

# UC San Diego

## SITC Research Briefs

### **Title**

Forces Shaping the US Defense Industry

### **Permalink**

<https://escholarship.org/uc/item/5n80302d>

### **Journal**

SITC Research Briefs, Series 9(2017-5)

### **Authors**

LUCYSHYN, William  
RIGILANO, John

### **Publication Date**

2017-02-28

# RESEARCH BRIEF

2017-5 January 2017

## Forces Shaping the US Defense Industry

William LUCYSHYN and John RIGILANO

---

**W**ith the US military's technological edge eroding, the US Department of Defense (DoD) has embarked on a path to renew its superiority through the implementation of its Third Offset Strategy. Implementation will require a vibrant and innovative industrial base; however, external forces are actively shaping the US defense industrial base and limiting its capabilities. This brief explores some of these forces—including continued budgetary pressure, downward trends in research investment, a growing regulatory burden, and a reluctance to embrace globalization—and offers suggestions for a course of action for policymakers.

---

*The Study of Innovation and Technology in China (SITC) is a project of the University of California Institute on Global Conflict and Cooperation. SITC Research Briefs provide analysis and recommendations based on the work of project participants. Author's views are their own.*

*This material is based upon work supported by, or in part by, the US Army Research Laboratory and the US Army Research Office through the Minerva Initiative under grant #W911NF-09-1-0081. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the US Army Research Office.*

## INTRODUCTION

In place of the numerical superiority of its forces, the US military has come to rely on technological advantage, highly-qualified operational forces, and the ability to sustain those forces. Between 1988 and 2000 defense spending declined by 36 percent and was mirrored by a proportional drop in US troop levels. This new level of spending forced a major restructuring of the nation's defense industry in the 1990s. The number of major US-based defense and aerospace companies was reduced from 21 to 5 major prime contractors: Boeing, Lockheed Martin, Raytheon, General Dynamics, and Northrop Grumman. Additionally, BAE Systems, a subsidiary of a British firm, operates in the United States. This consolidation (which included considerable vertical integration, with the primary contractors absorbing many of their suppliers) also had an impact at the lower levels, with many of the remaining suppliers moving much of their business to the commercial sector.<sup>1</sup>

Today, the defense industrial base exists as a small number of large firms that provide a permanent and effective defense capability. However, continued consolidation may begin to affect the competitive landscape, leaving only one supplier in certain areas and eliminating the benefits of a once-competitive environment characterized by innovation and incentives to contain costs. At the same time, military leaders, including the Deputy Secretary of Defense, have observed that the US military's technological edge is steadily eroding.<sup>2</sup>

The rapid, global diffusion of new technologies, coupled with evolving geopolitical and business environ-

ments, have created a great deal of uncertainty within the US national security environment. In an effort to regain its technological advantage, the DoD is now pursuing a Third Offset Strategy to renew and perhaps advance the competitive advantage of the United States and its military allies. This approach seeks to overcome or "offset" the military gains made by potential peer competitors like China and Russia, primarily through investments in superior technology. A key component of the initiative is a research program that will target several promising technology areas, including robotics and system autonomy, miniaturization, big data, and advanced manufacturing, while also seeking to improve the US military's collaboration with innovative private sector enterprises.

Implementing this strategy while addressing current and emerging security threats—for example, global terrorism, cyberattacks, proliferation of weapons of mass destruction, instability in the Middle East, the rise of a potential peer competitor—will require a vibrant and innovative industrial base. Accordingly, the DoD must pursue forward-looking policies that take into account forces that are shaping the defense industrial base.

The forces that play the most significant roles are: 1) continued budgetary pressure on the DoD; 2) downward trends in overall US research investment; 3) the growing regulatory burden faced by defense contractors; and 4) a reluctance to embrace globalization in the defense industrial realm.

### **Continued Budgetary Pressure**

Following the drawdown of contingency operations, and in response to

mounting pressure, the DoD's budget has already declined significantly (by more than 30 percent) from its high in fiscal year (FY) 2008. Historically, the DoD budget has displayed a cyclical trend (in current dollars), rising as threats to national security increase, and declining during peacetime or when the threats ease. Over the past six years the US Congress has enacted the Budget Control Act (which was later amended), the American Taxpayer Relief Act, and the Bipartisan Budget Act, all of which have led to significant budgetary fluctuations for the DoD.

