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Defense Acquisition Trends, 2015

Acquisition in the Era of Budgetary Constraints

A Report of Defense Outlook: A CSIS Series on Strategy, Budget, Forces, and Acquisition

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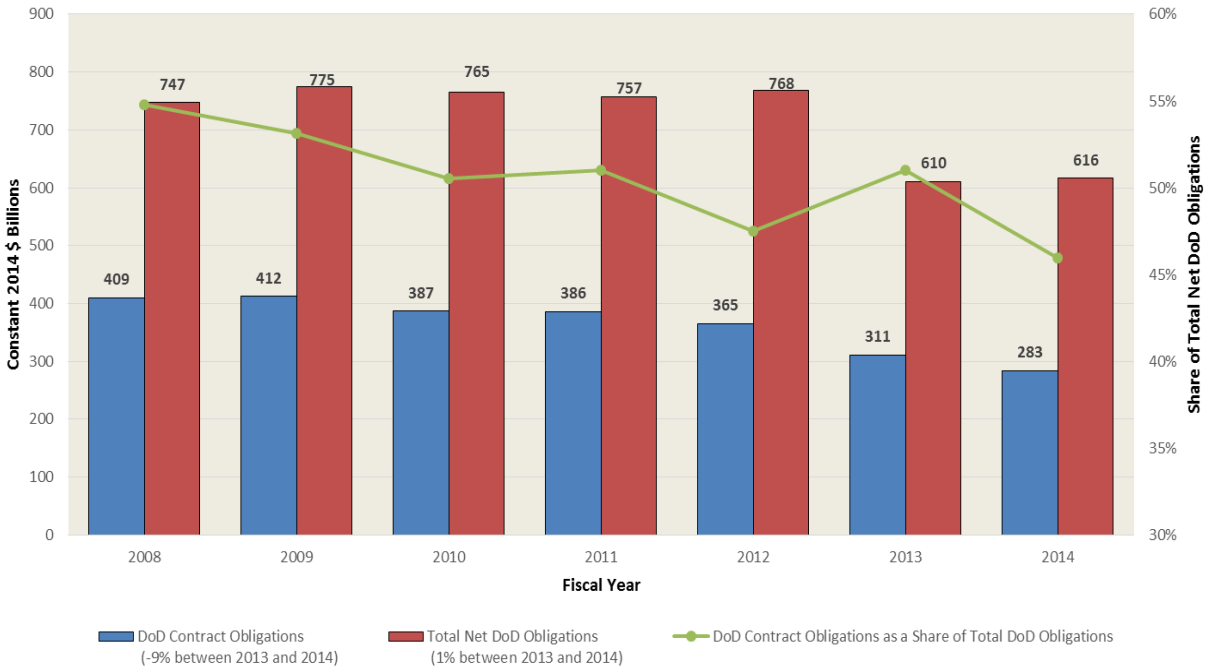
Executive Summary

This report, *Defense Acquisition Trends, 2015: Acquisition in the Era of Budgetary Constraints*, is the first in an annual series of reports titled "Defense Outlook: A CSIS Series on Strategy, Budget, Forces, and Acquisition." It builds upon previous CSIS reports on defense contract trends by identifying and discussing broader policy trends in acquisition and providing close analysis to these trends using information derived from contract data. This year's report looks in great depth at issues in research and development and the pipeline for major weapon systems, access to innovation, acquisition reform, the use of contract incentives, competition, shifts in industry and industry consolidation, and major trends apparent in the activities of the major defense components.[1] By combining detailed policy and data analysis, this report provides a comprehensive overview of the current and future outlook for defense acquisition.

For the past few years, the overriding factors influencing trends in DoD acquisition have been the postwar budget drawdown, defense budget caps, and sequestration and its aftermath. These factors have combined to result in a substantial decline in contracts to industry and a significant decline in contract spending's share of DoD funding. Figure I shows the impact that the recent budget reductions have had on DoD contracting, comparing total DoD contract obligations to total net DoD obligations[2] for each fiscal year.

Figure I: Defense Contract Obligations vs. Total Defense Net Obligations, 2008–2014



Source: Federal Procurement Data System (FPDS); DoD Comptroller Financial Summary Tables; CSIS analysis.

[1] See Appendix A, Methodology, for a detailed description of how this analysis is performed.
[2] Total Net DoD Obligations is a new category, created by CSIS for this analysis, that attempts to provide an apples-to-apples comparison of contract obligations to overall obligations. See Appendix A.2.1 for a detailed description of how CSIS generated this categorization.

While DoD contract obligations have declined steadily since their peak in 2009, total net DoD obligations were largely steady between 2009 and 2012, before declining precipitously in 2013. As shown by the green line, the share of total net DoD obligations going to contracts has declined notably over that same period, from 53 percent in 2009 to 46 percent in 2014. The exemption of the Personnel accounts from sequestration cuts, as well as rising health care and retirement costs, are major factors in the relative stability of total net DoD obligations, even as contract obligations continued to decline. There is no question that the declining pace of overseas operations, as well as budgetary pressures, have pushed DoD to reduce its contract spend.

The accelerating downward direction of this trend along with the contentious budgetary maneuvering between the Department of Defense and Congress in the period from 2012–2016 has created what we characterize as an era of budget constraints for acquisition that has created significant uncertainty for acquisition. This situation is particularly problematic because major acquisition programs require multi-decade investment decisions and the ability to make long-range budget estimates and projections with at least reasonable fidelity. With the passage of the Bipartisan Budget Agreement of 2015, an inflection point appears to have been reached, and defense acquisition is poised to begin to emerge from this era of budget constraints. Fiscal Year 2015 is likely to be either the bottom of the trough for contract spending or very close to the bottom depending on how quickly funding from the FY2016 budget translates into contract spending. However, it is almost certain that the recovery of acquisition from the defense draw down and sequestration and its aftermath will be slower and lower than the recovery of the defense budget overall. This is because the increased share of defense budgets going to cover personnel, readiness, and other internal DoD costs is unlikely to be significantly reversed in the foreseeable future absent unprecedented efforts by the Department of Defense and Congress to embrace heretofore unpopular reforms.

Our findings on the key issues in defense acquisition in 2015 are organized in four main sections:

- What Is DoD Buying?
- Whom Is DoD Buying From?
- How Is DoD Buying?
- What Are the Defense Components Buying?

What Is DoD Buying?

Birth of the Defense Innovation Initiative—Third Offset Strategy

Concrete details of the previously amorphous Defense Innovation Initiative, first launched in the fall of 2014 and more commonly referred to as the Third Offset Strategy, emerged in the latter part of 2015. Deputy Secretary of Defense Bob Work revealed the first set of insights about where the initiative is heading at the 2015 Reagan Defense Forum. He said that human-machine collaboration and combat teaming were the big ideas emerging from DoD's three simultaneous efforts over the past year to assess the capabilities required for potential conflicts in the next 5, 10, and 20–30 years. This suggests that the unique military advantage the United States must gain to counter adversaries who increasingly have access to many of the same high-end technologies will come from the integration of this technology with the capabilities of the highly trained personnel of the U.S. military.

The success of the third offset, just as with previous offset strategies, will not be measured simply by the development of new technologies, but by how those technologies solve operational

problems. To measure this impact, the following three guideposts bear watching: funding, force structure and doctrinal changes, and responsive investment priorities. If the technologies identified as potential game-changers are to reach the force, they must first be funded. Second, new technologies entering the force must be accompanied by changes to force structures and doctrines that maximize the value of those technologies. Finally, investment priorities should be continuously updated to reflect the changing security and technological environment and the emergence of new operational problems. The success of previous offset strategies was not the result of a singular investment decision, but rather the result of investment decisions continuously updated to reflect the emergence of new operational challenges.

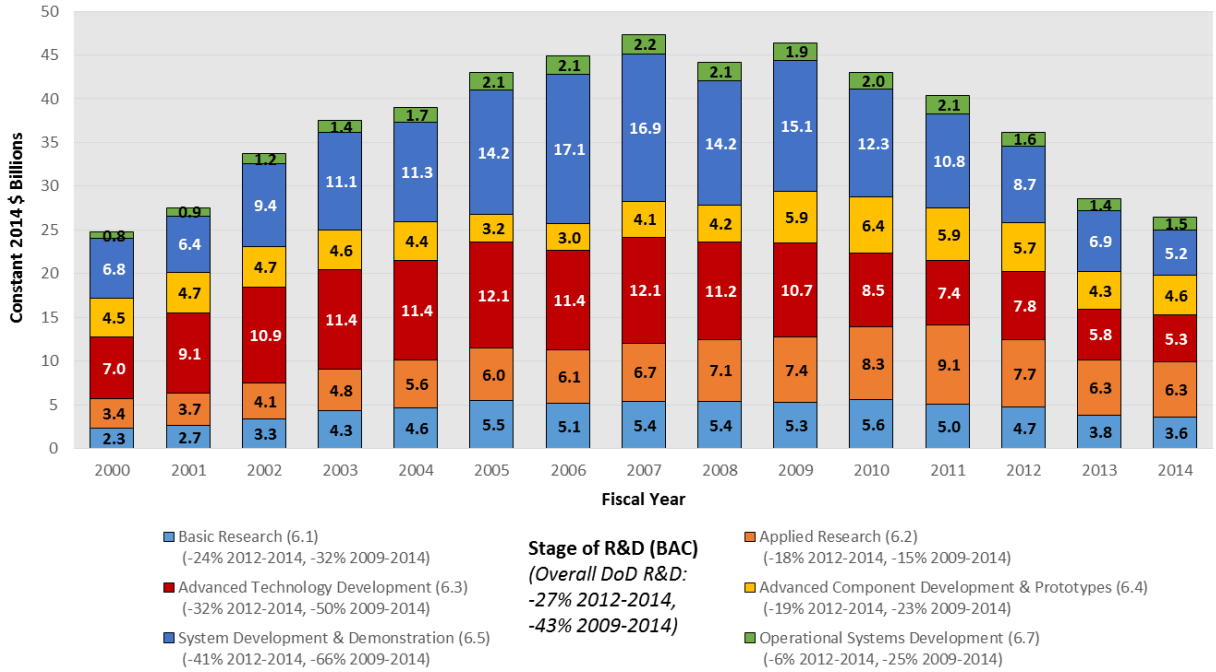
Access to innovative technology suppliers is critical to the Third Offset Strategy. Early in 2015, Secretary of Defense Ashton Carter announced that DoD would be establishing a new organization located in Silicon Valley, Defense Innovation Unit Experimental (DIU(X)), to help forge new and strengthen existing relationships between the Department and innovative companies such as those in Silicon Valley. DIU(X) is now in operation. Its success will be determined by its ability to establish effective partnerships, similar to the FlexTech Alliance established with several Silicon Valley firms this year, whether DoD succeeds in significantly enhancing its ability to recruit tech-savvy personnel, and ultimately in the ability of the DIU(X) model to replicate in other innovation hubs, domestically and internationally. Also notable will be the extent to which innovation available from traditional defense suppliers is encouraged and leveraged.

DoD's Seed Corn Has Been Relatively Preserved under Sequestration

Numerous statements by policymakers inside DoD and Congress, as well as outside experts, have expressed concern that under sequestration, DoD would be forced to "eat its seed corn"—that is, DoD would be forced to sacrifice the early stages of research and development (R&D) that lead to major technological advances—in order to preserve R&D contracts related to current, high-priority, later-stage efforts.

Figure II shows that early-stage R&D has fallen, but has done well relative to R&D generally.

Figure II: Defense R&D Contract Obligations, by Stage of R&D, 2000–2014



Source: FPDS; CSIS analysis.

The data show that the share of R&D contract obligations going to basic and applied research (6.1 and 6.2) has risen from 27 percent in 2009 to 38 percent in 2014. This is the result of contracts for those two stages of R&D being relatively preserved—compared to overall DoD R&D contract obligations, which declined by 43 percent between 2009 and 2014, contract obligations for 6.1 and 6.2 combined declined by only 22 percent. While early-stage R&D has fallen back to 2003 levels in constant dollar terms, R&D generally has fallen to 2001 levels.

A Five-Year Trough Has Developed in the Weapon Systems Pipeline

The enormous decline in System Development & Demonstration (6.5) reveals a significant trend: over the last several years, as many R&D programs related to Major Defense Acquisition Programs (MDAPs) have either been canceled or matured into production, DoD has been largely unable to start and sustain new development programs, either due to budgetary pressures or to programmatic difficulties. To a degree, the overall decline in R&D contract obligations does not represent broadly distributed cuts, but instead represents a five-year trough in the pipeline of new major weapons systems.

This problem particularly affects the Army, which, in the wake of the failure of the Future Combat Systems program, has been largely unable to start and sustain new major development programs. By contrast, the Air Force is preparing to begin large-scale development efforts, including for the Long Range Strike Bomber (LRS-B). The Navy, meanwhile, has major development programs in the pipeline, such as the Ohio-class ballistic missile submarine replacement. However, to preserve funding for current priorities, the Navy has been forced to push back the timelines for some of its efforts due to budgetary constraints.

This interruption of the developmental pipeline for new major weapons systems presents an unusual opportunity for DoD, and particularly for the Army. As spending on war materiel

continues to be replaced by funding for next-generation priorities, the Army has little to no developmental money already committed to projects. The Army thus has an opportunity to take a step back, draw lessons from the wars in Iraq and Afghanistan, evaluate potential future threats and missions, and direct their requirements and developmental priorities accordingly.

Services Contracts Surprisingly Resilient

A careful analysis of DoD contract obligations by budget account, with detailed examinations of trends in contract obligations funded out of the Procurement, Operations & Maintenance (O&M), and Research, Development, Test, & Evaluation (RDT&E) accounts, reveals that spending on services has been surprisingly resilient as the budget has fallen. In both the Procurement and O&M budget accounts, services declined less than obligations for products and R&D. Contrary to the expectations, and perhaps the intention of both Congress and DoD, spending on research and materiel has proven less compelling than services.

How Is DoD Buying?

Major Acquisition Reform Efforts in 2015 Will Take Time to Deliver Results

In 2015, both DoD and Capitol Hill simultaneously made substantial efforts to reform the defense acquisition system. DoD's internal effort, Better Buying Power 3.0 (BBP), represented the latest iteration of the Better Buying Power series originally launched in 2010 to improve the efficiency of the defense acquisition system. While largely continuing the initiatives of previous iterations, BBP 3.0's primary focus was not to find additional efficiencies in the system, but to preserve U.S. technological superiority into the future. As such, new initiatives under the BBP 3.0 guidance largely sought to maintain U.S. technological superiority by leveraging existing R&D investments made by both DoD and in the commercial firms, increasing the use of modular open-system approaches, or improving communication between industry and DoD.

On Capitol Hill, the 2016 National Defense Authorization Act (NDAA) made the most significant changes to the defense acquisition system since those made in the Federal Acquisition Streamlining Act of 1994. In fact, the provisions adopted in 2015 are simply the beginning of Congress's efforts to improve efficiency within DoD as both Armed Services Committee chairmen have indicated their intention to continue the effort in 2016. Key in the 2016 NDAA was the effort to consolidate authority, and therefore accountability, for acquisition in the military services. Along with this significant change, the 2016 NDAA also creates or expands several mechanisms intended to accelerate acquisition programs in the hopes of replicating acquisition successes such as the fielding of Mine-Resistant Ambush Protected vehicles (MRAPs) and developing and fielding rapidly emerging capabilities. Also notable were a range of provisions adopted to streamline documentation and approvals, increase access to commercial and non-developmental technologies, and improve the acquisition workforce.

CSIS research, especially a recent report for the Naval Postgraduate School titled "Measuring the Outcomes of Acquisition Reform by Major DoD Components," suggests that significant patience will be required to assess the success of the efforts. Changes in acquisition policy take years to begin to show effects, the complexity of the acquisition system makes it challenging to identify and implement policy changes that deliver clear outcomes, and it is even harder to identify policy changes that significantly alter the performance of the acquisition system. This evidence lends real credibility to the argument that there are no simple answers or silver bullets in the effort to improve performance of the acquisition system.

DoD Starting to Focus on Contract Incentives, Rather Than Contract Type

Recent research has led the Department of Defense to place more emphasis on contract incentive structures rather than solely on contract type. Throughout the drawdown there has been a notable rise in fixed-price incentive contracts while other types of fixed-price contracts declined. The same is not true, however, for cost-plus incentive fee contracts. In fact, cost-plus fixed fee contracts grew during the drawdown while other cost-based contracts declined. Disfavored incentive types such as award fee, however, have declined significantly. In September 2014, Better Buying Power 3.0 emphasized the use of contracts with objective incentive structures. FY2015 may see further increase in both types of incentive contracts and a reversal of the growth in cost-plus fixed fee contracts.

Effective Competition Rates Are Steady, Despite Desire to Promote Competition

Despite intense policy focus within DoD and from Congress on increasing competition for defense contracts, the rate of effective competition (that is, competed contracts receiving at least two offers) has been largely unchanged in recent years, with similar stability in the rates of competition for products, services, and R&D DoD-wide. It thus appears that, at a macro level, DoD's policy initiatives have been unable to move the needle on competition. Within the contracting portfolios of the major DoD components, however, there have been some notable shifts, but not all of them have been positive. As CSIS discussed in a report released in October, there has been a notable decline in the rate of effective competition within the Air Force's services contracting portfolio.[3] See the Air Force section in Chapter 5 for a brief summary of the scope of that decline.

Competition rates within particular states and at the Major Contracting Commands can be used to assess the health of the industrial base as demonstrated in CSIS's recent report for the Naval Postgraduate School, titled "Competition and Bidding Data as an Indicator of the Health of the U.S. Defense Industrial Base."

Contract Outcomes Can Be Examined Using Contract Data

Recent CSIS work—see our report for the Naval Postgraduate School entitled "Avoiding Terminations, Single-Offer Competition, and Costly Changes with Fixed-Price Contracts"—demonstrates that that there is increased risk of termination and cost ceiling increases in fixed-price contracts. The study team has overcome a notable limitation of FPDS, namely the difficulty of deriving any data on contract outcomes. By measuring the frequency and magnitude of contract cost ceiling breaches and terminations, this research demonstrates that risk in the acquisition system is asymmetric. Although the vast majority of contracts are relatively small and short, the vast majority of ceiling breaches and terminations occur on contracts that are either large, long, or both. These factors serve as indicators for complexity. The data demonstrate that the system handles non-complex acquisition contracts with relative ease, and that the problems of concern to policymakers are in fact almost exclusively a feature of more complex acquisitions. That said, there is still greater risk inherent in fixed-price contracts when they experience trouble, as the rate of termination for those contract types is consistently twice that of cost-based contracts. Based on these findings, any attempts to rebuild the system from the ground up may be

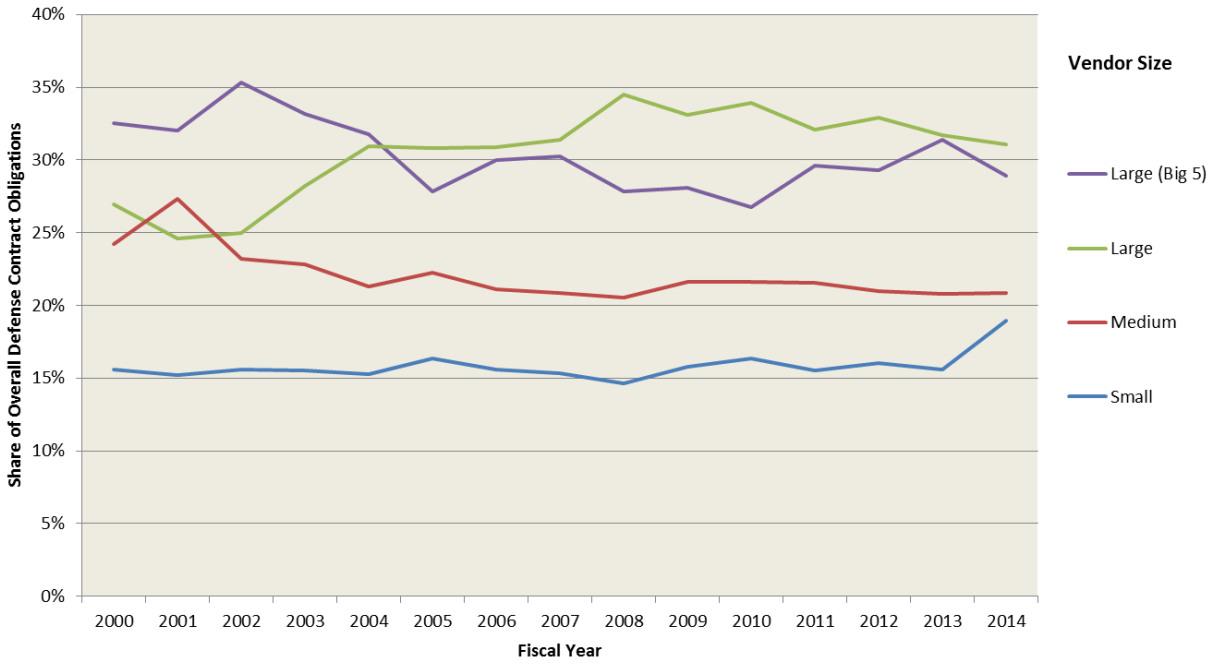
[3] Jesse Ellman, "Air Force Faces Puzzling Decline in Competition for Services," Center for Strategic and International Studies, October 2015, http://csis.org/files/publication/150925_Ellman_AirForceFacesPuzzlingDecline.pdf.

misdirected, as problems are focused where challenges are greatest, rather than endemic throughout the system. The current policy of offering greater flexibility below certain dollar thresholds and focusing management attention instead on larger contracts are justified not just because, as Willie Sutton said, "that's where the money is," but also because this is where the actual problems lie.

