
SUMMARY CONCLUSIONS

To achieve the benefits of CMI, advocates call for a relaxation of the regulatory restrictions that segregate weapon system acquisition from common commercial market practice and impose a regulatory cost premium on items purchased by the government. They base their arguments on two types of assumptions. First, they assume that an extensive “dual-use” overlap between commercial and military process and product technologies has created the potential for significant economies of scope and scale. Second, they assume that commercial business practices, together with the incentives and constraints provided by a commercial-like market structure, will spur the development of high-performing weapon systems at lower cost than can be achieved under the current heavily regulated military acquisition process.

However, although advocates claim that these barriers are preventing the acquisition process from operating more efficiently, critics argue that significant government regulation is necessary in a system that is fundamentally unlike the commercial world. In the view of the critics, highly specialized U.S. military requirements mean there is still relatively little dual-use overlap between commercial and military products and processes. Diversification of market and technical risk is not possible, so the existence of a specialized cadre of defense-oriented firms—with full government financing of military R&D—is unavoidable. Private-sector control over configuration management is also not practical because, for most weapon systems programs, private firms do not have the necessary incentives or information to make appropriate cost-performance tradeoffs. This implies that continued close governmental direction of product development is

necessary. In this environment, complete elimination of such features as Mil-Specs, detailed contract requirements, and extensive governmental oversight removes necessary protections against the waste, fraud, and abuse of taxpayer money.

POTENTIAL FOR INTEGRATION OF COMMERCIAL AND MILITARY TECHNOLOGIES

In this study, we have closely examined the claims and counter-claims about the nature of the dual-use overlap between civilian and military product and process technologies in the context of radar-related and other RF/microwave devices. The questions we addressed were:

- Is the commercial market in military-relevant electronics large enough to encompass an adequate range of technologies, parts, and components required to support a comprehensive CMI strategy for military-specific microwave subsystems such as fire-control radars?
- Is the market driving technology at a rate and in a direction that meets national security requirements? In other words, can CMI provide the necessary and desired performance capabilities?
- Are there cost and schedule benefits from inserting commercially derived parts and technology into military systems such as RF/microwave systems?

Our conclusion is that, in defense-related microwave and millimeter-wave technologies, the promise of CMI and other acquisition reform measures is likely to be realized. In response to our first question, we found that:

- The commercial marketplace does appear to be increasingly driving the development of new technologies and lower-cost manufacturing processes in RF/microwave products relevant to defense applications. Commercial demand for sophisticated RF/microwave parts and devices is likely to far outstrip military demand in the next few years, and commercial design methodologies and process technologies are becoming increasingly relevant to military radar system design and development and other

military microwave systems. Commercially developed RF/microwave parts and components are also becoming increasingly available for incorporation into military systems.

Thus, the technological breadth and depth in the commercial RF/microwave market necessary to support a comprehensive CMI strategy appears to be emerging. In fact, shrinkage of the military supplier base, together with the problem of increasing military parts obsolescence, indicate that the use of commercial-grade parts will increase dramatically whether or not a comprehensive CMI strategy is already in place.

We also conclude that CMI is likely to provide the necessary and desired performance capabilities, offering significant cost and schedule benefits from inserting commercially derived parts and technology into military systems. In response to our second and third questions, we found that:

- Commercially derived designs, technologies, and processes can be successfully applied to military RF/microwave systems with the potential of increasing performance. However, commercial technologies are probably not as relevant to the most advanced high-performance fire-control radars used in modern fighter jets, and some legitimate concerns remain about the long-term reliability and durability of commercial-grade parts and components.
- Evidence suggests that the systematic insertion of commercial parts, technologies, and manufacturing processes, combined with dual-use automated manufacturing, may reduce the costs of typical military digital avionics modules by 50 percent or more.

Finally, an important observation that emerged from our initial case study analysis was that:

- Effective implementation of a comprehensive CMI strategy may require granting configuration control and change authority to contractors during R&D and production, and—perhaps—throughout the life-cycle of a weapon system. This raises the potential for a fundamental change in the role of the contractor

and the current military depot system. More analysis of this question needs to be undertaken.

MECHANISMS TO MINIMIZE THE RISKS OF POOR PERFORMANCE AND HIGH COST

The second set of questions addressed in this study focused on the risks DoD might face by shifting from reliance on regulatory constraints to increased use of commercial-market mechanisms to ensure access to high-performing, low-cost weapon systems. Specifically, the questions we addressed were:

- What mechanisms have commercial-market participants evolved to reduce risks associated with the development, production, and maintenance of large transport aircraft? To what extent are they relevant to DoD?
- To what extent, and with what success, have commercial-like approaches based on market mechanisms been applied to military programs, and what can be learned from them for future efforts?

