the former. For example, the report stated that "after introduction of competition and outsourcing strategy in 1992, city budgets fell dramatically," and it mentioned the "benefits obtained…from…competition and outsourcing."(27) However, in its major conclusion the report said the city "has used outsourcing as an effective tool…."(28A) While not untrue, a more accurate assertion would have cited *competition* as an effective tool. In fact, because the public sector won more than half the competitions, the most accurate statement would not have emphasized "outsourcing strategy" but the strategy of letting city employees compete for work. This is all the more true considering that Mayor Goldsmith initially advocated increased contracting, which DSB did not mention. The CORM report likewise cited research on competition to advocate outsourcing.

In sum, the CNA and DSB reports showed that Indianapolis did benefit from outsourcing but more so from competition. DSB claimed private companies won almost half of the city's competitions but that those projects accounted for 85 percent of the total value involved. CNA said private companies won only 20 percent, and it did not address total value. Regardless of the discrepancy (perhaps partly a result of the study periods) over which sector won what percentage of the competitions, the total value figure, even if DSB overstated it, would have nonetheless demonstrated how outsourcing benefited the city. However, CNA offered the more valid conclusion: "the city's experience supports the view that government organizations are not inherently inefficient; they can provide superior services given the right business tools and incentives."(17)

Conclusion

The reports discussed here and in the previous chapter, even those least enthusiastic about contracting, addressed many benefits associated with it. The

RDT&E community needed no convincing on the general principle, as it had always contracted out the majority of its work. Nor did anyone resist the idea that DOD or the labs and centers could benefit from applying innovative private sector management techniques. NAVAIR's "competency-based alignment" received glowing reviews throughout the Navy and DOD. And Rear Admiral John J. Donegan, the first Commander of NCCOSC and former Commanding Officer of NRL, deliberately sought to manage government R&D organizations like businesses.[149]

But some of the influential studies obscured the real lessons learned. As a result, innovating – no matter who did it – came to mean imitating the private sector, while performing work in-house – no matter how efficient – came to mean adding infrastructure. However, as a whole the reports suggested an entirely different lesson and presented a high degree of consensus on the matter: in general and for DOD in particular, what made the difference was not who performed the work but whether competition existed in choosing the performer.

[149]RADM John J. Donegan, interview by Rodney Carlisle, April 20, 1995.

Chapter Five

Effectiveness Defeated

Introduction

While every major post-Cold War report on defense labs and R&D in general emphasized cost reductions, many also argued, more than parenthetically, that removing barriers to effectiveness would enable the efficiency DOD so zealously sought. In other words, freeing the technical centers to do their jobs, allowing them to engage in healthy competition with one another, and ensuring they had high-level officials advocating on their behalf – rather than delegating away all their work – would both enhance output and create savings. This chapter discusses reports and plans oriented toward improving rather than simply shrinking the labs.

Not surprisingly, many such studies originated within the lab community. However, while they reflected the predispositions of the authors, they also demonstrated an immediately recognizable depth of expertise often lacking among ad hoc, external panels, no matter how capable or well-intentioned. The DNL and Naval Research Advisory Committee (NRAC), for example, prepared reports that examined in convincing detail specific ways to optimize the productivity of the technical centers.

One major DOD endeavor that somewhat balanced the drive for efficiency and effectiveness involved cost visibility and cost comparability in the Service technical centers. As mentioned in previous chapters, many analysts had noted that the impossibility of comparing the costs of comparable work at different centers frustrated many cross-Service consolidation efforts. Members of Congress, dissatisfied with the inaction and with DOD's inability to tell them how much RDT&E work actually cost, directed further studies and reductions.

The primary difficulty involved different approaches to finance and accounting (see Appendix B). Most briefly, the Navy labs charge customers the full costs of work, while the Air Force lab(s) is institutionally funded through appropriations. The Army combines customer reimbursement and institutional funding. It therefore appears to the uninitiated that RDT&E work cost significantly more in the Navy.[150]

The attempt to provide Congress with full cost visibility and to create an environment for fair, healthy competition among the Service labs continued for

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[150]One good, brief overview is in GAO's "Defense Acquisition Infrastructure: Changes in RDT&E Laboratories and Centers" (September 1996).

years, entwined with the many concurrent consolidation initiatives. Section 277 of the FY 1996 NDAA, the NSTC lab review, Vision 21, the DRI, and Section 907 of the FY 1999 NDAA all directed responses to this financial management issue. The recommendations of an LQIP financial subpanel, an OSD overarching Integrated Product Team, and many other groups generally fit into one of three categories: charging full costs to customers, migrating the centers to a common financial system, or using activity-based costing methods.

In 1999 DOD developed a Cost-Based Management Tool (CBMT) aimed at providing cost visibility without full cost recovery. The labs clambered to respond to data calls. All three Services loathed the tool to varying degrees, and eventually OSD discarded it. The next year a DOD report and Program Budget Decision (PBD) directed migration of all labs to a Working Capital Fund, but the PBD was withdrawn after fierce resistance from the Services (a chronology is provided at the end of the chapter).

While the desire for cost reductions certainly drove this effort, so did the desire to have the best, most qualified organizations performing the work. Many also believed DOD should reward those doing the best work with more work, instead of having each Service fund its own labs regardless of quality. In these ways then, the endeavor to facilitate fair competition among the labs aimed at both efficiency and quality.

DOD and Congress took other steps to improve lab and center effectiveness, but these too bore few results. The Laboratory Demonstration Program morphed into the LQIP under President Clinton's National Performance Review, but both met organizational resistance at all levels and never brought relief from barriers in OSD, the Office of Personnel Management (OPM), or even the Services. Section 246 of the FY 1999 NDAA set up a pilot program, for both labs and T&E centers, designed to improve partnering and allow waivers on numerous restrictions. Later defense authorization bills contained sections promising other types of flexibilities. While Congress did provide some legislative relief for the labs in regard to personnel demos and Military Construction (MILCON), ultimately, cost-cutting efficiency measures were prioritized while effectiveness initiatives never had the chance to get their sea legs.

The Laboratory Community on Barriers to Effectiveness

The DNL's **Impediments to Cost Reductions at the Warfare Centers and Corporate Lab** identified three types of institutional barriers preventing the Navy's technical institutions from reengineering.[151] Issues involving procurement authority and procedures, centralized management of support functions (stove piping), and facilities modernization needed to be resolved at the Navy, DOD, OMB, and congressional levels before the lab directors would have the

[151]Director of Navy Laboratories, "Impediments to Cost Reductions at the Warfare Centers and Corporate Lab" (May 20, 1991).

authority to operate their organizations like commercial firms. Unlike many of the reports containing vague generalizations about inefficiency, this one, with 48 accompanying Issue Papers, addressed specific, concrete problems in the lab community – problems which, because they were institutional in nature and involved such matters as contract administration and oversight of support functions, could be not solved by outsourcing.[152]

Contract administration presented particular types of barriers.

- The Head Contract Activity (HCA) authority resided outside the RDT&E chain of command, a situation that multiplied reporting channels and obscured responsibilities.
- Excessive procurement lead times – how long it takes to buy products and services – exacerbated an already inefficient process.
- Complex administrative procedures created a host of problems. To give just one example, an extremely low small-purchase threshold meant that buying almost anything required navigating numerous procedures.
- Excessive procurement operation oversight reviews presented a fourth type of problem.
- The report listed others as well, for example contractor protest procedures.

Stove piping typically refers to a situation in which a large field activity, say RDT&E at a warfare center, supervises its primary mission functions, but separate commands or activities centrally manage and/or provide the support functions. The organizational chart depicting such an arrangement therefore shows reporting lines for support functions separated to various higher-level organizations, hence the term stove pipe. The DNL report noted that in practice, such arrangements might save money but also reduce effectiveness, because

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[152]Issue Papers: Public Works Centers, Travel Support Services, Effect of Stove Piping on Procurement, Personnel Administration, Medical Services, Communication Services, Printing and Publication Services, Davis-Bacon Constraints, Service Imposed Regulations, HCA Authority, Simplified Purchase Procedure, Short Form Research Contract Technique, Procurement Authority of Technical Director, Procurement Review Process, Navy Stock System, Supply System Preference Requirements, Automatic Data Processing (ADP) Approval Process, ADP Approval Authority, Legal Review, R&D Under $100K, Contract Action Reporting, Small Business/Small Purchase Set Aside Requirements, Small Purchase Procedures, Direct Contracting with 8(a) Contractors, Procurement Protest Procedures, Direct Contact with DCAA, Broad Agency Announcement (BAA) and Exceptions to Competition in Contracting Act (CICA), Expensing Funds Beyond Fiscal Year, Authority to Use Grants and Cooperative Agreements, Small Business Specialists, Minor Construction Limitations, Long-Term Facilities Investment Planning, Local Approval Authority for Equipment Installation, Duration Requirement for Relocatable Usage, Definition of Facility Repair, Personnel System, Position Classification System, Reduction in Force and Adverse Actions, Managing to Payroll (MTP), Overrun Write-Off Authority, Letters of Intent, Multiple Audits and Reviews, Efficiency Reviews (ER), Military Personnel Command Inspections, External Administrative Reports, Records Holding and Filing Equipment, Property Management, Control of Printing Requirements.

they were based on doing the minimum amount of work required with the fewest personnel possible. A second problem: the dynamic process of managing a warfare center required that a technical director balance funding among different elements as needs shifted. Otherwise, in times of scarcity, both the center manager and the support function manager would desperately hoard whatever they had. In addition, support personnel and their customers (for example a warfare center) had different interests and internal requirements and worked for different people, all of which impeded team building. And finally, hidden costs arose. For example, a warfare center often had to create its own small support staff to serve as liaison with the central support function.[153]

The DNL report also stated that impediments thwarted application of the planned warfare center concept designed to jettison some aging facilities and focus investments to procure new ones within budget constraints. For example, special projects required numerous approval and validation steps. The Davis-Bacon Act prevented taking advantage of low wage rates in particular geographic areas. And MILCON limits and procedures made it extremely difficult for the centers to construct new R&D facilities – approvals required an average of three years. In fact, MILCON procedures made it so difficult to obtain funds for new construction that it was easier for a center to spend 15 times as much to revamp an old facility than to build new one – a situation that encouraged using old facilities.

A few years later, in a point paper titled **The Navy's Technical Institutions: Under Siege**, Thomas Clare, Executive Director of NSWC's Dahlgren Division, presented his views about barriers to effectiveness.[154] Clare discussed what he called the four cornerstones of technical institutions' strength – their reason for existence, roles and functions, adequate resources, and a compatible regulatory environment – to argue that the current environment attacked each of these. As in the DNL report, he described barriers that prevented labs from emulating private industry. He also recommended modifying DBOF and organizing the technical community by functions.