Whom Is DoD Buying From?

Small Vendors Accounted for Their Largest-Ever Share of Defense Contracts in 2014

Figure III: Share of Defense Contract Obligations by Size of Vendor, 2000–2014



Source: FPDS; CSIS analysis.

While the composition of the defense industrial base, measured by size of vendor, has been remarkably stable in recent years, there was a notable shift in 2014. The share of defense contract obligations to small vendors rose from 16 percent in 2013 to 19 percent in 2014, the highest share in the period observed. This rise is not simply the result of obligations to small vendors declining more slowly than for other size categories—as overall defense contract obligations declined by 9 percent in 2014, obligations to small businesses rose by 11 percent. Within the Army, the share of contract obligations to small vendors increased from 21 percent to 26 percent, the highest share for any of the three military services between 2000 and 2014, while the Navy and Air Force saw smaller increases.

This increase in share was primarily concentrated in services and electronics & communications (E&C) products; for the latter, small vendors now account for the largest share of contract obligations. This is particularly notable, because the small vendors within the E&C industrial base likely include many of the sorts of small, high-tech, potentially innovative firms that DoD has made a concerted effort to bring into, and keep in, the defense market. While, in real dollar terms, obligations have not increased for small vendors in the defense E&C market in recent

years, the fact that small vendors have managed to maintain their level of obligations in an extremely tough market can be seen as a success.

The Big 5 Defense Vendors Are Winning a Declining Share of R&D Contract Obligations

The Big 5 defense vendors (Lockheed Martin, Boeing, Northrop Grumman, Raytheon, and General Dynamics) have consistently accounted for the largest share of defense R&D contract obligations. However, that share has declined significantly in recent years, from 63 percent in 2006 to 41 percent in 2014, the lowest share in the 2000–2014 period. As discussed in the analysis of R&D contracting trends, this decline is largely attributable to many large development programs either being canceled or maturing into production in recent years, as well as the dearth of new major development programs being started and sustained over that same period. Since the Big 5 disproportionately performs development for major weapons systems, this interruption of the development pipeline in recent years has impacted them the hardest.

With the Air Force recently issuing, or about to issue, large development contracts for major weapons systems such as the LRS-B, this trend within the Air Force should reverse in the next few years. The Navy will likely see a similar reversal once development work ramps up on programs like the Ohio-class replacement, but on a longer timeline due to many of those programs being pushed back during the current budget drawdown. For the Army, however, it is uncertain when this trend will begin to reverse, as the service does not currently have nearly as many large development programs for major weapons systems ready to begin over the next several years.

The Present and Future of Defense Industry Consolidation

Over the last year, there have been significant mergers and acquisitions (M&As) among the notable prime defense vendors. The purchase of Excelis by Harris Corporation, the merger of ATK and Orbital Sciences Corporation, the merger of CSCGov and SRA International, and the sale of United Technologies' Sikorsky business unit to Lockheed Martin all reduce the number of potential competitors in major sectors of the defense contracting portfolio. Though the current budget drawdown has not seen a wave of consolidation at the prime contractor level comparable to the post–Cold War "Last Supper," this M&A activity (particularly the Lockheed Martin acquisition of Sikorsky) has prompted statements of concern from Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) Frank Kendall.

This is in contrast to the preceding several years, where the trend had been one of spinoffs and divestitures, as major defense vendors attempted to refocus on their core business areas or get out of less promising/profitable business areas. The spinoff of Northrop Grumman's shipbuilding business into Huntington Ingalls Industries, the spinoff of ITT's defense business as Excelis, the spinoff of Computer Sciences Corporation's government services business, and the spinoff of Engility as L3 Communications have all changed the structure of the defense industrial base, particularly for services, but have not acted to lower the number of competitors in their respective markets. Media reports have noted that other major defense vendors, including Lockheed Martin and BAE Systems, either intend to sell or spin off major business units, or are seriously exploring the possibility of doing so. Notably, most of these major spinoffs have been in the government services sector, particularly for information technology services, which could

indicate significant pessimism within the defense industry for the future growth and profitability of that sector of the defense contracting market.

DoD Starts with a Narrow But Sustained Base for Outreach to Silicon Valley

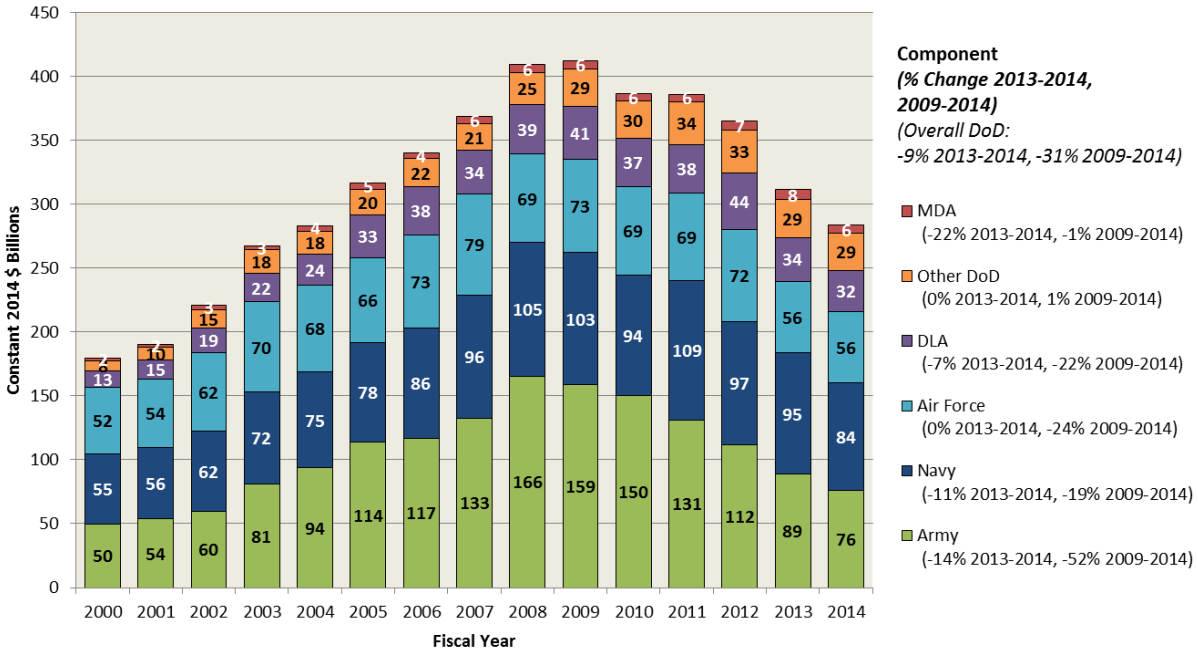
DoD generally and each of its major acquisition components already do a relatively small, but by no means insignificant, amount of contracting in Silicon Valley. The current base of activity is characterized by a solid base of a few firms such as Hewlett Packard and Lockheed Martin that consistently work with DoD joined from year to year by a frequently changing mix of smaller companies. The relative stability at the top of this list and the relative churn below the top suggest that smaller suppliers in Silicon Valley are stymied not just by barriers to entry, but by barriers to remaining involved in defense acquisition. To the extent that DoD's policy initiatives can help sustain the participation of smaller Silicon Valley firms in defense, real progress appears possible. Secretary Carter's plan for more cooperation between the big and smaller firms focuses on three steps. The first step, focusing on reforming the hiring process to make DoD more competitive, is crucial to any effort of incorporating Silicon Valley experts into the Department. Additionally, DoD must continue to make significant improvements to intellectual property efforts, as this is one of, if not the, main concern for persons considering working with the government. Lastly, similar to how it is in Washington, Silicon Valley highly values interpersonal relationships and networking with peers. Secretary Carter has made significant efforts to meet with the heads of many Valley companies in order to strengthen interpersonal relationships. Maintaining and building on these current efforts to strengthen relationships between DoD and Silicon Valley should be considered for the baseline during the new administration.

What Are the Defense Components Buying?

Service Acquisition Portfolios Are Shifting In Distinct Ways

Because most contracting decisions are made within contracting elements of the major DoD components, it is important to examine trends within the major DoD components engaged in acquisition: Army, Navy, Air Force, Defense Logistics Agency (DLA), Missile Defense Agency (MDA), and "Other DoD," which aggregates all other DoD contracting entities. Figure IV shows DoD contract obligations, broken down by the components responsible for the contract.

Figure IV: Defense Contract Obligations by Component, 2000-–2014



Source: FPDS; CSIS analysis.

The decline in Army contract obligations since 2009 (-52 percent) has significantly outpaced the decline in overall DoD contract obligations, reflecting the ramping down from the wartime buildup. The Navy (-19 percent), Air Force (-24 percent), and DLA (-22 percent) all declined more slowly than overall DoD. Meanwhile, contract obligations within MDA (-1 percent) and "Other DoD" (1 percent) were nearly steady, though MDA saw significant volatility within the 2009–2014 period.

Army

Army contract obligations in 2014 were at their lowest level since 2002, the result of several factors, including: the ramping down of overseas combat operations; the overall budget drawdown and fiscal uncertainty facing DoD; and the Army's recent inability to start and sustain major development and procurement programs meant to replace aging and worn-down platforms. Army obligations for products and R&D have declined significantly more steeply than Army contract obligations for services since 2009; and particularly in 2013, the first year in which the impact of sequestration could be observed. In 2014, however, products and services declined at roughly the same rate, while Army R&D contract obligations declined at half the rate of overall Army. Nonetheless, Army R&D contract obligations in 2014 were at their lowest level in the 2000–2014 period.

Navy

Navy contract obligations have fluctuated up and down in recent years, largely based on the timing of contracts for large programs such as the Joint Strike Fighter (JSF) and the DDG-51 destroyer. By 2014, overall Navy contract obligations were 19 percent below 2008 levels, at $84 billion, the lowest level since 2005. Navy contract obligations were virtually steady in 2013, despite the impact of sequestration, but in 2014 obligations declined roughly in parallel with the

overall decline in DoD contract obligations. Navy R&D contract obligations have declined by nearly half since 2007, largely as the result of major developmental programs like the JSF maturing into production, but also due to a 77 percent decline in Navy contract obligations for basic research.

Air Force

Air Force contract obligations fluctuated near $70 billion from 2008–2012, before declining significantly in 2013 to $56 billion. In 2014, however, Air Force contract obligations were virtually stable. Air Force contract obligations have been exceeded by the combined total of DLA, MDA, and "Other DoD" in every year since 2008. The declining pace of overseas combat operations has not altered that trend—contract obligations from outside the three military services exceeded Air Force levels by over $15 billion in 2013 (the largest difference was in the 2008–2014 period) and the gap in 2014 was only slightly lower.[4] Air Force contract obligations for products and R&D have declined sharply since 2009, while obligations for services were relatively preserved.

[4] Classified contracts, which are disproportionately administered by the Air Force, are not required to be reported into FPDS, which CSIS takes to mean that most are not. This artificially deflates Air Force contracting totals, though that is consistent across the 2000–2014 period, so trend analysis is still possible.

1. Introduction

Acquisition, budgets, force structure, and strategy all have critical distinctions and underlying linkages. The new CSIS initiative, "Defense Outlook: A CSIS Series on Strategy, Budget, Forces, and Acquisition," aims to better explain each element of the continuum by exploring the ways they enable and limit one another. This report, *Defense Acquisition Trends, 2015: Acquisition in the Era of Budgetary Constraints,* the first of the series, examines the state of defense acquisition and in combination with the other reports in the series, and is designed to inform policymakers on how well the acquisition system is enabling the Department of Defense to achieve its strategic objectives. It also represents an expansion of a previous CSIS report series on Defense Contract Trends. As before, the report will rely significantly on empirical analysis undergirded by contracting transaction data from the open-source Federal Procurement Data System (FPDS).[5] This edition continues the approach of identifying and studying emergent trends in the contracting data, and marries that analysis with discussion of changing goals and methods for the larger acquisition system.

Since the start of the twenty-first century, the U.S. defense industrial base has undergone a series of transformations in response to shifting national security priorities. Entering the start of the century, the 9/11 attacks and subsequent wars in Iraq and Afghanistan led to a sustained growth in contract spending. Much of this buildup was driven by overseas contingency operations spending and focused on wartime operations or rapid acquisition of platforms specific to those wars, such as Mine-Resistant Ambush Protected (MRAP) vehicles.

After contract obligations peaked in FY2009, and with the wars in Iraq and Afghanistan seemingly wrapping up, Defense Secretary Robert Gates anticipated that the Department of Defense (DoD) budget, and subsequently contract obligations, would face a decline. At that time, DoD planners did not expect that the defense budget would decline as rapidly as it would beginning in FY2013 as a result sequestration and the imposition of lower budget caps on defense spending imposed by the Budget Control Act of 2011 after the failure of Congress to achieve budget reductions in nondiscretionary spending. Intended as a poison pill to force the Republicans and Democrats to the negotiating table, the failure of the two parties to reach a grand bargain resulted in the Ryan-Murray deal that provided limited relief to the defense budget, but budget levels were still significantly lower than the Pentagon had been planning for. As such, during this period (2010–2014), trends can be divided into two unique periods: Beginning of the defense drawdown (2010–2012), and sequestration and its aftermath budget caps (2013–2014).

1.1. Report Organization

At the end of the third year of sequestration-level budget caps, this report assesses the state of defense acquisition system. To guide our analysis, each chapter takes on a single big question and a handful of related research questions:

[5] See the start of Appendix A: Methodology, for a detailed description of how the FPDS data are accessed and the data's limitation.

Chapter 2: What Is DoD Buying?
What are DoD's top acquisition priorities, and how have those priorities been implemented? How have the drawdown and budget caps changed what DoD is buying?

Chapter 3: How Is DoD Buying It?
What major reform efforts are currently underway? How have DoD contracting approaches changed over time and what causes can be identified? What contract outcomes can be derived from FPDS?

Chapter 4: Whom Is DoD Buying From?
How has the composition of prime vendors changed during the drawdown and what causes can be identified? Who are the top vendors and what do they tell us about industrial base consolidation? What's the baseline for DoD outreach for Silicon Valley?

Chapter 5: What Are the Defense Components Buying?

How have the budget drawdown, sequestration, and its aftermath affected contract spending within the major DoD components? What are the specific sources of any increases or declines in contract obligations within the major DoD components?

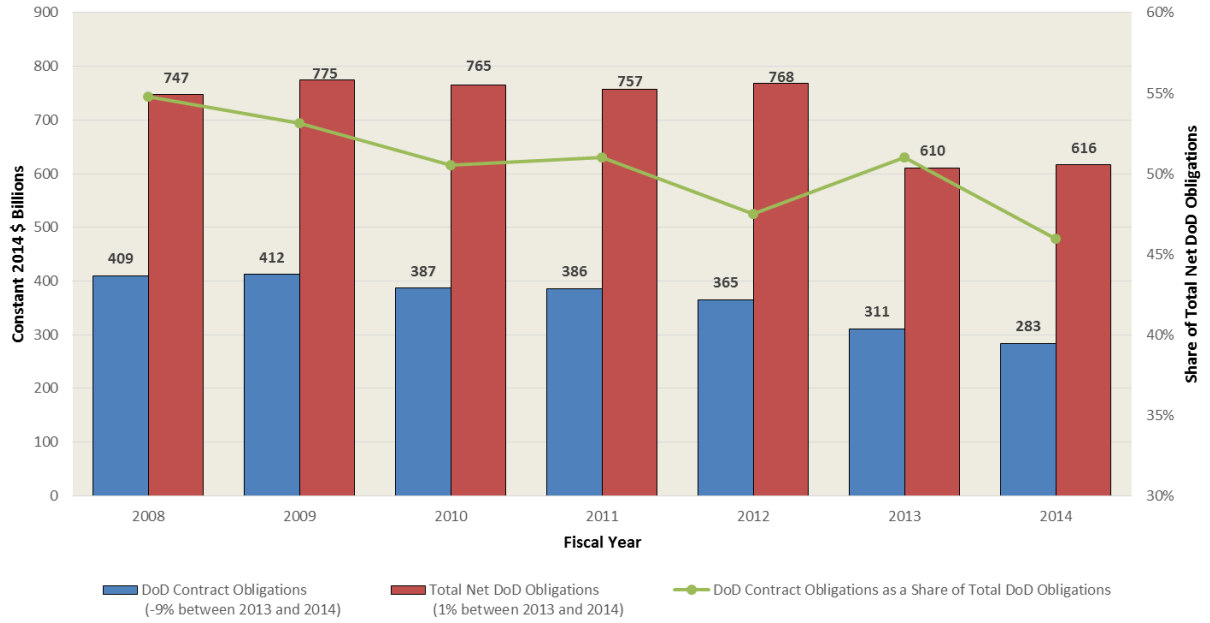
The final chapter of the report is the Conclusion, which summarizes the answers that the study team found to these questions. The report's research approach is discussed in Appendix A: Methodology.

1.2. DoD Contract Spending in a Budgetary Context

Before tackling these questions, it is helpful to understand how DoD's contract spend fits into the larger budgetary picture. To allow for a like-to-like comparison, CSIS compared DoD contract obligations to total DoD obligations, shown in Figure 1-1. These totals include contract spending associated with the Army Corps of Engineers (ACE) and foreign military sales through the Defense Security Cooperation Agency (DSCA) and so may not match those reported by other sources.[6]

[6] See section A.2.1 for additional methodological details.

Figure 1-1: Defense Contract Obligations vs. Total Defense Net Obligations, 2008–2014[7]



Source: FPDS; DoD Comptroller Financial Summary Tables; CSIS analysis.

In Figure 1-1, the blue columns show overall DoD contract obligations, while the red columns show total net DoD obligations, which include contract obligations. The green line, using the vertical axis on the right, shows DoD contract obligations as a share of total net DoD obligations.

Overall DoD contract obligations peaked at $412 billion in 2009, following a steady increase throughout the 2000s. Total net DoD obligations similarly peaked in 2009, at $775 billion.

As the pace of operations in Iraq and Afghanistan slowed and budget caps were imposed, overall DoD contract obligations declined by 31 percent between 2009 and 2014, the result of a steady year-to-year decline that spiked in 2013 due to the impact of sequestration. By contrast, total DoD net obligations were remarkably stable between 2009 and 2012, despite the pressures of the ongoing budget drawdown and the slowing pace of operations in Iraq and Afghanistan. It was only in 2013, the first year where the impact of sequestration can be seen in the data, when total net DoD obligations suddenly decline; net DoD obligations declined by 21 percent in 2013, notably faster than the 15 percent decline in contract obligations in the same year. As a share of total net DoD obligations, contract obligations declined from 53 percent in 2009 to between 48 percent and 51 percent from 2010–2013, before declining to 46 percent in 2014, the lowest share in the period observed.

In 2014, while DoD contract obligations declined by 9 percent, total net DoD outlays actually increased by 1 percent. This suggests that while the decline in total net DoD obligations has leveled off, the decline in contract obligations may continue into 2015. Final FY2015 contract obligation data, not available until 2016, will help clarify this point. Given the recent two-year budget deal reached in the Bipartisan Budget Agreement of 2015, it is apparent that 2015 will represent the bottom of the trough for the defense budget overall with modest defense budget

[7] This chart includes data starting in 2008 because, while the required DoD comptroller data for overall DoD are available starting for FY2003, Defense Security Cooperation Agency (DSCA) data are only broken out separately starting for FY2008.

increases projected going forward, but the funding levels in the budget agreement and competition for defense funding are such that contract spending is likely to remain at or near 2015 levels for some time and to recover much more slowly than the defense budget overall going forward.

