



*Report of the*  
**Defense Science Board**  
**Task Force on Integrating**  
**Commercial Systems into the DOD,**  
**Effectively and Efficiently**

**Buying Commercial:**  
*Gaining the Cost/Schedule Benefits*  
*for Defense Systems*

**February 2009**

Office of the Under Secretary of Defense  
For Acquisition, Technology, and Logistics  
Washington, D.C. 20301-3140

This report is a product of the Defense Science Board (DSB).

The DSB is a Federal Advisory Committee established to provide independent advice to the Secretary of Defense. Statements, opinions, conclusions and recommendations in this report do not necessarily represent the official position of the Department of Defense.

The DSB Task Force on Integrating Commercial Systems into the DOD, Effectively and Efficiently completed its information gathering in August 2008.

This report is unclassified and cleared for public release.



OFFICE OF THE SECRETARY OF DEFENSE  
3140 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3140

DEFENSE SCIENCE  
BOARD

January 13, 2009

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION,  
TECHNOLOGY & LOGISTICS

SUBJECT: Final of the Defense Science Board Task Force on Integrating Commercial  
Systems into the DoD, Effectively and Efficiently

I am pleased to forward the final report of the Defense Science Board Task Force on Integrating Commercial Systems into the DoD, Effectively and Efficiently. The report offers important considerations for the Department of Defense for acquisition of commercial systems.

Purchasing commercial or other government off-the-shelf and commercial- or foreign-derivative systems presents a significant opportunity to the Department of Defense. The challenge is to reap the advantages such as predictable and lower costs, short realization schedules, low risk and demonstrated performance, without the missed benefits that previous attempts have experienced. This study cites a number of issues related to the certification and qualification of commercial technologies to meet military requirements. The report makes recommendation to address these issues in the areas of acquisition practices, experience, education, communication, organization, and leadership.

I endorse all of the study's recommendations and encourage you to adopt them into the operations of the Office of Acquisition, Technology and Logistics.

A handwritten signature in black ink that reads "William Schneider, Jr." with a stylized flourish at the end.

Dr. William Schneider, Jr.  
DSB Chairman





DEFENSE SCIENCE  
BOARD

OFFICE OF THE SECRETARY OF DEFENSE  
3140 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3140

January 26, 2009

MEMORANDUM TO THE CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Final Report of the Defense Science Board Task Force on Integrating Commercial Systems into the DOD, Effectively and Efficiently

The final report of the Defense Science Board Task Force on Integrating Commercial Technologies into the DOD, Efficiently and Effectively is attached. The task force identified key elements of an action plan to gain the cost and schedule benefits of procuring commercial off-the-shelf, government off-the-shelf, and commercial- and foreign-derivative technology for the DOD.

The action plan is based on four key findings by the task force:

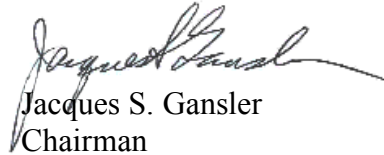
- Purchasing commercial or other government off-the-shelf, and commercial- or foreign-derivative systems presents a significant opportunity to DOD if done properly, including predictable and lower costs, shorter realization schedules, lower risk, and demonstrated performance.
- Decisions to buy COTS/GOTS and commercial- or foreign-derivative products are increasingly complex, owing to the changing nature and globalization of the defense industrial base.
- Technical authority for certification and qualification of components and systems is applied in different ways, in different Services, and on different programs. In some cases, several different organizations may provide applicable standards, especially for complex systems.
- Many current acquisition processes leave program managers with insufficient flexibility to trade off production schedules and life-cycle costs against desired performance.

The task force has identified a number of actions that would address the situation:

- DOD should adopt alternative effective and efficient acquisition strategies specifically aimed at COTS/GOTS in order to satisfy mission needs and to realize the potential speed of deployment and low cost needed for future military systems.
- DOD program managers should have relevant expertise, and should ensure relevant expertise and adequate manpower in both government and industry teams.

- DOD should form a rapid fielding agency, focused on guiding prototype developments of systems realizing proven technologies (including COTS and GOTS systems), and fielding capabilities in less than two years.
- DOD program management should facilitate full vertical and horizontal communication and visibility with government and industry partners, both during the procurement cycle and after the contract is awarded.
- DOD agencies should negotiate and contribute to DOD-wide licenses for commercial engineering standards, rather than requiring individual offices or services to purchase separate licenses.

Perhaps most importantly, this report identifies the leadership required to remove the barriers to rapid and affordable application of COTS/GOTS and commercial- or foreign-derivative products to military needs. In this uncertain future, it is critical to acknowledge that our adversaries are buying their technologies on the commercial global market. For these reasons, DOD's learning to make maximum use of COTS/GOTS and commercial- or foreign-derivative systems will be more important than ever.



Jacques S. Gansler  
Chairman

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## Executive Summary

The challenge to the task force was to examine the effective and efficient integration of commercial systems into the DOD. Specifically cited were the certification and qualification of commercial technologies to meet military requirements. These are only one aspect of the challenge, however. The task force identified many others, including acquisition practices, experience, education, communication, organization, and leadership.

Purchasing commercial or other government off-the-shelf (COTS/GOTS) and commercial- or foreign-derivative systems presents a significant opportunity to the DOD. The challenge is to reap the advantages—including predictable and lower costs and short realization schedules, as well as low risk and demonstrated performance—without the missed benefits that previous attempts have experienced. While a military system designed from the bottom up can deliver a total solution to an identified requirement, the goal of using COTS/GOTS and commercial- or foreign-derivative systems is to get the “80 percent” solution fielded rapidly and at a much lower cost and risk.

The task force looked for best practices to address the challenge by studying three commercial-derivative programs that have experienced significant cost growth and schedule delays:

- the Littoral Combat Ship
- the Presidential Helicopter Replacement
- the Armed Reconnaissance Helicopter

For balance, the task force also looked at three similar programs with lower profiles and greater success:

- the Acoustic Rapid COTS Insertion
- the P8-A Poseidon Aircraft
- the FSF-1 Sea Fighter

Interviews with a variety of experts, as well as background research complemented this analysis.

## Findings

A number of major issues and barriers to the effective and efficient use of COTS/GOTS and commercial- or foreign-derivative systems were identified.

### *Understanding “Commercial Systems”*

The terms of reference asked the task force to examine how DOD certification and qualification processes compare to commercial practices. Some DOD certification processes have been described as setting a “gold standard” and the task force was asked to determine what qualitative benefits have been gained from the exercise of this “technical authority,” and whether the benefits are commensurate with the cost.

The task force learned that the definition of commercial systems is expansive, both codified in law and in common understanding. The varying range of understanding is illustrated in Table 1, listing eight levels of commercial systems used by the military. At the most basic, “level 1 COTS” is truly off-the-shelf, but the task force found that buying commercial can also mean buying any product with commercial roots, indicated by “level 8 COTS.” The technical authority approval required to purchase each of these will vary greatly.

**Table 1.** Variations in Interpretation of a “Commercial System” can Affect Expectations

Level	Definitions of "Commercial Systems"
1	Buy it from a manufacturer—domestic or foreign—and use it as is
2	Buy it from a manufacturer and make minor modifications; <i>i.e.</i> , "paint it green"
3	Buy it from a manufacturer and make significant modifications, <i>i.e.</i> , adding armored doors, guns, military radio, or a ballistically-tolerant fuel system
4	Have a manufacturer make significant modifications before buying it
5	Have a manufacturer gut an existing product and replace most of it with other (military-specified) parts
6	Have a manufacturer modify a commercial prototype product to meet military requirements
7	Have a manufacturer assemble a collection of commercial and military components independently qualified on different systems
8	A product that does not yet exist, but requires commercial development and utilizes commercial plants or processes

The importance to the DOD of COTS/GOTS and commercial- or foreign-derivative products has evolved since the commitment to move away from military-driven standards in the early 1990s. Defense-funded research and development once drove commercial technology, but commercial technology now leads DOD in many key areas. Today, buying commercial is permissible under current law, and in some cases, it is mandated.<sup>1</sup>

The increased globalization of commercial technology has added complexity to these decisions, causing concern to DOD in a number of areas.<sup>2</sup> This factor may be mitigated (or compounded) as many foreign military systems are now available and adequate to meet the U.S. requirements. The issue is further complicated because few systems today are “military only”—all have some commercial or foreign parts. Very little of what the DOD purchases is also “commercial only;” most systems have been modified in some way to meet military needs.

**Decisions to buy COTS/GOTS and commercial- or foreign-derivative products are increasingly complex.**

The task force concluded that decisions to buy COTS/GOTS and commercial- or foreign-derivative products are increasingly complex. Currently, many procurement processes leave program managers with insufficient flexibility to trade off production schedules with desired performance and life-cycle costs. Many programs do not adequately integrate systems engineering analysis (including cost) and programmatic analysis early enough to influence decisions and tradeoffs. This means that a program manager may intend to purchase “level 2 COTS” as designated in Table 1, and end up buying “level 6” owing to unforeseen requirements. Many procurement processes today are not structured to explore if level 2 (or 3 or 4) might have been “good enough” to be militarily useful. In many cases, the task force observed increased usefulness of systems that could be delivered sooner with lower cost and reduced risk.

Without adequate systems engineering and programmatic analysis of alternatives, the DOD does not understand the cost of going from level 2 to level 6 in Table 1. An underlying reason is that traditional DOD costing models

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1. For example, 10 U.S. Code § 2377, "Preference for acquisition of commercial items;" 10 U.S. Code § 2501, "National security objectives concerning national technology and industrial base."

2. Defense Science Board. 2008. *Creating an Effective National Security Industrial Base for the 21st Century: An Action Plan to Address the Coming Crisis*. Available at <http://www.acq.osd.mil/dsb/reports/2008-07-DIST.pdf>

do not work well for commercial or commercially derived systems, especially for the cost of “minor” changes to established systems.

### *Independent Technical Authorities*

**“Technical authority” is primarily a Navy term referring to processes managed by organizations outside the program office that certify or qualify systems under development.**

The task force observed that technical authority is applied in different ways, in different Services, and on different programs. Often, neither the applicable technical authority, nor where the authority derives from, is clear at program start. In some cases, several different organizations may provide applicable standards, especially for complex systems.

The task force was asked to examine the current governance processes for technical authority, and to recommend improvements to achieve better affordability. Because of the high profile failures to obtain the projected benefits of modified commercial systems for military equipment, the task force was asked to assess the realism of pursuing such programs under these certification processes.