Clare defined the inherently governmental role of the labs as a unique connection between the warfighter and weapons developer. Understanding technical aspects of military problems, knowing who could solve those problems, and preserving the expertise to know if problems were being solved, all required a long-term continuity and accumulated expertise industry could not provide. Overall, this "corporate technical continuity" was the inherently governmental function.

The paper discussed negative consequences of outsourcing and why the centers could not operate as businesses. Clare believed that as more and more officials wanted to define fewer and fewer functions as inherently governmental, the labs devolved into government-owned contractors competing for work with the private sector, and doing so at a disadvantage because of preferences for the

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[153]Similar points are addressed in a paper by the Undersecretary of Defense for Research and Engineering, "Institutional Barriers on DOD Laboratories" (September 1979).

[154]Thomas Clare, "The Navy's Technical Institutions: Under Siege" (draft of August 1996).

latter. As for operating like businesses, Clare asserted, most variables that determined outcome – work years, spending on equipment, overhead budget controls, high grade personnel numbers – were controlled at levels above the labs and based on considerations other than market conditions, which would never happen in industry. Limits on "carryover" funding prohibited effective planning for resource distribution. Labs did not have the flexibility to assign personnel where needed. DBOF rate stabilization limited what labs could charge customers and often led to rates that fluctuated widely from year to year. And finally, despite all the insistence on partnerships, technical centers still had to charge up front for any service they might perform for their partners, another practice without parallel in industry.

Clare's recommendations focused on functions and modifying DBOF. He suggested dividing corporate technical continuity into specific functions and including these in reports, charters, and "enabling directives." Second, he recommended eliminating Rate Stabilization and Net Operating Result (NOR) recovery objectives, and holding the centers accountable "for annually achieving zero NOR, plus or minus .5% of earned revenue. Immediately, the unit of measure switches from inputs to results, [which] automatically introduces effectiveness as a measure of success." This would obviate the need for outside controls on capital investment, high grades, overhead expenses, and employment. And if "the customer supported product quality and price, and the Technical Institution delivered 'break even' operating results on the resulting volume of business, the conditions of the competitive paradigm would be satisfied."(quotes from 16-17)

The Naval Research Advisory Committee

NRAC's report on **Naval R&D** similarly focused on how to improve the effectiveness of the technical centers in an austere budget environment.[155] The panel, composed of members from industry, academia, and the Navy, heard presentations from representatives throughout the R&D community and visited 17 sites.[156] Its report sketched a brief history of Navy R&D, noted critical resources the Navy must retain, and discussed problems of organization and process. It focused throughout on improving the link between warfighter requirements and technology development. Of its recommendations, the most ambitious was to disestablish the SYSCOMs and designate their chiefs as Deputy Commanders under a new, four-star level Warfare Systems Command, which would report directly to both the ASN(RDA) and CNO.[157]

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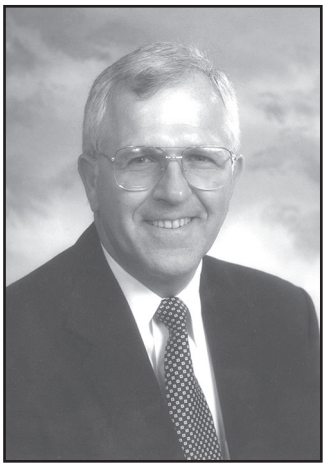
[155]Naval Research Advisory Committee, "Naval Research and Development" (October 1994). NRAC is the senior scientific advisory group to the SECNAV, CNO, Commandant of the Marine Corps, and CNR. Formed in 1946 along with ONR, it reports to SECNAV through the ASN(RDA). Its members, appointed for two-year terms, come from industry, academia, research organizations, and non-DOD government agencies. Usually, a member chairs each NRAC study, carried out by panels of experts.

[156]NSWC's briefing to the panel.

[157]See also Thomas Hone, "What Shall We Do With the SYSCOMs? An Issue that Won't Go Away" (Fall 2001).



Dr. Thomas Clare, Executive Director of the Naval Surface Warfare Center, Dahlgren Division, from 1989 to 1998.

One chapter examined five critical R&D resources. These included T&E facilities needed for unique products, support capabilities to analyze, develop, and prototype unique products and requirements (for example ordnance development), and unique "very high value fixed facilities"(36) (for example the tow tank at NSWC Carderock, Maryland and the airframe motion simulator centrifuge at NAWC Warminster). Other critical resources included rapid response capabilities (for example infrared countermeasures used in the first Gulf War). And finally, the report designated people and their corporate memory as "perhaps the most vital resource."(36) One cannot help but notice the difference in tone between reports that carped about a grievously outdated R&D system and one that acknowledged the vital assets R&D people possessed.

The report also devoted a chapter to seven significant problems in organization, the first of which – separation of material resources into the SYSCOMs and then again into the warfare centers – received the most attention. The panel believed this separation led to four specific difficulties. First, the integration of technical resources and program execution did not occur until the ASN(RDA) level, where there existed many additional demands. Second, because capable, influential people with their own agendas led the SYSCOMs, the Navy could never create uniform policies and procedures. Third, too much layering and redundancy resulted from the SYSCOMs and warfare centers managing additional field commands or divisions. And finally, the non-redundant yet similar efforts of some technical activities suggested the potential for improvement through integrating resources.

NRAC noted six other organizational problems, many of them related to downsizing. First, separating the PEOs and Program Managers (PMs) from the executing command imposed conflicting demands on warfare centers or field activities. In particular, downsizing requirements prevented those activities from meeting workloads. Second, SYSCOMs headquarters performed a host of support functions that diverted their attention from management and policy. Third, Manufacturing Technology (MANTECH), which could help save criti-

cal resources, received insufficient funding.[158] Fourth, budget reductions, hiring freezes, high grade controls, and an inflexible personnel system all thwarted strategic downsizing. Fifth, as Clare had mentioned, stabilizing DBOF rates two years in advance of the year the work was to be performed complicated budgeting for the field activities, especially during periods of reduction. And finally, although each field activity had its own downsizing plan, the Navy had no high-level, "corporate" plan.

The study panel offered three recommendations on organization. The first and most radical was to consolidate the trilateral (SYSCOM) headquarters structure into a unified "warfare system command" led by a four-star who would report to the ASN(RDA) and also to the CNO, the latter for logistics and administration matters. The SYSCOMs would be disestablished, and commanders for the four warfare areas – air, surface, undersea, and space – would be double-hatted as both Deputies to the Warfare Systems Commander and Commanders of the warfare centers. "Most significantly," the report asserted, "the Commander [of the overarching Warfare Systems Command] would constantly provide the leadership, consistency of policy, long-term perspective and overall advocacy needed to ensure the viability of the Navy's R&D/Material infrastructure into the future."(46)

The two other recommendations on organization involved downsizing and DBOF. The panel proposed that the Navy generate an overarching policy to guide strategic downsizing and that it invest local activities with the authority to tailor that policy to their needs. Regarding DBOF, it suggested either use of actual rates or more frequent stabilization.

Additionally, NRAC sought to improve the R&D process – translating warfighter capability requirements into technology requirements. The panel considered the 6.1-6.3 progression too cumbersome and disconnected to development (6.4-6.5). It mentioned the "present ad hoc process" by which 16 S&T "roundtable" meetings generated technology requirements. "The process is presently cumbersome and demanding of manpower and time. Neither attendance nor acceptance are uniform….This reflects the embryonic nature of [a] process…[that] requires a thorough review and validation."(61-62) Further, as budget cuts necessitated increased expertise in monitoring and acquiring outside technology, the Navy must "continue to perform technology development across a wide spectrum of areas so that competence is maintained."(63) Jim Colvard asserted this very point in his oral history interview discussed in Chapter Four.

The report discussed three additional process issues. The Navy badly needed an overall investment strategy, again as a means to improve the connection between warfighter and technologist. The panel suggested that the new Warfare Systems Command oversee this. Further, although the S&T portion of planning and execution "is presently the most mature and successful segment of

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[158]The Navy Manufacturing Technology Program develops manufacturing technology to produce, sustain, and repair weapons systems.

the R&D process,"(67) the Navy should resolve issues of in-house versus out-of-house needs through planning rather than arbitrary quotas. And finally, the panel recommended that the Navy evaluate R&D against an overall corporate investment strategy.

Clearly, the NRAC panel, while acknowledging the importance of responding to reductions by increasing efficiency, framed its discussion within a context of respect for the labs and centers and focused on improving them rather than getting rid of as much of their work as possible. The panel asserted that the key lesson learned from the period between world wars was the need to maintain unique facilities and in-house talent, especially during drawdowns. Similarly, it emphasized that "downsizing must not destroy capabilities that are irreplaceable and needed."(29) It discussed problems – such as the separation of the PEOs and PMs from executing commands – in terms of barriers to effectiveness rather than indicators of obsolescence. And it reminded its audience that "perhaps the most vital resource that we have is our people, and the knowledge and corporate memory that reside in them."(36)

Another distinction between efficiency and effectiveness reports involved premises versus conclusions. NRAC, Clare, the LIC and CORM studies, and many others agreed on how to frame the basic goal of R&D – translation of warfare requirements into technological capabilities. Outsourcing advocates did not explain how removing more and more work from the technical centers would *improve* connections to the warfighter, but presumably they believed that bureaucratic inertia and institutional myopia, so entrenched as to defy reform, should be bypassed. Studies focusing on effectiveness also lamented these obstructions but urged improvement rather than circumvention, based on the belief that the private sector could not provide the essential defense-oriented technical continuity.

Two years later another NRAC panel, chaired by Robert Galvin of Motorola, reported on the **Science and Technology Base**.[159] The substance of the Galvin report was 13 findings and 26 recommendations, grouped under the categories of vision, policy, and environment. The panel devoted attention to the relationship between ONR and the SYSCOMs, the Congress' "suffocating regulations and micromanagement" that "are driving us to mediocrity,"(8) and effectiveness in academic, industrial, and uniformed officer involvement in S&T.

The panel's discussion of an overall S&T vision dealt largely with the relationships among and responsibilities of the major players and advocated more ONR influence. After more or less asserting that downsizing can be fun – such periods, "painful as they are, also offer a special opportunity for taking a long-range view…."(9) – the panel analyzed the disconnect between ONR, the SYSCOMs and PEOs, and the Office of Navy Test and Evaluation and Technology Requirements (N091). While the SYSCOMs lamented that ONR investments

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[159]NRAC, "Visiting Panel Report on the Department of the Navy Science and Technology Base" (Galvin Report) (August 1996). Galvin chaired the panel on the DOE response to NSTC/PRD#1, which was also referred to as the Galvin report.

ignored later development, ONR bemoaned the SYSCOMs' fixation on the short term. NRAC proposed that ONR have an "unqualified charter" to manage tech base programs and that it become "the senior institutional cognizance of the long-term programs…."(13) It suggested that the Warfare Centers, "surrogate program managers" for 6.2 and 6.3, only provide administrative and contract support to ONR, which would actually manage those programs. It also recommended elevating the rank of Chief of Naval Research (CNR) to equal that of the SYSCOM commanders.