Starting in FY 2013, long-term defense spending plans underwent a series of cuts. According to the Congressional Research Service, the gap between the Obama administration's budget plans and the Budget Control Act caps narrowed between FY 2013 and FY 2015 as the administration incorporated additional savings into its plans. The FY 2013 defense budget fell by \$519 billion, from \$6.4 trillion to \$5.9 trillion. It fell again in FY 2014 and FY 2015, by \$93 billion and then by \$188 billion. In FY 2016, the defense budget was \$5.6 trillion, which represents a reduction of \$800 million compared to FY 2013.<sup>3</sup>

Against this backdrop of declining resources, the DoD has seen substantial growth in the cost of operations and maintenance (O&M). O&M costs increased by 34 percent in real terms between 2000 and 2014. A major driver of this growth was the cost of military healthcare. Costs increased by 130 percent between 2000 and 2012, outpacing growth in both the economy and in per capita healthcare spending in the United States. In FY 2014, O&M costs increased to \$193.5 billion; in FY 2017 costs are expected to reach \$205.9 billion. O&M costs are

1 Barry Watts and Todd Harrison, "Sustaining Critical Sectors of the US Defense Industrial Base," Center for Strategic and Budgetary Assessments Report, September 2011.

2 Robert Martinage, "Toward a New Offset Strategy: Exploiting US Long-Term Advantages to Restore US Global Power Project Capability," Center for Strategic and Budgetary Assessments Report, October 2014, iv; Peter Dombrowski, "America's Third Offset Strategy: New Military Technologies and Implications for the Asia Pacific," RSIS Policy Report, June 2015, 5–6.

3 Amy Belasco, "Defense Spending and the Budget Control Act Limits," Congressional Research Service Report, July 22, 2015, <https://www.fas.org/sgp/crs/natsec/R44039.pdf>.

still on the rise, constraining funds available for investment in new programs.<sup>4</sup>

As the DoD faces growth in O&M spending and continued budgetary constraints, spending for acquisitions will likely continue to be constrained. Limited funds for acquisitions may cause further consolidation in the defense industrial base, resulting in a market unable to support more than one major contractor in each market segment (such as fighter aircraft), virtually eliminating competition and leading to cost increases, schedule delays, and threats to innovation.

### **Downward Trends in Research Investment**

In the post-World War II era, the federal government provided significant levels of financial support for research to ensure technological superiority. In order to sustain an innovative industrial base, continued investments in research and development (R&D) are crucial.

When the R&D investment is viewed as a percent of the nation's GDP, federal investment has dropped from a high of approximately 1.75 percent in the mid-1960s to approximately 0.75 percent in 2013—a dramatic decrease. Although private sector R&D has increased significantly over the last decade, the story within defense firms is not as encouraging. The Information Technology and Innovation Foundation found that R&D spending as a share of sales by defense contractors declined by near-

ly one-third between 1999 and 2012.<sup>5</sup> Defense firms typically invest only 2 or 3 percent of their revenues in R&D, a much smaller fraction than commercial sector firms. For instance, firms like Microsoft, Panasonic, Volkswagen, and Johnson & Johnson invest more than 10 percent annually in R&D.<sup>6</sup>

Industry-funded R&D programs generally focus on near-term solutions or products for which there is clear demand, rather than basic research that may take years to mature. Defense contractors tend to concentrate on developing upgrades and complementary technologies for in-use products, in an effort to win contracts. This type of R&D is more likely to result in incremental innovation, as opposed to the development of disruptive technologies that enable a paradigmatic shift. A focus on evolutionary change could inhibit leap-ahead breakthroughs (for example, stealth), and at the same time enable potential adversaries to more easily modify their weapons to keep pace with US capabilities.

Firms specializing in the design and production of weapons systems and other defense goods may invest less than commercial-sector firms because they are limited in their ability to recoup their R&D costs through traditional means—that is, by spreading them across their product portfolio. Recognizing this limitation, the US Congress established the Independent Research and Development (IR&D) program. This program is, in a sense,

a market intervention designed to encourage the defense industry to invest more in forward-thinking solutions to the nation's greatest security challenges, by providing partial remuneration to reduce the associated costs.

In 2014, the DoD was spending approximately \$4 billion a year on IR&D, with more than half of the funds going to prime contractors.<sup>7</sup> At first glance, IR&D and bid and proposal (B&P) spending (which accumulate to the same government cost pool) seem to be on the rise, following general DoD budget trends. When taken as a percentage of sales to the DoD, however, it becomes clear that firms are actually investing proportionately less on IR&D than in years past, which may be cause for concern. In fact, a 2013 *Defense News* analysis of R&D spending by top defense contractors shows independent IR&D spending “declined by nearly a third in percentage terms from 1999 to 2012.”<sup>8</sup>

### **The Growing Regulatory Burden**

The DoD's acquisition process is tightly regulated. These regulations are intended to help improve acquisition processes; maintain public accountability; and prevent contractor waste, fraud, and other abuses. However, the end result is a system of rules and regulations that has no consistent, overarching framework, but is rather a compilation of many individual mandates designed to address specific issues.