After examining changes in the commercial aircraft industry as a result of airline deregulation, we conclude that current DoD policy on procurement of “commercial items” does not reflect the true variety and complexity of commercial buyer-supplier relationships and contract arrangements. There are many risk-management strategies now prevalent in the commercial aircraft industry that could be relevant to DoD. Examples include IPTs (encompassing users, buyers, system integrators, and vendors), “best value” sourcing through preferred providers, and various information-sharing and risk-sharing arrangements between buyers and suppliers. Probably the most important—and most currently relevant—strategy of all is the adoption of a “must cost” approach to pricing, which is the commercial aircraft industry’s rendition of CAIV. However to make “must cost” work, airframers are giving their suppliers greater control over product configuration and design than they have before.

If DoD’s approach to weapon system acquisition begins to resemble the approach used by commercial airlines to purchase airliners, DoD may expect to see an acceleration of the following trends:

- Greater emphasis by contractors on lowering the cost of purchasing and operating military aircraft as opposed to improving their performance characteristics
- Greater market and technical risk-sharing between prime contractors and suppliers of military aircraft systems, subsystems, parts, and components
- More intense competition between prime contractors accompanied by increased industry consolidation and greater foreign participation at all levels of the industry supply chain
- Greater integration of military aircraft R&D with maintenance, repair, and overhaul activities.

Will these trends prove beneficial to DoD? We believe the answer is a qualified “yes.” If military contractors follow the precedents set by their commercial counterparts, we expect to see a decline in the cost to DoD of developing, producing and maintaining military aircraft. We caution, however, that cost declines may be accompanied by a diminution of the technical virtuosity of U.S. military aircraft if too much emphasis is placed on cost control relative to performance innovations. The “commercial approach” to minimizing technical risk is to limit performance innovations to those that are highly incremental.

Finally, recognizing that there are still important differences between commercial and military aircraft markets, we examined DoD’s own initial experience in a variety of ongoing pilot programs aimed at testing a commercial-like approach to acquisition. A careful examination of three munitions acquisition reform pilot programs (JDAM, WCMD, and JASSM), as well as three other innovative acquisition reform efforts (DarkStar, Global Hawk, and COSSI) suggests that many acquisition reform measures have real merit, and that greater commercial-military integration is possible. In all three munitions programs, the likely acquisition prices appear to be considerably less than half of what they would have been in a traditional military procurement program. Further, although R&D is not complete on all of the munitions programs—and some technical problems have been encountered—operational performance capabilities appear on the whole to be meeting or exceeding original requirements. The R&D

phase for all three has also remained relatively short by traditional military developmental standards.

In our judgment, the main benefits of CMI for these acquisition reform pilot programs have not come from insertion of commercial technologies or the use of dual-use production facilities. For the most part, on all these programs the direct insertion of commercial technologies has been limited to the parts level. With the possible exception of the COSSI program, there are few cases where a major subsystem or component was designed or manufactured at a commercial facility. In no case did a traditionally nonmilitary contractor successfully develop a military-unique system.

The main benefits have come from the structuring and management of these programs in a manner that makes them more like complex commercial product markets where buyers and sellers establish and achieve price and performance targets in a cooperative rather than adversarial environment. Thus, the key aspects of these munitions pilot programs that have helped to achieve success are:

- Requirements reform and a closer customer-developer relationship through mechanisms such as IPTs and PPV criteria for “best value” sourcing, all within a CAIV or “must cost” environment
- Contractor ownership of and responsibility for design, technical content, performance, reliability, and price.

The real promise of CMI, therefore, is to help insert the incentives for price discipline and high performance that usually predominate in the commercial marketplace into the world of military R&D and production. One key to doing so successfully is to establish strict “must cost” guidelines while offering contractors real flexibility in design and technical content. A second key is to adopt mechanisms such as IPTs and “best value” sourcing to establish close working relationships with highly qualified contractors.

We close by cautioning once again that a CMI acquisition strategy does hold potential for a loss of useful military capability. To the extent that the old flexible budget approach to acquisition resulted in weapon systems with many unnecessary features (“gold-plating”), DoD’s move toward a more commercial-like “must cost” approach to military R&D represents a transition to more responsible, cost-

effective stewardship of the nation's resources. However, to avoid accidentally sacrificing features that may prove to be crucial to successful mission performance, DoD must thoroughly understand the performance, schedule, and cost priorities for each new weapon system. This can be a daunting task in a global environment of great uncertainty about potential future threats, especially when weapon systems are expected to remain in active service inventories for decades. Perhaps no less important, DoD must be able effectively to communicate those priorities to the weapon system developers who are responsible for making the tradeoffs between them.

For these reasons, the issues of ensuring open-system architecture, developing a strategy of "continuous insertion" of new technologies, and providing incentives to contractors to continue to improve capabilities and reduce costs after production is under way deserve considerable further examination and analysis.