The report underscored the importance of S&T in other ways. For example, it recommended channeling some money to academia simply to explore the unknown, "to come up with solutions that are literally looking for a problem to solve."(15) It also suggested modifying rotation requirements so that both civilian and military S&Es could help ensure long-term continuity in S&T.

The section on policy dealt with the 6.1-6.7 categorization and burdensome bureaucratic requirements. The panel asserted that separate research categories created communication and administrative barriers.[160] It lamented the steady decline of 6.1 and 6.2 funding and again noted the mistrust and poor communication among the Office of Naval Technology (ONT), ONR, NRL, the SYSCOMs, and the warfare centers. It recommended modifying the Goldwater-Nichols Act to improve SECNAV and CNO cooperation. It also recommended relaxing the profuse accountability and personnel policy requirements.

The panel also disliked the churning environment created through constant policy, budget, and restructuring adjustments. The Warfare Centers struggled to hire and retain even the minimum number of high-quality S&Es needed – not even to carry out research, but simply to make informed investment decisions. The Navy would have to cooperate better with industry and academia, bringing industrial partners into the process as early as possible and expanding prototyping, increasing the role of UARCs in 6.2 and 6.3, and re-establishing SECNAV and CNO chairs in academic departments. Likewise, officers should serve in S&T units "as part of routine in-service training."(20) NRAC also suggested spending at least 50 percent of S&T funds in industry and academia (a proposal that contradicted its earlier report, which criticized arbitrary in-house/contracting out quotas).

The report also contains appendices, written by people with extensive experience in the R&D community, on impediments to executing the S&T program, management of personnel in the Warfare Centers, and human resource management. The first appendix discussed issues such as contracting procedures, problems with DBOF, intellectual property rights, and the proliferation of congressional requirements that prioritized compliance over execution. The second, written by Dr. Ira Blatstein, Executive Director of NSWC, described the diffi-

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[160]NRAC also analyzed this issue in a November 1992 report, "Techbase Strategy for the Year 2010." That report examined many of the same matters as in the two reports discussed here, including prototyping, modeling and simulation, Advanced Technology Demonstrations, and increased discretionary funding for the labs and centers.

culties of maintaining a talent base during downsizing. He recommended better support of the Laboratory Personnel Demonstration Project, increased flexibility in the Personnel Placement Program, and the use of some BRAC-related savings for new hires. The appendix on human resource management discussed external controls, recruitment, compensation, and performance management.

Leveling the Playing Field – A Common Financial System

The Navy and DOD tried to address many of the problems with DBOF that Clare and others mentioned, and many additional problems, in a large-scale, long-term, ultimately unsuccessful effort to "level the playing field" regarding cost accounting and cost distribution at the Defense technical centers. Parts of DMRD 922, consolidation plans, and Reliance included a commitment to increase healthy competition among the Service R&D communities. However, as studies noted, a number of disparities prevented meaningful cost comparisons. This caused many difficulties when, for example, Congress or DOD attempted reform efforts that would help the labs equally.[161]

Two of the most significant differences involved the ways in which labs received funding and calculated the costs of doing business (see Appendix B). The Navy's industrial type funding under DBOF provided a fairly accurate accounting of costs, both direct and overhead, because those costs had to be recovered from customers. On the other hand, Air Force technical centers were institutionally funded through congressional appropriations. Most of the Army's centers combined direct appropriations and partial overhead reimbursement. Also, Air Force labs, typically tenant organizations, received free support services from their hosts, while Navy centers were most often host activities themselves and had to recover those costs from customers as well.

These arrangements created all kinds of problems in trying to establish healthy and fair competition among the Service labs. For example, a member of Congress, looking at the total dollar figures without knowing the system, would believe the Air Force worked more cheaply than the Navy because the former listed only direct costs. But while a *customer* could get a better deal from the Army or Air Force, the *taxpayer* might not.

Other differences that affected competition included scope of mission, private sector capabilities, and organizational arrangements. Unlike the Air Force, the Navy's mission includes undersea, surface, land, and air warfare, all of which require their own specialized personnel and technologies. Further, while the Army and Air Force draw from robust commercial aviation, automotive, and armament industries, the Navy relies much more on internal capabilities for its ships, submarines, mines, and torpedoes. To give just one example, organizational differences include a full-spectrum versus a more narrow focus. As men-

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[161]The discussion in this section draws from NRAC, "S&T Community in Crisis," Michael Marshall, "Differing Service Approaches to RDT&E" (June 1996), and material in the NRL archive. See also GAO, "Defense Acquisition Infrastructure," esp. 24-29.

tioned in previous chapters, labs across and within the Services work in different areas along the research-testing-engineering spectrum. They differ in how much work they conduct in-house, how much of their staff consists of military personnel, and in the structures of their reporting chains.

Throughout 1994 and into 1995, the effort to create comparability among the labs and centers intensified. The DBOF Corporate Board examined ways to reduce costs at DBOF activities and recommended increased cross-Servicing, especially in light of the failure of BRAC in this area. The Deputy DDR&E for lab management, Dr. Craig Dorman, responded with a request for the LQIP to charter a financial subpanel. This group would seek a management system that could provide flexibility, facilitate cost visibility and control, and allow equity in costing and pricing, not only among Service labs but also with partners in industry, academia, and other agencies.

The Laboratory Quality Improvement Program (LQIP)

Chapter One discussed the difficulties of the highly touted Laboratory Demonstration Program (LDP), particularly the ways in which it floundered up against conflicting DMRD efforts. In early 1993 the three Service Acquisition Executives (SAEs) committed to reinvigorating the venture, renaming it the Laboratory Quality Improvement Program, or LQIP. About the same time, President Clinton's National Performance Review (NPR) set up a Defense Performance Review (DPR) office to, among other things, guide laboratory "reinvention" efforts within DOD. In March 1994 the DPR designated the LQIP and all of its participating labs as a single NPR "reinvention laboratory," which allowed the technical centers to request waivers of certain policies and regulations (the fate of the LQIP in general and other similar programs is discussed below).

Although the Services and DOD discussed LQIP in terms of saving money, it derived from efforts most concerned with effectiveness. Rather than fixating on increased outsourcing, for example, the program sought to provide lab directors with the authority and flexibility to improve their operations, a byproduct of which would be savings. In practice, efficiency meant excising and effectiveness meant enabling.

The LQIP Financial Subpanel Report

In April 1996 an LQIP financial subpanel, chartered a year earlier and composed of 22 people with vast experience in DOD R&D management, published **Recommendations for a Common Financial Management Approach at the DOD Laboratories**.[162] It sought "a single standard approach" that would increase directors' flexibility, "facilitate cost visibility and control…and allow equity in costing and pricing for comparable work performed at different

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[162]Laboratory Quality Improvement Program (LQIP) Financial Subpanel, "Recommendations for a Common Financial Management Approach at the DOD Laboratories" (April 1996).

activities."(ES-1) However, the subpanel concluded that no current method could achieve those goals. Further, any such homogenizing would excessively alter "programmatic policies, requirements, and procedures,"(ES-1) all of which had grown from financial management infrastructures based in turn on well-established philosophies. In short, changing the labs' financial management would have meant changing almost everything. The subpanel therefore recommended a "hybrid approach" whereby each Service would retain its arrangements but the system as a whole would reach something resembling comparability.

Essentially, only two options existed – revolving funds or direct/institutional funds. The former, used in the Navy DBOF centers and four Army Corps of Engineers (CE) centers, entailed financing operations by customer orders. The latter, used in the Air Force and other Army centers, entailed financing operations by appropriations through headquarters.

The first of four considerations – flexibility – also involved two issues: did a lab director have the authority and resources to pursue opportunities at his/her discretion; and did the director have alternative means to perform the mission, including alternatives for support services? At least in practice, DBOF gave directors little flexibility because higher headquarters levels (customers) exercised significant control. On the other hand, institutionally funded directors had flexibility in program direction but fiscal controls prevented significant adaptations during execution. Regarding support services, the Navy and Army CE labs enjoyed flexibility but the Air Force and other Army labs did not.

Program versus financial management complicated this question of flexibility. The differences just discussed resulted from organizational cultures, not from financial systems. Stated another way, program management rather than financial management determined a director's authority to carry out a mission. Changing the latter depended on first changing the former.

The next two considerations – cost visibility and cost control – were related. The Navy's revolving fund system arose largely for the purpose of providing cost visibility and for the most part had succeeded. Institutional funding provided less visibility, but the capacity could readily be extended. The problem was not the system but its application. Revolving fund visibility existed because activities had to fund all costs through customer rates. As tenants, on the other hand, institutionally funded centers received support/overhead services for free, which obscured overall cost visibility. Cost control, in turn, should result from visibility, but consolidations that centralized support services had wrested control from center directors by determining who did what, and when, where, and how they did it.

The problem with the fourth and final consideration – equity in pricing – arose not from cost recovery but from the way the Services treated and assigned costs. Again, revolving funds expensed all costs to labs, institutional funding only direct costs. A second inequity involved the DBOF stabilization rates both Clare and NRAC had criticized. Established two years in advance, the rates in theory gave customers up-front knowledge of costs. The Navy's inability to predict the future, however, complicated what seemed like a good idea at the time. This problem did not arise automatically from the nature of funding either

– an Army CE lab director, operating under a non-DBOF revolving fund, could modify rates based on changes as they occurred, just as any business could.

Ultimately, the subpanel found that imposing a single financial system that satisfied the objectives in the study charter would require major structural and cultural changes in at least one if not all three Services. Even if feasible, such an imposition was undesirable because the varied systems had evolved over time in response to specific responsibilities, concepts, policies, and organizational relationships. Further, the change would mean "putting the cart before the horse," or forcing management to accommodate a support system.

The study charter had directed particular attention to DBOF, which the subpanel deemed unsuitable as a DOD-wide system (for many of the same reasons Clare discussed). First, while it met the cost visibility and equity objectives, it gave the OSD and Service comptrollers control over matters more appropriately the purview of lab directors. In other words, it failed the flexibility test. Second, because headquarters levels not fiscally accountable for lab missions set regulations and work-year rates, reporting requirements had proliferated under the funding system. Imposing it on other Services would simply expand the bureaucracy and reduce what flexibility they had. Third, stabilizing work-year rates caused more problems than it solved. Fourth, DBOF regulations made it too expensive to employ significant numbers of military personnel, which would sever connections with operational elements. And finally, DBOF was simply incompatible with the Air Force and Army cultures.