In the Services, the technical authority generally operates outside the programmatic chain of command, independently from program management and systems engineering. A common entity supervising both the technical authority and the program management generally exists only at the highest levels. This means that the responsibility for technical authority is not organizationally responsible for meeting cost and schedule requirements, but it can drive program decisions. The reasons for the separation of requirements is clear—an external and independent authority can ensure that program managers do not sacrifice future supportability, safety, or system performance to meet development or production cost and schedule. However, an inflexible and sometimes adversarial separation can also preclude trading off any of these, even in cases where such tradeoffs were intended at the start.

Flexibility in choosing and applying technical authorities varies across the DOD. The task force observed that the Army and Navy tend to have large offices that rigidly enforce long-standing design specifications. These are often unique to military systems, and can require major changes to the COTS/GOTS system. The Air Force and Special Forces follow a more flexible model; for example, both organizations work with the Federal Aviation Authority for certification of military-owned, commercially derived aircraft. The variance in

practices across the military demonstrates that a variety of options exist to allow contracting and program management to satisfy technical authority.

### ***Sustainment***

A key component in integrating commercially derived products into DOD systems is the consideration of life-cycle costing and sustainment in the decision to use any commercial system. Technical authorities rarely take these considerations into account in their test, certification, and qualification processes.

A primary advantage of using many commercial systems is access to a commercially driven sustainment infrastructure. A corresponding disadvantage is that commercial suppliers and products do not remain constant over the life of a typical defense system, owing to the need for commercial suppliers to keep advancing their product (while reducing cost) to stay ahead of competitors. Each factor needs to be considered in trading off time and cost when specifying a commercial-derivative product.

Delegating responsibility for sustainment to the contractor is often preferable, via warranties or specified performance-based logistics. Government acquisition personnel must recognize that taking advantage of commercial sustainment means funds must be available to assure upgrades are made. In the 21st century, adversaries of the United States can and do buy advanced commercial systems. DOD, therefore, must find ways to accommodate these commercial practices to maintain a technological edge.

### ***Standards***

A major cost advantage in the use of many commercial-derivative systems is their adherence to published industry standards. While the government's technical authority may use such standards, certification is based on test and evaluation, rather than only meeting a standard. The use of global standards, however, can ease the requirements process significantly and can enable cost-effective sustainment models. Use of published industry standards can also speed test, certification, and qualification steps because industry no longer needs to learn, follow, and maintain two or more systems.

The current federal policy is to work within commercial standards;<sup>3</sup> however, the task force observed this is not common practice in the offices holding technical authority. Access to commercial standards is limited in many cases to the cost of licenses. Progress toward a DOD or government-wide license for electronic equipment standards, for example, has been slow. In some cases, individual services or agencies may be paying license fees that could be more efficiently put toward a DOD-wide license.

In current acquisition practice, the government can mandate specialized standards that conflict with common industry practices. The use of these government-only standards can impose many derived requirements; the task force found a number of examples where seemingly minor standards incurred wholesale design changes and associated time delays in major systems. In some cases, a change in operational practice could have avoided these costs. However, there was no opportunity—no process—to evaluate these trade-offs.

The task force observed that current acquisition practices do not provide incentives to DOD prime contractors for use of commercial (non-government) standards. For example, some system integrators use their own proprietary standards rather than commercial interface/ middleware standards. It was also noted that government participation in standards communities could help to generate standards useful to both government and industry. Current government participation is uneven. Finally, the use of commercial products may also expand the knowledge base of personnel, increasing the expertise and experience needed for successful acquisition.

### *Program Examples and Insights*

Some common insights were observed across the three programs named in the terms of reference: the Littoral Combat Ship (LCS), the Presidential Helicopter Replacement (VH-71), and the Armed Reconnaissance Helicopter (ARH), and often, by contrast, from the additional programs considered: the Acoustic Rapid COTS Insertion (ARC-I), the P8-A Poseidon Aircraft, and the FSF-1 Sea Fighter.

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3. Established by the Packard Commission in 1986. See *A Quest for Excellence: Final Report to the President*. Available at <http://www.ndu.edu/library/pbrc/36ex2.pdf>. Also see DoDD 5000.1, issued March 15, 1996 by Secretary of Defense William J. Perry.



All three programs in the terms of reference were driven by perceived urgency that led to unrealistic timelines and underestimated costs. No program had adequate personnel experience or expertise, on either the government or the prime contractor staffs. The lack of personnel, time, and funding to carry out adequate systems engineering and programmatic analysis of alternatives was especially noticeable. This lack of planning resulted in post-award changes, which severely limited the potential benefit of using commercial-derivative systems.

**The lack of personnel, time, and funding to carry out adequate systems engineering and programmatic analysis of alternatives was especially noticeable.**

Overall, all six programs showed evidence that conventional DOD acquisition practices are increasingly less effective in a changing industrial world. The reasons for this are varied. Design and manufacturing are increasingly global, evidenced in the selection of equipment, procurement of subsystems, and even the use of foreign contract labor. Contractor teams were found to be vertically integrated yet horizontally disperse. Many government requirements (*i.e.*, the Berry Amendment, Naval Vessel Rules, and so on) directly contradict design and manufacturing trends today. All of these things must be considered or revised when buying commercial- or government-derivative systems.

An additional factor observed in some programs was poor contractor team communication. A lead system integrator working with an original equipment manufacturer must have excellent management personnel, with knowledge and experience of the systems to be constructed. In the same vein, the equipment manufacturer needs to have a solid understanding of the government's expectations and processes. Learning these things on the job, under tight timelines, is a fast track to failure.

## Recommendations

### RECOMMENDATION 1. ACQUISITION STRATEGIES

DOD should adopt effective and efficient acquisition strategies that utilize COTS/GOTS, as well as commercial- or foreign-derivative systems and practices to satisfy mission needs, and to realize the speed of deployment and low cost needed for future military objectives.

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*A rapid acquisition process, within the DOD Directive 5000 series, is needed for certain commercial-derivative systems. This process would not apply to, and is not needed for, the development of major new DOD weapons systems.*

The most important step to improve the acquisition strategy for commercial-derivative systems is to *create a process and to require early Systems Engineering and Programmatic Analysis of Alternatives (SEAPA)*. An effective SEAPA process will ensure that the properly evaluated cost and schedule (including sustainment and life-cycle cost) are firm requirements, along with performance, before Milestone B. As part of a competitive procurement, the SEAPA process can be part of a request for interest or a broad agency announcement, and then be part of the subsequent negotiations between the government and two or three finalists.

In addition, DOD should recognize that some *flexibility of technical and performance requirements—including certification—is needed to effectively and affordably balance schedule, cost, and performance*. Strategies include the use of Other Transaction Authority (OTA), innovative ownership and licensing of intellectual property, spiral “block” development, and the application of a modular open systems approach (MOSA). Strategies also include extended opportunities for competition (for example, by eliciting “bid samples” for commercial items), updating import regulations, and including test and evaluation methods with initial procurement planning.

*Plan for life-cycle sustainment up front.* As such, sustainment over the life cycle of the system (and beyond) should be considered in selecting commercial systems; toward this goal, commercial manufacturers may provide warranties and offer performance-based logistics plans. Acquisition officials should state in the request for proposals that the system will receive scheduled technology refreshment rather than assume a system is frozen in the original configuration. As part of an original bid, any technology refreshment should be specified to be interoperable and must also be pretested to prevent unintended consequences on the overall military system.

## RECOMMENDATION 2. MANPOWER

In procurements that involve commercial systems, DOD program management should have proven commercial leadership experience and should ensure leadership experience, domain expertise, and adequate manpower in both government and industry teams.

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For rapid acquisitions especially, the DOD needs to ensure there is relevant competence and experience, across both technical domain and project management, in the key government personnel as well as the primes and subcontractors. Specialized education and training in acquiring COTS/GOTS and commercial- or foreign-derivative items (including use of Other Transaction Authority, OTA) is needed across the team: program managers, financial managers, technical personnel, contracting personnel, and systems engineers.

Ensuring adequate numbers of these experienced people is also critical. This expertise may be fulfilled via use of contractors without conflicts of interest (*i.e.*, scientific, engineering, technical, and administrative (SETA) support contractors that do not participate on contractor teams) for some non-inherently governmental functions. Greater use of government hiring authority for “specially qualified scientists and engineers” is also encouraged, including experienced individuals from industry who may rotate through government positions—and (without conflicts) benefit both sides over time.

## RECOMMENDATION 3. ORGANIZATION AND PROCESS CHANGES

DOD should form a Rapid Fielding Agency, focused on guiding prototype development (rather than basic or applied research) and fielding capabilities in less than two years.

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The formation of a Rapid Fielding Agency is intended to respond to encouragement from Congress and the Government Accountability Office to develop such a centralized and highly qualified capability. The agency is intended to create a sustainable operation for more than one capability or project. In addition, it will serve to integrate the many current *ad hoc* “rapid reaction” programs now in DOD.

The agency as proposed will foster a culture of responsiveness where people are entrepreneurial and the organization is flat, lean, and mission-oriented. It should integrate and consolidate current budgets and personnel; as such, no new funding or positions are anticipated. The agency may also utilize detailees from Services and from global industrial concerns, and retain a core of personnel to retain institutional memory.

While the agency would operate in a fashion compatible with current acquisition law, it would encourage an independent culture from traditional acquisition. This will allow useful demonstrations—and eventual transition—to a parallel approach for rapid acquisition in DOD program management.

#### RECOMMENDATION 4. COMMUNICATION

DOD program management should facilitate full vertical and horizontal communication and visibility, both during the procurement cycle and after the contract is awarded.

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Good vertical communication is essential between the program management office and the prime and subcontractors, especially in cases where subcontractors have not had significant military experience. Equally important is horizontal communication between the acquisition community and the users of the procured equipment, *i.e.*, the warfighter community.

This is best accomplished with a recognized integration program built into the RFP and the contract, and applies to all hardware and software procurements—not only to COTS providers. An example of this type of communication is exemplified by the use of earned value management (EVM) accounting. EVM implementation prescribes a valuation of planned work and pre-defined metrics to quantify the accomplishment of work, called the “earned value.” For example, finalizing all specifications—both performance and certification—in the contract. In other words, the government should “say what we mean and mean what we say.” Full communication and shared understanding is needed between the government, prime contractors, and key subcontractors working as a team throughout the acquisition process and continuing through sustainment.

## **RECOMMENDATION 5. STANDARDS**

DOD agencies should negotiate and contribute to DOD-wide licenses for commercial engineering standards, rather than requiring individual offices or services to purchase separate licenses.

Over 9,000 non-government standards are currently adopted for use across the DOD. While the DOD has no good way to measure such use, anecdotal evidence suggests that the cost of purchasing site licenses or individual documents (generally around \$50 to \$150 per copy) has inhibited all but the largest commands and program offices from using the documents the way DOD policy had intended.