2. What Is DoD Buying?

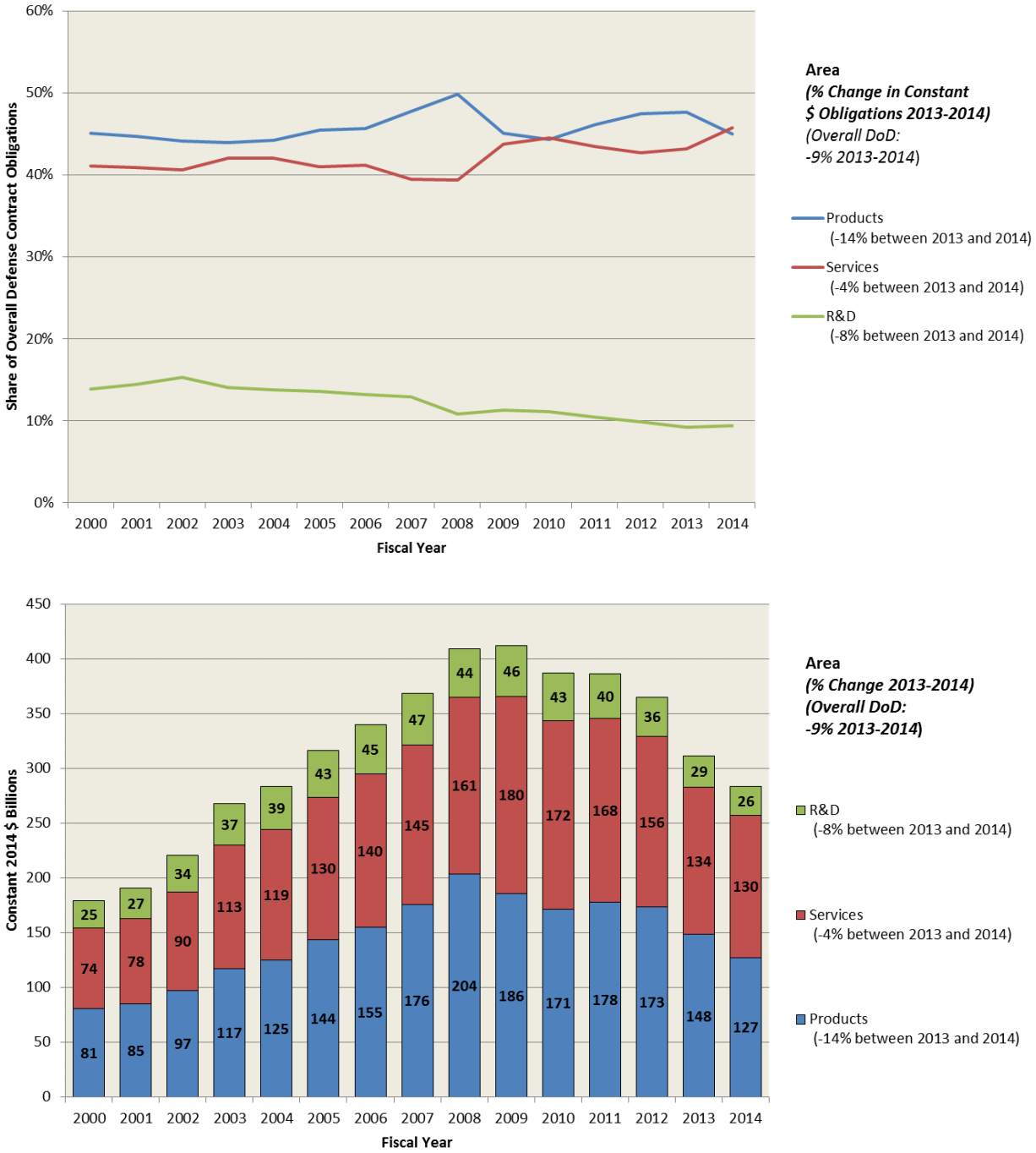
In the post–World War II era, DoD has relied on private-sector vendors for the production and sustainment of its systems, infrastructure, and supplies. As was shown in Figure 1-1, even after the recent decline, contract spending accounts for over 40 percent of total net DoD obligations. With the prominent exception of personnel spending, contract spending claims the lion's share of most DoD funding accounts. Those studying what DoD prioritizes typically look at budgets, but data on contract obligations can fill in valuable details and answer questions obscured when looking only at appropriations data.

This section on "What Is DoD Buying" seeks predominantly to answer the following two questions: First, what are DoD's top acquisition priorities, and how have those priorities been implemented? Second, how have the drawdown and budget caps changed what DoD is buying? Both questions are of vital interest to the industrial base that supports the Department, as contracts are their predominant source of revenue for defense goods and services. They also provide an indication of how well the acquisition system is supporting the Department in achieving its strategic objectives.

One of DoD's key strategic objectives is an attempt to prioritize innovation in order to ensure continued technological superiority over potential adversaries. To provide background for that discussion, Figure 2-1 shows overall DoD contract obligations awards, broken down by what is being contracted for: products, services, and R&D. The stated priority on innovation from top leadership must be examined in the context of declining R&D contract obligations, which account for a small and, for much of the drawdown, shrinking portion of DoD obligations.

As Figure 2-1 shows, between FY2000 and FY2006, the share of contract obligations for each of the Product or Services categories was largely steady. On average, 45 percent of contract obligations were awarded for Products, 41 percent for Services, and 14 percent for R&D. In FY2007 and FY2008, the share of contract obligations awarded for Services decreased to 39 percent in both years, as the procurement of MRAPs took an increasingly larger share of the procurement budget. However, the decrease in share for Services was not sustained—during the FY2009 to FY 2014 period Services averaged 44 percent, consistently above the level at the start of the prior decade. This result demonstrates that the contract spend for services has been remarkably resilient at a time when both Congress and DoD leadership has targeted this spending for reduction. Instead, R&D experienced the sustained drop, falling significantly as a share in FY2008 and after briefly stabilizing suffering a further serious decline. FY2014 may be the start of a new pattern, as Services overtook Products and R&D declined at a slightly slower pace than the overall drop in contract spending.

Figure 2-1: Defense Contract Obligations by Area, 2000–2014



Source: FPDS; CSIS analysis.

Section 2.1 focuses on the first research question and how DoD intends to achieve its priority of preserving technological superiority despite a funding level comparable to the start of the century and a notably lower share of contract spending. Sections 2.2 and 2.3 address the second research question of how contract spending by platform and by funding have changed during the drawdown.

2.1. Innovation, R&D, and Technological Superiority

The hallmark of U.S. defense strategy for the past 30 years has been overwhelming technological superiority. Following the end of the Cold War, the United States lacked a "super power" or even a near-peer competitor capable of threatening that technological supremacy. However, the combination of the failure of several "leap ahead" technology development efforts such as the Future Combat Systems program, the demand for funding for urgently needed war materiel, the limitations imposed recently by defense budget caps, and the unexpected pace of technological advances among our global competitors led to a situation where serious questions about the U.S. lead in technological supremacy have emerged. Senior Department leaders began talking about this risk in 2013 and formulating a strategy to combat it. When Under Secretary of Defense Frank Kendall released the third iteration of the Department's Better Buying Power initiative on September 19, 2014, it was explicitly formulated as a way to sustain a U.S. technological advantage. In addition, calling upon the lessons of the Cold War, there was a growing support for a Third Offset Strategy as a possible solution to the problem. The previous offset strategy, led by Secretary of Defense Harold Brown and Dr. William Perry, then-director of defense research and engineering, laid the foundation for networked warfare and precision strike that ensured U.S. military supremacy for the last several decades. Repeating such an effort was seen as the means of extending U.S. technological supremacy into the twenty-first century.

2.1.1. Defense Innovation Initiative—"Third Offset Strategy"

On September 3, 2014, then-Secretary of Defense Chuck Hagel announced that he had asked Deputy Secretary of Defense Bob Work to "move forward with an initiative to develop a third, game-changing offset strategy."[8] In addition to directing Deputy Secretary Work to begin work on developing a Third Offset Strategy, Secretary Hagel announced that Under Secretary of Defense for Acquisition, Technology, and Logistics (AT&L) Frank Kendall would be developing a Long-Range Research & Development Plan (LRRDP). Based on the program of the same name from the 1970s that guided the investment decisions during the Second Offset strategy, the LRDDP would focus on identifying the game-changing technologies that, if successfully invested in, would sustain U.S. military supremacy into the 2030s.

Two months later, Secretary Hagel announced the official launch of the Third Offset Strategy on November 14 at the 2014 Reagan National Defense Forum with the creation of the Defense Innovation Initiative. In his speech, Secretary Hagel described the effort:

> This new initiative is an ambitious department-wide effort to identify and invest in innovative ways to sustain and advance America's military dominance for the 21st century. It will put new resources behind innovation, but also account for today's fiscal realities—by focusing on investments that will sharpen our military edge even as we contend with fewer resources.
>
> The Defense Innovation Initiative will explore and develop new operational concepts, including new approaches to warfighting, and how we balance DoD's

[8] Chuck Hagel, "Defense Innovation Days," Opening Keynote, Southeastern New England Defense Industry Alliance (Newport, RI: U.S. Department of Defense, September 3, 2014), http://www.defense.gov/News/Speeches/Speech-View/Article/605602.

> investments between platforms and payloads. It will focus on new approaches on war-gaming and professional military education.[9]

When it was first announced, the Third Offset Strategy created more questions than it answered. Beyond a mandate to "identify and invest in innovative ways to sustain and advance America's military dominance for the 21st century,"[10] there was little public discussion by the senior DoD leaders as to the eventual direction of the Third Offset Strategy. Critical questions of whom are we offsetting against and what future operational challenges this effort was aimed at solving went unanswered.[11]

While Secretary Hagel listed "robotics, autonomous systems, miniaturization, big data, and advanced manufacturing, including 3D printing," as potential cutting-edge technologies of a Third Offset Strategy, a subsequent request for information for the LRRDP sought input on five focus areas: space technologies, undersea technologies, air dominance and strike technologies, air and missile defense technologies, and technology-driven concepts.[12] Lacking a clear guiding principle, at least to those outside government, third offset became the platform from which people used to argue for increased investments in their preferred military capabilities. Arguments called for the Third Offset Strategy to focus investments on everything ranging from specific platforms to asymmetrical warfare.[13]

One year after Secretary Hagel's initial announcement, a much clearer picture of the trajectory of the third offset finally emerged. Speaking at the 2015 Regan Defense Forum, Deputy Secretary of Defense Bob Work articulated a clear definition of what an offset strategy is and whom it is aimed against:

> Offset strategies are focused on great powers, and are focused on one thing and one thing alone, that is making sure that our conventional deterrent is as absolutely strong as possible, to make sure the chance that we would go to war would be very, very low.
>
> It [offset strategy] is strategy-based, technologically oriented, and you want operational and organizational constructs that give you an advantage and an offset against your adversaries who might outnumber you. It is focused on the operational level of war, or the campaign. That's what an offset strategy is.[14]

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[9] Ash Carter, "Reagan National Defense Forum Keynote" (U.S. Department of Defense, Simi Valley, CA, November 15, 2014), http://www.defense.gov/News/Speeches/Speech-View/Article/606635.
[10] Chuck Hagel, "A New Era for the Defense Department," *Defense One*, November 18, 2014, http://www.defenseone.com/ideas/2014/11/new-era-defense-department/99392/.
[11] Andrew Metrick, "Offset from What?" (Washington, DC: Center for Strategic and International Studies, November 26, 2014), http://fysa.csis.org/2014/11/26/offset-from-what.
[12] Cheryl Pellerin, "DoD Seeks Novel Ideas to Shape Its Technological Future," *DoD News, Defense Media Activity*, February 24, 2015, http://www.defense.gov/News-Article-View/Article/604159/dod-seeks-novel-ideas-to-shape-its-technological-future.
[13] Benjamin Locks, *Bad Guys Know What Works: Asymmetric Warfare and the Third Offset* (War on the Rocks, June 23, 2015), http://warontherocks.com/2015/06/bad-guys-know-what-works-asymmetric-warfare-and-the-third-offset/3; Paul Scharre, *Unleash the Swarm: The Future of Warfare* (War on the Rocks, March 4, 2015), http://warontherocks.com/2015/03/unleash-the-swarm-the-future-of-warfare/.
[14] Bob Work, "Reagan Defense Forum: The Third Offset Strategy*"* (Simi Valley, CA: U.S. Department of Defense, November 7, 2015), http://www.defense.gov/News/Speeches/Speech-View/Article/628246/reagan-defense-forum-the-third-offset-strategy.

At the same time, Deputy Secretary Work revealed that three simultaneous efforts within the Pentagon were undertaken to assess the capabilities required for future conflicts. The first effort, led by the Strategic Capabilities Office, looked at capabilities requirements in the first Future Years Defense Program. The second effort, looking at what near-mature technologies could enter the force with investment in the next 10 years, was guided by strategic portfolio reviews. The third and final effort, the LRRDP, focused on looking at the critical capabilities 20 to 30 years from now.

Overall, Secretary Work stated that the three efforts reached approximately 70 to 75 percent agreement on the outcomes. Emerging from this consensus was one big idea: human-machine collaboration and combat teaming. The efforts concluded that automation and artificial intelligence combined synergistically with human intelligence offered the potential for significant force-multiplying effects in the following areas:

- Learning machines
- Human-machine collaboration
- Assisted human operations
- Human-machine combat teaming
- Autonomous weapons.

What are the future implications of the Third Offset Strategy?

The articulation of a clearly defined strategy is an improvement over the haziness of the past year, but the success of the Third Offset Strategy will be measured ultimately by the capabilities that enter the force. As the Third Offset Strategy moves forward, three guideposts will serve as gauges of the third offset: funding, force structure and doctrinal changes, and the ability to adapt to changes in the security environment.

The first guidepost for measuring the long-term impact of third offset will be the FY2017 defense budget. Secretary Work has indicated that third offset-related investments started in the FY2016 budget, but that the 2017 President's Budget would include clearer indications of future priorities with third offset-related investments totaling $12–14 billion. If the Third Offset Strategy is to be a success, investments in identified technologies must be made at levels sufficient to allow for advancement and maturation of technologies to occur and must be sustained and increased over time. Making investments at the margins will be indicative of the failure of the third offset.

Second, as technologies enter the force, the third offset will be measured by changes to existing force structures and concepts of operations. As Secretary Work has often repeated, offset strategies are not just about technologies. Advances in technologies should enable the armed forces to operate in new ways. Benchmarks include the level of experimentation and wargaming within the services, changes in force structure, and the development of new doctrine to include joint doctrine such as AirSea Battle and the related Joint Staff effort currently called the Joint Concept for Access and Maneuver in the Global Commons. The success of the Third Offset Strategy will also be measured by how quickly related technologies enter the force structure and help enable new concepts of operations.

Finally, the Department must constantly adapt to the future security environment. As technology advances and the global security environment changes, so too should the Department's investment priorities. Previous offset strategies succeeded not because of a singular investment, but because of the inherent adaptability of a number of investments originally aimed at discrete operational problems. Technologies that seemed revolutionary in 2015 may no longer be so in 2020 as a result in the shifting of global dynamics.

2.1.2. Defense Innovation Unit Experimental: Finding New Sources of Innovation

Shortly after his confirmation as secretary of defense, Secretary Carter made a speech at Stanford University in which he called for a renewal and strengthening of the partnership between Silicon Valley and DoD. Secretary Carter highlighted that if the Department hoped to face the technological chances of the future, returning that partnership between DoD and Silicon Valley to previous levels was needed, but to do that the Department would "need to change and . . . need to be open" and "think outside of our five-sided box."[15] To kick-start that relationship, Secretary Carter outlined the reforms he planned to implement as secretary to encourage cooperation with Silicon Valley. First, he announced that a series of personnel reforms aimed at modernizing the hiring process and personnel system in order to make it easier for DoD to bring in the needed expertise located outside of government. These personnel reforms targeted not only those entering government service but also those already in the government, with the expansion of the Secretary of Defense Corporate Fellows program that sends people each year to leading commercial firms. Second, Secretary Carter reassured industry that DoD was cognizant of their concerns over intellectual property and was working to protect it. Finally, Secretary Carter announced that DoD would establish a new organization located in Silicon Valley, called Defense Innovation Unit Experimental (DIU(X)), to help forge new and strengthen existing relationships between the Department and those in Silicon Valley.

Opened in early August 2015, DIU(X) will "serve as the hub for the Department's core initative to increase DoD's communication with, knowledge of, and access to innovating, leading edge technologies from high-tech startups and entrepreneurs."[16] Specifically, DIU(X)'s stated mission is to "strengthen existing relationships and build new ones; scout for breakthrough and emerging technologies; and function as a local interface for the Department."[17]

Three major streams of effort are planned for DIU(X) to accomplish these stated efforts: investment funds, scouting efforts, and personal involvement from Secretary Carter. In August, DoD kick-started the first stream of effort, investment funding, with the launch of a new research institute in Silicon Valley focused on flexible hybrid electronics. Partnering with FlexTech Alliance—"a consortium of 96 companies, 41 universities, 14 state and local government organizations, and 11 labs and non-profits"—Secretary Carter announced the Department was investing $75 million into the new research institute to produce the next generation of flexible

[15] Ash Carter, "Drell Lecture: 'Rewiring the Pentagon: Charting a New Path on Innovation and Cybersecurity' " Stanford University (Palo Alto, CA: U.S. Department of Defense, April 23, 2015), http://www.defense.gov/News/Speeches/Speech-View/Article/606666.
[16] U.S. Department of Defense, "Defense Innovation Unit—Experimental (DIUx): Silicon Valley," Fact sheet, http://www.defenseinnovationmarketplace.mil/resources/2015828_DIUxFactSheet.pdf.
[17] Robert Work, "Creation of New 'Point of Presence' Defense Innovation Unit Experimental," July 2, 2015, http://www.defenseinnovationmarketplace.mil/resources/03_OSD006596-15_RES_Final.pdf.

hybrid electronics for both commercial usage and defense missions.[18] The FlexTech Alliance partners not only matched DoD's initial $75 million investment, but exceeded it by investing $96 million to bring the total funding for the research effort to $171 million.[19]

The second stream of effort, scouting, focuses on identifying not only potential game-changing technologies, but also personnel who might be interested in working with DoD. Accompanying proposed personnel and acquisition reforms necessary to make the system more agile and competitive, DIU(X) efforts focus on demonstrating that the Department can be a more favorable customer or potential employer. Efforts in this include, but are not limited to, visiting startups across the Valley to establish relationships between themselves and DoD, working to recruit engineers and other "tech-minded personnel" by demonstrating that working for DoD can be compelling and fulfilling, and providing desk space for reservists to work on projects.

Finally, the last major stream of effort, and perhaps the most important, is the personal involvement of Secretary Carter. Unlike many in Washington, D.C., Secretary Carter understands how Silicon Valley operates, having previously worked in the Valley himself. Recognizing that rebuilding the relationship between Silicon Valley and DoD must be a major effort of his tenure as secretary of defense, Secretary Carter has not simply directed DoD to rebuild the relationship, but has made the personal effort to rebuild the relationship through his involvement and trips to Silicon Valley. For example, Secretary Carter's speech at Stanford was the first time that a secretary of defense spoke at the university in two decades.[20] Secretary Carter's involvement is not limited to making speeches, but includes meeting with leaders at Facebook, LinkedIn, and other major technology companies to discuss how they recruit top talents, meeting with Silicon Valley angel investors, and attending roundtables of Silicon Valley entrepreneurs.[21]

Silicon Valley's response to date to this major effort remains mixed. While there has been cautious engagement from some in Silicon Valley, others remain hesitant that Secretary Carter can make the reforms necessary to make the system more appealing. William Broderick, Chief Financial Officer of Analytical Graphics, Inc., in response to the issue of contracting for commercial products, stated: "While we wholeheartedly applaud Secretary Carter's stated objective of increased access to commercial suppliers, the actual behaviors of other organizations within the department run contradictory to the secretary's stated goals."[22] This quote demonstrates the challenges facing DIU(X) and Secretary Carter's attempts to rebuild the Silicon Valley-DoD relationship. Rebuilding the relationship will not happen overnight and will take ample time and effort.

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[18] Ash Carter, "Remarks Announcing a New Manufacturing Innovation Institute in Silicon Valley" (Mountain View, CA: U.S. Department of Defense, August 28, 2015), http://www.defense.gov/News/Speeches/Speech-View/Article/615268/remarks-announcing-a-new-manufacturing-innovation-institute-in-silicon-valley.
[19] W. J. Hennigan, "Secretary of Defense unveils $75-million investment in Silicon Valley venture," *Los Angeles Times*, August 28, 2015, http://www.latimes.com/business/la-fi-pentagon-cyber-20150829-story.html.
[20] Jessi Hempel, "Department of Defense Head Ashton Carter Enlists Silicon Valley to Transform the Military," *Wired*, November 18, 2015, http://www.wired.com/2015/11/secretary-of-defense-ashton-carter.
[21] Jill R. Aitoro, "What Can DOD chief Ash Carter learn from Facebook's Sheryl Sandberg?," *Washington Business Journal*, April 23, 2015, http://www.bizjournals.com/washington/blog/fedbiz_daily/2015/04/what-can-dod-chief-ash-carter-learn-from-facebooks.html.
[22] Sandra Erwin, "Defense Innovation Initiative Burdened by High Expectations," *National Defense Magazine*, November 30, 2015, http://www.nationaldefensemagazine.org/blog/lists/posts/post.aspx?ID=2031.