The report recommended a modified, or hybrid, arrangement called Cost Accounting for Science and Technology (CAST). A "hybrid management approach expressly designed to achieve…the charter objectives,"(19) CAST could be implemented without adding staff and would spread out the pain of transition more or less equally. It would improve cost visibility and control for Air Force and (non-CE) Army labs and "achieve the flexibility and cost objectives of the study, without the unnecessary burdens that uniform conversion to DBOF would impose."(20) The features of CAST included:

- Charging customers for work
- Charging customers for overhead directly related to a project
- Not charging government customers for military pay
- Retaining MILCON without changes
- Tracking funding and distributing costs through job order cost accounting systems
- Establishing labor hour rates at the beginning of each fiscal year
- Charging government customers the same rates for work done at same lab
- Charging non-government customers for other costs incurred (for example military personnel)
- Reimbursing host commands for services provided, and charging for services to other activities
- Including equipment costs in project costs
- Funding functions not central to a lab's mission from the appropriate account

Although no optimum solution, only CAST met both the study objectives and the limits the study charter imposed.

The Cost-Based Management Tool (CBMT)

DOD responded to the LQIP report by saying, in effect, "not good enough," and efforts to find a financial approach applicable to all Service labs continued and became intertwined with other plans. In February 1997, as part of the DRI (discussed in Chapter Three), OSD chartered a Laboratory Financial Management Integrated Product Team (IPT) to recommend a way for migrating the labs to full cost visibility and recovery. The IPT (an SES/flag/general officer group) proposed three options, one of which contained two sub-alternatives: 1a) moving all labs to a Working Capital Fund (WCF) or 1b) to a WCF with modifications; 2) achieving full cost recovery within existing financial management structures; 3) employing an approach that provided full cost visibility but did not require full cost recovery. The Navy favored Option 1b, the Air Force Option 3. The Army also favored 1b but pointed out various inequities that would complicate immediate implementation.

As discussed in Chapter Three, at this same time S.912 of the FY 1998 NDAA directed a review of all acquisition activities in order to streamline management and reduce personnel by between 10,000 and 25,000. Part of the SECDEF's response included establishing a Senior Steering Group (SSG) to examine smart-buyer capabilities, duplication of effort, competing non-core functions, management reforms under the NPR, partnering, reinvesting savings in the labs and centers, and alternative management structures. SECDEF also directed the SSG to find a way to identify the true costs to taxpayers in each functional area in each Service.

In addition to the overarching IPT, other DRI efforts sought a common financial management system for the technical centers. One of Secretary Cohen's DRIDs, an RDT&E action memo issued on December 2, 1997, urged reviving some of the Vision 21 efforts (S. 277, FY 1996 NDAA, discussed in Chapter Three) and following through on the IPT's recommendations. It also directed using a CBMT as the vehicle for collecting financial data from the technical centers. In theory the CBMT, an activity-based (as opposed to budget-based) financial management tool, would allow DOD to determine operating costs of all Service RDT&E activities.

Many in the Navy adamantly objected to the CBMT and engaged in discussions with Deputy DDR&E Dr. Lance Davis about its flaws. An ASN(RDA) memo to DDR&E (ca. Jan 1998) argued that, rather than launching another study, DOD should fix problems everybody in the lab community had understood and been trying to fix for at least 25 years. The memo also pointed out that the CBMT contradicted every Service option the LQIP financial subpanel had proposed.

In a series of emails in July 1998, many NLCCG members explained why they believed the CBMT could not identify operating costs. Primarily, a flawed taxonomy, which categorized work into nine bins for cross-Service comparison, threw a wrench into the entire full-spectrum concept. Requiring centers to report

S&T work separately from engineering work would mean reporting related activities of the same center independently and otherwise artificially dividing unified work. And second, the NLCCG argued that the CBMT could not be certified and audited, unlike DBOF and the WCF, which the Navy already employed. Nevertheless, OSD forwarded CBMT data calls to all Service RDT&E activities.

Meanwhile, DOD's April 1998 response to S.912(c), "**Actions to Accelerate the Movement to the New Workforce Vision**," focused on RDT&E restructuring and "sustainment" (product support), workforce education and training, an integrated, paperless acquisition process, a price-based approach to acquisition, and T&E integration.[163] Like Vision 21, this document stated guiding principles for further studies (one of which is discussed below). As with other studies concerned primarily with efficiency, this one also stemmed from the by now reflexive assumption that DOD maintained too many capabilities duplicated in a more efficient private sector. It also called for yet another review of all S&T and engineering capabilities in DOD, industry, and academia.

Later that year, S.907 of the NDAA for FY 1999 also called for a plan to improve the labs and centers and included paragraph (b) – "Cost-Based Management Information System." DOD responded to both S.907 and S.912c with its report on streamlining **DOD's Science and Technology, Engineering, and Test and Evaluation Infrastructure**.[164] The previously abandoned Vision 21 guided this study's four main initiatives: intra-Service and intra-Agency plans, cross-Service efforts, and improvement in both T&E and cost visibility. The report detailed each Service's response to S.912c, including consolidations, workload changes, and business process reengineering. The discussion here focuses on the CBMT.

The chapter on the CBMT provided tables derived from data calls sent to the labs. The tool, which organized costs and resources along organizational, cost-element, and workload axes, tried to account for the fact that Navy's technical centers had the broadest missions and employed many of their own support staff personnel. The tables included data generated for operations costs in total and by Service; mission versus overhead costs; costs by life cycle taxonomy, product taxonomy, and support taxonomy; in-house versus total technical costs; work-year analysis; capital equipment; and building condition.

The report's conclusions regarding the CBMT are a model of rhetorical dexterity:

> Populating the CBMT has allowed a better understanding of the complexities involved in collecting and using cost data for the diverse enterprises [in the labs and centers]. Lessons learned from the initial

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[163]Secretary of Defense, "Actions to Accelerate the Movement to the New Workforce Vision" (April 1, 1998).

[164]DOD, "A Plan to Streamline DOD's Science and Technology, Engineering, and Test and Evaluation Infrastructure: Report of the Section 907 and 912(c) Senior Steering Group for Review of the RDT&E Infrastructure" (July 1999).

> experience will allow OSD to further assess the utility in providing additional cost visibility…. Future improvement will focus on finding already-existing alternative sources for some of the data to reduce the burden of data collection, refining the definitions of the data elements, reducing the data collection to just those aspects that contribute to improved management, and maximizing the fidelity of the data.(x)

In other words, the tool failed to serve its purpose, unless demonstrating its own futility counted. It forced redundant data collection, defined key terms improperly, failed to narrow its scope sufficiently, and provided inaccurate data. Not surprisingly, OSD deemed the CBMT unsatisfactory and abandoned it.

Migrating DOD Labs to a Working Capital Fund

Congress continued to press for change, and in response to the FY 2000 Defense Authorization Conference Report, DOD published a study on financing all RDT&E facilities through a **Working Capital Fund Financial System**.[165] The report described funding at the labs and Major Range Test Facility Base (MRTFB) activities and discussed the necessity of combining appropriations and a WCF in some instances. It projected one-time implementation costs of $55 to $85 million but deemed the transition to a WCF feasible and beneficial. The report noted the Air Force's and Army's objections but nonetheless recommended completing the shift by FY 2003.

As had other overviews, this too explained the advantages and disadvantages of a WCF versus appropriations. The latter provided stability during the fiscal year, but did not allow a laboratory Commanding Officer to reallocate funds already designated for specific program elements. And it did not provide cost visibility. Conversely, a WCF gave lab directors more authority, and more important, provided the cost visibility essential to competitive pricing.

Transitioning MRTFB activities to a WCF presented particular but not insurmountable difficulties, and the report recommended a combination of appropriation and industrial funding. The problem: customer demand did not cover the costs of unique capabilities DOD had to sustain. The report asserted the Navy had solved this problem by excluding certain "well-defined expenses"(13) from its rates and charging military customers only for costs directly incurred. This system allowed both flexibility and visibility.

The paper listed four criteria for and eight steps to the transition to a WCF. The four criteria:

- Outputs can be identified.
- An accounting system can collect and identify costs to outputs.
- Customers can be identified so resources can be aligned properly in accounts.

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[165]DOD Comptroller, "Report on the Evaluation of the Potential for Financing DOD Research Development Test and Evaluation Facilities Through a Working Capital Fund Financial System" (August 2000).

- Buyer-seller advantages and disadvantages are evaluated, including "an assessment of the customer's ability to influence cost by changing demand."(14)

The eight steps:

1. Define customer and product areas.
2. Identify all costs, including those for military personnel.
3. Categorize costs into direct, indirect, general, and administrative.
4. Establish cash requirements and develop a plan to provide cash balances.
5. Identify the value of capital assets and establish a depreciation schedule.
6. Establish a cost recovery pricing methodology.
7. Use a job order cost accounting system.
8. Realign funding from direct program elements or sub activity groups to customer accounts.

Despite objections from the Air Force and Army, the report recommended all Service RDT&E facilities operate with a WCF. The Air Force claimed to have sufficient cost visibility already, and the Army declared willingness to convert provided that DOD could generate an acceptable cost accounting system. The report discussed the funding and organizational changes required for those two Services to transition but concluded that the "implementation of working capital funds at additional RDT&E facilities is clearly feasible."(22) WCF would provide cost visibility, pricing comparability, and allocation flexibility, and promote healthy competition, efficiency, and cost control.

After publication of this report, DOD's PBD 411C in fact directed migration of all RDT&E activities to a WCF. The Services strenuously objected – inexplicably, even the Navy. Navy Comptroller Charles Nemfakos believed the change would actually increase operating costs and complicate infrastructure control. He noted, for example, that even with the Navy's diverse customer base "it is difficult to ensure a focus on core mission areas." With presumably less diversity for Army and Air Force labs, "you will see a tendency to grow product lines in an attempt to spread overhead more thinly, thus increasing organic infrastructure." Also, a WCF worked well when DOD's "business-like activities operated within a robust and very competitive environment" and could "take advantage of the customer-provider relationship engendered by WCF financing." But downsizing had dissipated this competitive pressure and DOD instead had to protect core capabilities.[166]

The DOD Comptroller soon withdrew PBD 411C. Thus ended more than a decade of attempts to improve inter-Service competition by leveling the playing field and determining the true cost of doing business in the DOD labs and centers.

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[166]Charles Nemfakos, Memorandum for Undersecretary of Defense (Comptroller). Subj: Program Budget Decision (PBD) 411C, Research, Development, Test, Evaluation (RDT&E) Activities" (December 5, 2000).

LDP and LQIP Successes and Failures[167]

The LDP, officially chartered in November 1989 (see Chapter One), enjoyed about as much praise as one could expect for any reform initiative and seemed certain to succeed. A consensus existed about the problems in personnel management, laboratory management, contracting and procurement, and facilities modernization. The China Lake personnel demo had received fulsome acclaim throughout DOD and Congress and extending its scope into similar programs seemed feasible. DDR&E established an oversight working group and several sub-groups to provide continuous attention to the LDP. The Navy had nine and the Army 18 labs and centers participating. For three years, they identified specific barriers to effectiveness and offered detailed plans – the Navy, for example, proposed 62 specific actions.