The negotiation, contracting, and oversight of hundreds of individual site licenses has meant that the DOD pays far more than it should (at least double and perhaps as much as 10-fold, according to some estimates) for access to specific standards. Returning to central procurement of the private sector documents would save significant money, and provide access to the standards by smaller programs, procurement offices, testing labs, design centers, and other offices that cannot afford subscription services.

## **RECOMMENDATION 6. LEADERSHIP**

Leadership is required to remove the barriers to rapid and affordable application of COTS/GOTS and commercial- or foreign-derivative products to military needs.

To be successful, effective and efficient acquisition of COTS/GOTS and commercial- or foreign-derivative must be explicitly stated as the responsibility of program management offices, acquisition officials, and (perhaps most importantly), the Under Secretary of Defense for Acquisition, Technology, and Logistics. The Under Secretary should provide oversight to ensure that the program office and the technical authority agree on the certification process prior to award.

Leadership will be critical to make needed trade-off decisions regarding costs, schedules, and performance for early “blocks,” especially in the early stages of

procurement. High-level visibility will also be needed to establish and insist on full SEAPA prior to commitment to contracts. The most difficult decisions, such as allowing necessary waivers for low-risk, rapid fielding of early “blocks,” will also need high-level support.

## Conclusions

Searching for, and buying, modified COTS/GOTS and commercial- or foreign-derivative systems requires a change in thinking. Such a “culture change” mandates both a recognition of need and leadership with vision and strategy to implement the change. If done properly, the results—in rapid response, lower costs, lower risks, and easily fielded performance—will be significant.

Future conflicts will continue to be asymmetric, as adversaries exploit our vulnerabilities, undermine our strengths, and challenge our assumptions. Our adversaries will fight the war they want, not the war we plan for. Many experts predict that future conflicts will require alliances with other federal agencies and international allies, and that “surprise” will be the norm—requiring fast response.

In this uncertain future, it is critical to acknowledge that our adversaries are buying their technologies on the commercial global market.

For these reasons, DOD’s learning to make maximum use of COTS/GOTS and commercial- or foreign-derivative systems will be more important than ever.

# Chapter 1. Commercial Systems and DOD Technical Authorities

The terms of reference for this study asked the Defense Science Board to address “improving the effectiveness and efficiency of DOD’s administration of technical authority.” The terms went on to include examples, as follows:

Several programs, including but not limited to, Presidential Helicopter Replacement (VH-71), Armed Reconnaissance Helicopter (ARH), and Littoral Combat Ship (LCS), have experienced significant cost growth and schedule delays. A major contributing factor in each of these cases was the Government’s post-award direction of hardware changes to what had been a Non-Developmental Item (NDI)/Commercial Off-the-Shelf (COTS) acquisition that necessitated qualification reviews and testing to achieve the Service’s technical authority or military certification. While it is likely that these changes make the platforms better, these changes also drove dramatic cost growth, delayed delivery, and often reduced quantities. It is essential that this technical authority process be reviewed in detail and recommendations developed to achieve a more pragmatic and resource conscious process.

Additional questions posed included:

- How do DOD certification/qualification processes compare to commercial practices?
- Some DOD certification processes have been described as “gold standard.” What qualitative benefits have been gained, and are the benefits commensurate with the cost?
- What are the current governance processes for technical authority? What changes and improvements need to be made to achieve better affordability?
- Is it realistic to pursue COTS modification programs for military equipment when the military use is governed under one of these certification processes?
- The P-8A is a militarized version of the Boeing 737. That program has not evidenced the same issues with the air worthiness certification as the VH-71 and ARH. Did that program address the air worthiness requirement differently?
- What are the lessons from the application of technical authority to the DOD programs with stated objectives of procuring a commercial standards-based VH-71, ARH, and LCS?

## Commercial Systems

To address these issues, the task force first examined the role of commercial components and systems in DOD service. The importance to the DOD of COTS and GOTS has evolved in a number of ways since the commitment to move away from military-driven standards in the early 1990s. GOTS systems are those in current use by government agencies, and may include NASA, the Department of Homeland Security, and other entities. Both categories may also include systems in use by agencies of foreign governments, and products that are derived from all of these.

Defense-funded research and development once drove commercial technology, but commercial technology now leads DOD in many key areas. While this may have been predicted in the early stages of the drive away from DOD ownership of systems development, the degree of globalization of commercial design, development, and manufacturing of systems of interest to the DOD has resulted in huge systemic changes. Consolidation in the defense industry has exacerbated this trend, causing concern to DOD in a number of areas.<sup>4</sup> These factors are complicated by the availability of foreign military systems, as well as the financial support of foreign military sales to the military industrial complex.

### *Understanding “Commercial Systems”*

Presentations from a number of experts revealed that the definition of commercial systems is complex, both in law and in common understanding. The usage of “commercial,” “COTS,” and “commercially derived” systems was found to vary widely, as seen in Table 1 (and summarized below). Understandably, the certification and qualification required to purchase any of these will also vary.

**Level 1.** DOD buys a component or system from an original equipment manufacturer—either domestic or foreign—and uses it “as is.”

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4. Defense Science Board. 2008. *Creating an Effective National Security Industrial Base for the 21st Century: An Action Plan to Address the Coming Crisis*. Available at <http://www.acq.osd.mil/dsb/reports/2008-07-DIST.pdf>



**Level 2.** DOD buys a component or systems from an original equipment manufacturer and then makes minor modifications. This describes changes that do not affect functionality, such as “painting it green.”

**Level 3.** DOD buys a component or system from an original equipment manufacturer and then makes significant modifications that affect functionality. This many include adding armored doors, weapons systems, communications systems, or a ballistically tolerant fuel system.

**Level 4.** DOD buys a component or system from an original equipment manufacturer, but specifies significant modifications in the purchase agreement that are made prior to delivery.

**Level 5.** DOD buys a component or system based on an existing product. System requirements drive the replacement of many subsystems with other military-specified components.

**Level 6.** DOD directs a manufacturer or system integrator to modify a prototype product to meet requirements.

**Level 7.** DOD directs a manufacturer or system integrator to assemble a collection of components independently qualified on different existing systems into a new system.

**Level 8.** DOD specifies and purchases a product that does not yet exist, but requires commercial development and utilizes commercial plants or processes.

Few systems today are composed of only military-specified parts—all have some commercial or foreign parts.<sup>5</sup> Similarly, very little of what the DOD purchases is composed of only COTS components; most systems have been modified in some way to meet military needs.

These trends are permissible under current law, and in some cases, they are mandated. For example:

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5. National Academies Press. *Equipping Tomorrow's Military Force: Integration of Commercial and Military Manufacturing in 2010 and Beyond*. 2002. Available at [http://books.nap.edu/catalog.php?record\\_id=10336](http://books.nap.edu/catalog.php?record_id=10336)

10 U.S. Code § 2377. Preference for acquisition of commercial items

**(a) Preference.— The head of an agency shall ensure that, to the maximum extent practicable—**

- (1) Requirements of the agency with respect to a procurement of supplies or services are stated in terms of—
  - (A) functions to be performed;
  - (B) performance required; or
  - (C) essential physical characteristics;
- (2) such requirements are defined so that commercial items or, to the extent that commercial items suitable to meet the agency's needs are not available, nondevelopmental items other than commercial items, may be procured to fulfill such requirements; and
- (3) offerors of commercial items and nondevelopmental items other than commercial items are provided an opportunity to compete in any procurement to fill such requirements

**(b) Implementation.— The head of an agency shall ensure that procurement officials in that agency, to the maximum extent practicable—**

- (1) acquire commercial items or nondevelopmental items other than commercial items to meet the needs of the agency;
- (2) require prime contractors and subcontractors at all levels under the agency contracts to incorporate commercial items or nondevelopmental items other than commercial items as components of items supplied to the agency;
- (3) modify requirements in appropriate cases to ensure that the requirements can be met by commercial items or, to the extent that commercial items suitable to meet the agency's needs are not available, nondevelopmental items other than commercial items;
- (4) state specifications in terms that enable and encourage bidders and offerors to supply commercial items or, to the extent that commercial items suitable to meet the agency's needs are not available, nondevelopmental items other than commercial items in response to the agency solicitations;
- (5) revise the agency's procurement policies, practices, and procedures not required by law to reduce any impediments in those policies, practices, and procedures to the acquisition of commercial items; and
- (6) require training of appropriate personnel in the acquisition of commercial items.

**(c) Preliminary Market Research.—**

- (1) The head of an agency shall conduct market research appropriate to the circumstances—
  - (A) before developing new specifications for a procurement by that agency; and

- (B) before soliciting bids or proposals for a contract in excess of the simplified acquisition threshold.
- (2) The head of an agency shall use the results of market research to determine whether there are commercial items or, to the extent that commercial items suitable to meet the agency's needs are not available, nondevelopmental items other than commercial items available that—
  - (A) meet the agency's requirements;
  - (B) could be modified to meet the agency's requirements; or
  - (C) could meet the agency's requirements if those requirements were modified to a reasonable extent.
- (3) In conducting market research, the head of an agency should not require potential sources to submit more than the minimum information that is necessary to make the determinations required in paragraph (2).

In addition, purchasing from U.S.-only sources is mandated in the following:

10 U.S. Code § 2501. National security objectives concerning national technology and industrial base

- (a) **National Security Objectives for National Technology and Industrial Base.**— It is the policy of Congress that the national technology and industrial base be capable of meeting the following national security objectives:
  - (1) Supplying and equipping the force structure of the armed forces that is necessary to achieve—
    - (A) the objectives set forth in the national security strategy report submitted to Congress by the President pursuant to section 108 of the National Security Act of 1947 (50 U.S.C. 404a);
    - (B) the policy guidance of the Secretary of Defense provided pursuant to section 113 (g) of this title; and
    - (C) the future-years defense program submitted to Congress by the Secretary of Defense pursuant to section 221 of this title.
  - (2) Sustaining production, maintenance, repair, and logistics for military operations of various durations and intensity.
  - (3) Maintaining advanced research and development activities to provide the armed forces with systems capable of ensuring technological superiority over potential adversaries.
  - (4) Reconstituting within a reasonable period the capability to develop and produce supplies and equipment, including technologically advanced systems, in sufficient quantities to prepare fully for a war, national emergency, or mobilization of the armed forces before the commencement of that war, national emergency, or mobilization.