Going forward, the ultimate success of DIU(X)'s efforts will not necessarily be measured by any changes the office itself can impact, but those outside its control. Historical evidence suggests that whomever is elected president in 2016 is likely to bring in his or her own person to replace Dr. Carter as secretary of defense. Will the person brought in replace Secretary Carter place the same emphasis on rebuilding the Silicon Valley-DoD relationship? If not, will DIU(X) have the sway necessary to convince potential Silicon Valley partners that DoD is still working to becoming a more favorable customer? Probable changes in DoD leadership are not the only issue outside of DoD's control, with congressional approval required for many of the proposed personnel changes designed to make the system more agile and competitive that allow DoD to recruit the best and the brightest from Silicon Valley and elsewhere. If Congress does not cooperate with the Department in this effort, even DIU(X)'s best effort to recruit tech-minded individuals to come work for DoD could provide ineffective.

With those issues, DIU(X)'s efforts should be measured on its ability to establish partnerships and relationships between DoD and Silicon Valley, similar to the FlexTech Alliance-DoD partnership. The fact that FlexTech Alliance's investment not only matched DoD's investment, but exceeded it, suggests there is cautious optimism. Second, determining the success of this effort will be based on whether personnel reforms are allowed to happen. The current personnel system is a barrier that prevents DoD from recruiting the tech-minded personnel who might already want to work for the government. If DoD hopes to recruit the best and the brightest, people who previously had not considered working for the government, then the personnel system must be changed to increase the competitiveness of the system. Finally, a major test of this effort will be how it continues after Secretary Carter's departure. Without Secretary Carter personally driving change, will improving outreach to Silicon Valley continue as a major DoD effort? The challenges to DoD are clear, but early evidence suggests that some people in Silicon Valley believe there is an opportunity to once again partner with DoD to develop breakthrough technologies. The question for DoD is, will the political and bureaucratic fights in Washington allow that to actually happen**?**

New Sources of Increasing Innovation—Beyond Just Silicon Valley

DIU(X)'s efforts in Silicon Valley should not be DoD's only effort in pursuit of its stated priority to increase access to innovation and maintain U.S. technological superiority. Rebuilding the relationship between Silicon Valley and DoD is a crucial component of that effort, but must be part of a larger strategy. Beyond Silicon Valley, both nontraditional technology firms located outside of Northern California and traditional defense firms will play a crucial role in increasing DoD's access to innovation.

While Silicon Valley is the best-known innovation hubs in the United States, it's not the only place where critical nontraditional defense technological companies are located. Other significant U.S. innovation hubs include, but are not limited to, Silicon Alley in New York; Austin, Texas; the Route 128 corridor in Massachusetts; Atlanta, Georgia; the North Carolina Research Triangle, and Northern Virginia.[23] As such, improving access to the innovations emerging from these other innovation hubs will be a key component in DoD's capability to maintain U.S. technological superiority. Additionally, DoD must recognize that the United States

[23] Stephanie Walden, "Beyond Silicon Valley: Top emerging startup markets in the U.S.," *Mashable*, August 19, 2015, http://mashable.com/2015/08/19/top-new-cities-startup-markets/#jItRN5Uty5qj.

is not the only source of major innovation as global value chains have made the globalization of technological development the norm, not the exception. Ensuring continued U.S. technological superiority will require the United States to continue leveraging technological advances made by our partners and allies.[24]

Just as Silicon Valley should not be seen as the only source of commercial technology, commercial technology should not be seen as the exclusive solution to acquisition problems. As Dr. Arati Prabhakar, director of the Defense Advanced Research Projects Agency (DARPA) said about commercial innovation, "It's not a substitute, it's something that we have to learn how to leverage."[25] Traditional defense firms will continue to play a major role in sustaining U.S. technological superiority as national security concerns present problems that run counter to commercial business practices. For example, as Wes Bush, chairman, chief executive officer, and president of Northrup Grumman Corporation, highlighted in a May 26, 2015, speech, defense industry is expected to support programs well past the point in which commercial industry would support a program.[26] Finding ways to getting more innovation out of traditional suppliers will be just as critical for the future of DoD as increasing access to commercial innovation is.

Increasing innovation coming out of traditional suppliers begins with improving the dialogue between industry and DoD. In the defense industrial base, spending on internal research and development (IRAD) has had to compete with efforts to return cash to shareholders instead of "investing in defense projects that might die on the vine."[27] Today, no defense contractor ranks among the top 20 companies in IRAD spending globally, and the sum of the top five defense vendors' annual IRAD spending combined is approximately half of the annual IRAD spending of Microsoft. If the traditional defense firms are to increase innovation, DoD must better communicate investment priorities to traditional defense firms and reward those companies who make IRAD investments.

Simply improving the dialogue between industry and defense and rewarding IRAD investments is not sufficient for getting more innovation from traditional defense suppliers. These traditional defense firms will continue to play a critical role in integrating new commercial technologies to meet national security needs. In that same May 26 speech, Wes Bush highlighted that prime defense contracts "become basically a risk translator" for those nontraditional defense firms seeking to sell to the government. Rewarding those traditional defense firms that do increasingly seek out commercial technologies and integrate them into defense programs is critical if DoD hopes to incentive firms to continue doing so.

Given these considerations, the success of DIU(X) and the Defense Innovation Initiative cannot be measured simply on the basis of outreach to Silicon Valley. Maintaining U.S. technological

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[24] David J. Berteau, Scott Miller, Ryan Crotty, and Paul Nadeau, *Leveraging Global Value Chains for a Federated Approach to Defense* (Washington, DC: Center for Strategic and International Studies, December, 2014), http://csis.org/files/publication/141216_Crotty_LeveragingGlobalValueChains_Web.pdf.

[25] Sydney J. Freedberg, "Big Primes Don't Cry: Wes Bush Defense Contractors," *Breaking Defense,* May 26, 2015, http://breakingdefense.com/2015/05/big-primes-dont-cry-wes-bush-defends-defense-contractors/.

[26] Wes Bush, "Rethinking R&D for the DoD," Speech, Center for Strategic and International Studies, Washington, DC, May 26, 2015, http://www.northropgrumman.com/MediaResources/Presentations/2015/Pages/05262015WesBushAtCenterForStrategicAndInternationalStudies.aspx.

[27] Richard Whittle, "CEOs Question DoD's New IRAD Rule," *Breaking Defense,* June 30, 2015, http://breakingdefense.com/2015/06/ceos-question-dods-new-irad-rule/.

superiority will require DoD to pull from all sources, both commercial and traditional defense firms as well as the best technologies available internationally. For DIU(X)'s outreach to commercial firms, an important benchmark to watch for is the establishment of additional offices beyond Silicon Valley. Is the model worth replicating in other locations? If the answer to that question is yes, it suggests that DIU(X) will have succeeded. Getting more from traditional DoD firms requires DoD to improve the dialogue between industry and government as well as reward those who innovate. However, the burden is not entirely on the government, as industry must respond positively to this increase dialogue through increased IRAD spending even if it doesn't necessarily lead to immediate payoffs.

2.1.3. Research and Development Contracting during the Budget Drawdown

DoD contract obligations for R&D rose dramatically in the early to mid-2000s, nearly doubling between 2000 and 2007, from $24.8 billion to $47.4 billion. Since 2009, however, R&D contract obligations have fallen by 43 percent, from $46.4 billion in 2009 to $26.4 billion in 2014; obligations declined by 21 percent in 2013 alone. As discussed in the FY2012 edition of CSIS's series of reports on trends in DoD contracting, the portion of the decline between 2009 and 2012 primarily resulted from particular Major Defense Acquisition Programs (MDAPs) either being canceled (such as the Army's Future Combat Systems (FCS)) or maturing from development into production (such as the Joint Strike Fighter). For FY2013, by contrast, CSIS's report on DoD contracting trends noted that the decline was more broad based, with a mix of MDAP-related declines and cuts to more generalized R&D. In 2014, which saw an 8 percent decline in overall defense R&D contract obligations (in line with the overall decline in DoD contract obligations), the cuts seem once again to be tied primarily to R&D related to MDAPs. This trend will be explored further in this section when R&D trends within the major DoD components are analyzed.

Over the course of the entire current defense drawdown, contract obligations for R&D decreased (-11 percent 5-year CAGR) disproportionately compared to Products (-7 percent 5-year CAGR) and Services (-6 percent 5-year CAGR). During the beginning of the defense drawdown, Products saw relative minor declines (-2 percent 3-year CAGR), only to see those declines accelerate under sequestration and its aftermath (-14 percent 2-year CAGR). Contract obligations for Services saw a steadier decline during both drawdown periods (-5 percent 3-year CAGR; -9 percent 2-year CAGR). Notably, the trends in R&D contract obligations were discouraging even prior to the imposition of the sequestration and its aftermath. Between 2010 and 2012, R&D contract obligations fell sharply (-8 percent 3-year CAGR) to just 10 percent of total Overall DoD contracting obligations. Under sequestration and its aftermath, the decline further accelerated (-14 percent 2-year CAGR) between 2012 and 2014. By FY2014, DoD contract obligations for R&D were a little over half of what they had been at in FY2010.

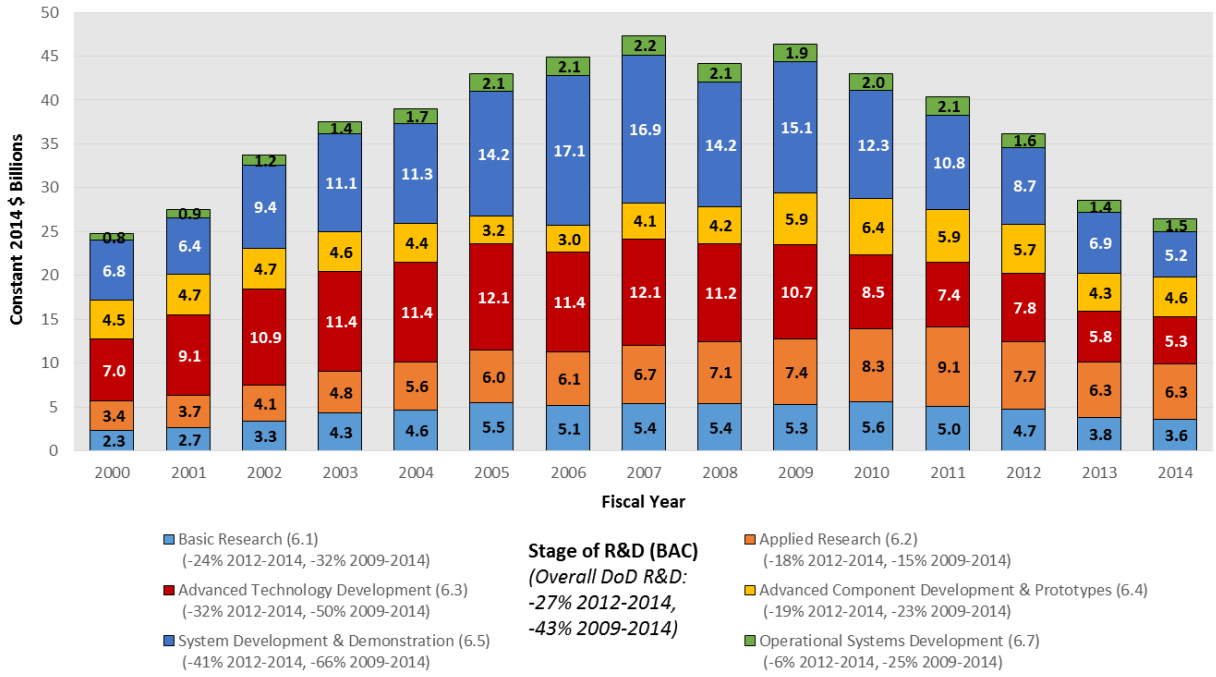
As part of an ongoing research project on federal R&D contracting that CSIS is undertaking with the support of the Naval Postgraduate School, CSIS has developed a methodology to categorize R&D contract obligations by stage of R&D, roughly corresponding to the commonly used R&D Budget Activity Codes (BACs).[28] The six stages of R&D contracting (with their equivalent BAC) are:[29]

[28] See 0 for details on how the study team categorized R&D contracts.
[29] R&D Management Support (6.6) is classified by CSIS under services rather than R&D.

- Basic Research (6.1)
- Applied Research (6.2)
- Advanced Technology Development (6.3)
- Advanced Component Development & Prototypes (6.4)
- System Development & Demonstration (6.5)
- Operation Systems Development (6.7)

Figure 2-2 shows overall defense R&D contract obligations, broken down by stage of R&D.

Figure 2-2: Defense R&D Contract Obligations, by Stage of R&D, 2000–2014



Source: FPDS; CSIS analysis.

As overall DoD R&D contract obligations declined by 43 percent between 2009 and 2014, obligations for basic research declined by only 32 percent. Over the last two years, however, obligations for basic research have declined by 24 percent, roughly in line with the overall decline in DoD R&D contract obligations, although most of the decline occurred in 2013. There was a broad-based decline in 2013, with the only significant changes being a roughly $300 million decline in obligations for basic research related to electronics and communications equipment and a $150 million decline in obligations for Missile Defense Agency support. In 2014, basic research related to Missile Defense Agency support declined by a further $200 million. As a share of overall DoD R&D contract obligations, basic research has risen from 11 percent in 2009 to 14 percent in 2014, the highest share in the 2000–2014 period.

R&D contract obligations for applied research appear to have declined notably more slowly than overall R&D at first glance, but that is because the obligations for applied research actually peaked in 2011. From that point, applied research contract obligations have declined by 30 percent, somewhat slower than the 35 percent decline for overall R&D between 2011 and 2014.

The 2011–2013 period saw an over $700 million increase in applied research contract obligations related to the Advanced Extremely High Frequency (AEHF) satellite program, but that was outweighed by declines of $1.5 billion for space-related applied research and $1.3 billion for uncategorized defense-related applied research. The share of overall R&D contract obligations awarded for applied research has risen from 16 percent in 2009 to 24 percent in 2014.

For advanced technology development (ATD), contract obligations declined somewhat faster than for overall R&D both in the 2009–2014 period and over the last two years. The decline between 2009 and 2011 was primarily in MDAPs: a nearly $900 million decline related to the DD(X) destroyer, a $600 million decline for Missile Defense Agency support, and a $300 million decline related to the Terminal High Altitude Area Defense (THAAD) antiballistic missile system. The other significant decline, between 2012 and 2013, was driven by a nearly $700 million decline in Missile Defense Agency support (after a large jump in 2012), as well as $400 million declines for ATD related to both electronics and communications equipment, and missiles and space systems. Both of those latter two categories declined by a further $300 million in 2014, while Missile Defense Agency support rose by $300 million. The share of R&D contract obligations awarded for ATD declined from 23 percent in 2009 to 20 percent in 2014.

R&D contract obligations for advanced component development and prototypes (ACD&P) declined at roughly half the rate of overall DoD R&D contract obligations between 2009 and 2014, with most of the decline coming between 2012 and 2013 (-24 percent). The main drivers of that fall were a $250 million decline for Missile Defense Agency support and a $400 million decline related to electronics and communications equipment. In 2014, contract obligations for ACD&P actually rose by 6 percent, the result of a broad-based increase, rather than notable increases for a particular MDAP or category of systems. As a share of overall DoD R&D contract obligations, ACD&T rose from 13 percent in 2009 to 17 percent in 2014.

Contract obligations for system development and demonstration (SD&D) have declined by two-thirds since 2009, by 41 percent since 2012, and by 25 percent in 2014. The biggest driver of this decline was the cancellation of the FCS, which fell from nearly $2.9 billion in obligations in 2009 to -$180 million (a deobligation) in 2012. Several other MDAPs, including the Wideband Gapfiller and Mobile User Objective System (MUOS) satellite programs, the F-35, and the E-2D Advanced Hawkeye, saw significant declines during the period as the programs matured into production. The massive decline in obligations for SD&D in recent years speaks to the difficulties that DoD has faced in starting development of major weapons systems, as maturing programs have not been replaced by new MDAPs in development. As a share of overall R&D contract obligations, SD&D fell from 32 percent in 2009 to 20 percent in 2014.

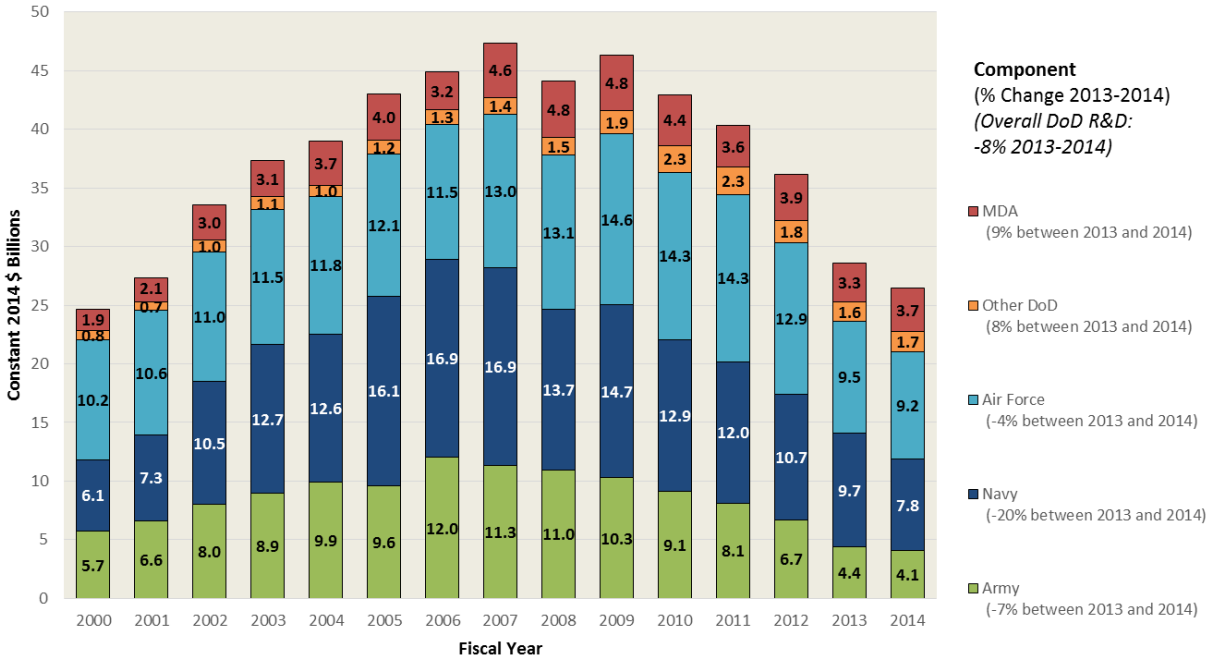
R&D contract obligations for operational systems development declined at a rate (-25 percent) significant slower than for overall R&D contract obligations from 2009–2014, and have only declined slightly (-6 percent) since 2012. The biggest source of decline during the period was related the F-22 program, with operational systems development contract obligations declining from over $800 million in 2010 to under $6 million in 2014. As a share of overall R&D contract obligations, operational systems development rose from 4 percent in 2009 to 6 percent in 2014.

The data show that, despite the concern that early-stage R&D—the so-called “seed corn” of defense R&D efforts—was suffering under the budget drawdown, the share of R&D contract obligations going to basic and applied research (6.1 and 6.2) has risen from 27 percent in 2009 to 38 percent in 2014. This is the result of contracts for those two stages of R&D being relatively

preserved—combined, contract obligations for the two stages declined by 22 percent between 2009 and 2014, approximately half the rate of overall DoD R&D contract obligations. The enormous decline in SD&D is telling, and speaks to the larger trend in DoD R&D contracting—over the last several years, as R&D programs related to MDAPs have either been canceled or matured into production, DoD has been largely unable to start and sustain new development programs, either due to budgetary pressures or to programmatic difficulties. The decline in R&D contract obligations during the budget drawdown is being driven by a five-year trough in the pipeline of new major weapons systems.

Research and Development Contract Obligations with Major DoD Components

Figure 2-3: DoD R&D Contract Obligations by Component, 2000–2014



Source: FPDS; CSIS analysis.

The following sections will examine the trends in R&D contracting within selected major DoD components (Figure 2-3).

Army

From the peak in 2006, Army contract obligations for R&D have declined by nearly two-thirds. This decline has been gradual but steady for most of the period, but in 2013, Army R&D contract obligations declined by 34 percent. Obligations for every stage of R&D except ACD&P have declined by at least half, with obligations for SD&D declining by 95 percent, primarily as a result of the failure and cancellation of FCS. In fact, total Army R&D contract obligations in 2014 are equal to those obligated for SD&D alone in 2006. This decline is primarily the result of the Army's difficulty in starting and sustaining new development programs for major weapons systems in recent years.