Currently, the DoD's acquisition process is directed by three broad

4 Congressional Budget Office, “Long-term Implications of the 2016 Future Years Defense Program,” January 2016, <https://www.cbo.gov/publication/51050>.

5 Dan Steinbock, “The Challenges for America's Defense Innovation,” The Information Technology and Innovation Foundation, November 2014, <http://www2.itif.org/2014-defense-rd.pdf>.

6 Colin Clark, “Lockheed CEO Hewson: IRAD Climbing 5%, Praises Major Air Shows,” *Breaking Defense*, June 9, 2014, <http://breakingdefense.com/2014/06/lockheed-ceo-hewson-irad-climbing-5-praises-major-air-shows/>; Norton Schwartz and Col. Tom Harrison, “If the Pentagon buys Less, It Needs to Invest More,” *Defense One*, July 16, 2014, <http://www.defenseone.com/ideas/2014/07/if-pentagon-buys-less-it-needs-invest-more/88909/>; Marcus Weisgerber, “Defense Firms Could Be Skeptical of Investing in Research,” *Defense One*, November 26, 2014, <http://www.defenseone.com/business/2014/11/defense-firms-could-be-skeptical-investing-research/100025/>.

7 Frank Kendall, “Better Buying Power 3.0,” white paper, Office of the Under Secretary of Defense Acquisition, Technology, and Logistics, September 19, 2014.

8 Zachary Fryer-Briggs and Marcus Weisgerber, “US Giants Skimp on Research, Development,” *Defense News*, August 19, 2013, <https://engineeringevil.com/2013/08/19/us-giants-skimp-on-research-development-defense-industry/>.

sets of regulations—the Federal Acquisition Regulation (FAR), the Defense Federal Acquisition Regulation Supplement, and unique component FAR supplements—as well as a variety of statutes and policies. There are costs to implementing each of the numerous regulations, and although the costs of complying with any individual rule may not be significant, the cumulative effects of complying with all the mandates are significant.

A number of studies have attempted to estimate the DoD regulatory and oversight cost premium. The most comprehensive and most cited is the 1994 Coopers & Lybrand study, which determined that DoD's acquisition regulations and oversight requirements added an 18 percent cost premium—a figure that did not include DoD's direct oversight costs (such as government auditors).<sup>9</sup> These increased costs reduce the available funds for acquisition and increase the already high barriers to entry.

Import and export policies also are a major regulatory concern. Because the United States is a dominant source of many countries' defense technology and weapon systems, the tension over these policies and their impact on the defense industrial base is persistent. To maintain its technological advantage, the United States must control foreign access to revolutionary military technologies. On the other hand, sales of military weapon systems and equipment constitute a major US industry that not only impacts their per-unit cost but can also be used to help achieve geopolitical goals.

Today's most important export regulatory authorities, the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR) both derive from the 1970s. The leading legislation in-

cludes the Arms Export Control Act (AECA) of 1976, the International Emergency Economic Powers Act (IEEPA) of 1977, and the Export Administration Act (EAA) of 1979.

AECA and EAA both rely on regulatory mechanisms for enforcement; namely the ITAR, administered by the Department of State, and the EAR, administered by the Bureau of Industry and Science within the Department of Commerce. These organizations develop the lists of controlled exports in each category, determine which applicants receive licenses, and punish those who violate the law. To remain in compliance, exporters must navigate a demanding licensing process that can take a significant amount of time and resources. Commercial firms and small businesses in particular fear that if they do business with the DoD, the products or critical components that they provide will be designated as critical technologies subject to export controls.

Current import restrictions impede the ability of the United States to acquire defense-related goods as efficiently and cost-effectively as possible. The DoD is barred from acquiring foreign suppliers' products—products that are not only cheaper, but in many instances, technically superior. Although there is a waiver process, it is often lengthy, creating needless delays for products that may not even be available domestically.

An additional area of concern is the government's attempt to impose what are perceived as unfavorable technical data rights policies. Some of these policies discourage innovation and can limit competition, especially from commercial firms and small business. For example, commercial firms could lose their intellectual property rights on past developments—excluding “off-the-shelf”

commercial items—if they do not have the past engineering and accounting records to prove development at private expense. Unless a contractor can prove that their intellectual property (IP) for a given federal contract was developed at private expense, the government now has the right to that IP.