- (5) Providing for the development, manufacture, and supply of items and technologies critical to the production and sustainment of advanced military weapon systems within the national technology and industrial base.
- (b) Civil-Military Integration Policy.— It is the policy of Congress that the United States attain the national technology and industrial base objectives set forth in subsection (a) through acquisition policy reforms that have the following objectives:**
- (1) Relying, to the maximum extent practicable, upon the commercial national technology and industrial base that is required to meet the national security needs of the United States.
  - (2) Reducing the reliance of the Department of Defense on technology and industrial base sectors that are economically dependent on Department of Defense business.
  - (3) Reducing Federal Government barriers to the use of commercial products, processes, and standards.

### *Non-government Standards*

Until the early 1990s, the DOD relied on “United States Defense Standards,” often called military standards (MIL-STD), or military specifications (MIL-SPEC) to help achieve standardization objectives. Over time, these standards became overwhelming and were found to impose unnecessary restrictions, increase cost, and delay incorporation of new technology. For these reasons, Secretary of Defense William Perry issued a memorandum in 1994 entitled, “Specifications & Standards—A New Way of Doing Business,” that prohibited the use of most defense standards without a waiver. As a consequence, DOD encouraged the use of non-government standards such as those set by industry consortia and professional organizations. Further, weapon systems were required to use “performance specifications” that described the desired features of the weapon, as opposed to requiring a large number of defense standards.

Since that time, the DOD has made significant strides in replacing military standards with standards from the private sector.<sup>6</sup> At the start, the Services maintained a central fund to purchase those standards for distribution to DOD users. However, as government credit cards (IMPAC) became more widely available and as budgets were tightened, the Services stopped funding central procurement of these standards. The result has been that while the adoption of standards across industrial suppliers has continued to grow, their use in DOD

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6. As directed by Public Law 104-113, the National Technology Transfer and Advancement Act.

design, contracts, Service laboratories, and certification/qualification offices has apparently declined.

Over 9,000 non-government standards are currently adopted for use across the DOD. Access to these standards is not pervasive, however. The task force heard examples of offices that have required compliance to documents that they cannot afford to buy and, therefore, cannot apply per the licensing agreements. Worse, some may also evaluate compliance with no access to the standards. While the DOD has no good way to measure such use, anecdotal evidence suggests that the cost of purchasing site licenses or individual documents (generally around \$50 to \$150 per copy) has inhibited all but the largest commands and program offices from using the documents the way DOD policy had intended.

The negotiation, contracting, and oversight of hundreds of individual site licenses has meant that the DOD pays far more than it should (at least double and perhaps as much as ten-fold, according to estimates) for access to specific standards. Returning to central procurement of the private sector documents would save significant money, and provide access to the standards by smaller programs, procurement offices, testing labs, design centers, and other offices that cannot afford subscription services. Even more importantly, this would simplify and encourage use by all DOD offices.

### ***Independent Technical Authorities***

The organizations of particular interest for this study include: for the Navy, the Naval Sea Systems Command (NAVSEA) and the Naval Air Systems Command (NAVAIR); and for the Army, the Aviation and Missile Research, Development, and Engineering Center (AMRDEC) of U.S. Army Research, Development, and Engineering Command (RDECOM). As is true across the DOD, these organizations have undergone significant changes since they were chartered.

Beginning at the end of the 1980s, the DOD began a long period of steady downsizing across the acquisition workforce. The reduced numbers of staff went without great impact through the 1990s, as procurement in the post-Cold War world was neither heavy nor urgent. The need for certification of new systems or examination of new standards was low. As a result, many of the design engineers and technicians that certifying organizations employed to develop and evaluate criteria for construction and design standards retired and were not replaced.

## Underlying Disconnects

The task force found that decisions to buy COTS/GOTS and commercial- or foreign-derivative products are increasingly complex. As an example, a DOD program manager may intend to purchase a “commercial system” with the intent to make minor changes and incorporate the system directly into service. The minor changes (*i.e.*, “painting it green”) may include such straightforward steps as pasting on safety labels or adding DOD virus protection to software. However, if the system is subjected to rigid levels of military certification, so many changes, both minor and major, may be required as to make the original system unrecognizable—in cost as well as configuration.

A program manager may intend to purchase a commercial system with the understanding—at a high level—that the unmodified commercial system is “good enough” to be militarily useful. The task force observed a number of cases where commercial systems could provide tremendous and immediate military value, especially when the advantages of lower cost, reduced delivery time, and lack of development risk are considered. However, many procurement processes today are not structured to explore if minor changes, or even a smaller number of major changes, would provide military value. Many procurement processes leave program managers with insufficient flexibility to trade off production schedules with desired performance and life-cycle costs.

More specifically, many programs do not adequately integrate systems engineering analysis and programmatic analysis early enough to influence decisions and tradeoffs. Traditional DOD costing models do not work well for commercial or commercially derived systems, especially in the cost of “minor” changes to established systems. Without adequate systems engineering and programmatic analysis of alternatives, it is impossible to understand the cost of modifications to commercial systems.

## Chapter 2. Lessons Learned

Commercial systems have always made up some part of the annual acquisition of the Department of Defense. For this reason, many of the issues the task force observed are not new. However, trends in acquisition practices and certification have combined with recent global changes in commercial manufacturing with significant results.

The task force observed a number of illuminating trends in DOD systems leveraging commercial- or foreign-derivative systems purchased with the intention to save time, reduce costs, and avoid risk. Of 72 weapons programs assessed by the General Accountability Office (GAO) in FY2007, none had met system development goals for cost, schedule, and performance outcomes.<sup>7</sup> In their report, GAO noted a striking lack of adoption of knowledge-based acquisition processes.

Four additional factors with the potential to influence DOD's ability to manage programs were also assessed: performance requirements changes, program manager tenure, reliance on nongovernmental personnel to help perform program office roles, and software management. All of these were shown to have a negative influence on programmatic outcomes. The following systems were specifically examined.

### Examples of “Unsuccessful” Procurements

The following sections describe the three problematic procurements specified in the terms of reference for the task force. While each experienced difficulties, whether or not they were successful is not immediately clear.

#### *Littoral Combat Ship*

The Littoral Combat Ship (LCS) concept emphasizes speed, a flexible mission module space, and a shallow draft. The design is intended to replace slower and larger specialized ships, such as minesweepers and larger assault ships.

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7. General Accountability Office. *Defense Acquisitions: Assessments of Selected Weapon Programs*. GAO-08-467SP March 31, 2008. Available at <http://www.gao.gov/new.items/d08467sp.pdf>

This level of speed and maneuverability is intended to enable ships to be deployed faster and to have improved tactical strike and evasive capacities.

Capabilities include a flight deck and hangar large enough to base two SH-60 Seahawk helicopters, the ability to recover and launch small boats from a stern ramp, and enough cargo volume and payload to deliver a small assault force with armored vehicles to a roll-on/roll-off port facility.

To achieve this mission, six 90-day concept studies were awarded in November of 2002 and three contracts were awarded in May 2004. After restructuring in 2007, the LCS program is poised to commission two operational Navy ships six years after contract award. While both contractors (Lockheed Martin and General Dynamics) have experienced substantial cost overruns, the reasons for these are complex.<sup>8</sup>

Both defense contractors worked with commercial high-speed ship builders—Lockheed with Marinette Marine and General Dynamics with Austal. Difficulties on both teams can be traced to lapses in planning, communication, and leadership on all sides of the process. Of primary relevance to the terms of reference for this task force was the development of the U.S. Navy-sanctioned *Naval Vessel Rules* that added new requirements after designs were completed and building was initiated.

A high-speed ship such as the LCS is a substantial departure from typical navy designs. Commercial interest in high-speed transport—ships that can travel a more than 30 knots—is making new hull designs and jet propulsion technology viable options to improve passenger ferries and short-distance cargo transport. However, because efficiency drives long-distance shipping, the extended high-speed requirements of the LCS are unique and very demanding. LCS is expected to travel at over 40 knots for a sustained distance of 1,600 nautical miles.

Unfortunately, development of the *Naval Vessel Rules* began late and, while they were developed quickly given their scope, the final rules were provided to the contractors only a week before contracts were awarded, well after designs were finalized and construction schedules were determined. Although the draft rules were available four months earlier, the number of technical requirements

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8. Congressional Research Service. *Navy Littoral Combat Ship (LCS) Program: Background, Oversight Issues, and Options for Congress*. Updated April 7, 2008. Available at <http://fas.org/sgp/crs/weapons/RL33741.pdf>



almost doubled—from 15,261 in the draft to 29,435 in the final rules.<sup>9</sup> Even considering the substantial reengineering effort, none of the parties involved, including the government program office and certifying authority, fully understood the impact of these requirements until after ship construction began.

One of the core drivers for the affordability of the LCS was the reliance on traditionally commercial shipyards to perform the construction work. Confusion over the mission and design requirements, however, negated many commercial advantages. Examples include the requirement to self-deploy in Sea State 8 conditions, a requirement far above anything a commercial littoral ship would encounter. This required a full redesign of both ship hulls. Another example presented was the fire suppression systems. Redundant automated systems were initially proposed, as these are standard on commercial ships. The Naval Vessel Rules, however, required the ability to access all ship areas to manually fight a fire, which led to substantial redesigns of subsystems and of physical access throughout the ship.

For these reasons, the commercial advantages were not fully realized in the initial production, although eventual benefits are anticipated. Each ship is estimated to cost more than \$500 million, more than doubling the original cost requirement of \$220 million.

### ***Presidential Helicopter Replacement (VH-71)***

The VH-71 helicopter is intended to replace the United States Marine Corps' Marine One Presidential transport fleet. Marine Helicopter Squadron One is missioned to provide safe and timely transportation for the President and Vice President of the United States, heads of state, and others, as directed by the White House Military Office.

Many of the requirements for this helicopter are not made public, but those that are point to a tremendous challenge in design and deployment. VH-71 must be capable of operating day or night; in adverse weather worldwide; in climates including, but not limited to, arctic, desert, mountainous, littoral, and tropical; and in a variety of threat spectrums, including chemical, biological, radiological, and nuclear (CBRN).

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9. The draft in February 2004 increased from 65 sections in 2,304 pages to 88 sections in 3,207 pages when issued on 21 May 2004, one week before contract award.

DOD issued a Request for Proposals in December 2003 for 23 helicopters to replace the 19 existing units in the HMX-1 squadron. The RFP did not specify a commercial or foreign derivative; it was intended to be a bottom-up design.

The winning bid from the Lockheed Martin-led US101 Team included AgustaWestland and Bell Helicopter, and proposed a variant of the AgustaWestland EH101.<sup>10</sup> In January 2005, after a delay of more than 10 months, DOD awarded a \$1.7 billion contract for the system development and demonstration.

Since that time, a number of engineering issues have stalled the VH-71's development and contributed to cost overruns. These included changing requirements, in both performance and schedule. The schedule was acknowledged at the start to be high-risk and very aggressive, driven by post-9/11 global war on terror (GWOT) urgency. It included an initial operational capacity (IOC) milestone accelerated from 2013 to January 2009, including the 10-month hiatus between submittal and award, with no change in delivery date.