For various reasons, some already discussed, despite this vigorous effort the program never achieved the reforms envisioned. Some personnel authorities were withdrawn, while others languished awaiting the necessary approval. Further, even after prolonged discussions, OPM remained unwilling to approve any personnel demos. In fact, the relevant organizations resisted nearly every request for legislative and regulatory relief. And as mentioned, DMRD steamrolled over any conflicting LDP programs, as was the case throughout the decade whenever efficiency clashed with effectiveness.

When DEPSECDEF Atwood, the DDR&E, and the three SAEs recommitted in 1993 to revamping the program as LQIP, and as the program entwined with President Clinton's NPR and reinvention efforts, the labs and centers again sought waivers of burdensome policies and regulations. Again the requests met with resistance from stakeholders, and again protracted negotiations occurred. The compromises the principals finally reached were too watered down to benefit the technical centers substantively.

Ultimately then, both LDP and LQIP failed to generate relief from OSD-, OPM-, and Service-imposed barriers. Laboratory managers actually lost authority. Although the centers benefited somewhat from streamlined procurement regulations, none of those had resulted from LDP/LQIP. The few changes that occurred in personnel management, such as consolidation and centralization of human resources support, slowed rather than sped processes. And only slight improvements occurred in facilities modernization, the fourth and final area LDP/LQIP targeted.

The latter improvement resulted from congressional relief in regard to MILCON funding thresholds. The competitive advantage of operational commands had left the labs with aging buildings that hampered cutting edge research. After five years of trying, the labs finally convinced Congress to raise both the major and unspecified minor MILCON financial limits. However, this

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[167]The following discussion is drawn from NRAC, "S&T Community in Crisis," esp. 22-29. See also Jacqueline Caldwell, Bridget Schay, Craig Simmons (Office of Personnel Management), "Summative Evaluation Report, National Institute of Standards and Technology Demonstration Project: 1988-1995 (June 21, 1997).

did not translate into additional funds but rather raised the dollar amount the centers could use for construction without specific congressional approval of each project.

Legislation regarding the personnel demo projects also resulted in measurable success, although not commensurate with their full potential. Provisions such as flexible job classification and performance-based pay had reduced administrative costs and helped decrease turnover among high performers. Other agencies, both within and outside DOD, set up personnel demo projects as a result. Again however, as the labs sought to take full advantage, OPM and OSD blocked or significantly delayed proposals, many of which contained wording almost identical to that of already approved plans.

Other Congressional Attempts at Laboratory Reform

Section 912(c) Technology Leaders Workshop

DOD's S.912 report to Congress in April 1998 directed further study of, among other things, the ability to "recruit, develop, and retain technology leaders."(15) The USD(AT&L) and USD for Personnel and Readiness(P&R) sponsored a workshop on this subject in December. Representatives from most of the Service labs and centers attended. As with previous efforts, they accumulated and analyzed data and crafted plans. The resulting proposals included most of those previously proposed but rejected under the Lab Demo program. A Senior Steering Group's draft plan[168] underwent exhaustive review for more than a year. However, USD(P&R) could not accept its recommendations, and the plan never appeared in final form.

Section 246 Pilot Program

Toward the end of the decade Congress tried other ways to give technical centers the authority and flexibility to improve operations. One of these, established in S.246 of the FY 1999 NDAA, was described in a DOD report on the **Pilot Program for Revitalizing the Laboratories and Test and Evaluation Centers**.[169] S.246 allowed each Service to designate one lab and one T&E center for a three-year program that provided directors the authority and flexibility to improve partnering with universities and the private sector, waive restrictions not legally required, and develop methods to improve return on investment. The report also focused on hiring and retaining high-quality personnel and improving facilities.

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[168]Senior Steering Group for Technology Leaders, "A Plan to Recruit, Develop, Reward and Retain Technology Leaders: Report of the Section 912(c) Senior Steering Group for Technology Leaders" (April 2000), working draft.

[169]DOD, "Pilot Program for Revitalizing the Laboratories and Test and Evaluation Centers of the Department of Defense: A Report in Response to Section 246 of the Strom Thurmond National Defense Authorization Act of FY 1999" (July 1999).

The short description of the pilot program explained five critical elements for measuring progress in sustaining the world-class, organic capabilities DOD required. First, effective partnerships must include not only interactions with industry, academia, and other government agencies but also joint publications, increased revenue from joint ventures, and innovative business processes such as non-government management of facilities. Second, recruitment and retention must involve reducing hiring time and rewarding individual technical excellence. Third, accessing state of the art facilities should include improving both recapitalization and the use of the best technical information resources. The fourth and fifth metrics, visionary leadership and challenging problems, were "expected to benefit from strong cooperative relationships formed in the laboratories."(4)

The report listed the participants and mentioned some categories of potential innovations. The labs and centers chosen, respectively, were the Army Medical Research Laboratory and Materiel Command, and Aberdeen Test Center; the Space Vehicles Directorate of the Air Force Research Laboratory and Arnold Engineering Development Center; and NRL and the Aircraft and Weapons Divisions of NAWC. The labs planned to focus on pricing and intellectual property flexibilities, Cooperative Research and Development Agreements (CRADAs), limits on high grade ratios, term employees, pay comparability, the Priority Placement Program, retention of uniformed S&Es, and local director authority, especially in managing budgets. The T&E centers would focus on Small Business Innovative Research (SBIR) partnerships, mini-CRADAs (where one partner combines an S&T capability with the other partner's T&E capability), and Commercial Service Agreements designed to expand prototyping and production.

The following year, in S.245 of the FY 2000 NDAA, Congress approved another, similar three-year pilot program directed toward personnel issues. DDR&E jointly managed the two efforts, both of which met the same internal resistance that foiled the LDP and LQIP. In May 2000, the DOD Office of General Counsel ruled that neither program gave SECDEF any additional authority – in other words he could already begin every one of the proposed reforms if he so chose, without congressional direction or a special program.[170] (DSB had commented similarly in its 1987 report on technology base management). Nevertheless, meetings continued to be held to plan reforms. In August, the USD(P&R) informed the USD(AT&L) that many of the proposals under S.245 and S.246 contradicted long-term plans for the DOD personnel system.[171] USD(P&R) therefore insisted on participating in any planning. Then in November, DDR&E announced that the authorities required to inaugurate the S.245 program at the participating labs could not be obtained.[172]

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[170]OGC memo of May 8, 2000 to Director, Operational Test and Evaluation, and Deputy Director, DDR&E.

[171]USD(P&R) memo of Aug 10, 2000 to USD(AT&L).

[172]Robert Tuohy (Office of DDR&E) email of November 14, 2000.

In December NRL responded to DDR&E and withdrew from participation in the S.246 pilot.[173] It noted its great investment in both overall program planning and the development of initiatives but stated that by now it was clear the program would yield nothing of value. In essence, the memo summarized lab reform programs of the 1990s.

Other Legislation

Congress passed other lab-related legislation.[174] S.1107 of the FY 2000 NDAA eliminated controls on high-grade S&E positions at those technical centers with personnel demo programs (such controls remained for other activities). Although a significant development – both the LDP and LQIP had identified it as a goal – unfortunately, neither program had actually made any progress on achieving it. S.1113 of the FY 2001 NDAA permitted recruiting S&Es outside of DOD for short-term projects. S.1151-1153 aimed to give more control over downsizing. And S.1114 sought to enhance personnel demo projects by transferring OPM's statutory authorities to the Secretary of Defense. The latter enormously powerful provision allowed SECDEF to create new demos, modify existing ones, and in effect establish entirely new personnel systems free from the strictures of OPM's interpretation of Title 5. However, SECDEF never used the authorities granted.

In sum, based on DSB's 1987 study on technology base management and many reports with similar recommendations, the LDP, LQIP, personnel demos, pilot programs, and legislation attempted to provide DOD's labs and centers with the authority to manage their own fate. None of these projects approached their potential – not for lack of effort, because they consumed tens of thousands of lab personnel work-hours and produced thousands of pages of carefully reasoned plans and justifications. However, the climate of the decade simply favored contractors over federal laboratories. And in the end, bureaucratic obstructions stifled the initiatives designed to relieve the technical centers of stifling bureaucratic obstructions.

Bibliographic Note – Other Studies on Lab/Center Effectiveness

Two other subjects oriented toward RDT&E effectiveness received considerable additional attention before, during, and after the period under discussion. The first – hiring and retaining high-quality personnel – troubled the RDT&E community throughout the post-WWII era and has been mentioned periodically here. However, in the late 1990s it took on a new dimension as many grew worried about the effects of a decade of hiring freezes and personnel downsizing. Reports began discussing the "graying" of the workforce and the attendant loss of corporate memory and long-term continuity.

Two recent studies have reviewed at considerable length the relevant literature. One book-length paper, Michael Marshall's **The Key to a 'World-Class'**

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[173]Director of Research, NRL memo of December 18, 2000.

[174]See NRAC, "S&T Community in Crisis," 53-55.

Science and Technology Enterprise, deals with many of the issues discussed in this book and also examines more specifically matters such as human resource strategy, competitive compensation, the "contingent" workforce, and the personnel system overall. Robert Kavetsky's, Michael Marshall's, and Davinder Anand's ***From Science to Seapower*** also discusses these and many similar issues.

Many articles and studies have addressed the second issue – "alternative" governance. Alternatives to GOGOs include GOCOs, GOCAs, COCOs, FFRDCs, Public-Private Partnerships, and Government-Owned Corporations. Ideally, such alternatives combine the best of private and public sector arrangements, allow tailoring to specific missions and functions, and/or facilitate partnering and collaboration. Although studies have often recommended consideration of such options, DOD has never attempted conversion, even in a small-scale pilot program. One of the best overviews is Timothy Coffey's, Kenneth Lackie's, and Michael Marshall's **Alternative Governance: A Tool for Military Laboratory Reform**.[175]

Alternative governance at NRL has been examined in considerable detail. A proposed structure evolved over the years, culminating with a recommendation for a government-owned corporation. Although the Federal Government had established more than a dozen such corporations (Saint Lawrence Seaway Development Corporation, Federal Prison Industries, Uranium Enrichment Corporation), no two were alike. The NRL plan resembled a state university in its organization and governance. While the proposal received a relatively positive response, it never got approved at all the required levels of the Navy and OSD at the same time. It remains a viable option and might still some day receive consideration. The NRL archive houses the following studies:

1. NRL, "Management of the Naval Research Laboratory: An Examination of Alternative Approaches." September 17, 1988.
2. NRL, "Study of Alternative Laboratory Management Structures for the Naval Research Laboratory." May 1994.
3. NRL, "Alternative Management Approaches for the Naval Research Laboratory." May 1998.
4. National Academy of Public Administration, "NRL: Position Management Analysis." March 1999.