Navy

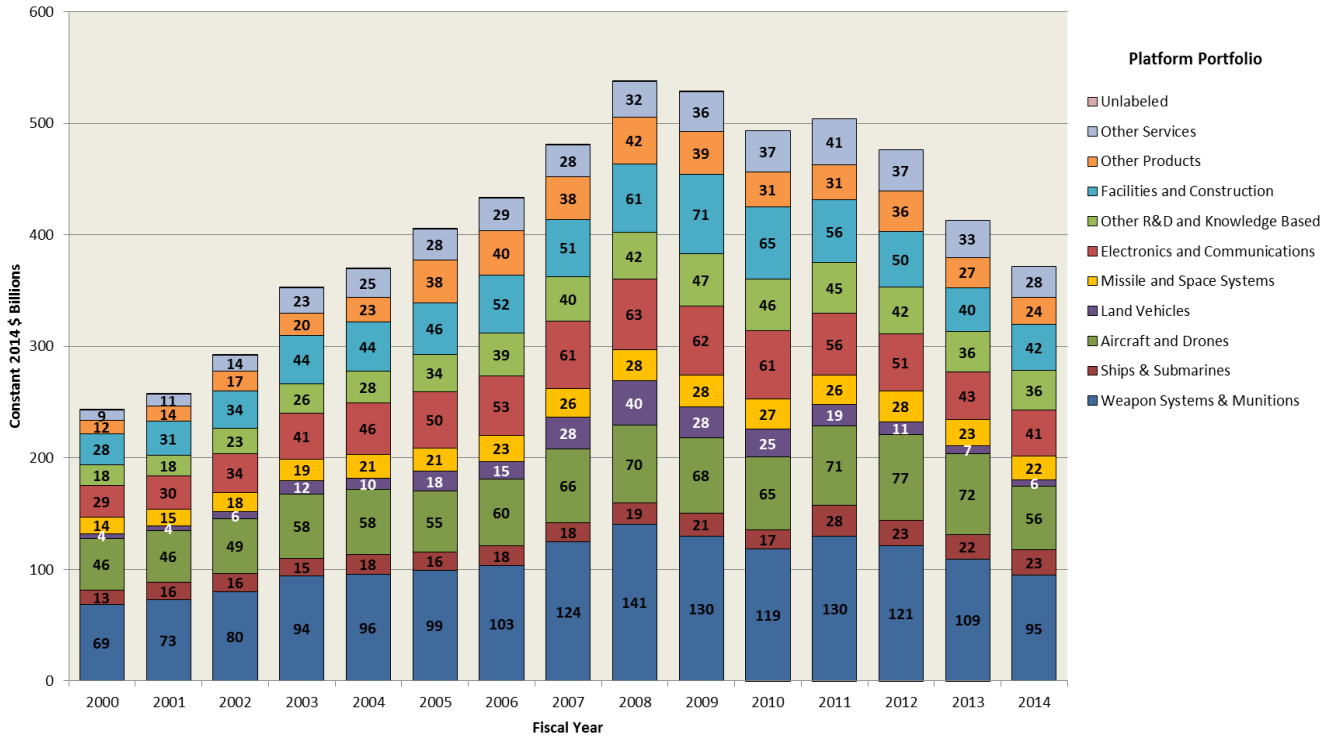
Navy R&D contract obligations declined by 54 percent since their peak in 2006 and 2007, notably more steeply than overall DoD R&D. Navy R&D contract obligations were relatively preserved in 2013 (-9 percent), but fell at over twice the rate of overall DoD R&D in 2014 (-20 percent). Basic research (-77 percent), ATD (-71 percent), and SD&D (-64 percent) have fallen particularly sharply since 2007, while applied research (-13 percent) has been relatively preserved, and operational systems development (-57 percent) has declined roughly in parallel with overall Navy R&D. Interestingly, ACD&P has risen by 118 percent since 2007, though that figure actually understates the rise; Navy ACD&P contract obligations actually more than tripled between 2007 and 2011, the result of a broad-based increase, before falling off in recent years.

Air Force

Since their peak in 2009, Air Force R&D contract obligations have declined by 37 percent, somewhat less steeply than overall DoD R&D, though nearly all the decline has taken place since 2011. Air Force R&D contract obligations declined by 26 percent in 2013, but declined by only 4 percent in 2014. Like the Navy, Air Force applied research (-3 percent) has been relatively preserved since 2009, while ATD (-64 percent) and SD&D (-58 percent) declined notably more steeply than overall Air Force R&D. Unlike the Navy, ACD&P (-60 percent) also declined significantly more steeply than overall Air Force R&D contract obligations, while basic research (-25 percent) was relatively preserved.

2.2. Defense Contract Obligations by Platform Portfolio

Figure 2-4: DoD Contract Obligations by Platform Portfolio



Source: FPDS; CSIS analysis.

Figure 2-4 shows contract obligations by platform portfolio for the entirety of DoD between FY2000 and FY2014. The chart demonstrates how the study period can be divided into three unique periods: (1) The rapid growth in defense contract obligations between 2000 and 2009; (2) the beginning of the Defense drawdown from 2010 to 2012; and (3) the sharp cuts of sequestration in 2013 and 2014.

This figure demonstrates why Andy Krepinevich and others consider the 2000–2009 period to have been a "hollow buildup."[30] While DoD contract obligations grew at a 9 percent Compound Annual Growth Rate (CAGR), increasing from $179.37 billion in FY2000 to a peak of $411.93 billion in FY2009, the largest increases were not seen in the traditional modernization platform portfolio category "Weapon Systems and Munitions," but in other sectors of the industrial base. During this period, "Weapons Systems and Munitions" grew at 7 percent CAGR; other platform portfolios such as "Other Products" (13 percent CAGR) and "Other Services" (14 percent CAGR) saw significantly larger growth. However, even this 7 percent CAGR increase for "Weapons Systems and Munitions" contract obligations is misleading without additional context. While there was an increase in contract obligations for the traditional modernization platform portfolios, the largest increase was the 20 percent CAGR increase in contract obligations in

[30] Sandra Erwin, "The Coming Decade: A Slowdown in Spending, but No 'Procurement Holiday,' " *National Defense Magazine*, March 2012, http://www.nationaldefensemagazine.org/archive/2012/March/Pages/TheComingDecadeASlowdownInSpending,butNo%E2%80%98ProcurementHoliday%E2%80%99.aspx.

"Land Vehicles" stemming from the purchase of Mine-Resistant Ambush Protected (MRAP) vehicles for the wars in Iraq and Afghanistan. As the U.S. drew down military operations in the two wars, a majority of those MRAPs were either placed in warehouses as pre-deployed equipment sets, provided as excess equipment to foreign security forces, or deemed war-damaged materials not worth repairing and scrapped. Most are not part of today's operational equipment packages.

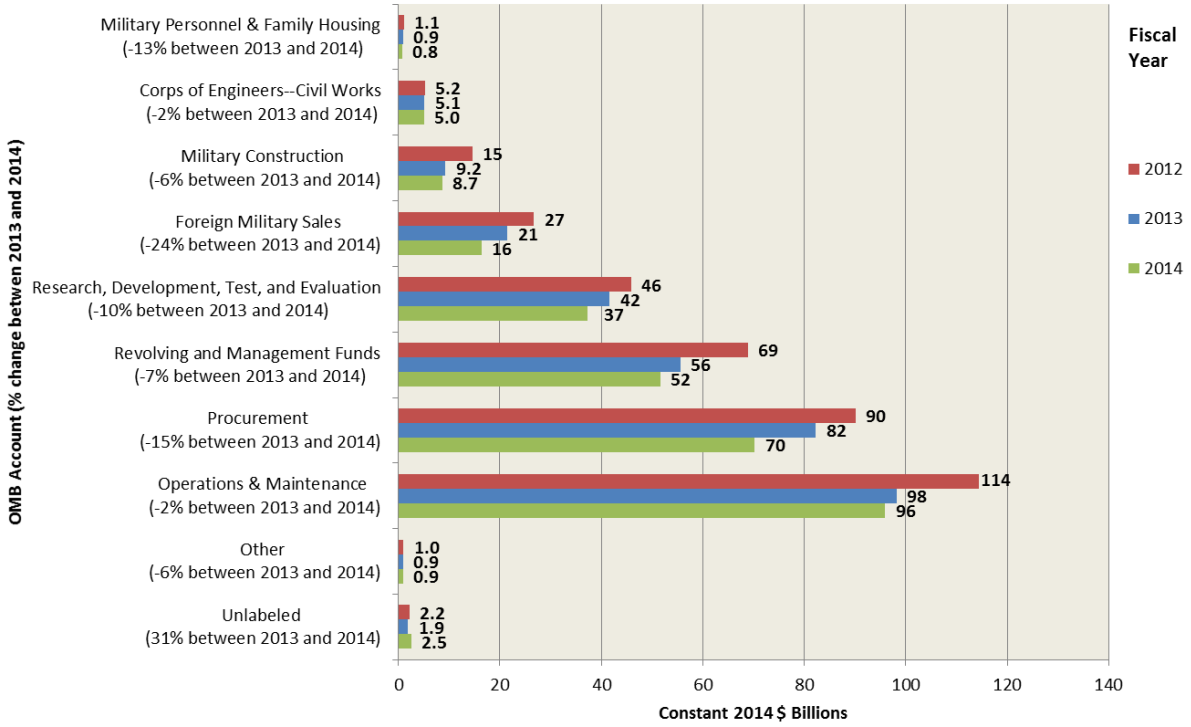
During the beginning of the defense drawdown, average yearly contract obligations for "Aircraft and Drone" actually saw an increase compared to the period between 2000 and 2009 (3 percent). However, under the caps imposed by sequestration and its aftermath, average yearly aircraft contract obligations fell significantly (-10 percent), for a total loss over the entirety of the defense drawdown (-1 percent). During this same period, "Missiles and Space Systems," "Other Products," and "Other Services" all experienced significant declines during sequestration and its aftermath disproportionate to the declines experienced during the beginning of the drawdown.[31]

2.3. Defense Contract Obligations by Budget Account

Prior to 2012, there was no practical way to crosswalk DoD contract obligations data in FPDS back with budget appropriations data. Due to changes implemented as a result of provisions in the American Recovery and Reinvestment Act of 2009, however, the field in FPDS that associates contract obligations with the Treasury account that they are funded out of began to be populated regularly. For DoD, this field started to be regularly and reliably filled in starting in FY2012, allowing CSIS to evaluate changes in how DoD contract obligations have been funded in the wake of sequestration and its aftermath. Figure 2-5 shows DoD contract obligations from 2012 to 2014, broken down by the budget account those contract obligations are funded out of.

[31] Missiles and Space Systems: (2010–2012: -4 percent; 2013–2014: -16 percent average yearly contract obligations; 2010–2014: -10 percent average yearly contract obligations).
Other Products: (2010–2012: -18 percent average yearly contract obligations; 2013–2014: -23 percent average yearly contract obligations; 2010–2014: -26 percent average yearly contract obligations).
Other Services: (2010–2012: 14 percent average yearly contract obligations; 2013–2014: -21 percent average yearly contract obligations; 2010–2014: 4 percent average yearly contract obligations).

Figure 2-5: DoD Contract Obligations by Budget Account, 2012–2014



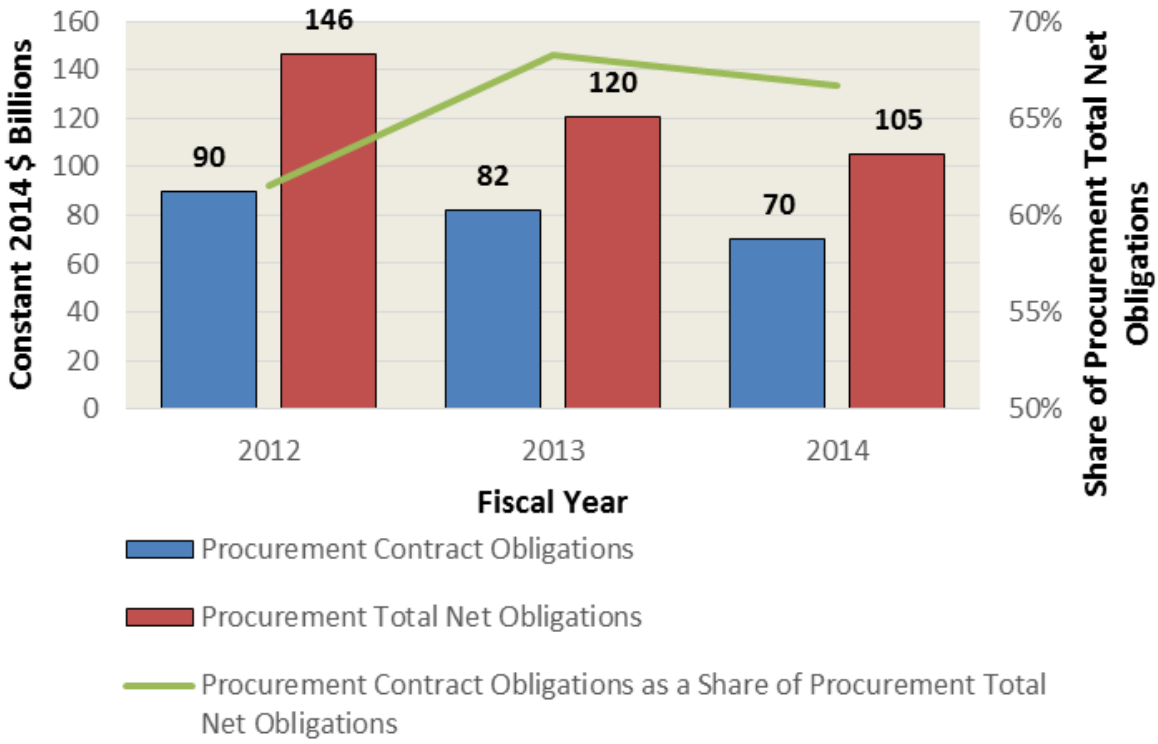
Source: FPDS; CSIS analysis.

The sections that follow will examine the contracting activity within three of the budget accounts: Procurement; Operations & Maintenance (O&M); and Research, Development, Test, & Evaluation (RDT&E).

2.3.1. Procurement

Figure 2-6 shows contract obligations and total net obligations within the DoD Procurement budget account.

Figure 2-6: DoD Procurement Contract Obligations vs. Procurement Total Net Obligations, 2012–2014



Source: FPDS; DoD Comptroller Financial Summary Tables; CSIS analysis.

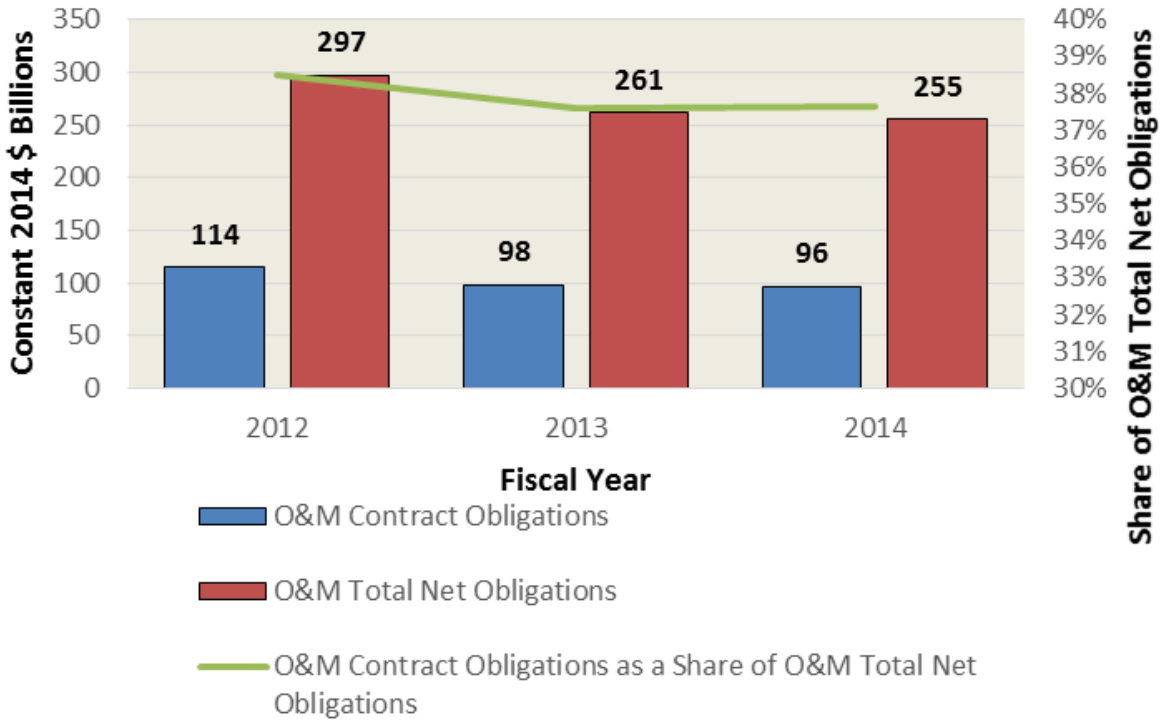
Contract obligations within the DoD Procurement budget account declined the same amount (-22 percent) as overall DoD contract obligations between 2012 and 2014, but the pattern of that decline was nearly opposite: while overall DoD contract obligations declined 14 percent in 2013 and 9 percent in 2014, Procurement contract obligations declined by 9 percent in 2013 and 15 percent in 2014. Procurement total net obligations declined more steeply (-28 percent) than both Procurement contract obligations and total net DoD obligations between 2012 and 2014. Procurement total net obligations declined more steeply in 2013 (-18 percent) than in 2014 (-13 percent); the 2014 decline is particularly notable, since total net DoD obligations were nearly stable in 2014. Due to the more rapid decline of Procurement total net obligations, the share obligated for contracts rose from 61 percent in 2012 to 68 percent in 2013, before declining slightly to 67 percent in 2014.

As would be expected, over 80 percent of Procurement contract obligations were for products, but a not-insignificant share (between 12 percent and 15 percent) were awarded for services, while the remainder (between 4 percent and 6 percent) were awarded for R&D. Interestingly, while Procurement contract obligations for products declined by over 20 percent between 2012 and 2014, and R&D declined by nearly half, contract obligations for services funded out of the Procurement budget account were nearly stable.

2.3.2. Operations & Maintenance

Figure 2-7 shows contract obligations and total net obligations within the DoD O&M budget account.

Figure 2-7: DoD O&M Contract Obligations vs. O&M Total Net Obligations, 2012–2014



Source: FPDS; DoD Comptroller Financial Summary Tables; CSIS analysis.

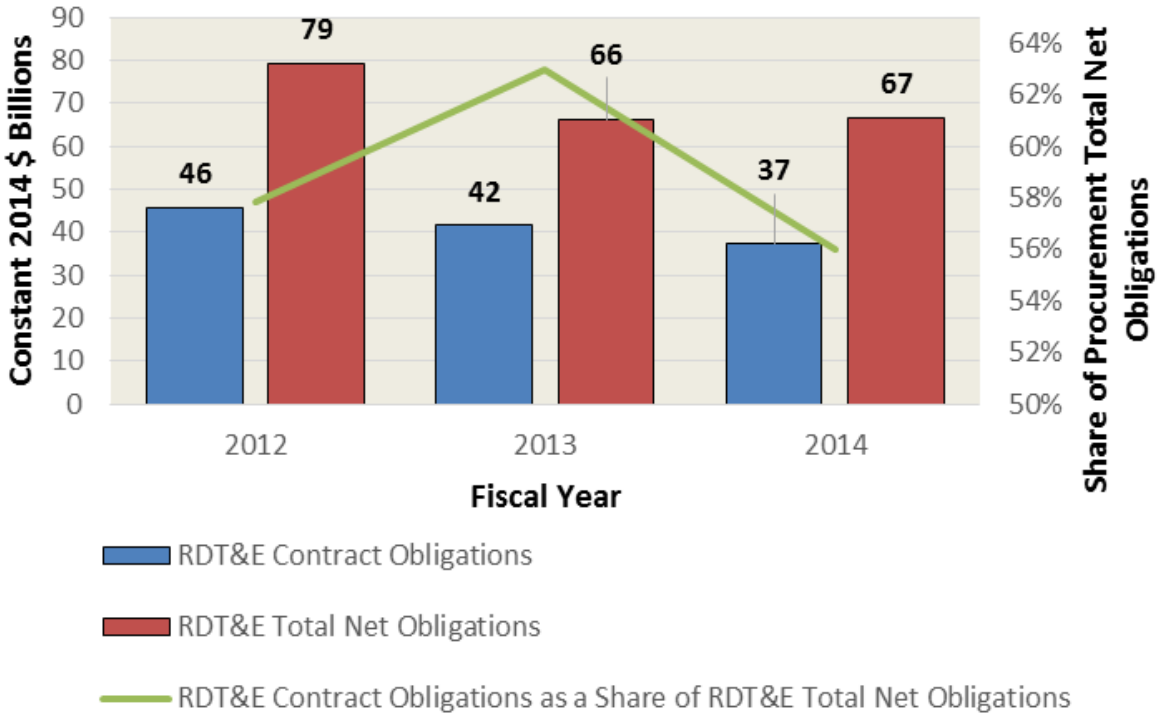
O&M contract obligations declined somewhat less steeply (-16 percent) than overall DoD contract obligations between 2012 and 2014. The decline in 2013 (-14 percent) matched the decline for overall DoD, but the decline in 2014 (-2 percent) was less than one-fourth the decline for overall DoD contract obligations. O&M total net obligations (-14 percent) declined similarly to O&M contract obligations overall, and year-to-year (-14 percent in 2013, -2 percent in 2014), but the decline was notably less steep than for total net DoD obligations. The share of O&M total net obligations going to contracts remained at 38 percent in all three years.