The procurement was further confused by the removal of two appendices of technical requirements from the RFP, apparently to ensure a meaningful competition. These requirements were reinserted post award, leading to communication breakdowns and eventual reengineering of entire subsystems and structures. Confusion over these mission requirements led to confusion over safe operation. Some requirements plainly exceeded the limits of available technology and schedule.

The task force concluded that poor communication among White House, Navy, Marines, the prime contractor, and the helicopter designer/manufacturer did not provide the alignment needed for successfully executing a high-risk schedule. Government and industry partners both reported that "urgency" precluded standard engineering processes and systems engineering reviews.

Currently, the VH-71A (increment 1) is planned to reach operating capability in 2010. The second phase, VH-71B (increment 2) is expected to enter service in 2017. The full cost of the project is estimated at more than \$11 billion with a unit cost approaching \$480 million.

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10. The EH101 (now the AW101) first flew in 1987 and entered service with the British Royal Navy in 2000. Dozens are currently in service for military units in Great Britain, Italy, and several other countries. The unit cost of these well-established helicopters is estimated at \$57 million.

### *Armed Reconnaissance Helicopter (ARH)*

The Armed Reconnaissance Helicopter (ARH) program was initiated as a replacement for the aging OH-58D Kiowa Warrior fleet. Acquisition of the ARH was intended from the start as a commercial-derivative solution, beginning with a commercial helicopter and adding intelligence, surveillance, and reconnaissance (ISR) and engagement capabilities. It was a combination of a modified commercial airframe integrated with an NDI, mission-equipment package.

The rapidly reconfigurable ARH was intended to provide the space, weight, and power to incorporate different mission packages for use in hot conditions, complex terrain, and urban environments. The platform was intended to address the capability gaps of survivability, versatility, agility, lethality, and sustainability to ensure interoperability over extended ranges, while reducing the logistical burden on the tactical unit.

The ARH is single-pilot-operable aircraft and was a militarized version of the highly successful Bell 407 single-engine light helicopter. To enable the ARH's larger, enhanced engine, an upgraded tail rotor was incorporated from the Bell 427 to provide greater directional stability and control authority.

In early 2004, the U.S. Army announced the results of the Aviation Modernization Task Force, which included the termination of the Comanche Helicopter Program. As a result, an RFP was issued by the Army in late 2004 for an Armed Reconnaissance Helicopter.

The winning contractor, Bell Helicopter, teamed with a number of top aerospace suppliers to provide the mission package. These include Lockheed Martin, Rockwell Collins, Honeywell, FLIR Systems, L-3, Flight Safety (FSI), and Computer Sciences Corporation. The contract was awarded in July 2005, and called for 368 aircraft.

The winning bid specified that the helicopter would be certified for flight in a commercial process—just as the Bell 407 was certified. However, soon after the contract award, the U.S. Army's Aviation and Missile Research Development and Engineering Center asserted technical authority that the ARH go through military certification. After a year of negotiations, the commercial certification process was abandoned.

This change from the initial requirement led to a substantial cost increase. In addition to the long delay in starting work, the eventual decision to use

traditional military certification added development time, reduced capability, and added cost. For example, this limited the use of third-party subsystems from suppliers without the commitment to follow military certifications. The change also eliminated planned concurrency in the certification process, a standard commercial practice that is impossible according to military procedures.

The ARH program was cancelled by the DOD on 17 October 2008. Increased cost was cited as the primary reason. Development costs increased from an initial \$350 million to more than \$900 million. Each aircraft, initially estimated to cost \$8.5 million, would have cost more than \$14 million each.

## Examples of "Successful" Procurements

### *Acoustic Rapid COTS Insertion (ARC-I)*

The ARC-I program features the installation of a COTS-based sonar system, with a common, cost-effective, open architecture that provides increased capability and flexibility. A main thrust of the phased approach is to ruggedize the cabinet to reduce shock and vibration, and to enhance thermal controls for cooling and heat dissipation.

The open architecture design exploits commercial electronics development and allows the use of subcomponents and approaches that could not be accommodated under military specifications. In this way, system capabilities can parallel commercial industry developments and both software and hardware can be updated continuously, as needed. This phased approach also allows legacy submarine sonar systems to be upgraded.

The initiative was intended to replace as much military-grade electronic hardware as possible in the non-propulsion electronics system with COTS technology. ARC-I is one of the first high-profile departures from the traditional MIL-SPEC approach.

The program was delivered on time, on schedule, and at a significantly lower cost than traditional approaches. This success was attributed to staying in the technology mainstream rather than working in the "bleeding edge," and incentivizing industry to stay at the "state of the practice." Systems engineering played a major role in successful implementation. Replacement and refreshment must be planned for and constantly evaluated over the life cycle of the system. Integrating commercial technologies into a military system over time has proved

challenging owing to the rapid changes in commercial equipment and the constancy of a deployed military system.

Additional conclusions were that COTS supportability challenges remain. Program participants observed that systems engineering is even more important in the COTS environment because change is constant and change management is critical. Replacement and refreshment must be constantly evaluated over the life cycle of the system.

### ***Poseidon P-8A Aircraft***

The P-8A multi-mission surveillance aircraft is intended to provide a means to accomplish armed anti-submarine warfare (ASW), anti-surface warfare (ASuW), and ISR in maritime and littoral areas above, on, and below the surface of the ocean. Capabilities include collection, processing, and dissemination of intelligence. The aircraft is a critical element in network-centric warfare environment.

While never intended as a COTS or NDI system, the P-8A is a commercial-derivative aircraft with a traditional NAVAIR airworthiness certification requirement. The system is based on a modified Boeing 737-800 aircraft with fuselage and wing modifications and aerial refueling. The designers have introduced an innovative open systems architecture, and the task force found that the development is focused on the payload, rather than the vehicle.

The use of a commercial-derived vehicle afforded a significant cost savings to the program. The program reached Milestone A in March 2000, and Milestone C is projected for 2010 with minimal cost and schedule slippage. The program is on track to receive a NAVAIR flight clearance.

### ***FSF-1 Sea Fighter***

The Sea Fighter (FSF-1) is an experimental littoral combat ship deployed by the U.S. Navy. It is able to operate in both blue and littoral waters using either dual gas turbine engines for speed or dual diesel engines for efficient cruising. The ship can be easily reconfigured using interchangeable mission modules. As such, helicopters can land and launch on its deck and smaller water craft can be carried and launched from its stern.

The Sea Fighter was built as an experiment by Nichols Bros. Boat Builders in Freeland, Washington, under contract to Titan Corporation, a subsidiary of L-3 Communications. It was ordered in 2003 and launched in 2005, 29 months from concept to a ship in the water. In 2008, the Sea Fighter was renamed the FSF-1 and commissioned for Navy duty for a total cost between \$180 and \$220 million.

The success of this effort can be attributed to a lack of hard requirements. The ship was intended as a research project to test design limits; it included an innovative seaframe, communications systems, and weapons configurations. The requirements document “fit on less than one page” and the designers utilized full commercial practices. The ship was commissioned under commercial American Bureau of Shipbuilding classification rules; military certification was not a factor until the ship was deployed.

The purpose of this program was to provide incentives and guidance for subsequent procurements—specifically, the LCS program. The effort demonstrated a wide range of innovative capabilities, including the previously unexplored feasibility of the aluminum hull trimaran design of the LCS2.

## Chapter 3. Innovative Acquisition Strategies

To achieve improved speed of deployment, lower costs, and reduced risk, the task force concluded that the DOD needs to utilize commercial systems and practices. To take advantage of COTS/GOTS and commercial- and foreign-derived systems, however, DOD must utilize innovative acquisition strategies that address existing shortfalls and reinforce best practices.

Commercial or government off-the-shelf (including foreign) derivatives, if approached correctly, are clear alternatives that can lower risk and cost. Incentives should drive contractors to use these existing solutions where possible to meet initially proposed cost and schedule.

### Systems Engineering and Programmatic Analysis of Alternatives

Cost and schedule need to be firm requirements, along with performance, before Milestone B, including sustainment and life-cycle cost. Compromises to any requirement—cost, schedule, or performance—need to be considered in the broadest sense.

The need for fundamental systems engineering in large defense systems is well documented.<sup>11</sup> An important aspect of systems engineering occurs pre-Milestone A, where an analysis of alternatives considers programmatic needs, available technologies, and trades off performance, schedule, and cost. The degree to which this step was carried out in the programs the task force examined was a reliable indicator of program success.

The need to create a process for early SEAPA is clear. Once created, the implementation should be required in any large-system acquisition to avoid a fast track to failure.

Consideration of COTS/GOTS commercial- or foreign-derivative components or systems should be a logical part of this analysis and pre-

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11. National Academies Press. *Pre-Milestone A and Early-Phase Systems Engineering: A Retrospective Review and Benefits for Future Air Force Acquisition*. 2008. Available at [http://books.nap.edu/catalog.php?record\\_id=12065](http://books.nap.edu/catalog.php?record_id=12065)

Milestone A generation of requirements. This includes a comparison of tradeoffs among existing, modified existing, and new designs, and among available DOD, commercial, and foreign components and systems. Tradeoffs may arise from cost, schedule, certification regimes, risk, and estimates of “operational usefulness” and “supportable” mission performance in various concepts of operation.

Effective implementation of SEAPA would incorporate routine planning for “blocks” to implement spiral development. This allows the injection of new technologies with low risk and evolves system performance. Establishing a timeline for insertion allows feedback from users, maintainers, and technologists, and keeps programs on track.

Each block would have a defined prototype, which could be a virtual prototype achieved via modeling and simulation, or a more traditional hardware prototype. Evaluation of the prototype includes analysis of military utility, technological achievability (technology readiness level at or above 6), affordability, producibility, and supportability. Some flexibility of technical and performance requirements, including certification, may be needed to effectively and affordably balance schedule, cost, and performance.

As part of a competitive procurement, SEAPA can be part of a Request for Information (RFI) or a broad agency announcement (BAA), with subsequent negotiations between the government and two or three finalists. Completion of an initial SEAPA should be required within six months (or less in some cases). This should include required testing of available and existing systems. After award, the program manager brings any required tradeoffs of cost, schedule, and performance to a configuration steering board. This board may include the Under Secretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)) and the Vice Chief of the Joint Chiefs of Staff (VCJCS). Alternatives include the Service Acquisition Executive and the Vice Chief.

