

# AMERICA'S ERODING CRITICAL TECHNOLOGY BASE

## *A Program Management Concern?*

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The six weeks of Desert Storm dramatically drove home a vital fact that the U.S. seemingly failed to appreciate fully in the four decades spanned by the Cold War. This nation is becoming alarmingly dependent upon foreign sources of technologies critical to our most sophisticated weapons systems. While the warning signs were there for some time, the Gulf War dramatically highlighted the problem of foreign technology dependence.

### **The Framework for Concern**

Of interest is the fact that this condition surfaced despite the spectacular performance of America's sophisticated weaponry. Much of the success of these weapons must be attributed to a vast array of system components developed and manufactured by overseas competitors. Among this long list were such items as optical glass used in reconnaissance satellites, manufactured in Germany; gallium-arsenide semiconductor chips found in satellite and radar receivers from Japan; and five different parts of the Abrams tank, including the gunner's sight optics and an ingredient in the

seal, which were also made by overseas companies.<sup>1</sup>

The extent of this nation's foreign dependence cannot be precisely quantified. What is known, however, is that there no longer exists any major U.S. producer of robots. Overseas investors also acquired the last major American manufacturer of silicon wafers, a component critical to production of semiconductors. This country also lost its lead in the manufacture of supercomputers, optoelectronics, semiconductors, digital imaging, and in dozens of additional critical technologies.<sup>2</sup>

Numerous government reports over the past several years warned of the erosion of U.S. industrial competitiveness. A 1990 Commerce Department study reported that this country lost competitive advantage to Japan in all but three of 12 key technologies.<sup>3</sup> That the potential loss of control over these advanced technologies portends deleterious impact upon a broad range of industrial capabilities is widely recognized.

Generally, with the loss of technologies also flows a diminished job base, lost national income and prestige, a lowered standard of living, lost market share, and an increased trade deficit. Loss of control also places the U.S. in the situation where overseas competitors could raise prices or even withhold products to enhance the fi-



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financial standing of their own industries.<sup>4</sup>

The implications of a nation's forfeiture of its technological competitiveness are fairly well known in an economic sense. However, the impact upon national military security, an arena where the stakes are even higher, is less well understood. Accord-

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ing to a 1991 Defense Science Board assessment, the U.S. military was “dangerously dependent” upon foreign suppliers for spare parts and technologies critical to operating many weapons systems.<sup>5</sup> A 1991 report from the Office of Technology Assessment noted that “almost all U.S. weapon systems contain component parts from foreign sources.”<sup>6</sup>

During the Gulf conflict, many U.S. military commanders found that even with significant cooperation from foreign governments, existing dependence upon overseas suppliers greatly complicated the efficient flow of logistics supplies to U.S. forces in the field. This situation also raised concerns

among many senior U.S. policy makers about how to ensure future combat readiness in the event that this country would encounter shortages of components from non-cooperative overseas suppliers during future conflicts.<sup>7</sup>

### The Program Manager’s Dilemma

It appears obvious why an issue such as foreign technology dependence might capture the interest of and invite speculation from economists, international traders, and perhaps even national security specialists. But why should such a macroeconomic and trade concern be of even remote interest to military program managers (PM)? The answer

to this important question lies in recognizing and understanding the degree to which programs rely on foreign sources for critical technologies and parts support. The answer also resides in appreciating the PM’s responsibility, as detailed in governing acquisition regulations, to consider the impact of programmatic decisions upon the defense industrial base.

It might be of value to review what existing guidance is provided in the applicable acquisition instructions. DoD Instruction (DoDI) 5000.2 (Part 5, Section E) states the following:

Plans and actions must ensure that adequate industrial capability exists to produce, in an efficient and cost-effective manner, the goods and services required to meet DoD missions...

The DoD Federal Acquisition Regulation Supplement (DFARS) also has something to say about responsibilities that government PMs shoulder in addressing the national technology and industrial base. Part 207 (Acquisition Planning) specifically states that major defense acquisition program planning must address the following areas:

- An analysis of the capabilities of the national technology and industrial base to develop, produce, maintain and support programs, including consideration of the following factors related to foreign dependency:

- Identification of items that are available only from sources outside the national technology and industrial base if such items become unavailable from sources outside the national technology industrial base.

- Analysis of any military vulnerability that could result from the lack of reasonable alternatives.