The mix of products/services/R&D within contracts funded out of the O&M budget account is nearly the opposite of the mix seen for the Procurement account. Over 80 percent of O&M contract obligations were awarded for services from 2012–2014, while between 14 percent and 16 percent were awarded for products, with the remainder (between 3 percent and 4 percent) going to R&D. As overall O&M contract obligations declined by 14 percent, O&M obligations for services declined by only 11 percent, while obligations for products and R&D both declined more steeply (-23 percent for both).

2.3.3. Research, Development, Test, and Evaluation

Figure 2-8 shows contract obligations and total net obligations within the DoD RDT&E budget account.

Figure 2-8: DoD RDT&E Contract Obligations vs. RDT&E Total Net Obligations, 2012–2014



Source: FPDS; DoD Comptroller Financial Summary Tables; CSIS analysis.

Note that RDT&E contract obligations are likely understated relative to total net obligations because classified contracts are not required to be reported in FPDS, whereas the total net obligations total is presumed to include classified obligations funded out of the RDT&E account.

RDT&E contract obligations declined at a rate (-19 percent) near that of overall DoD contract obligations between 2012 and 2014, but unlike overall DoD, that decline was nearly evenly distributed between 2013 (-9 percent) and 2014 (-10 percent). By contrast, R&D total net obligations declined at a rate (-16 percent) relatively near that of total net DoD obligations, and the patterns of change in 2013 (-17 percent) and 2014 (1 percent increase) track closely to each other. This pattern led to the share of RDT&E total net obligations going to contracts increasing from 58 percent in 2012 to 63 percent in 2013, before falling back to 56 percent in 2014.

Somewhat counterintuitively, only slightly more than half of contract obligations funded out of the RDT&E budget account from 2012–2014 were awarded for what CSIS classifies as R&D; the remaining half was relatively evenly distributed between products and services. Approximately 70 percent of total contract obligations for R&D were funded out of the RDT&E budget account, however, with most of the remainder evenly distributed between O&M and Procurement.

Both services and R&D contract obligations funded out of RDT&E declined at the same rate (-20 percent) between 2012 and 2014, which tracked closely with the overall decline in contract obligations within RDT&E over the same period. But the distribution of those declines differed significantly: while services, like overall contracts within RDT&E, declined relatively evenly in 2013 and 2014 (-11 percent and -10 percent, respectively), R&D declined by 16 percent in 2013, but only 5 percent in 2014. Products contract obligations funded out of the RDT&E budget

account actually increased by 7 percent in 2013, before declining 19 percent in 2014, almost twice the rate of decline for overall RDT&E contracts; for the 2012–2014 period, products declined at a rate (-13 percent) notably slower than that of overall RDT&E contracts obligations.

3. How Is DoD Buying It?

As the report moves from what DoD buys to how DoD buys it, issues of the operation of the acquisition system and contracting move to the forefront. This chapter's first focus is on acquisition policy: what major efforts to change the acquisition system are currently underway and what can we predict about their likely effects? The second focus is a continuation of CSIS's long-running examination of how DoD contracting approaches change over time. Finally, this chapter summarizes recent Naval Postgraduate School (NPS)-sponsored CSIS research for its final question: what can data about contract outcomes tell us that the headlines may miss?

This past year, in "Measuring the Outcomes of Acquisition Reform by Major DoD Components" Rhys McCormick placed recent acquisition policy changes in the context of the past few decades of acquisition reform and analyzed whether recent legislation and internal mandates produced measurable changes in DoD contracting behavior. The study team recommends that NPS-sponsored report for those wishing to examine the first two research questions in greater detail. Key results are summarized in Table 3-1.

Table 3-1 Measuring the Contracting Approach Outcomes of Acquisition Reform by Major DoD Components

	Overall DoD	Army	Navy	Air Force	DLA	MDA
Competition	→ →	→ →	→ →	→ →	→ →	→ →
Contract Type (Fixed-Price)	→ →	→ →	→ →	→ →	→ →	→ →
Contract Vehicle (Multiple-Award Contracts)	→ →	→ →	→ →	→ →	→ →	→ →

Legend

→ Trend followed the intention of the policy change	→ Trend did not follow the intention of the policy change	→ Trend did not change from the previous regime, or there was not a specific policy change to measure against.

Source: Sanders, "Measuring the Outcome of Acquisition Reform by Major DoD Components" Presentation."[32]

[32] Greg Sanders, "Measuring the Outcome of Acquisition Reform by Major DoD Components," PowerPoint Presentation, Panel Discussion from Center for Strategic and International Studies, Washington, DC, September 30, 2015, http://csis.org/event/outcomes-recent-defense-acquisition-reform-lessons-future-0.

One subtle point in Table 3-1 is made explicit in the text: "reform does not always move in a single direction. . . . Thus, in some cases the continual process of acquisition reform may not represent a consistent failure to get results, but instead shows a steady effort to adapt to the requirements placed on the acquisition system."[33] Fixed-price incentive fee contracting was emphasized and then deemphasized in subsequent reform initiatives, and multiple-award contracts were given broad rein and subsequently restricted. The overall implication of this research is that changes in acquisition policy take years to begin to show effects, the complexity of the acquisition system makes it challenging to identify and implement policy changes that deliver clear outcomes, and it is even harder to identify policy changes that significantly alter the performance of the acquisition system. This evidence lends real credibility to the argument that there are no simple answers or silver bullets in the effort to improve performance of the acquisition system.

Section 3.1 focuses on the priorities of current reform efforts, even though it is far too soon to see their results in the data. Section 3.4 expands on past CSIS work that looked at fixed-price and cost-based contracting to look at incentive structure as well. This shift was driven by the 2014 Performance of the Defense Acquisition System report, which argued that "***When cost control is predetermined and formulaically incentivized in the contract, vendors respond***. The key is predictable incentives, not fixed pricing" [emphasis in original].[34]

While contract types fall in and out of favor, competition has been consistently emphasized throughout the Better Buying Power (BBP) reforms. However, results have been mixed: "Across the board, the data show DoD components made little progress in making contracting more competitive during BBP 1.0, but there is a glimmer of progress for BBP 2.0. While the Army and DLA remained relatively competitive, the Air Force and the Navy both saw effective competition rates decline considerably during BBP 1.0. Since then, both services have made small improvements during BBP 2.0, but it remains too early to tell if these are long-term shifts or the result of short-term trends driven by particular large contracts."[35] Section 3.3 explores the state of competition in greater detail, elaborating on the differing rates based on the platform portfolio that the contract supports.

Finally, while the story of high-profile programs is often told, billions of dollars and millions of contracts are smaller and less high-profile. These headlines are rightly given the focus, as one MDAP project hitting trouble can cost billions of dollars, but a complete look at the health of the acquisition system requires a more comprehensive approach. Recent CSIS work on "Avoiding Terminations, Single-Offer Competition, and Costly Changes with Fixed-Price Contracts" enabled the study team to address the third research question. Section 3.4 opens a new window on the defense contract by studying contracts with outcomes on cost growth and termination risk.

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[33] Rhys McCormick, *Measuring the Outcomes of Acquisition Reform by Major DoD Components* (Washington, DC: Center for Strategic and International Studies, September, 2015), 49, http://csis.org/publication/measuring-outcomes-acquisition-reform-major-dod-components.

[34] Frank Kendall, *Performance of the Defense Acquisition System, 2014* (Washington, DC: U.S. Department of Defense, June 13, 2014), 89, http://www.defense.gov/Portals/1/Documents/pubs/Performance-of-Defense-Acquisition-System-2014.pdf.

[35] McCormick, Meas*uring the Outcomes of Acquisition Reform by Major DoD Component,* 47.

3.1. Reforming the Defense Acquisition System

Acquisition reform has been a topic of discussion within DoD and Congress for decades. While a substantial range of policy changes have been debated and instituted over this period, at no time have the results been entirely satisfactory to policymakers, and in most respects, the problems identified as reasons for acquisition reform in the 1950s continue to be issues today. Notwithstanding the seeming intractability of the concerns about acquisition, recent years have seen heightened activities, as AT&L's Better Buying Power reforms have entered their third iteration and Congress in the National Defense Authorization Act for Fiscal Year 2016 passed the largest set of legislative acquisition policy changes since the Federal Acquisition Streamlining Act of 1994.

It is too early to determine the results of Better Buying Power 3.0 or the current round of congressional reforms in the contracting data. However, *Measuring the Success of Acquisition Reform by Major DoD Components* findings do guide us on what to expect from both internal and externally mandated reforms. The first key observation is that patience will be necessary: "the data show that while trends are largely cyclical in the first two years of an acquisition regime, it's in the years beyond those first two or so that you begin to see the largest impacts of changes in acquisition policy and guidance."[36] Thus, it may not be until after the data from FY2018 *and* FY2019 are collected that analysts can meaningfully judge whether they were successful. McCormick's research also gives guidance where to look first for changes: "defense agencies, perhaps due to their narrower scope of acquisition activity, necessarily closer relationship between agency leadership and the acquisition workforce, and direct relationship to the Defense Acquisition Executive, exhibited the greatest responsiveness to policy guidance."[37] As section 3.1.2 discusses, congressional reform efforts have transferred greater authority to the military services, which may lead to increasing divergence in how DoD components conduct their contracting.

3.1.1. Better Buying Power[38]

Anticipating the imminent budget tightening that eventually led to the passage of the Budget Control Act, then-Under Secretary (AT&L) Ashton Carter introduced the first iteration of the Better Buying Power (BBP) initiative on June 28, 2010.[39] This initiative supported a Department-wide goal to find efficiencies and savings within the contracted portion of the DoD budget under the overarching goal to "do more without more."[40]

Accompanying BBP were implementation guidelines containing general guidance and specific actions for the five major areas: target affordability and controlling cost growth, incentivize

[36] Ibid.
[37] Ibid., 48–49.
[38] This section was first printed in McCormick, *Measuring the Outcomes of Acquisition Reform by Major DoD Components*, 14–16.
[39] Ash Carter, *Better Buying Power: Mandate for Restoring Affordability and Productivity in Defense Spending*, (Washington, DC: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, June 28, 2010), https://acc.dau.mil/adl/en-US/395003/file/53863/Memo%20for%20Aquisition%20Professional.pdf.
[40] Ibid.

productivity and innovation in industry, promote real competition, improve tradecraft in services acquisition, and reduce nonproductive processes and bureaucracy.[41]

In 2012, two years after the launch of Better Buying Power 1.0, DoD published a second iteration of the initiative. According to the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD AT&L) Frank Kendall, the progression from BBP 1.0 to 2.0 "reflected a change in emphasis from specific 'best practices' to an increased emphasis on helping acquisition professionals think critically and make better decisions as they confront the myriad, complex situations we encounter in defense acquisition."[42] Continuing the efforts of BBP 1.0, BBP 2.0 represented not a major change in policy, but a shift in the cited emphasis while retaining the core initiatives. It emphasized a new focus on the importance of the acquisition workforce.

Continuing the overarching theme to improve costs and efficiencies within the defense acquisition enterprise, USD AT&L Kendall published the third iteration of BBP, Better Buying Power 3.0, in April 2015. While BBP 3.0 maintains the themes from its predecessors to increase efficiency in DoD, it emphasizes reducing bureaucracy, improving contracted services, and shifting toward innovation and technical excellence. The shift toward innovation and technical excellence focuses on the goal of maintaining U.S. technological superiority.[43]

One long-term initiative of BBP 3.0 is increasing DoD support for science, technology, engineering, and math (STEM) education and careers. The general guidance for this initiative includes direct and indirect support from DoD to STEM education. It also dictates the strengthening of relationships between DoD and the civilian technical community. Under this initiative, DoD is instructed to become more desirable for professionals in STEM careers to improve RDT&E in DoD. [44] BBP 3.0 continues the goals of improving efficiency combined with an attempt to orient the system to the greatest perceived challenges of the time.

3.1.2. 2016 National Defense Authorization Act

As promised early in 2015 by Senate Armed Services Committee Chairman John McCain and House Armed Services Committee Chairman Mac Thornberry, the National Defense Authorization Act for Fiscal Year 2016 (2016 NDAA) included significant changes to the basic statutes governing defense acquisition. Both chairmen have also indicated that the provisions adopted in 2015 are simply the beginning of their efforts to improve efficiency within DoD. Key in the 2016 NDAA was the effort to consolidate authority, and therefore accountability, for acquisition in the military services. Along with this significant change, the 2016 NDAA also creates or expands several mechanisms intended to accelerate acquisition programs in the hopes

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[41] Ash Carter, "Implementation Directive for Better Buying Power—Obtaining Greater Efficiency and Productivity in Defense Spending" (Washington DC: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, November 3, 2010), http://bbp.dau.mil/doc/Memo%20for%20Services%20and%20Agencies%203Nov10.pdf.

[42] Frank Kendall, *Better Buying Power 3.0 White Paper* (Washington, DC: Office of the Under Secretary of Defense Acquisition, Technology, and Logistics, September 19, 2014), http://bbp.dau.mil/docs/2_Better_Buying_Power_3_0(19_September_2014).pdf.

[43] Frank Kendall, "Implementation Directive for Better Buying Power 3.0—Achieving Dominant Capabilities through Technical Excellence and Innovation" (Washington, DC: Office of the Under Secretary of Defense Acquisition, Technology and Logistics, April 9, 2015), http://bbp.dau.mil/docs/BBP3.0ImplementationGuidanceMemorandumforRelease.pdf.

[44] Ibid.

of replicating acquisition successes such as the fielding of Mine-Resistant Ambush Protected vehicles (MRAPs) and developing and fielding rapidly emerging capabilities. Also notable were provisions adopted to streamline documentation and approvals, increase access to commercial and non-developmental technologies, and improve the acquisition workforce.

Increasing Authorities of the Military Services

The 2016 NDAA gives more authority to the services when making decisions regarding MDAPs, which deal with the procurement of complex, expensive weapons and other major hardware systems. Section 825 of the 2016 NDAA transfers milestone decision authority for most new MDAPs from the USD AT&L to the service acquisition executives. Milestone decisions address the fundamental assumptions and strategies undergirding an acquisition program, and occur at major inflection points such as the transition from development to production. The objective of this transfer is to consolidate authority for, and therefore accountability for, major defense acquisition programs within the military services. In pursuit of the same objective, the 2016 NDAA tasks the military service chiefs with the responsibility for making tradeoffs among cost, schedule, and performance in acquisition programs and serving as the customer of the acquisition system (Section 802), and in reviewing requirements changes made in the design process (Section 830). These provisions enhance the service chiefs' responsibility for ensuring that the various aspects of the acquisition process are well coordinated. USD AT&L retains authority for setting acquisition policy and defining the steps of the milestone-approval process, but serves an advisory role on individual programs with a few notable exceptions, such as joint and international programs and programs with major cost overruns. Furthermore, Congress effectively invites the service chiefs to ask for additional acquisition authority (Section 801) by requiring them to develop recommendations considered necessary to further advance their role "in the development of requirements, acquisition processes, and the associated budget practices of the Department of Defense." Finally, Section 828 requires each of the military services to pay a penalty of 3 percent to the secretary of defense each year in which they have cumulative cost overruns on their MDAPs with the funds taken as an across-the-board reduction in their research and development programs.

New Authorities for the Secretary of Defense

The 2016 NDAA also provides several new authorities focused on accelerating acquisition programs in the interest of enabling greater innovation. Section 803 expands the secretary of defense's existing Rapid Acquisition Authority to assist in addressing urgent operational needs that could result in loss of life or critical mission failure and to address cyber attacks. Previously this authority was limited to situations involving real or potential combat casualties. This expansion of DoD's Rapid Acquisition Authority is supplemented with the creation of a "Middle Tier of Acquisition" for the prototyping and fielding of new systems in two to five years and includes creation of a Rapid Prototyping Fund (Section 804), funded in part by the penalties paid by the services under Section 828. Section 815 also codifies and makes permanent the authority to enter into Other Transaction Authority (OTA) agreements with companies. OTAs are not bound by the extensive requirements of the Federal Acquisition Regulation (FAR), which specify a wide variety of required contract clauses, allowing for more tailored agreements better suited to nontraditional suppliers. Consistent with the recommendations developed by a task force of the National Defense Industrial Association for a pilot program to test streamlining acquisition, Section 806 of the 2016 NDAA provides broad authority for the secretary of defense

to waive acquisition laws or regulations in order to acquire a capability that is of vital interest for the United States.

Streamlining of Process and Documentation

Section 809 of the 2016 NDAA requires the secretary of defense to establish an advisory panel reviewing acquisition processes and regulations. This panel will be appointed by USD AT&L and tasked to report back within two years on additional streamlining measures. Sections 816 and 817 raise or clarify thresholds for several simplified acquisition authorities. Several provisions streamline existing statutory elements in the acquisition system including simplifying approval for MDAPs at Milestone A and B (Section 823 and 824), simplifying statutory requirements for the use of prototyping (Section 822), clarifying requirements for acquisition strategies for MDAPs (Section 821), and clarifying reporting on development and manpower issues (Sections 829, 831, and 832). Section 883 streamlines the review processes associated with defense business systems.

Commercial and Non-Developmental Items

The 2016 NDAA addresses several issues raised by industry around the acquisition of commercial items and other non-developmental technologies. It clarifies the process for making commercial item determinations (Section 851) particularly for systems previously purchased as commercial items (Section 856), and makes clear that the intellectual property rights for commercial items remains with the supplier (Section 813). Sections 852 and 853 limit the ability of the government to require cost data for commercial items. Finally, Section 857 authorizes the government to treat non-developmental items from nontraditional defense suppliers as commercial items.

Acquisition Workforce

Several provisions of the NDAA seek to improve the acquisition workforce, including by extending the Defense Acquisition Workforce Development Fund (Section 841) that pays for training and education of the workforce; enhancing career prospects for military members of the acquisition workforce by providing joint duty credit and allowing for dual-track specialization (Sections 842 and 843); and extending the acquisition workforce personnel demonstration project (Section 846) that allows for more flexible management of the acquisition workforce.

Other Notable Provisions

In addition, the 2016 NDAA grants U.S. Cyber Command (CYBERCOM) limited acquisition authority that would allow them to obligate and spend up to $75 million per year over the next five years to address fast-moving cyber vulnerabilities. This provision creates a fast track for CYBERCOM to acquire technologies to keep pace with and overcome continually advancing cyber threats.

It includes a range of provisions (Sections 861–876) to promote small businesses in order to improve innovation in the defense-industrial base, including an exception for small businesses receiving contracts less than $7.5 million that develop innovative programs to be exempt from having their records examined for information on cost and pricing data. These provisions are designed to allow the Pentagon and other federal agencies to more easily work with small businesses and contractors that are working on cutting-edge research and technology.

Overall, the 2016 NDAA makes the biggest suite of changes to the Pentagon's acquisition system since the Federal Acquisition Streamlining Act of 1994. With more alterations promised for the future from both Armed Services Committees' chairmen, there is sure to be more to come.

3.2. Contract and Fee Type

As mentioned previously, part of the BBP 3.0 reforms was an explicit call to "Employ appropriate contract types, but increase the use of incentive type contracts."[45] Encouragingly, this finding was grounded in empirical social science research, namely the 2014 Performance of the Defense Acquisition System report.[46] The white paper further elaborated on this call, with the caveat that a "whole sale conversion" was not the intent. [47]

> This analysis demonstrated that the use of Cost Plus Incentive Fee (CPIF) and Fixed Price Incentive Fee (FPIF) contracts was highly correlated with better cost and schedule performance. In these "formulaic incentives" contracts, the impact of overruns and underruns are shared between the industry and government based on a formula (established in the contract) that explicitly ties the contractor's cost or benefit to performance. . . . We do want to reinforce our preference for these types of contracts when they are appropriate.