For many small and non-traditional firms, the combined regulatory burden constitutes a significant barrier to entry. For these firms, the ‘costs to play’ are simply far too high; compliance with cost accounting standards, auditing burdens, and legal compliance with government regulations outweigh potential profits.<sup>10</sup>

### ***Reluctance to Embrace Globalization***

The impacts of globalization on defense must be better understood so that policymakers can better balance the requirements of defense industrial and trade policy with political, economic, and security considerations. Today, technology development and production are globally dispersed. As a result, the US defense industrial base has become increasingly reliant on international sources for its development, production, and provision. Non-US firms are major players within the US defense industrial base. Moreover, these companies often work with each other across national boundaries.

No defense program illustrates the role that non-US firms play in developing and manufacturing US weapons systems better than the F-35 Joint Strike Fighter. Nine nations partnered in the F-35's 10-year system development and demonstration (SDD) phase. By partnering with the United States during SDD, firms in these countries could bid for work on a “best value” basis and participate in

9 Coopers & Lybrand and TASC, “The DoD Regulatory Cost Premium: A Quantitative Assessment,” report prepared for Dr. William J. Perry, Secretary of Defense, December 1994.

10 Nicole Crain and W. Mark Crain, “The Impact of Regulatory Costs on Small Firms,” report for the Small Business Administration Office of Advocacy, September 2010.

the development and acquisition of the aircraft.

It is regrettable, then, that current US defense policy does not address, let alone embrace, today's technology and industrial globalization. Because there is no agreed-upon point of reference, Congress, industry, and the public regularly challenge DoD decisions to, for example, buy or lease foreign systems, collaborate on projects with overseas partners, or share technology with allies. To be sure, there are risks associated with globalization, especially within the context of national defense. This is precisely why the United States must pursue a defense industrial policy that anticipates, rather than reacts to, the expansion of global trade and technological innovation.

US dominance in most fields of science and technology (S&T) has dropped off rapidly since the latter half of the last century, when almost half of all scientists and engineers conducting research were doing so in the United States. The lack of qualified graduates in science, technology, and engineering has begun to erode America's global competitiveness. The United States ranks near the bottom of the list in terms of its percentage of doctorates in the natural sciences and engineering, manufacturing, and construction.<sup>11</sup>

Another perceived challenge, "offshoring," is a politically charged topic that is often blamed for exploitative practices and lost American jobs. However, while relocating production and manufacturing of goods, often to Asian countries, may have moved some jobs away from the United States, IT companies such as IBM, Dell, Cisco, and Apple have also moved significant portions of their businesses, to include engineering and design functions, outside of the United States, primarily to India and China.

Given these challenges, autarky—that is, non-reliance on outside sources—may seem to be desirable policy; however, given the current environment—that is, domestic budgetary realities and the pace of foreign technological innovation—protectionist policies are not only unaffordable, but would quickly lead to an evaporation of US military superiority. In fact, today every US weapons system contains foreign parts—not because they are cheaper, but because they are better.

## THE WAY FORWARD

The international security landscape is constantly evolving, and as a result, the DoD needs flexible capabilities to meet a wide range of mission needs. Acquiring modernized capabilities to respond to these new security challenges as they emerge is paramount to US national security. To a large degree, US military dominance will depend on the ability of its military forces to retain their technological advantage over potential adversaries. This outcome will be directly reliant on a vibrant defense industrial base.

Although today's defense industry has provided the DoD with the required weapons development and manufacturing capabilities, the existing industry may not be well suited for the rapidly evolving future security environment. To a large degree it will be shaped by the forces described in the previous sections. To adapt to these forces, the DoD and the defense industry should collaborate in pursuing a deliberate course of action, which is outlined in the sections that follow.

### ***Plan for Ways to Maintain the Required Industrial Base***

Continued US military dominance will be based, to a large degree, on the ability of US forces to maintain their tech-

nological advantage over potential adversaries. In today's rapidly changing threat environment, other states and non-state actors are working diligently to overcome this technological advantage. The defense industrial base must be more responsive to rapidly changing requirements, focus more on technology and innovation, offer the DoD lower-cost alternatives, and provide responsible management.

Based on anticipated budgetary constraints, the DoD must also address future industry consolidations and mergers. The impacts of potential mergers and acquisitions must be evaluated; the DoD's goal should be to maintain at least two viable, competitive suppliers in mature markets. In sectors where technology is rapidly evolving or demand is exceptionally high, a greater number of suppliers should be maintained. The objective must be to create an industrial base that is vibrant enough to preserve a competitive environment, while discouraging anti-competitive consolidation (horizontally or vertically) and anti-competitive teaming. The DoD should develop an appropriate mix of incentives to encourage industry to take the necessary actions.