- The effects on the national technology and industrial base that result from foreign acquisition of firms in the United States.



Lockheed Advanced Development Company photo

Department of Defense photo unless otherwise noted

A. M1A1 Abrams Tank  
 B. F-117A Stealth Fighter  
 C. U.S. Navy Tomahawk Cruise Missile

D. USS Normandy (CG-60) D.

Because of the acknowledged difficulty and arcane nature of attempting to forecast industry activity, particularly those aspects involving corporate acquisitions and mergers, viability of the defense industrial base has not always represented an area of concentrated attention from PMs. Nevertheless, political, military, economic and social pressures will increasingly compel program offices to direct attention to the impact upon their programs of America's migrating, and in some cases eroding, defense industrial base. The question that ultimately arises, then, is what steps can be taken to influence and respond appropriately to the dynamics of this changing technology marketplace?

### The Way Out

From the vantage point of the typical program office, seemingly little overt influence can be brought to bear in meeting the national challenge of reinvigorating America's diminishing high-technology market share. Nevertheless, a coordinated response to guidance contained in DoDI 5000.2 and DFARS Part 207 will provide some modicum of insurance against inadvertently designing a system containing potentially insupportable foreign technology or components.

In considering tradeoffs among competing technologies, PMs would be advised to insist upon the development of system architectures containing technologies and components that are projected to be continuously available over the system's entire life cycle. In support of this design approach, efforts should be initiated to make available to the defense systems acquisition communities a database that details the status of various critical technologies.

This database could be used to track those technologies and specialized components that are either exclusively held by foreign concerns, or are in danger of achieving that status. Likewise, the database would enable

government and contractor PMs to make prudent choices in identifying the technologies that they project as available for inclusion in developing systems, and that they estimate as supportable in the out-years of a system's life cycle. Similarly, the database would enable program offices to steer the design of their systems away from a dependence upon technologies that are in danger of being fully acquired by foreign interests.

Within the bounds of what makes good economic sense, the government should place an emphasis upon rewarding companies for automating their manufacturing plants. Likewise, firms should be compensated for retaining critical organic production capabilities, as opposed to contracting-out for various specialized manufacturing processes. These corporate capabilities could be considered during the source selection process, as well as during other contract award and administration activities.

Any U.S. corporations with contracts for critical weapons systems that are not presently doing so would be advised to identify alternate manufacturing materials and processes, including those that are readily available from American producers. Defense firms, of course, should maintain a healthy vigilance of the status of their suppliers, and should remain cognizant of industry forecasts of the availability of existing critical materials. Companies should also continuously seek to identify materials and processes that could be substituted for those presently employed. This effort should be undertaken not simply with the objective of reducing current unit production costs, but also as a hedge against incurring inflated costs as a result of a future takeover of a supplier by an overseas investor.

The prospect of diminished military preparedness arising from emigration of selected technologies from the U.S. is a topic of intense public debate. Ultimately, the debate will

come home to roost in the backyards of the military-user communities, which will be held accountable for supporting and maintaining systems in operational environments. The PM's responsibility to the user community demands proactive involvement in comprehensively addressing the various impacts upon a system of technology migration.

As the trend of foreign acquisition of American high-technology companies continues, military PMs will likely encounter increasingly formidable challenges developing systems that are not over-reliant upon critical technologies owned exclusively by overseas companies. Only by directing careful consideration to the source and supportability of components selected for inclusion in developing weapons systems, will PMs be assured that available and affordable life-cycle support of these systems will exist well into the future.

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### Endnotes

1. Pollack, Andrew, "In U.S. Technology, a Gap Between Arms and VCRs," *New York Times*, March 4, 1991, p. D8.
2. Tolchin, Martin and Susan, *Selling our Security: The Erosion of America's Assets* (New York: Alfred A. Knopf, 1992), p. 5.
3. U.S. Department of Commerce, *Emerging Technologies: A Survey of Technical and Economic Opportunities*, Spring 1990, p. 13.
4. Tolchin, p. 4.
5. Department of Defense, *Report of the Defense Science Board Study of the Defense Industrial and Technology Base*, October 1988.
6. U.S. Congress, Office of Technology Assessment, *Arming our Allies: Cooperation and Competition in Defense Technology*, May 1989, p. 5.
7. O'Rourke, Ronald, Congressional Research Service, *Persian Gulf War: Defense Policy Implications for Congress*, May 15, 1991, p. 71.