Past CSIS research had largely focused on the division between use of fixed-price and cost-type contracts. The BBP 3.0 guidance emphasized the judgment of the decisionmakers rather than a categorical preference for fixed-price or cost-type on this issue. In a recent CSIS report on the use of fixed-price and cost-based contracts, Greg Sanders found evidence that defense contracting officers seem to be effectively choosing the appropriate contract type in most cases, (the one notable exception being for longer contracts), and that fixed-price contracts ran into problems disproportionately more often than longer cost-based contracts.[48]

Given the Department's recent findings on the importance of contract incentive structure, Figure 3-1 takes a closer look at both how contracts are priced and what incentives they offer.

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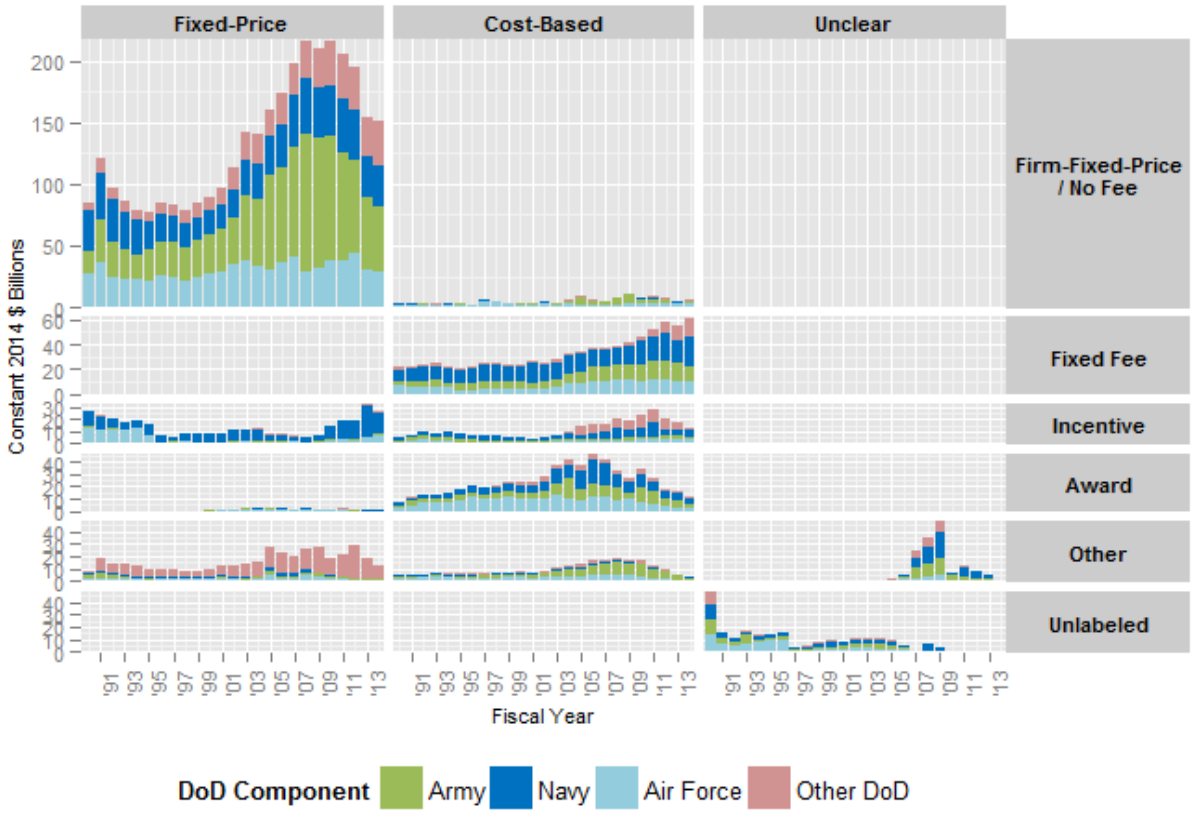
[45] Kendall, "Implementation Directive for Better Buying Power 3.0—Achieving Dominant Capabilities through Technical Excellence and Innovation," 2.
[46] Kendall, *Performance of the Defense Acquisition System, 2014*.
[47] Kendall, "Implementation Directive for Better Buying Power 3.0," 7.
[48] Greg Sanders, *Avoiding Terminations, Single-Offer Competition, and Costly Changes with Fixed-Price Contracts* (Washington, DC: Center for Strategic and International Studies, December 2015), 60, http://csis.org/files/publication/151216_Sanders_FixedPriceContracts_Web.pdf.

Figure 3-1 Defense Contract Obligations by Contract Pricing and Fee, 1990–2014



Source: FPDS; CSIS analysis.

In the chart, the three columns on top refer to fixed-price, cost-based, and unclear pricing mechanisms.[49] The six rows on the right cover different possible fees. For example, in the upper left corner is the graph for firm-fixed-price contracts. While the rows are different sizes, the x-axis scale remains consistent, so a centimeter-tall bar represents the same amount of contract obligations regardless which of the smaller graphs it appears in. Similarly, the y-axis scale remains consistent for all three columns, although in 1990 there is a spike in the obligations to unlabeled contracts. Finally, the different colors represent which Defense component manages the contract, although that will not be the focus of this analysis.

Focusing on the third row, incentive contracts, there has been a notable rise in fixed-price incentive contracts even while other forms of fixed-price contracts declined during the drawdown. That rise does coincide with direction from the top, as an October 27, 2009, Executive Office of the President Memorandum called for using "incentives to motivate lower costs with improved delivery or technical performance and to discourage contractor inefficiency

[49] Time and Materials, Labor Hours, and Fixed-Price Level of Effort contracts are grouped under cost-based / other. Combination contracts and contracts with variable type defending on the task order are grouped under unclear / other. Cost-sharing contracts were included with cost-based / incentive, but do not see significant use in recent years.

and waste."[50] While that memo was more focused on incentive fees for cost-type contracts, the September 14, 2010, BBP 1.0 guidance was more focused on FPIF: "Increase the use of Fixed-Price Incentive Firm Target (FPIF) contract type where appropriate using a 50/50 share line and 120 percent ceiling as a point of departure."[51] This concrete emphasis was walked back on November 13, 2012, in BBP 2.0, which substituted the guidance to "Employ appropriate contract types" and limited the FPIF endorsement to Low Rate Initial Production.[52] FPIF contract usage also peaked in FY2013, although even with a decline from 2013 to 2014 usage during the budget-cap period remains at a higher level than the last peek during the early 1990s. FY2015 may bring increases in both sorts of incentive contracts, as BBP 3.0's emphasis on that type of fee debuted on September 19, 2014, with less than a dozen days left in the FY2014 and the implementing guidance for BBP 3.0 was not published until the following year.[53]

The proportionally greater use of FPIF contracts in the early 1990s that only recovered when BBP 1.0 was announced fits with a "historic cyclical preference for fixed-price contracts."[54] Past Navy and Air Force experience with that contract type should give guidance as to what to expect. The uncharted territory is what will happen if there is a sustained increase in cost-plus incentive fee contracts. Their recent bump was predominantly driven by Military Health Program spending, which is less relevant to recent studies that focused on weapon systems. There is significant room for cost-plus incentive fee contracts to take over from cost-plus fixed fee contracts to prove whether they can deliver promised cost containment.

[50] Lesley A. Field, "Increasing Competition and Structuring Contracts for the Best Results*" (*Washington, DC: Office of Federal Procurement Policy, October 27, 2009), 5, https://www.whitehouse.gov/sites/default/files/omb/assets/procurement_gov_contracting/increasing_competition_10272009.pdf.

[51] Carter, *Implementation Directive for Better Buying Power*, 6.

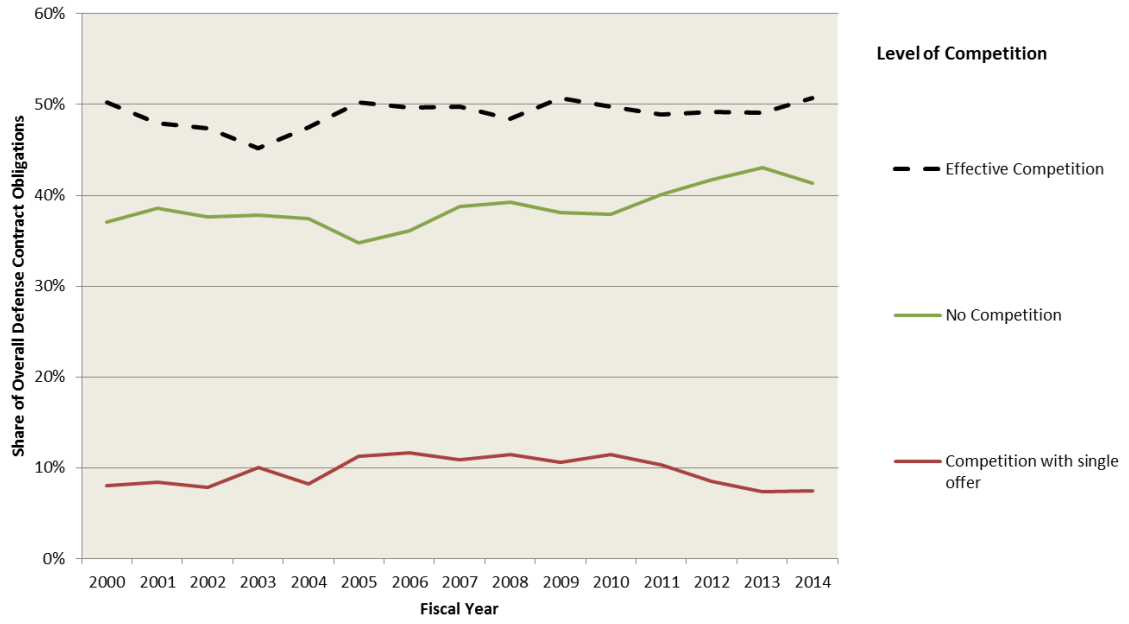
[52] Frank Kendall, *Better Buying Power 2.0: Continuing the Pursuit for Greater Efficiency and Productivity in Defense Spending* (Washington, DC: Office of the Under Secretary of Defense Acquisition, Technology, and Logistics, November 13, 2012), 4, http://www.acq.osd.mil/fo/docs/USD(ATL) Signed Memo to Workforce BBP 2 0 (13 Nov 12) with attachments.pdf.

[53] Kendall, *Better Buying Power 3.0 White Paper*, 5.

[54] Sanders, *Avoiding Terminations, Single-Offer Competition, and Costly Changes with Fixed-Price Contracts*, 4.

3.3. Defense Contract Obligation by Rate of Effective Competition

Figure 3-2: Share of Defense Contract Obligations by Level of Competition, 2000–2014



Source: FPDS; CSIS analysis.

Figure 3-2 shows the share of overall defense contract obligations by level of effective competition between 2000 and 2014. Over the course of the entire the study period, the data show that there were no groundbreaking shifts in the competitiveness of the defense industrial base. There were minor year-to-year shifts, but those were primarily fluctuations around a consistent level of competition.

At the start of the decade, the data show a small decline in the rate of effective competition for overall DoD, but by and large those trends reversed themselves by 2005. At its lowest, the effective rate of competition for the Department had fallen to as low as 45 percent in 2003, but began trending upwards in 2004 toward the average yearly share of contract obligations awarded following effective competition of 49 percent for the entirety of the Bush administration buildup. During the middle of the decade, there was a second minor shift in the share of contract obligations between single-offer and no-competition contracts, before soon afterwards returning to normalcy in 2007. This trend can be partially explained by the larger-than-overall DoD growth in contract obligations for single-offer contracts and the smaller-than-overall growth in DoD contracting obligations for no-competition contracts, rather than by any actual declines.

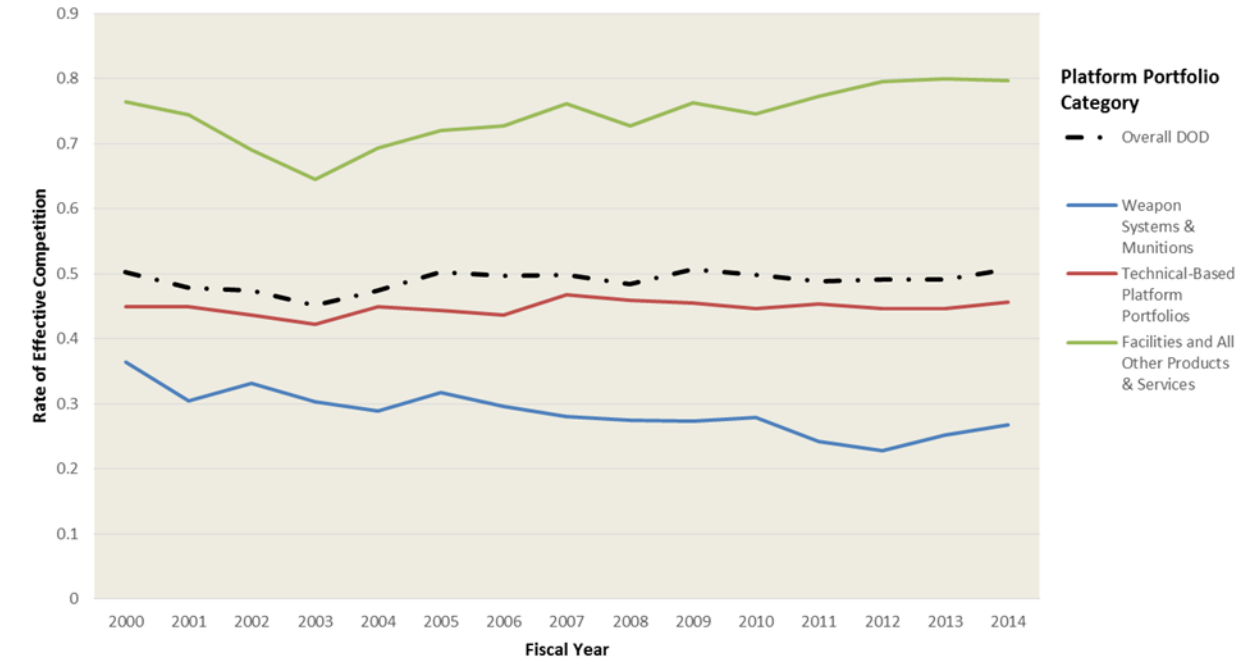
At the beginning of the most recent drawdown, the average yearly contract obligations awarded after receiving just a single offer (-15 percent) and three to four offers (-16 percent) fell more sharply than the overall rate of decline (-8 percent). In that same period, contracts awarded without competition fell at a slightly more gradual rate (-5 percent). Finally, contracts awarded after receiving five or more offers fell at rates significantly slower than the overall rate of decline (-1 percent).

Under the sharp and fast cuts imposed by sequestration and its aftermath, average yearly contract obligations awarded after just one offer in 2013 and 2014 continued to fall precipitously (-43

percent) compared to the overall rate of decline (-22 percent). While average yearly contract obligations for contracts awarded after receiving two offers continued its more gradual decline (-11 percent), contract obligations for contracts awarded after receiving five or more offers and the sum of contract obligations awarded without competition all saw trends differing than those seen during the early phase of the recent defense drawdown. Contract obligations awarded after receiving five or more offers fell sharply (-25 percent), but in line with overall DoD trends, during the 2013–2014 period as compared to the early drawdown period, while contact obligations for contracts awarded without competition saw a more accelerated decline than in prior years cuts (-17 percent), but still fell less than the overall rate of decline.

In total, over the course of the entire 2010–2014 drawdown, the overall competitiveness of the defense industrial base was basically unchanged. At the peak of contracting obligations in 2008 and 2009: 50 percent were awarded after "effective competition," 11 percent were awarded after receiving just a single offer, and 39 percent were awarded without competition. Over the course of the entire drawdown, on average: 49 percent were awarded after effective competition, 7 percent were awarded after receiving a single offer, and 42 percent were awarded without competition. Of note to watch in the data for FY2015: as a share of Overall DoD contract obligations, contracts awarded without competition fell in 2014 after a three-year trend upwards.

Figure 3-3: Overall DoD Platform Portfolio Categories by Rate of Effective Competition



Source: FPDS; CSIS analysis.

Weapon Systems and Munitions[55]

During the 2000–2009 period, "Weapon Systems and Munitions" saw the steady decline of the share of Overall DoD contract obligations awarded after "effective competition." At the start of the decade, 36 percent of Defense contract obligations for Weapon Systems and Munitions were

[55] The Weapon Systems and Munitions Platform portfolio category consists of Ships & Submarines, Aircraft & Drones, Land Vehicles, and Weapons & Ammunition.

awarded after effective competition; by 2009, just 27 percent of contract obligations were awarded following effective competition. The decline in the share of contract obligations after effective competition does not stem from declines in effective competition contract obligations (4 percent CAGR), but as a result of their slower growth than contract obligations awarded after both single-offer (6 percent CAGR) and no competition (8 percent). As share of contract obligations, contracts awarded without competition grew from 56 percent to 66 percent.

At the start of the recent defense drawdown, the effective competition trends seen earlier in the last decade continue and fall even sharper than before. Between 2010 and 2012, average yearly contract obligations for Weapon Systems and Munitions awarded after effective competition declined (-17 percent) faster than the overall DoD rate of decline (-9 percent). As a share of Weapon Systems and Munitions contract obligations, effective competition contract obligations fell from 27 percent to 25 percent. Over that same period, contract obligations awarded after single offer (-1 percent) and no-competition (-6 percent) declined more slowly than the category overall.

During 2013 and 2014, average yearly contract obligations for those contracts awarded after effective competition fell more gradually (-15 percent) than the overall rate of decline for Weapon Systems and Munitions (-17 percent). Whereas contract obligations awarded without competition had either grown faster or fell more gradually than the categories' trends in the earlier periods, in 2013 and 2014, contract obligations fell at a rate equal to the overall rate of decline (-17 percent). In this same period, contract obligations for contracts awarded after receiving just a single offer fell slightly (-4 percent). As a share of contract obligations, effective competition increased from 25 percent to 27 percent, no competition increased from 68 percent to 70 percent, while single offer fell to just 4 percent.

Across the entire recent drawdown (2010–2014), average yearly contract obligations for effective competition (-22 percent) and single offer (-20 percent) have fallen at rates higher than the overall rate of decline (-13 percent). Weapon Systems and Munitions contract obligations awarded without competition declined more gradually than the overall rate of decline (-13 percent) across the total most recent drawdown.

Technical-Based Platform Portfolio Portfolios[56]

The trends seen in Technical-Based Platform Portfolios (TBPP) rate of competition largely follow the Overall DoD competition rates.

The trends for TBPP contract obligations after effective competition follow a distinct pattern of gradual decline, followed by a one-year spike that established a new plateau from which the rate decreased until the next large spike. At the start of the decade, the share of effectively competed contract obligations fell from 2000–2003 before a large spike in 2004. This spike was followed by a gradual decline until the next one-year spike in 2007. For contracts awarded without competition, the share of overall TBPP contract obligations was relatively steady until a large increase in 2005, when it increased from 33 percent in the two years prior to 36 percent. Following this increase in 2005, the share of TBPP contract obligations increased again in 2006, to 37 percent, and remained at that share until the middle of the latest defense drawdown. For

[56] The Technical-Based Platform Portfolios consists of Missiles & Space Systems, Electronics & Communications, and Other R&D & Knowledge Based.

contracts awarded after receiving a single offer, the trends largely follow the no-competition trends, but with volatility in share of contract obligations between 2006 and 2009.

During the early period of the most recent defense drawdown, average yearly contract obligations for contracts awarded without competition (-3 percent) and competition with single offer (-4 percent) decreased more gradually than the overall rate of TBPP decline (-6 percent). Contract obligations for TBPP contracts awarded following effective competition decreased at a rate higher than the overall rate of decline (-7 percent.) As a share of average yearly contract obligations, effective competition fell just slightly from 46 percent to 45 percent, while competition with single offer and no competition saw slight increases to 17 percent and 38 percent of TBPP contract obligations, respectively.[57]

Under sequestration and its aftermath, contract obligations for no competition (-15 percent) continued to fall slower than the overall rate of decline (-21 percent). Whereas contract obligations for competition with single offer had fallen slower than the overall rate of decline at the beginning of the recent defense drawdown, under the caps imposed by sequestration and its aftermath they fell sharply (-38 percent). Finally, contract obligations that were effectively competed fell at a rate equal to the overall rate of decline during this period (-21 percent).

Over the course of the entire drawdown, no-competition contract obligations increased as a share of TBPP contract obligations from 37 percent to 39 percent as a result of their slower decline (-9 percent 2010–2014 decline) than the overall rate of TBPP decline (-14 percent 2010–2014 decline). Contract obligations for effectively competed contract obligations fell slightly from 46 percent to 45 percent as average yearly contract obligations fell (-15 percent) just above the overall rate of decline.