### ***Continue to Invest in Research***

To achieve its future objectives, the DoD must continually focus on maintaining its technological superiority—even as technology continues to change and improve at an ever-increasing pace. This will require the DoD to incentivize the industrial base to resist the demonstrated tendency to reduce funding for S&T research and other "engines of innovation."

There is a need to balance the DoD's desire to seek broad IP rights (to foster competition and provide efficient product support during a system's life cycle) with commercial firms' desire to profit from their R&D investment. IP rights provide a strong

<sup>11</sup> Organization for Economic Cooperation and Development, *OECD Science and Industry Scorecard 2015: Innovation for Growth and Society* (Paris: OECD Publishing, 2015).

incentive for firms to conduct research and innovate, providing them with a competitive advantage. These incentives are diminished when the balance shifts too much in favor of the government. The DoD must better protect data rights and develop profit policies that reward commercial firms with a fair market value for their technical data. This is particularly important for small and non-traditional firms, if they are to enter the defense market.

Finally, the DoD should communicate a unified technology strategy so that firms can better direct their research investments to develop innovative solutions that meet DoD objectives.

### **Reduce the Regulatory Burden**

The current government acquisition regime does not facilitate the development, deployment, and support of the innovative, affordable, and rapidly-acquired weapons, systems, and services needed by twenty-first century forces. Reform initiatives should work to streamline and rationalize existing policies and procedures and strive to reduce the regulatory burden.

### **Relax Import and Export Restrictions**

Import and export controls are necessary in some cases to protect US military technology as well as the health of the defense industry; however, the current system has significant flaws that negatively impact economic growth and national security. Correcting these issues will require a strong plan of action.

A major concern for commercial firms is that having a product controlled by the ITAR, or even having a part go into a weapon controlled by ITAR, could keep it from being export-

ed. As a result, some firms choose not to do business with the US government at all, or, at a minimum, refrain from selling a product to the US government until that product has wide commercial distribution. Barring a significant change in export control laws and their implementation, these factors will continue to impact many commercial firms' investments and government contracting decisions.

The United States should also rely on free-market exchange, not protectionist import policies, to promote and improve competitiveness both at home and abroad.

### **Embrace Globalization**

Defense industry globalization is already underway. To maximize the associated benefits, the United States must embrace this development while not losing sight of the associated challenges. Denying the reality of defense industry globalization, or insisting that the United States could just as easily pursue an autarkic policy, is counterproductive.

The GDP growth of developing nations, combined with demographic realities, all but guarantee that US dominance in S&T will continue to decline. In fact, recent estimates by Coffey and Ramberg suggest that the US share of S&T productivity will continue to decrease, from 26 percent in 2005 to 18 percent in 2050.<sup>12</sup> In order to remain competitive, US industry will need to rely on more STEM-degree holders, both American-born and foreign. US-educated foreigners are not only highly skilled, but are often highly motivated by their desire to gain permanent US residency.

Firms based in both Europe and the United States must be encouraged to fully compete for contracts awarded by governments on both sides of

the Atlantic in order to facilitate interoperability and take advantage of the benefits that derive from competition.

Failure to embrace the globalization of S&T in general, or defense industry globalization in particular, will isolate the United States from the newest developments, the majority of which will soon more frequently occur in other countries. In order for the DoD to shape and take advantage of the technologies of tomorrow, it should embrace industry globalization by relying on the best technologies available, allowing foreign access to certain US technologies, and building partnerships within the global S&T community.

## **CONCLUSION**

There are many factors that are driving changes in the twenty-first century security environment. While at present the United States maintains a significant military advantage in the world, we should not assume that this advantage will last forever. Prudent planning and vigilant leadership will be necessary to ensure the existence of an adequate and innovative defense industrial base so that the DoD can execute its Third Offset Strategy and ensure US security throughout the century.

---

**William LUCYSHYN** is a senior research scholar and the director of research at the Center for Public Policy and Private Enterprise, School of Public Policy, University of Maryland.

---

**John RIGILANO** is a defense acquisition researcher at the Center for Public Policy and Private Enterprise, School of Public Policy, University of Maryland.

---

<sup>12</sup> Timothy Coffey and Steven Ramberg, "Globalization of S&T: Key Challenges Facing DoD," Center for Technology and National Security Policy, National Defense University, February 2012.