Overviews of FFRDCs include:

1. Congressional Research Service (CRS), "DOD's Federally Funded Research and Development Centers." June 3, 1993.
2. Ibid., April 13, 1995.
3. DSB, "The Role of Federally Funded Research and Development Centers in the Mission of the Department of Defense." April 25, 1995 (Available online).

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[175]Coffey, Lackie, and Marshall, "Alternative Governance."

4. Office of Technology Assessment (OTA), "A History of the Department of Defense Federally Funded Research and Development Centers." June 1995.
5. DSB, "Federally Funded Research and Development Centers (FFRDC) and University Affiliated Research Centers (UARC)." January 1997.

Cost Visibility/Comparability Chronology

August 15, 1994	DBOF RDT&E review, chaired by OSD Comptroller, states that a method for comparing costs would improve cross-Servicing decisions.
May 17, 1995	DDR&E charters LQIP Financial Subpanel.
April 1996	LQIP Financial Subpanel recommends "hybrid" solution for common financial approach among Services.
April 30, 1996	Vision 21 combines response to NSTC and S.277. Abandoned when Congress declines to authorize another BRAC.
September 1996	GAO report on Defense Acquisition Infrastructure, directed to provide information on operating costs, reports that DOD itself did not know true costs.
FY 1998 NDAA, S.912(c)	Directs review of all acquisition activities, personnel, and infrastructure, reduction of personnel numbers by 10,000 to 25,000 and report to Congress by April 1, 1998.
November 4, 1997	OSD(Comptroller)/USD(A&T) IPT generates three options for a common financial approach, and each Service chooses the one most resembling its current system.
November 26, 1997	In response to DRI/DRID on labs, Deputy DDR&E (Lab Management) brief to USD(A&T) says optimum restructuring can be achieved only if costs can be identified and recommends CBMT to track costs (not revenues).
August 17, 1998	S.912(c) charter for SSG on S&T, Engineering, and T&E says CBMT to be instituted within 60 days.

FY 1999 NDAA	S.907(a), USD(A&T) to develop lab/center management plan and consider consolidation via designating lead agencies by area or function. S. 907(b), SECDEF to develop Cost-Based Management Information System for identifying and comparing costs and to assess feasibility of common methodology for measuring costs.
February 23, 1999	USD letter response to Congress for S.907(b), states that if CBMT works it will become the model for implementation.
July 1999	SSG 907/912 report concludes CBMT efforts showed the significant complexity of task. Services identify CBMT deficiencies, and it is abandoned.
FY 2000 Defense Authorization Conference Report	Directs a study to examine migrating all Service labs to WCF.
August 2000	OSD(Comptroller) study favors migration to WCF.
Fall 2000	PBD 411C directs migration to WCF, fierce Service resistance, PBD withdrawn.

Conclusion

In 1987, the Defense Science Board wrote, "This nation has long been well served by defense laboratories in innovative research and in the support of national emergencies….The quality of the laboratories and their technical leadership are of supreme importance…." Two years later the Office of Technology Assessment wrote that DOD S&Es "are a national asset that…should be retained beyond the immediate programs for which they were hired," and "the lab is a going concern, not a job shop…[whose] professional staff must do basic and exploratory research, simply to evaluate work done outside its walls." And two years after that, the Congressional Research Service noted that since World War II, DOD labs "have played a crucial role in solving science and engineering problems and in meeting needs that are unique to the military."[176] Most studies of this time reiterated the basic reasons for a DOD laboratory system: to perform smart-buyer, inherently governmental, special- or unique-purpose, and/or life-cycle support work that aligned directly with the missions of their customers.

By 1994 however, DSB called the laboratory system "an obsolescent artifact of the Cold War" and a few years later claimed "The effectiveness of the technical staff of the Service laboratories is significantly impaired compared with the private sector."[177] Many similar statements indicated a prevailing view that DOD not only *must* turn to commercial companies in order to reduce unneeded infrastructure but also *should* in order to receive quality work. Although major reports continued to contain superficial declarations about the labs' performance, fewer and fewer bothered to include substantive sections about their key roles.

What changed? At least part of the answer is perceptions. In other words, the technical centers did not suffer from some sort of prolonged slump over the course of a few years, during which their performance level dropped off from outstanding to outdated. Instead, interpretations changed. And as has been noted, this change usually derived not so much from analysts reconsidering their positions but from a changed composition in high-level study groups. Many panels in the mid and late 1990s either had no representatives from the in-house S&T community or ignored their input.

What allowed this more negative view to prevail? For one, just like the rest of DOD, technical centers simply met continuing pressure to shrink. Because a national security mission meant reductions could not be justified on the basis

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[176]DSB, "Technology Base Management," E-2, OTA, "Holding the Edge," 65, and CRS, "Defense Labs" 1991, 1.

[177]DSB, "Defense Laboratory Management," Cover Letter, and "Science and Technology Base for the 21st Century," 4.

of quantity alone, DOD had to argue that they would actually enhance defense. And it was much easier to justify a downsizing process that targeted obsolescent artifacts rather than national assets. Second, reports emanating from panels with plenty of representatives from DOD labs had for years rued the sad situation resulting from aging equipment and facilities, barriers to hiring and retention, and bureaucratic millstones. Like any jeremiad, such lamentations originated from a hope for reformation, but perhaps by the mid 1990s that general optimism had vanished given that little progress had occurred.

One subject addressed in many reports offers another explanation – the problem of continuous, aggressive support for S&T from high-ranking leaders. In the Navy, the Naval Material Command (NAVMAT) had managed the R&D Centers (but not NRL) through the DNL. In 1985, when SECNAV Lehman disestablished NAVMAT, the act not only removed a four-star R&D advocate but also "demoted" the DNL. Although not a senior rank official, the DNL had in practice functioned as a Deputy ASN for labs, helped coordinate lab activities and communications, represented the labs on panels carrying out major studies, and served as a principal member (along with CNR) of the Joint Directors of Laboratories (JDL). The JDL's parent group – the three/four-star Joint Logistics Commanders (JLC) – collaborated regularly with OSD. The DNL could at least indirectly advocate for labs on almost any issue at almost any level.

The creation of the Warfare Centers in 1991-92 further altered the advocacy for Navy R&D. The Office of DNL was disestablished. The NLCCG was created to help coordinate the activities of the Warfare Centers. ASN(RDA) Gerald Cann also established the Navy Laboratory/Center Oversight Council (NLCOC), which he chaired – in part "to be the benefactor of the [lab] community" – and which also consisted of the VCNO, Assistant Commandant of the Marine Corps, SYSCOM Commanders, and other senior DON representatives. The NLCCG/NLCOC arrangement somewhat mirrored, at the Service level, the JDL/JLC channel. However, the NLCOC ceased to function after Cann left office only a year later.[178]

The overall organization below the ASN(RDA) left the labs with only one high-ranking official to provide continuous advocacy – the CNR. CNR represented the ASN(RDA) for S&T, but while this position theoretically equaled a Deputy ASN, the CNR was typically a two-star admiral. The SYSCOMs Commanders, two of whom were typically three-stars, also reported to both ASN(RDA) and the CNO and now oversaw the labs that had been realigned into the larger Warfare Centers.

These organizational changes tended to emphasize acquisition over S&T. As acquisition commands, the SYSCOMs naturally focused on the short-term needs of the current Fleet more so than the long-term "Fleet after next" objectives natural to performers of S&T. Although the SYSCOMs still supported RDT&E activities, they also often worked more closely with the engineering and acquisition elements of those activities. And further, just as everyone else, they

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[178]Cann interview, 4, and NLCCG, "A Historical Perspective," 16.

faced pressure to downsize. The warfare/systems centers provided them a logical "outside" source of engineering. In fact, the centers had generally resisted such an organizational arrangement precisely for fear of becoming "job shops" for the SYSCOMs. Articulation of that very concern had led ASN(RDA) Cann to say he would act with the NLCOC to check and balance those tendencies, as had the DNL.[179]

Similarly, while the Packard/Goldwater-Nichols/DMR reforms streamlined customer impact on R&D management, they also gave one person – the ASN(RDA), or Navy SAE – responsibility for the entire acquisition process. As with the SYSCOMs, the SAEs naturally focused on acquisition (the "A" rather than the "R&D"), as people at every level from Congress through DOD to the taxpayers expect products in return for large investments.[180] Recognition of the imbalance between acquisition and S&T led the NRAC Galvin Panel in 1996 to recommend elevating the CNR to the same rank as the SYSCOMs Commanders.

The void in S&T leadership – again, filled almost exclusively by the CNR – manifested itself even in the basic material for this survey: reports. Because the NLCOC never materialized as planned, because the emphasis shifted toward acquisition, and because the warfare/systems centers and NRL reported through multiple chains, many S&T management issues were dealt with through ad hoc forums, as the NRAC Galvin panel discussed. Typically, these had no reporting requirement. The Re-Investment and Infrastructure (RII) group (although it included more than just RDT&E commands) is a prime example.

It might also seem that the missed opportunities to reshape the DOD and Navy technical centers as envisioned in the LDP and similar efforts resulted inevitably from sheer bureaucratic and organizational resistance and inertia. However, the 45 percent reduction in workforce personnel occurring between 1991 and 2005 and the ever increasing proportion of work contracted to the private sector both show unambiguously that the system could produce a revolution when it wanted to. Changes in the Navy laboratory community did not affect everyone equally. Significant sites with proud histories – those at New London, Warminster, and White Oak, for example – closed, while others – Dahlgren, and Patuxent River and Indian Head (Maryland), for example – gained new facilities and responsibilities. Overall however, the Navy RDT&E community as it existed in the four-plus decades after World War II is gone.

Will it return? Should it? While it is highly unlikely that the technical centers will ever exist again as they did during the Cold War era, reviews from a growing number of analysts suggest a need to strengthen significantly the internal capabilities of defense R&D organizations. In fact, something of a cottage industry has developed for books warning of the dangers of outsourcing. Most, but certainly not all, focus on the Iraq War. Paul Verkuil's well publicized *Outsourcing Sovereignty*, primarily a legal analysis, argues that the obsession with efficiency through contracting "threatens democracy" because it removes too many

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[179]Cann interview, 11.

[180]Marshall, "Best and Brightest," 38-41.

key decisions from elected public officials. Jeremy Scahill's *Blackwater* likewise argues that over reliance on privatization endangers democracy. Tim Shorrock has written about the negative effects of outsourcing in the CIA. There is even a novel in the thriller genre about the dangers of privatizing military functions; it has what now is apparently assumed to be an ominous title – *Outsourced*.[181]

While a war and privatization of actual fighting have made outsourcing more dramatic and palpable, the issues raised have troubled DOD in the past. As discussed in Chapter Four, the rush to contract out defense work following the Hoover Commission report in the mid 1950s stemmed from a belief that the private sector performed work more efficiently than the government. Then a few years later, DOD reversed the trend, especially in R&D. Analysts documented the many unforeseen problems resulting from contracting, lamented the "brute force" with which it had been applied, urged that in-house labs must again become a "primary means" of executing research, and insisted that labs "should never lose a strong, internal competence."