## **Flexible and Rapid Acquisition**

DOD will need to employ flexible acquisition strategies to improve integration of COTS/GOTS and commercial- or foreign-derivative systems into the DOD. These strategies include the following:

- Other Transaction Authority
- Intellectual property (IP) ownership and licensing



- Spiral development and a modular open systems approach (MOSA)
- Competition (including bid samples for commercial items)
- Updated export regulations, including the International Traffic in Arms Regulations (ITAR) and Export Administration Regulations (EAR)

### ***A Rapid Fielding Capability***

A rapid fielding capability is envisioned to carry out this mission. This vision is largely based on how the United States Special Forces Command (USSOCOM) currently—and very successfully—operates.

The overarching purpose of a rapid fielding capability is to field systems in less than two years, and to field smaller systems, subsystems, or system upgrades, in months or weeks. The goal of such a capability is to respond (when possible, within 30 days) to urgent needs submitted by combatant commands or other priority sources according to their requirements and window of opportunity. This response would follow a parallel but independent process apart from the Joint Capabilities Integration Development System (JCIDS) process.

To accomplish this type of acquisition, USSOCOM has a full suite of authorities to execute its mission, and this includes independent contracting authority. Funds, up to \$75 million in addition to existing funding, are made available as needed, with communication to Congress to follow. USSOCOM carries out this mission with success owing to their experience and culture, continuous and rapid mission shifts, and overall lower quantities when compared to the procurements described in Chapter 2.

To enable time-critical acquisition, a rapid fielding capability utilizes OTA as needed. OTA is commonly used to refer to the 10 U.S. Code § 2371 authority to enter into transactions other than contracts, grants, or cooperative agreements.<sup>12</sup> OTA provides tremendous flexibility in procurements for prototype projects, and has had significant and positive impact on the few programs where it has been applied.

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12. DOD Directive Memorandum. “Other Transaction” Authority (OTA) for Prototype Projects. 21 December 2000. Available at <https://acc.dau.mil/GetAttachment.aspx?id=37937&pname=file&aid=9151&lang=en-US>

Where possible, spiral development is also utilized, deploying a system first as “Block I” and inserting improvements when available to meet corresponding upgraded requirements. Also, where possible, a MOSA is essential. MOSA is an integrated business and technical strategy that employs a modular design and, where appropriate, defines key interfaces using widely supported, consensus-based standards that are published and maintained by a recognized industry standards organization.<sup>13</sup>

Rapid acquisition strategies consider the full life cycle of the system, from first fielding through transition to Services and sustainment. This includes doctrine, training, and testing. As such, a rapid fielding organization involves the test, evaluation, and qualification community early in the process. Such testing ensures interoperability with related legacy equipment.

The staff of a rapid fielding organization is small and personnel have high qualifications and expertise. Personnel need knowledge on specific systems, including hardware and software, as well as an understanding of management and operations issues. The organization needs the ability to surge as required, using borrowed personnel or contracted services. All stakeholders must be involved: government, Services, combatant commands, original equipment manufacturers (OEMs), and system integrators. Staff includes individuals who are the “best and brightest” from industry who can be persuaded to public service. Personnel strategies utilize the government’s Excepted Service rules, calling on “highly qualified experts.”

To find timely solutions and minimize development time and cost, personnel need the capability to search worldwide, across all foreign and commercial products for related processes and products. The use of competitive evaluations, including testing and modeling, is a key step in this process.

### ***Sustainment and Life-Cycle Costing***

Acquisition of COTS/GOTS and commercial- or foreign-derived systems allows a lower risk than developing a new system, and therefore allows a different approach to sustainment and life-cycle costing. Costs, especially unit production cost in the quantities anticipated, should be a requirement in the

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13. Cyrus Azani and Col. Kenneth Flowers. *Integrating Business and Engineering Strategy Through Modular Open Systems Approach*. Defense AT&L, January-February 2005. Available at [http://www.acq.osd.mil/osjtf/pdf/MOSA\\_ATL\\_Article.pdf](http://www.acq.osd.mil/osjtf/pdf/MOSA_ATL_Article.pdf)

acquisition process. By virtue of inserting cost into the requirements process, changes to the cost would incur analysis and trades against other performance and schedule requirements.

Life-cycle sustainment must always be considered in selecting commercial systems. For example, commercial providers may include warranties and contractor performance-based logistics (PBL) that affect life-cycle costs. The use of commercial components also means that planning for change is critical. Initial requirements planning should allow for technology “refresh” cycles, as freezing a commercial component in its original configuration will make a system quickly obsolete. Insertion of technology updates must ensure interoperability and be pretested for side effects. All of this should be included as part of the original requirements statement, and should be proposed in initial bids.

## Implementation

The DOD should revise acquisition models (5000.1 and 5000.2) to establish a SEAPA process and to allow a “rapid fielding alternative” for systems that need to be fielded within two years and that are based on COTS/GOTS and commercial- or foreign-derivative systems. A number of knowledge management and business practices will enable such a rapid fielding alternative to be successful.

Lessons learned are critical. Assessments and case studies should be conducted, from both inside and outside the government, to encourage future “informed” risk-taking. Best practices should be documented on issues ranging from the wording of procurements to relationships to testing organizations to team management structure. As with any commercial product, attention is needed to verify authenticity and ensure counterfeit items do not enter the defense supply chain.

An important final step in any implementation plan is to transition technologies to the Services in a timely manner.

## Chapter 4. Influence of People and Organizations

Personnel, communication, and organizations are key to efficient and effective insertion of commercial systems into the DOD.

### Manpower

For rapid acquisitions especially, the DOD needs to ensure there is relevant competence and experience, both domain and management, in the key government personnel, as well as the primes and subcontractors. This may include non-conflicted contractors (known as SETAs) for non-inherently governmental functions. Adequate numbers are needed in all categories.

To support such specialized teams, program managers should have relevant expertise and should ensure relevant expertise and adequate manpower, in both government and industry teams. Because there is a near-term shortage of qualified personnel who have appropriate clearances to tackle these problems, creative approaches are needed.

To accomplish this, greater use of “specially qualified” scientists and engineers may be needed. These are experienced industry people who are rotated through government. All personnel will need specialized education and training in acquiring COTS/GOTS and commercial- or foreign-derivative items. This is needed for program managers, financial managers, technical personnel, contracting personnel, and systems engineers.

Sources of cross-functional expertise should be identified. On-demand and “surge” skilled experts are essential to rapid project management. These include experts with technical, legal, contracting, and budgeting experience. In addition, “innovation counselors” should support and counsel project leaders on an as-needed basis. These may be retired military, civilian, or industry experts.

### Communication

Program management should provide a greater focus on facilitating improved communication and visibility, both during the RFP process and post-

award. This includes full vertical interactions, *e.g.*, between the program management office, primes, and subs, as well as horizontal interactions, *e.g.*, between the acquisition community and the warfighter community.

All specifications should be finalized in the contract—both performance and certification. This means the DOD should “say what we mean and mean what we say” in order to avoid “requirements creep.”

Full communication and shared understanding is needed both in the RFP process and post-award between government, prime, and key subcontractors working as team (with a formal integration program up front).

This applies to all hardware and software, especially for the COTS/GOTS providers. Implementation of EVM practices within the basic program is essential. To be effective, this must be part of the RFP and built into the contract.

## Organization

A rapid fielding capability that can draw on COTS/GOTS and commercial- or foreign-derivative items should be immediately available to respond to urgent needs from Combatant Commanders or initiatives issued from the Office of the Secretary of Defense (OSD). The need for such a capability was discussed by the DSB Summer Studies in 2006 and 2008, and responds to criticism from Congress and the GAO.

The organizational structure for such a capability is critical. It must foster a culture of responsiveness where people are entrepreneurial and the organization is flat, lean, and mission-oriented. Such an organization creates sustainable operation, not just for one capability or one project, but retains institutional memory and builds on lessons learned.

It is important that this organization maintain an independent culture from traditional acquisition, while complying with current acquisition law. This approach allows experimentation that may demonstrate usefulness to traditional acquisition.

In order to move quickly, all current “rapid acquisition” organizations in OSD should be incorporated within it, including Joint Capability Technology Demonstrations (JCTDs), the Joint Improvised Explosive Device Defeat Organization (JIEDDO), the Rapid Reaction Technology Office (RRTO), and

others. Transitioning these existing funding responsibilities may allow creation of a new line item. This approach integrates and consolidates current budgets and personnel slots. No new funding or positions would be required.

## **Leadership**

Leadership is essential to remove the barriers to rapid and affordable application of COTS/GOTS and commercial- or foreign-derivative products to military needs.

At the highest levels, leadership is needed to make the “tough” trade-off decisions regarding costs, schedules, and performance. Deciding what is acceptable in early “blocks” and what can be delayed for later implementation is not an easy choice. Leadership will also be needed to establish and insist on full SEAPA prior to commitment to contracts, and to allow for phased requirements or necessary waivers to achieve low-risk, rapid fielding of early system implementations.

A critical overarching need is leadership to address globalization barriers, including export controls and political will, for both COTS and GOTS systems.

Finally, to be successful, these responsibilities must be explicitly stated for all parties, up to and including USD (AT&L).

## **Conclusions**

Searching for, and buying, modified COTS/GOTS and commercial- or foreign-derivative systems requires a change in thinking. This level of cultural change generally requires a recognition of need and leadership with vision and strategy. If done properly, the results—in rapid response, lower costs, lower risks, and easily fielded performance—are significant.

# Terms of Reference







ACQUISITION,  
TECHNOLOGY  
AND LOGISTICS

## THE UNDER SECRETARY OF DEFENSE

3010 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3010

FEB 13 2008

### MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Terms of Reference – Defense Science Board (DSB) Task Force on  
Integrating Commercial Systems into the DoD: Effectively and Efficiently

The DSB is requested to initiate a study on improving the effectiveness and efficiency of DoD's administration of technical authority. Several programs, including but not limited to, Presidential Helicopter (VH-71), Armed Reconnaissance Helicopter (ARH), and Littoral Combat Ship (LCS), have experienced significant cost growth and schedule delays. A major contributing factor in each of these cases was the Government's post-award direction of hardware changes to what had been a Non-Developmental Item (NDI)/Commercial Off-the-Shelf (COTS) acquisition that necessitated qualification reviews and testing to achieve the Service's technical authority or military certification. While it is likely that these changes make the platforms better, these changes also drove dramatic cost growth, delayed delivery, and often reduced quantities. It is essential that this technical authority process be reviewed in detail and recommendations developed to achieve a more pragmatic and resource conscious process. Some of the questions which need to be addressed include:

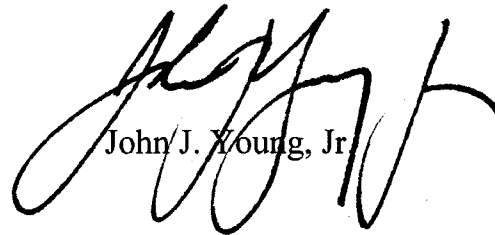
- How do DoD certification/qualification processes compare to commercial practices?
- Some DoD certification processes have been described as "gold standard." What qualitative benefits have been gained, and are the benefits commensurate with the cost?
- What are the current governance processes for technical authority? What changes and improvements need to be made to achieve better affordability?
- Is it realistic to pursue COTS modification programs for military equipment when the military use is governed under one of these certification processes?
- The P-8M is a militarized version to the Boeing 737. That program has not evidenced the same issues with air worthiness certification as the VH-71 and ARH. Did that program address the air worthiness requirement differently?
- What are the lessons from the application of technical authority to the DoD programs with stated objectives of procuring a commercial standards-based VH-71, ARH, and LCS?