Major reports on defense S&T indicate that DOD remembered this lesson for quite some time. Despite the drawdown following the end of the Vietnam conflict and the generally pro-business approach of the Reagan administration, every report that dealt with the labs echoed the argument that they were indispensable to national security and performed certain types of crucial work more effectively than any other type of organization. As demonstrated in Chapter One, most of those reports expressed frustration at the inability of the system to solve long-standing, widely-recognized problems. But an underlying premise remained: that the technical centers played a vital role in creating the most formidable fighting force in history, one based on technological rather than numerical superiority.

That lesson was forgotten or ignored in the 1990s. In effect, this means DOD can once again join the ranks of those who, discouraged by difficulties, have left a solid, working relationship for the beguiling charms of a flashy seductress, only to find some serious dysfunction under the surface.

While defense laboratories always struggled to offer the pay frequently necessary to recruit and retain top talent, they also attracted people motivated by meaningful work and a desire for public service. Ask anybody who worked at White Oak in the 1960s or 1970s what it was like to decide to spend a Saturday at the lab and to arrive to find a half-full parking lot. And even though bureaucracy often prevented the labs from becoming models of efficiency, the White

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[181]Paul Verkuil, *Outsourcing Sovereignty: Why Privatization of Government Functions Threatens Democracy and What We Can Do About It* (Cambridge, 2007), Jeremy Scahill, *Blackwater: The Rise of the World's Most Powerful Mercenary Army* (New York, 2008), Tim Shorrock, *Spies for Hire: The Secret World of Intelligence Outsourcing* (New York, 2008), R.J. Hillhouse, *Outsourced* (Toronto, 2008). See also Deborah D. Avant, *The Market for Force: The Consequences of Privatizing Security* (Cambridge, 2005), Robert Young Pelton, *Licensed to Kill: Hired Guns in the War on Terror* (New York, 2007), and Ann Markusen, "The Case Against Privatizing National Security," in *Governance*, Vol. 16 No. 4 (October 2003), 471-501.

Oak (and other) anecdotes along with plenty of other evidence indicate they were good at effectiveness – getting the job done. Yet DOD nonetheless charted a course that sailed away from what had worked for decades. As argued in the many recent publications detailing the problems with outsourcing, the course apparently needs some correcting.

This book has focused on developments in the technical centers in the 1990s and the causes of those changes; specific recommendations are beyond its scope. However, it is worth noting that there is still a tremendous body of expertise among professionals who have spent their careers in the laboratory community. They know how the labs solved pressing technical problems and spurred innovations that provided unforeseen capabilities. Surely, that body of corporate memory along with the technical and managerial savvy of a new generation of S&Es could combine to create state of the art organizations with the ability to help build a Fleet tailored to the exigencies of modern warfare.

A number of recent publications have in fact offered suggestions for strengthening defense in-house capabilities. For example, the final chapter of *From Science to Seapower* (cited several times in this book) gives ten recommendations in its "roadmap for S&T revitalization." An article on S&T innovation, written by highly regarded experts, provides a different set of justifications for in-house expertise.[182] Again, the point here is not to endorse specific recommendations, but to remind readers of some reasons for maintaining an internal technical expertise – and to warn about the costs of losing it.

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[182]Timothy Coffey's, Jill Dahlburg's, and Eli Zimet's "The S&T Innovation Conundrum," cited in Chapter Three.

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how the makeup of various study groups may have affected their recommendations.)

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Appendix A

Sources on the Management of Navy/DOD RDT&E

The reports section of NRL's archive served as the basis for this survey. The collection is an unclassified resource for post-Cold War management initiatives at the DOD and especially DON scientific and engineering activities. Collected over the course of some two decades by people serving as immediate staff of the DNL, NLCCG, DDR&E, and Research/Executive/Technical Directors of NRL and NSWC, the material reflects efforts to coordinate RDT&E across the Navy and in some instances DOD.[183] The collection complements the much larger RDT&E Management Archives housed at the Naval Historical Center, Washington Navy Yard. Together, they are the sole, formal repositories for the Navy's materiel establishment.

Overview of NRL Archive[184]

The records effectively preserve the major laboratory management initiatives between 1984 and 2001 that affected the DON, especially during the NLCCG era. The collection consists of four record groups.

1. Government-wide management initiatives affecting defense laboratories – among these records is material on outsourcing and privatization and the Government Performance and Results Act.
2. DOD and non-Navy initiatives – includes material on acquisition reform, Laboratory Demonstration Program, Laboratory Quality Improvement Program, Defense Management Review, Base Closure and Realignment, and DOD common financial system.
3. Navy – the largest record group contains documents on alternative governance (especially as related to NRL), reinvestment/infrastructure, return on investment, defense conversion and revitalization, RDT&E

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[183]Director of Research (NRL), Technical Director, and Executive Director all mean the chief civilian at a laboratory or other technical center or one of its divisions.

[184]This refers to the post-Cold War management collection only. NRL also has an archive devoted to its own history.

management/acquisition guides, and policy instructions, directives, notes, and drafts. There is also a near complete set of NLCCG meeting minutes and minutes summaries, which addresses every issue of significance to the Navy RDT&E community during the era.

4. Reports/Oral histories – some 300 reports, with authors including but not limited to the White House National Science and Technology Council, the Defense Science Board, the General Accounting Office, the Naval Research Advisory Committee, Blue Ribbon Defense Panels/Commissions, the Office of Technology Assessment, the Institute for Defense Analysis, the Center for Naval Analyses, and the NRL. Brief abstracts are provided for about half the reports. 19 oral histories, all abstracted, deal primarily with BRACs.

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Overview of Cold War-Era RDT&E Management Archive, Naval Historical Center (NHC)

This archive, comprising some 700 cubic feet, was established in 1980 as part of an effort by then Chief of Naval Material Admiral Frederick Michaelis to create a broader awareness of the contributions of the Navy's materiel establishment. Under the aegis of the DNL, a small history and archives program was begun. The records reflect the concerns of that office, providing a macro-level view of the laboratory community during the Cold War, with an emphasis on the DNL era (1966-1992).

Some of the types of records included:

1. Oral histories – more than 300 interviews of numerous major players in the community. Many, such as 44 interviews on the establishment of SPAWAR, are a tremendous asset to researchers trying to understand the nuances of DOD policy and program decision processes. The *Abstracts of Oral Histories Related to Navy RDT&E and Acquisition*, available upon request, provides abstracts of these and other interviews and also includes an extensive subject index.

2. R&D Center records – includes congressional correspondence files, personnel, organizational, policy, and budget records, Independent Research/Independent Exploratory Development (IR/IED) reports (abstracts of the center programs), long-range and five-year plans, program reviews and summaries, and management briefs.

3. Management reports – contains most of the major reports on the management of Navy and often DOD labs issued from the late 1940s to the late 1980s. In some cases the working papers, correspondence, and other related background material are included. The reports are the basis for Rodney Carlisle's *Management of the U.S. Navy R&D Centers during the Cold War* (available upon request).

4. The Navy Industrial Fund (NIF) – the archive contains a complete set of the NIF resource/financial management records of the R&D centers in the 1980s.

5. Eminent Naval scientists and engineers – an example is the Records of Waldo Lyon and the Arctic Submarine Laboratory (ASL). Fondly known in the Navy as "Mr. Arctic," Waldo Lyon ran the ASL for more than 40 years and was the Chief Scientist on board the *Nautilus* submarine in 1958 for the first transpolar crossing. This collection, approximately 75 cubic feet, has a separate finding guide, with abstracts for every document and a complete subject index.

6. Vietnam Laboratory Assistance Program/Navy Science Assistance Program (VLAP/NSAP) – established during the Vietnam War, VLAP rapidly transitioned war fighting innovations from the laboratory to the field and provided technologists with field experience. The collection contains final reports for all the projects and much of the working material generated.

For additional information contact Dr. Eric Hazell at 202-433-3224, or erichaze@aol.com

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Box 483-490	Space and Naval Warfare Systems Command (SPAWAR)

Box 491-548	DNL/DLP Reading File (1966-1990)
Box 549-641	DNL Subject File – more than 100 subjects, including Acquisition, Closures, Consolidation, Desert Shield/Storm, Empress, FOSAD, GOGO/GOCO, High-Speed Anti-Radiation Missile (HARM), Laboratory Demonstration Program (LDP), Managing to Payroll (MTP), Navy Industrial Fund (NIF), Navy Science Assistance Program (NSAP), STILO, SEACON, Small Business Innovation Research (SBIR), Strategic Planning, Technology Transfer, UNDEX
Box 642-659	DNL Reading File (1979-1985)
Box 660-671	Navy Science and Technical Employee Program (NSTEP)
Box 672-678	Laboratory Programs Division Subject File
Box 679-688	Originator Files – C.E. Biele, J.A. Corrado, G.R. Gay, Robert Hillyer, Al Himes, William Hunt, Mike Marshall, Gary Morton, Z.L. Newcomb, D.F. Parrish, James Probus, Jerry Reed, Susan Sampson, Edward Tunstall, L.P. Woodburn
Box 689-713	DNL Resources, Plans, and Programs Division – includes Series Correspondence, Memoranda, REFLEX, R&D Center Personnel Ceiling and Hiring Information, NIF
Box 713-717	DNL E-mail Files (1985-1987)
Box 718-744	DNL Laboratory Desk Officer Files (Contact Points Between DNL/R&D Centers)
Box 745-772	DNL Chronological Files (1962-1986)
Box 773-819	NIF, System/Standard Automated Financial System (STAFS)
Box 820-831	R&D Centers Operations Files
Box 832	United States Naval Academy

NHC Record Collection 7 – Reports

Box 833-867 (1945-1994)

NHC Record Collection 8 – Oral Histories

Box 868-887

NHC Record Collection 9 – Other Government Agencies

Box 888-890

NHC Record Collection 10 – Non-Government Research Organizations

Box 891-911

NHC Record Collection 11 – Individual Contributions

Box 912-914

NHC Record Collection 12 – Personal Papers

Box 915-1024 Includes Al Christman, Robert Hillyer, Gerald Johnson, Marvin Lasky, Joel Lawson, William McLean, Gary Morton, David Parrish, Alan Powell, James Probus, Gerald Schiefer, David Taylor, L.T.E. Thompson

NHC Record Collection 13 – DNL History Office

Box 1025-1032

NHC Papers of Captain Joseph P. Kelly

Box 1-29

NHC Records of Waldo Lyon and the Arctic Submarine Laboratory

Box 1-155 Includes 1,544-item fully searchable finding guide

NHC Records of the Vietnam Laboratory Assistance Program (VLAP), Naval Research and Development Unit Vietnam (NRDU), Navy Science Assistance Program (NSAP)

Box 1-100 In processing

Appendix B

A Brief Overview of the Navy's Industrial Funding

The Navy Working Capital Fund (NWCF, formerly known as the Defense Business Operations Fund, or DBOF, and the Navy Industrial Fund, or NIF) is the Navy component of a DOD financial management and cost-distribution system similar to that employed by private industry. The general concept, known as "industrial funding," is applied under a number of different titles in the Federal Government. Under industrial funding, performing activities (such as laboratories) charge customers (PMs, SYSCOMs, other agencies) not only for the direct cost of providing a product or service but also for a proportional share of all overhead costs (such as support services, utilities, buildings and grounds maintenance) not directly related to the specific task being funded. WCF activities receive no direct funding from Congress or their Service headquarters, and their customers are under no obligation to fund them.

Most of the larger Navy RDT&E activities have worked under some form of industrial funding since the 1950s (prior to DBOF, the labs operated under NIF). The Navy was an early proponent of industrial funding mechanisms in the Federal Government because its technical centers have always supported a number of different Service customers rather than being totally beholden to a single headquarters command. Industrial funding fairly and equitably distributed overhead costs to all customers.

This arrangement has a number of consequences, both positive and negative. Because customers can choose who performs needed work, competition permeates the culture of Navy technical activities. In addition, the requirement to identify and properly distribute all costs provides a high level of cost visibility and also forces performers to reduce costs wherever possible. In other words, the DON and DOD can rather accurately account for the price of doing business at a WCF activity. This, in turn, helps measure somewhat objectively an organization's efficiency in the use of resources.

On the other hand, most Army and Air Force labs (with the significant exception of the Army Corps of Engineers labs) receive some or all of their funding as direct appropriations. They also charge customers for little or none of the overhead expenses, because generally host commands, funded from different accounts, provide them free support services. These differences significantly affect what R&D work the Service labs do, how much they charge, and whether the "playing field" on which they operate can be truly leveled so their efforts can

be integrated. The differences also create many situations in which it appears, at least to those unfamiliar with the systems, that the Air Force or Army can do the same work as the Navy for a significantly lower price. And while an Air Force or Army lab can frequently charge a customer less for a given job, the arrangements obscure the total cost to the taxpayer. In fact, Congress has often lamented the fact that the Services (or at least the Army and Air Force) cannot identify the true costs of R&D.

Also, although designed to replicate industrial practice, DOD WCF procedures include some inequities. For example, new facility construction over certain dollar limits must be funded from the MILCON budget and cannot employ funds derived from the depreciation of existing facilities (which is industrial practice). Another example: most Navy WCF activities have generally been required to employ "stabilized rates," or work-year rates established about a year and a half in advance in an attempt to maintain both the predictability of the costs charged to customers and a zero profit/loss. Service comptrollers approve these rates, which cannot be modified later to accommodate fact-of-life changes. As a result, charges to a customer may misrepresent the true cost of providing the service. A third example: military personnel assigned to WCF activities are usually paid out of the Military Personnel (MilPers) budget rather than by the activity. If the WCF activity reimburses MilPers, it usually must do so based on a comptroller-established formula, not on the actual cost of employing the uniformed personnel.

As discussed in Chapter Five, the LQIP Financial Subpanel's "Recommendations for a Common Financial Approach at the DOD Laboratories" (April 1996) and GAO's "Defense Acquisition Infrastructure: Changes in RDT&E Laboratories and Centers" (September 1996, available online) contain straightforward summaries of these differences. A later draft statement, "Report on the Evaluation of the Potential for Financing DOD Research Development Test and Evaluation Facilities Through a Working Capital Financial System" (August 2000), provides a more detailed discussion.

Both the NRL and NHC archives contain a wealth of information on funding of the Navy's technical activities. The latter repository, for example, houses a complete set of the NIF management records of the R&D centers in the 1980s.

Acronyms

A&M	Acquisition and Modernization
A/E&C	Architecture/Engineering and Construction
ACAT	Acquisition Category
AFOSR	Air Force Office of Scientific Research
ARL	Army Research Laboratory
ARO	Army Research Office
ASN	Assistant Secretary of the Navy
ASN(RDA, RD&A)	Assistant Secretary of the Navy for Research, Development and Acquisition
ASN(RE&S)	Assistant Secretary of the Navy for Research, Engineering and Systems
ATTD	Advanced Technology Transition Demonstration
BSAT	(BRAC) Base Structure Analysis Team
BSEC	(BRAC) Base Structure and Evaluation Committee
BRAC	Base Realignment and Closure
C3I	Command, Control, Communications and Intelligence
C4I	Command, Control, Communications, Computing and Intelligence
CA	Commercial Activities
CAS	Contract Administrative Services
CAST	Cost Accounting for Science and Technology
CBMT	Cost-Based Management Tool
CCC	Commission on Consolidation and Closure
CINC	Commander in Chief
CMP	Civilian Materiel Professional
CNA	Center for Naval Analyses
CNR	Chief of Naval Research
COBRA	Cost of Base Realignment Actions
COCO	Contractor-Owned, Contractor-Operated
CORM	Commission on Roles and Missions
CRADA	Cooperative Research and Development Agreement
CRS	Congressional Research Service
CSF	Common Support Function
DAB	Defense Acquisition Board
DAE	Defense Acquisition Executive
DBOF	Defense Business Operations Fund
DCAA	Defense Contract Auditing Agency
DCMA	Defense Contract Management Agency
DDR&E	Director of Defense Research and Engineering

DEPSECDEF	Deputy Secretary of Defense
DMR	Defense Management Review
DMRD	Defense Management Review Decision
DNL	Director of Navy Laboratories
DOD	Department of Defense
DOE	Department of Energy
DON	Department of the Navy
DPR	Defense Performance Review
DRI	Defense Reform Initiative
DRID	Defense Reform Initiative Directive
DSB	Defense Science Board
DTP	Defense Technology Plan
DTRC	David Taylor Research Center
ED	Exploratory Development
ESOP	Employee Stock Ownership Plan
FAC	Federal Advisory Commission
FAR	Federal Acquisition Regulation
FCCSET	Federal Coordinating Council for Science, Engineering and Technology
FEPCA	Federal Employees Pay Comparability Act
FFRDC	Federally Funded Research and Development Center
FTE	Full-Time Equivalent
GAO	General Accounting Office, now Government Accountability Office
GOCA	Government-Owned, Contractor-Assisted
GOCO	Government-Owned, Contractor-Operated
GOGO	Government-Owned, Government-Operated
GPRA	Government Performance and Results Act
HCA	Head of Contract Activity
ICP	(BRAC) Internal Control Plan
IDA	Institute for Defense Analyses
ILIR	In-House Laboratory Independent Research
IPA	Intergovernmental Personnel Act (1971)
IR&D, IRAD	Independent Research and Development
ISE	In-Service Engineering
IT	Information Technology
JCS	Joint Chiefs of Staff
JCSG	(BRAC) Joint Cross-Service Group
JDL	Joint Directors of Laboratories
JLC	Joint Logistics Commanders
JMA/SA	(Navy) Joint Mission Area/Support Area
JRMB	Joint Requirements Management Board
LDP	Laboratory Demonstration Program
LIC	Laboratory Infrastructure Capability
LJCSG	Laboratory Joint Cross Service Group
LQIP	Laboratory Quality Improvement Program

MANTECH	Navy Manufacturing Technology Program
MILCON	Military Construction
MIS	Management Information System
MRTF	Management Review Task Force
MRTFB	Major Range Test Facility Base
NAE	Navy Acquisition Executive
NAVAIR	Naval Air Systems Command
NAVELEX	Naval Electronics Systems Command
NAVMAT	Naval Material Command
NAVSEA	Naval Sea Systems Command
NAWC	Naval Air Warfare Center
NBC	Nuclear-Biological-Chemical
NCCOSC	Naval Command, Control, and Ocean Surveillance Center
NDAA	National Defense Authorization Act
NESEC	Naval Electronics Systems Engineering Center
NHC	Naval Historical Center
NIF	Navy Industrial Fund
NLCCG	Navy Laboratory/Center Coordinating Group
NLCOC	Navy Laboratory/Center Oversight Council
NMCI	Navy/Marine Corps Intranet
NORDA	Naval Ocean Research and Development Activity
NOSC	Naval Ocean Systems Center
NPR	National Performance Review
NRAC	Naval Research Advisory Committee
NRC	National Research Council
NRL	Naval Research Laboratory
NSAP	Navy Science Assistance Program
NSTC	National Science and Technology Council
NSWC	Naval Surface Warfare Center
NUSC	Naval Undersea Systems Center
NUWC	Naval Undersea Warfare Center
NWC	Naval Weapons Center
O&M, O&MN	Operations and Maintenance (Navy)
OCNR	Office of the Chief of Naval Research
OMB, OM&B	Office of Management and Budget
ONR	Office of Naval Research
ONT	Office of Naval Technology
OPM	Office of Personnel Management
OSTP	Office of Science and Technology Policy
OTA	Office of Technology Assessment
PBD	Program Budget Decision
PEO	Program Executive Officer
PM	Program Manager
POM	Program Objective Memorandum
PPBS	Planning, Programming and Budgeting System

PPP	Public-Private Partnerships; Priority Placement Program
PPV	Public/Private Venture
PRD	Presidential Review Directive
QDR	Quadrennial Defense Review
R&D	Research and Development
RBA	Revolution in Business Affairs
RDT&E	Research, Development, Test and Evaluation
RIF	Reduction in Force
RII	Re-Investment and Infrastructure (group)
S&Es	Scientists and Engineers
S&T	Science and Technology
SBIR	Small Business Innovative Research
SA	Support Area
SAE	Service Acquisition Executive
SECDEF	Secretary of Defense
SES	Senior Executive Service
SPAWAR	Space and Naval Warfare Systems Command
SSC	SPAWAR Systems Center
SSG	Senior Steering Group
STIG	Space Technology Integration Group
SYSCOM	Systems Command
T&E	Test and Evaluation
TAP	Technology Area Plan
TARA	Technology Area Review and Assessment
TOA	Total Obligational Authority
UARC	University Affiliated Research Center
USD(A)	Undersecretary of Defense for Acquisition
USD(A&T)	Undersecretary of Defense for Acquisition and Technology
USD(AT&L)	Undersecretary of Defense for Acquisition, Technology and Logistics
USD(P&R)	Undersecretary of Defense for Personnel and Readiness
USDRE	Undersecretary of Defense for Research and Engineering (now DDR&E)
VCNO	Vice Chief of Naval Operations
WCF	Working Capital Fund
WSA&E	Warfare Systems Architecture and Engineering

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