Please undertake this work urgently. This is a major issue confronting the Department of Defense as it seeks to reduce cost and deliver programs on budget and schedule. Please convey the lessons learned in real time to the appropriate DoD program managers and leaders.

The Study will be sponsored by me as the Under Secretary of Defense for Acquisition, Technology and Logistics and the Deputy Under Secretary of Defense for Acquisition and Technology.

Dr Jacques Gansler will serve as the Task Force chairman. Mr David Ahern will serve as the Executive Assistant, and Major Chad Lominac will serve as the DSB Military Assistant.

The Task Force will operate in accordance with the provisions of P.L. 92-463, the "Federal Advisory Committee Act," and DoD Directive 5105.4, the "DoD Federal Advisory Committee Management program." It is not anticipated that this Task Force will need to go into any "particular matters" within the meaning of title 18, United States Code, section 208, nor will it cause any member to be placed in the position of action as a procurement official.



John J. Young, Jr.

## Biographical Sketches for Task Force Members

**The Honorable Jacques S. Gansler** is former Under Secretary of Defense for Acquisition, Technology, and Logistics and is the first holder of the Roger C. Lipitz Chair in Public Policy and Private Enterprise at the University of Maryland School of Public Policy. As the third-ranking civilian at the Pentagon from 1997 to 2001, Professor Gansler was responsible for all research and development, acquisition reform, logistics, advanced technology, environmental security, defense industry, and numerous other security programs. Before joining the Clinton Administration, Dr. Gansler held a variety of positions in government and the private sector, including Deputy Assistant Secretary of Defense (Material Acquisition), Assistant Director of Defense Research and Engineering (Electronics), Vice President of IIT, and engineering and management positions with Singer and Raytheon Corporations. Throughout his career, Dr. Gansler has written, published, and taught on subjects related to his work. He is the author of *Defense Conversion: Transforming the Arsenal of Democracy*, MIT Press, 1995; *Affording Defense*, MIT Press, 1989, and *The Defense Industry*, MIT Press, 1980. He has published numerous articles in *Foreign Affairs*, *Harvard Business Review*, *International Security*, *Public Affairs*, and other journals, as well as newspapers and frequent Congressional testimonies. He is a member of the National Academy of Engineering and a Fellow of the National Academy of Public Administration.

**Mr. David J. Berteau** is senior adviser and director of the CSIS Defense-Industrial Initiatives Group, where he leads research related to the health and management of the defense industrial base, including projects on defense acquisition reform, export controls, contracts for federal services, the U.S. defense software industrial base, and complex program management. He also serves on the Secretary of the Army's Commission on Army Acquisition and Program Management in Expeditionary Operations. Prior to joining CSIS, he was director of national defense and homeland security for Clark & Weinstock, with state governments, academic institutions, associations, and private firms as clients. A former director of Syracuse University's National Security Studies Program, Mr. Berteau is an adjunct professor at Georgetown University, a member of the Defense Acquisition University Board of Visitors, a director of the Procurement Round Table, and a fellow of the National Academy of Public Administration. Previously, Mr. Berteau was a senior vice president at Science Applications International Corporation (SAIC) for seven years, and he served in the Defense Department under four defense secretaries, including four years as principal deputy assistant secretary of defense for production and logistics. Mr. Berteau graduated with a B.A. from Tulane University and received his master's degree from the LBJ School of Public Affairs at the University of Texas.

**General Michael P. C. Carns** retired from the United States Air Force in September 1994. After retirement, General Carns served as the Managing Director of a small healthcare firm, followed by founding and leading a Wall Street policy research firm as Executive Director. He served as Vice Chief of Staff, United States Air Force, during 1991-1994; as Director of the Joint Staff, Joint Chiefs of Staff, during the Gulf War and the Panama Invasion (1989-1991); as Deputy Commander in Chief, U.S. Pacific Forces in the late '80s; and as Commander of the 13th Air Force, Republic of the Philippines, during the Philippine government crisis, 1986-1987. General Carns is a member of the Board of Directors of Entegris Corporation, Chaska, MN and IAP WorldWide Systems, New York, City. He holds appointments as: Member, U. S. Comptroller General (GAO) Board of Advisors; Member, Department of Defense Science Board; Member, Board of Advisors, National Security Agency (NSA); Senior Fellow, National Defense University (NDU), Department of Defense; Member, Threat Reduction Advisory Council, Defense Threat Reduction Agency (DTRA); Member, Defense Science Study Group, Institute for Defense Analysis; Member, Board of International Advisors, Monterey Institute of International Studies; Member, Board of Trustees, the Fisher Foundation; and member, Board of Trustees, Falcon Foundation, an educational foundation. General Carns graduated from the United States Air Force Academy in 1959 as a member of its first class; from the Harvard Business School, with Distinction, in 1967; and from the Royal College of Defense Studies, London, 1977.

**Dr. Stephen E. Cross** is a Vice President of the Georgia Institute of Technology and the Director of the Georgia Tech Research Institute. He also holds faculty appointments as a Professor in Industrial and Systems Engineering and as an Adjunct Professor in the College of Computing. Before joining Georgia Tech in 2003, he was the Director and CEO of the Software Engineering Institute, a Department of Defense-sponsored federally funded research and development center at Carnegie Mellon University. Dr. Cross was a member of the Defense Science Board Task Force on Defense Software in 2000 and also supported several past National Research Council studies. In addition, he has served as a member of the Air Force Scientific Advisory Board (SAB) and the Defense Advanced Research Project Agency (DARPA) Panel for Information Science and Technology. Dr. Cross has published over 60 technical papers and book chapters in applications of artificial intelligence and technology transition. A former Editor-in-Chief of *IEEE Intelligent Systems*, he currently serves as an Associate Editor of the *Journal of Information, Knowledge, and Systems Management*. Dr. Cross is currently a Fellow of the Institute of Electrical and Electronics Engineers (IEEE). He received his PhD from the University of Illinois at Urbana-Champaign, his MSEE from the Air Force Institute of Technology (AFIT), and his BSEE from the University of Cincinnati.

**The Honorable Lawrence J. Delaney** is a senior executive specializing in space and missile systems, information systems, propulsion systems, and environmental technology. Dr. Delaney received the Outstanding Civilian Service Medal for his work

on the Army Science Board (1981-1988). In 2001, he was awarded the Secretary of Defense Medal for Outstanding Public Service and the Department of the Air Force Decoration for Exceptional Civilian Service. He has authored numerous articles in research and engineering journals. He has recently completed his service as Chair of the National Academies' Air Force Studies Board and currently serves as Vice Chair of the Army Science Board. As a member of the National Academies' Special Operations Command (SOCOM) Acquisition Committee, he chairs their study on Universal RF Systems. Dr. Delaney is a member of the Board of Trustees of Clarkson University and on the boards of several high technology companies. Dr. Delaney retired in 2005 as Vice President, Special Programs, L-3 Communications. Previously he held the position of Executive Vice President of Operations and President and CEO of the Advanced Systems Development Sector of the Titan Corporation. Dr. Delaney was Chairman of the Board, CEO and President of Areté Associates from 2001-2003. He was Assistant Secretary of the Air Force (Acquisition) and Chief Information Officer from May 1999 to January 2001. From January 20, 2001 until June 1, 2001, Dr. Delaney held the position of Acting Secretary of the Air Force. He received his PhD in Chemical Engineering from the University of Pennsylvania in 1961.

**Mr. Richard L. Dunn**, an independent consultant, provides advice and engages in research and analysis related to the deployment and implementation of technology in the military and civil sectors through partnering and other innovative means; he conducts research in national security operations, technology, and their interactions; and analyzes related laws, policies, and practices. From 2000-2007, Mr. Dunn was a Visiting Scholar/Senior Fellow at the University of Maryland, in the Department of Logistics, Business and Public Policy, R.H. Smith School of Business. Prior to that, he was appointed as the first General Counsel of DARPA. From 1980-1987, Mr. Dunn served in several positions at NASA, including Counsel to the Space Commercialization Task Force and Deputy Associate General Counsel, and from 1979-1980, he was in private law practice with the Washington firm of Sullivan and Beauregard. Previously, from 1970-1979, Mr. Dunn was a Judge Advocate in the United States Air Force. He is the author of numerous law review articles. Two of Mr. Dunn's research papers were selected for presentation at the Naval Postgraduate School's annual Acquisition Research Conferences. Mr. Dunn is a primary author of *Strategy for an Army Center for Network Science, Technology, and Experimentation* (National Academy of Sciences, 2007). He has also published numerous articles on military history. Mr. Dunn holds a B.A. cum laude from the University of New Hampshire, 1966; a J.D., University of Maryland, 1969; and an LL.M. with Highest Honors from the George Washington University.

**Mr. Paris Genalis** retired in 2006 as director of naval warfare in the Office of the Secretary of Defense. Prior, he was Deputy Director of Naval Warfare and was a Principal Advisor to the Under Secretary of Defense (Acquisition, Technology, and Logistics) on maritime systems. He was Assistant Director for Research and Laboratory

Management for Defense Research and Engineering (DDR&E). Before that position, Mr. Genalis was Special Assistant to the Deputy Under Secretary of Defense for Tactical Warfare programs. Mr. Genalis also taught at the U.S. Naval Academy in Annapolis and other schools. His honors included two Presidential Rank Awards and Defense Department awards for meritorious civilian service. Mr. Genalis graduated from the University of Michigan, where he received both a BS and MS. He received a doctorate in naval architecture and marine engineering from the university in 1970.

**Dr. Ronald L. Kerber** currently splits his time among a variety of entrepreneurial and pro bono activities as president of SBDC, a small consulting firm; partner in Dominion Development Company; visiting professor at the Darden Business School at the University of Virginia; member of both the Department of Defense Science Board and the Board of Analytic Services, Inc. As Executive Vice President and Chief Technology Officer at Whirlpool, Kerber had line responsibility for global product development and global procurement, and P&L responsibility for three global businesses. Dr. Kerber also served as Corporate Vice President of Advanced Technology and Business Development at McDonnell Douglas, Deputy Undersecretary of Defense for research and advanced technology, and as a program manager at the Defense Advanced Research Projects Agency (DARPA) in the Department of Defense. Before beginning his business career, Kerber was a professor of electrical and mechanical engineering and Associate Dean of Graduate Studies and Research at Michigan State University. He has published more than 60 technical articles and is the recipient of the Secretary of Defense Medal for Outstanding Public Service, the Michigan State University Teacher Scholar Award, the Purdue University Distinguished Engineering Alumni, and Outstanding Aerospace Engineer Award. He was a National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA) Fellow at the California Institute of Technology, and is coauthor of *Strategic Product Creation* with Timothy Laseter (McGraw Hill, 2007). Dr. Kerber received his B.S. degree from Purdue University and his M.S. and Ph.D. degrees in engineering science from the California Institute of Technology.

**The Honorable R. Noel Longuemare, Jr.** currently operates his own consulting firm. Previously, he was Principal Deputy Under Secretary of Defense for Acquisition and Technology in 1993, where he served for four years. While in that assignment, he was appointed Acting Under Secretary of Defense (Acquisition and Technology) on two occasions. He is credited with introducing the concepts of cost as an independent variable (CAIV) and the modular open systems approach (MOSA). Prior to his government service, Mr. Longuemare served as a Corporate Vice President and General Manager of the Systems Development and Technology Divisions at the Westinghouse Electronic Systems group in Baltimore. Mr. Longuemare holds eight patents and 17 patent disclosures, and was active in technical and industrial societies in the Aerospace field. He was Chairman of the Aerospace Industries Association (AIA) Technical and Operations Council, the AIA Key Technologies Trust, and the Advanced Sensors



Technology Panel. He was also Chairman of the Computer-Aided Logistics Support and Concurrent Engineering (CALs/CE) Steering Group for the National Security Industrial Association (NSIA). Mr. Longuemare was inducted into the National Academy of Engineering in 2003. He served as Vice Chairman of the National Academies Air Force Science and Technology Board and was a consultant to the National Commission for the Review of the National Reconnaissance Office. He was awarded three DOD Distinguished Public Service awards as well as the DOD David Packard Award. He has been elected Fellow at the Institute of Electric and Electronics Engineers, the American Association for the Advancement of Science, and the American Institute of Aeronautics and Astronautics. Mr. Longuemare graduated from the University of Texas-El Paso (BSEE), the Johns Hopkins University (MSE), and the Stanford University Executive Program.

**Mr. Robert E. Luby, Jr.** is a Vice President, IBM Business Consulting Services. He leads the Supply Chain Management practice for the entire public sector in the Americas. Mr. Luby has over 30 years of logistics experience. His clients include all the Services, numerous defense agencies, several major defense depots, public and private shipyards, aviation depots, and defense suppliers. During his career he has been involved in several complex projects, both as a project manager himself and as an advisor to many project leaders. He is a recognized leader in logistics, supply chain management, and complex project management and is also a key leader in several current efforts to develop our approach and strategic thinking in the area of sense and respond logistics and net-centric operations. He is frequently called upon to advise key clients on complex sense and respond challenges and critical supply chain management problems. Mr. Luby is a graduate of the U.S. Naval Academy and also holds masters degrees from Northwestern University in Engineering Management and the Naval Postgraduate School in Mechanical Engineering.

**Mr. Herman M. Reininga** is the current chair of the National Research Council's Board on Manufacturing and Engineering Design. He retired as senior vice president of operations for Rockwell Collins, where he was responsible for overall management of Rockwell Collins' global production and material operations, including manufacturing, material, quality, and facilities activities. He has testified in front of the Senate Armed Services Committee on defense technology, acquisition, and the industrial base, and is called upon regularly to provide perspective for future manufacturing strategies. In June 2001, Mr. Reininga was inducted into the University of Iowa College of Engineering Distinguished Engineering Alumni Academy. In 1999, he received the prestigious Meritorious Public Service Citation from the Chief of Naval Research, Department of the Navy. In 1998, he was awarded the Defense Manufacturing Excellence award, endorsed by nine national trade associations and professional societies. Mr. Reininga is the current chair of the National Research Council's Board on Manufacturing and Engineering Design. He holds a B.S. in industrial engineering from the University of Iowa and a master's in industrial engineering from Iowa State University.

**Ms. Leigh Warner** is an independent management strategist providing counsel to senior government officials, business leaders and social entrepreneurs on strategic plans and programs, with emphasis on anticipation of impacts from alternative futures and emerging trends. Ms. Warner was Assistant to the Secretary of Defense for Special Projects and was a White House Fellow. She now serves frequently as a member of Defense Science Board and Defense Business Board task forces and contributed to Department of Defense management planning for the 2008 Presidential Transition. She has also served as a member of an expert panel that reviewed U.S. homeland security from the citizens' perspective for the Secretary of Homeland Security. In the private sector she was Managing Partner and CEO of an institutional investment management firm and President of an open business knowledge exchange created by several Fortune 100 corporations to identify shared strategic opportunities associated with emerging technologies, trends, and management processes. At Kraft and General Foods she led established business management as well as new product development and strategic planning for some of the world's best known consumer brands, including as Director of Marketing and Director of Strategy. Ms. Warner is a Principal of the Council for Excellence in Government. She was an Executive Committee Member of the Eisenhower Institute Board of Directors and also served as a Board Director of the White House Fellows Foundation and Association and the Committee on Foreign Affairs of The Chicago Council. She graduated from Cornell University with a Master of Business Administration and a Bachelor of Arts with Distinction.



## Presentations to the Task Force

Name	Topic
<b>FEBRUARY 21–22, 2008</b>	
CAPT Jim Murdoch, Naval Sea Systems Command	Littoral Combat Ship Program
CAPT Donald "BD" Gaddis, Naval Air Systems Command	VH-71 Presidential Helicopter Replacement Program
RDML Kevin McCoy, Naval Sea Systems Command	Overview of Navy Ship Certification Processes
COL Keith Robinson, Army Aviation and Missile Command	Armed Reconnaissance Helicopter Program
Mr. David Cripps, AMRDEC	Overview of Army Aviation Certification Processes
<b>MARCH 19–20, 2008</b>	
Mr. John Bean and Mr Mike Miller, Bell Helicopter	Armed Reconnaissance Helicopter Program
Mr. Glenn Ashe and RADM Thomas H. Gilmour, USCG (ret), American Bureau of Shipping	ABS, Classification, Naval Vessel Rules and the LCS Program
RDML Steven Eastburg and Richard Gilpin, Naval Air Systems Command	NAVAIR Certification Processes
<b>APRIL 23–24, 2008</b>	
CAPT Joe Rixey, Naval Air Systems Command	Discussion of P-8 Multi Mission Maritime Aircraft (MMA) Program
Mr. Joe North and Mr. Dan Schultz, Lockheed Martin	LCS1 <i>USS Freedom</i> Program
LtCol Gregory Masiello, National Defense University	VH-71 Helicopter Program
RDML Tom Eccles, Naval Sea Systems Command	Report of the Program Management Advisory Group on the LCS Program
Mr. Richard McNamara and Mr. Vic Gavin, PEO Submarines	Acoustic Rapid COTS Insertion (ARC-I) Program
Mr. Robert Whelan, WTW LLC	FSF-1 Sea Fighter: Cost Reduction is the Most "Disruptive" Technology
Mr. Jeff Bantle, Mr. Robert Wirt, and Mr. Timothy Malin, Lockheed Martin	VH-71 Presidential Helicopter Program

Dr. Dale Uhler	USSOCOM Airworthiness Certification
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**MAY 19–20, 2008**

RDML Steven Eastburg, Naval Air Systems Command	Report of the Program Management Advisory Group on the VH-71 Program
Mr. Robert Spreng, Integrated Dual-use Commercial Companies	Federal Procurement from Commercial Companies
Mr. Richard Dunn	Other Transaction Authority
Mr. Dugan Shipway, General Dynamics Bath Iron Works	LCS2 USS Independence Program

**JUNE 24–25, 2008**

Ms. Kathleen Harger, Office of Defense Innovation and Technology Transition	Innovation and Technology Transition in the DOD
Dr. Craig Fields, Study Co-Chair	Perspectives from the 2007 DSB Summer Study
Mr. David Tillotson, US Air Force	Air Force Perspectives
Mr. Dan Cundiff, DOD Comparative Testing Office	Comparative Testing in the DOD
Dr. David McQueeney and BrigGen Gary A. Ambrose (ret.), IBM Federal	Perspectives from IBM Federal

**JULY 28–29, 2008**

Mr. Gregory Saunders, Defense Standardization Program Office	Defense Standardization Efforts
Mr. John Weiler, Interoperability Clearinghouse	Commercial Practices for Technology Acquisition
Ms. Kathleen Harger, Office of Defense Innovation and Technology Transition	More on Innovation and Technology Transition in the DOD

## Glossary

ARC-I	Acoustic Rapid COTS Insertion
ARH	Armed Reconnaissance Helicopter
ASW	anti-submarine warfare
ASuW	anti-surface warfare
BAA	broad agency announcement
CBRN	chemical, biological, radiological, and nuclear
COTS	commercial off-the-shelf
DOD	Department of Defense
DSB	Defense Science Board
EAR	Export Administrative Regulations
EVM	earned value management
GAO	General Accountability Office
GOTS	government off-the-shelf
GWOT	global war on terror
IEEE	Institute of Electrical and Electronics Engineers
IOC	initial operating capability
IP	intellectual property
ISR	intelligence, surveillance, and reconnaissance
ITAR	International Traffic in Arms Regulations
JCIDS	Joint Capabilities Integration Development System
JCTD	Joint Capability Technology Demonstration
JIEDDO	Joint Improvised Explosive Device Defeat Organization
LCS	Littoral Combat Ship
MIL-SPEC	military specification
MIL-STD	military standard
MOSA	modular open systems approach
NAVAIR	Naval Air Systems
NDI	non-development item
OEM	original equipment manufacturer

OSD	Office of the Secretary of Defense
OTA	Other Transaction Authority
PBL	performance-based logistics
RFI	Request For Information
RFP	Request For Proposals
RRTO	Rapid Reaction Technology Office
SEAPA	Systems Engineering and Programmatic Analysis of Alternatives
SETA	scientific, engineering, technical, administrative
USD (AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USSOCOM	U.S. Special Forces Command
VCJCS	Vice Chief of the Joint Chiefs of Staff