Facilities and All Other Products & Services[58]

Of the three platform portfolio categories, the Facilities and All Other Products & Services is the most competitive. On average, approximately 74 percent of all Facilities and All Other Products & Services contract obligations were awarded after effective competition. While trends for Facilities and All Other Products & Services follow the Overall DoD trends at the start of the decade, they began to diverge thereafter.

Over the 2000–2009 period, trends for the Facilities and All Other Products & Services platform portfolio category follow the Overall DoD trends at the start of the decade before diverging. Just as there was a decline in Overall DoD rate of effective competition between 2000 and 2003, the share of Facilities and All Other Products & Services contract obligations awarded after effective competition fell, but more sharply than the overall rate of decline. In 2000, 76 percent of Facilities and All Other Products & Services contract obligations were awarded after effective competition, but by 2003 only 64 percent of contract obligations were awarded after effective competition. Following 2000–2003, the rate of effective competition with Facilities and All Other Products & Services began to rise and hovered between 73 percent to 76 percent rates of effective competition until the peak of contract obligations in 2009.

[57] In the peak years of DoD contracting obligation of 2008 and 2009, 16 percent of TBPP contract obligations were awarded after competition with a single offer and 37 percent were awarded without competition.
[58] The Facilities and All Other Products & Services platform portfolio category consists of Facilities & Construction, Other Products, and Other Services.

At the beginning of the most recent defense drawdown, Facilities and All Other Products & Services contract obligations awarded after competition with a single offer saw the largest decline (-38 percent) as compared to the overall rate of decline (-9 percent). Contract obligations for Facilities and All Other Products & Services contract obligations after effective competition (-6 percent) fell more gradually than the overall rate of decline, while the decline in no competition was minimal (-1 percent).

Under sequestration and its aftermath, the trends for effective competition and competition with a single offer remained steady. In 2013 and 2014, average yearly contract obligations for contracts awarded after effective competition (-22 percent) continued to fall more gradually than the overall rate of decline (-25 percent). Contract obligations for contracts awarded after competition with a single offer continued their steep descent (-49 percent). Whereas average yearly contract obligations for contracts awarded without competition saw little impact of the early defense drawdown, in 2013 and 2014 they fell at a rate (-25 percent) in line with the overall rate of decline.

Across the entire defense drawdown, competition within the Facilities and All Other Products & Services platform portfolio category has increased. As a share of contract obligations, contracts awarded after effective competition has increased from 75 percent in 2008 and 2009 to 78 percent. Contracts awarded after competition with a single offer saw the largest decline as a share of total Facilities and All Other Products & Services obligations, falling from 11 percent in the peak period to an average of 7 percent across the drawdown period.

3.4. Contract Outcomes beyond the Headlines[59]

One of the largest limitations of FPDS is that it does not directly include evaluations of contract outcomes. Measures of contract performance do exist in other databases, but they are largely inaccessible without, at the very least, an official government purpose or permit. Similarly, overall measures of major defense acquisition program performance are available to the public, but only in aggregate reports. These aggregate reports can tell us a lot about MDAPs and other high-profile projects, but over a $100 billion in annual contracting obligations can lay beyond their scope. Recent CSIS work takes a step toward overcoming that problem by analyzing three outcome measures: the number of change orders, the extent of ceiling breaches, and whether a contract was partially or completely terminated.[60] This section gives an early look at those metrics and shows why large contracts merit close scrutiny.

3.4.1. Terminations

Terminations are a natural area of focus in defense contract because of the magnitude of program cancellations in recent history. Todd Harrison did the math on the 2012 defense budget to determine the magnitude of the cuts:

> Over the past decade at least a dozen major programs were terminated without any operational systems being fielded. The sunk cost of these terminated programs totals at least $46 billion in then-year dollars. Additional programs had their quantities cut far

[59] This section is adapted and updated from Sanders, *Avoiding Terminations, Single-Offer Competition, and Costly Changes with Fixed-Price Contracts*, 11–21.
[60] Ibid.

> below initial plans, such as the F-22 and DDG 1000. While the reasons for cancelling each program may have been justified due to significant cost overruns or technical challenges, the aggregate effect is that a significant portion of DoD's investment in modernization over the past decade did not result in force modernization.[61]

Partial and complete terminations are not exactly analogous to cancelled programs. On longer-term programs, many contracts are completed before the cancelation occurs. Nonetheless, canceled programs as expected have notably higher canceled contracts rates. Whether or not a major defense acquisition program is involved, abruptly ending a contract through termination is a challenging endeavor for the government. While the government is able to terminate its obligations through special clauses called "termination clauses," in practice the costs and inconveniences of this approach are significant. The proximate cause of the termination may not be vendor performance but instead a drastic change in government needs, the failure of a related contract, or the cancellation of the entire program. However, in all three cases the government has the option of simply paying out currently exercised options and stopping further payments. Thus, even if the source of the failure was outside the contract, a termination indicates that the contract was unable to adapt to changing circumstances.

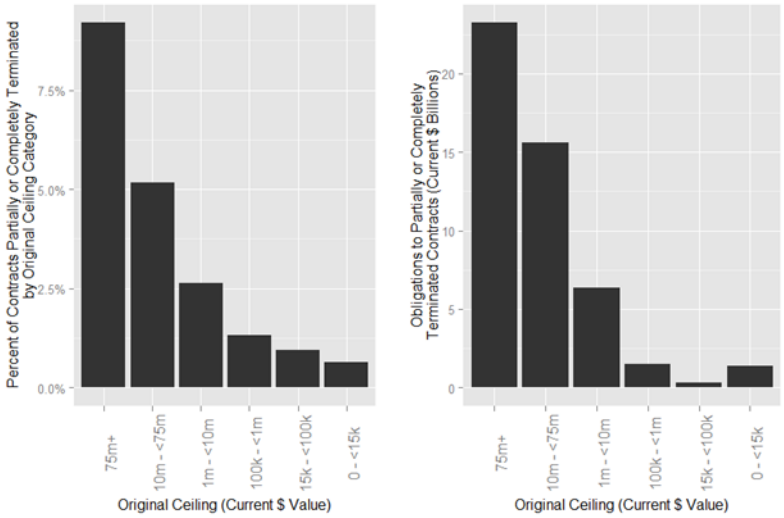
CSIS first analyzed terminations as part of a project examining under what circumstances fixed-price and cost-based contracts delivered better outcomes. The results were striking: "across every cost category and for most of the controls, fixed-price contracts have a termination rate that is 100 percent higher than that of cost-based contracts."[62] This is not the same as saying that fixed-price contracts are twice as likely to fail; the greater flexibility in cost-based contracts typically makes them easier to end without undertaking the considerable effort required to terminate.

When looking at the demographics of canceled programs, one factor stands out: initial estimated size. Figure 3-4 breaks down the percentage of contracts terminated by percentage of total contracts in an original ceiling category in the left chart. When calculated as such, the data show that those contracts with higher original ceilings have a higher percentage of complete or partial terminations than those with lower original ceilings. Contracts with original ceilings of $75 million or more were partially or completely terminated over 9 percent of the time. Contracts with partial or complete terminations under $15,000 account for less than 1 percent of contracts in this original ceiling category.

[61] Todd Harrison, *Analysis of the FY 2012 Defense Budget* (Washington, DC: Center for Strategic and Budgetary Assessment), viii, http://www.csbaonline.org/wp-content/uploads/2011/07/2011.07.16-FY-2012-Defense-Budget.pdf.

[62] Gregory Sanders, "Avoiding Terminations, Single-Offer Competition, and Costly Changes with Fixed-Price Contracts" (Washington, DC, 2015), 59, http://csis.org/publication/avoiding-terminations-single-offer-competition-and-costly-changes-fixed-price-contracts.

Figure 3-4: Contract Terminations by Original Ceiling, Contracts Completed 2007–2013



Source: FPDS; CSIS analysis.

In the right chart of Figure 3-4 the same analysis is done by total obligations, similar to Harrison's sunk-cost analysis. In that case, as well, large contracts account for the bulk of the cuts, although the divide between contracts with initial ceilings above $75 million and with initial ceilings between $10 million and $75 million is not as stark.

This result has limitations; due to transaction cost and shorter time frames, it may simply often not be worth the time and effort for the government to terminate smaller contracts. Nonetheless, it appears clear that during this period, a principle of "as above, so below" does not apply to defense acquisition. The risks of outright failure are notably higher for larger and more complex projects and that the lower reporting requirements for contracts below certain thresholds have a firm basis in outcomes, not just in workload considerations. The higher cancellation rate for fixed-price than cost-based contracts does show that even simpler contracts can fail badly, but the base cancellation rate is so low that this doesn't undermine the larger pattern.

3.4.2. Change Orders

Change orders are not as distinctive an indicator of trouble as terminations. A change order might result from a contract being adapted to a changing environment or to take further advantage of a successful innovation. Even when a change order indicates a mistake, it often may not be on the vendor's side. Instead, elevated requirements mandated by the government can add expensive new tasks to the contract. However, analysis of past growth shows why change orders are worth monitoring. Of the 27 programs that experienced extreme cost growth between 2000–2015, 25 cited "unstable engineering or system requirements," making it the most commonly cited factor.[63] That categorizations means "that during contract execution new work was added by contract modification beyond what was initially envisioned when the contracted effort began. . . . These are usually dominated by detailed system engineering requirement and

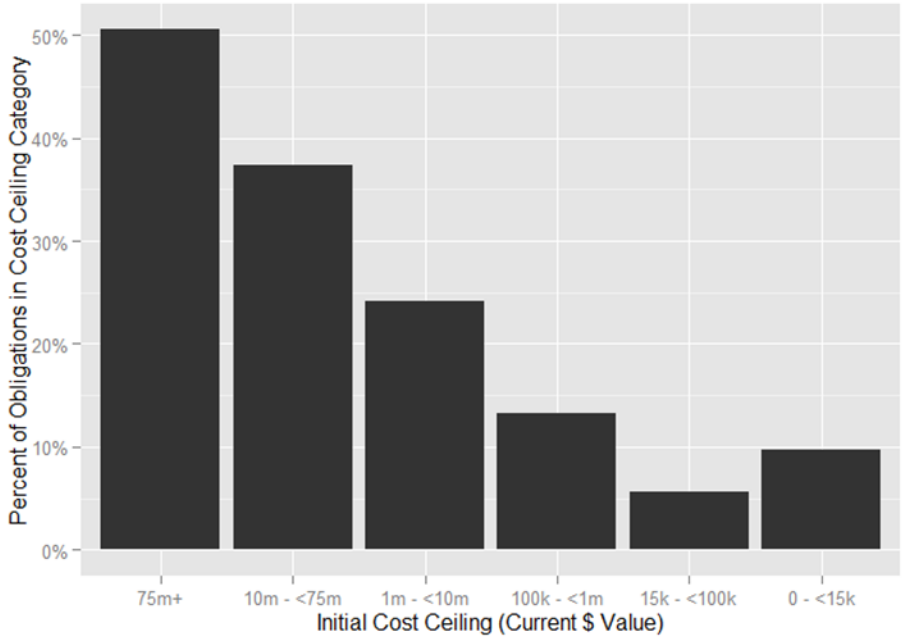
[63] Kendall, *Implementation Directive for Better Buying Power 3.0*, 47. The second-most commonly cited factor was the contractor-performance factor "underestimated cost (for given work)." The two programs that did not cite "unstable engineering or system requirements" were Littoral Combat Ship I and II.

specification changes to meet usually stable [Key Procurement Parameters (KPP)] and [Key System Attributes (KSA)], but there are few instances of KPP and KSA changes." [64]

The following analysis focuses on change orders that are not directly tied to new work, because for many contracts the purchase of additional work is a sign of positive performance rather than a fault. Instead, the discussion of change orders is limited to those new requirements that are not tied to an explicit expansion of the contract scope but that may nonetheless involve significant new costs and fees.[65]

Figure 3-5 shows the percentage of change orders broken down by original ceiling. From this, we can tell that change orders are most prevalent in contracts with higher cost ceilings. Over 25 percent of contracts in the two highest original ceiling categories ($10 million or more) experienced a change order. On the other hand, contracts with cost ceilings of $15,000 or less only had change orders in about 2 percent of contracts.

Figure 3-5: Percentage of Contracts with Change Orders by Original Ceiling, Contracts Completed 2007–2013

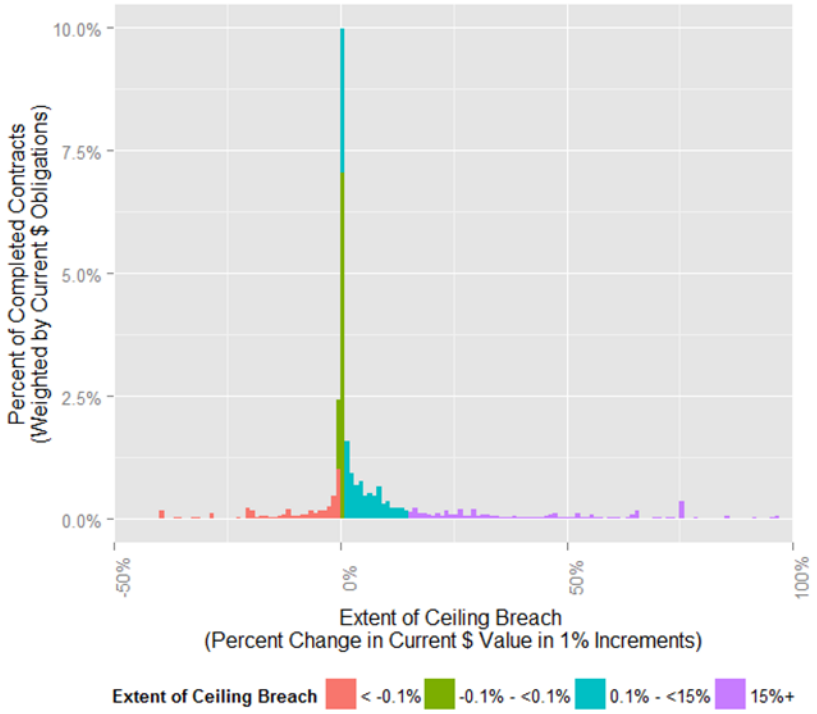


Source: FPDS; CSIS analysis.

Figure 3-6 shows the breakdown of the 30 percent of obligations to contracts completed between 2007 and 2013 that had change orders.

[64] Ibid., 46.
[65] See section A.2.5 in the methodology for further details on how change orders and ceiling breaches are calculated.

Figure 3-6: Weighted Distribution of Contracts, by Ceiling-Breach Percentage, Contracts Completed 2007–2013



Source: FPDS; CSIS analysis.

The spike in the middle of Figure 3-6 is for ceiling breaches of between 0 and 1 percent. Another 4 percent of obligations went to contracts that had a change order that decreased the total ceiling. Nearly 19 percent of obligations went to contracts that experienced a ceiling breech of 1 percent or more, with 7 percent of obligations going to contracts with a breach of 15 percent or more. As the long purple right tail of the graph shows, there are sizable outliers as large as the 75 percent ceiling breach mark.

As with terminations, change orders and ceiling breaches are predominantly an issue for contracts with high ceilings. As cost ceilings reduce, change orders and ceiling breaches become rarer. The distribution also begins to flatten out; for those with original cost ceilings below $100,000, negative changes to ceilings are more common than non-changes. Similarly, growth of 15 percent or more is more prevalent than the smaller contract breach category. However, as noted above, this number is comparatively small overall and only accounts for 2 percent of contracts with change orders, thus resulting in far less of a financial impact than those contracts with higher original cost ceilings.

The finding on change orders and ceiling breaches reinforces the results on terminations. While the government can simply allow small contracts to run out because they are not worth the pain of terminating, even small contracts are not allowed to receive more than their ceiling without some sort of change order. Combined with the fact that fixed-price contracts are less likely to experience change orders than cost-based contracts, it appears that the reform efforts that focus on high-ceiling contracts have a greater marginal potential for improvement than efforts to rebuild the entire system.

4. Whom Is DoD Buying From?

The prime industrial base supporting DoD is sizable, with earnings of more than $280 billion in 2014, but it is also a small, and at times isolated, part of the $17.42 trillion U.S. economy. The isolation comes from the fact that for many military goods, the government is a monopsony buyer, which is to say that it is the only buyer. Regulated sales to other governments, dual-use items, and commercial goods like fuels complicate this picture, but still leave a sector strongly influenced by policies and incentives set by the U.S. government.

However, this is not to say the government controls this base. As was discussed in section 2.1, Secretary Carter is making a large push to increase technology sector participation in the defense industrial base; this push is driven by past difficulty bringing domestic and global innovation into the highly regulated U.S. defense acquisition system. For major weapons systems, especially since the "last supper" consolidation of the 1990s, there is often only one manufacturer so that in parts of the defense market there is both a monopsony buyer and monopoly supplier.

This chapter's research questions relate to better understanding the makeup of vendors that participate in the defense industrial base. First, how has the composition of prime vendors changed during the drawdown, and what causes can be identified? Section 4.1 addresses this question by breaking down the sector by size of vendor, and then deepening that analysis by looking at the base for each military department, as well as for products, services, and R&D. Second, the focus shifts to individual contractors: who are the top vendors and what do they tell us about industrial base consolidation? That question is addressed in section 4.2, which discusses recent merger and acquisition activity and analyzes the top vendors overall and for products, services, and R&D. Finally the report turns to the potential for expanding the industrial base working on defense technologies in Silicon Valley by examining the baseline for current defense contracting in Silicon Valley. Section 4.3 looks at Silicon Valley prime participation in the post–Cold War era to clarify how big of a challenge the DIU(X) (discussed in section 2.1.3) has before it.

In this past year, CSIS has also examined how the industrial base responded to recent acquisition reform efforts.[66] Notably, McCormick found that starting with the BBP 2.0 round of reforms (see section 3.1.1), DoD has been able to notably increase small business participation in the defense industrial base with the Army taking the lead. As Table 4-1 shows, there were exceptions: "the Navy saw slight decreases under the SBTF guidelines before returning to pre-SBTF levels under BBP 2.0. The Air Force contracting data show that service has not improved small business participation since the recent reforms. Under the SBTF guidelines, Air Force small business participation rates fell but did improve under BBP 2.0."[67]

McCormick also gives context to section 4.2; Table 4-1 demonstrates that the volatility of top vendors varies greatly between the defense components. The variety of the Army should come as no surprise, given the cancellation of major programs and that service's responsibility for a large portion of contingency contracting (see section 5.1). The Navy and Air Force were largely stable,

[66] McCormick, *Measuring the Outcomes of Acquisition Reform by Major DoD Components.*
[67] Ibid., 47.

with the exception of notable joint ventures and spinoffs. Outside the military departments, the story is rather different:

> *The three smaller DoD components (DLA, MDA, and Military Health) all saw shifts in their top ten vendors to an even greater degree than those seen in the Army. While DLA largely retained contracting obligations for three of their largest vendors, outside of those top three vendors there was significant turnover. . . . For MDA, the shift from an almost exclusive R&D industrial base saw many of the largest defense vendors secure their positions as MDA vendors.*[68]

Table 4-1: Measuring the Industrial Base Outcomes of Acquisition Reform by Major DoD Components

	Overall DoD	Army	Navy	Air Force	DLA	MDA
Small Business	➡➡	➡➡	➡➡	➡➡	➡➡	➡➡
Top Ten Vendors	*Top Five Steady*	*Many Changes*	*Same*	*Same*	*Many Changes*	*Many Changes*

Legend

➡ Trend followed the intention of the policy change.	➡ Trend did not follow the intention of the policy change.	➡ Trend did not change from the previous regime, or there was not a specific policy change to measure against.

Source: Sanders, *Measuring the Outcomes of Acquisition Reform by Major DoD Components.*

Note: The first arrow represents the change in the share of contract obligations awarded to small businesses between the Secretary Carter pre-Small Business Task Force (SBTF) Regime and the SBTF Guidance regime. The second arrow represents the change in the share of contract obligations awarded to small businesses between the SBTF regime and the BBP 2.0 regime.

4.1. Changes in the Composition of the Defense Industrial Base

In a recent report released by CSIS on trends in defense products contracting,[69] the study team noted that, in contrast to the significant upheaval in the defense industrial base during the post–Cold War drawdown of the 1990s, the composition of the defense industrial base has been relatively little changed during the current drawdown. The massive wave of consolidation and major vendors exiting the defense market in the wake of then-Deputy Secretary of Defense William Perry's "Last Supper" message to the defense industry has not been repeated during the current drawdown, despite the significant decline in contract obligations over the last several years. Despite the relative stability in the defense market overall in recent years, however, there

[68] Ibid., 48.
[69] Jesse Ellman and Jacob Bell, *Analysis of Defense Products Contract Trends, 1990-2014* (Washington, DC: Center for Strategic and International Studies, October 20, 2015), http://csis.org/publication/analysis-defense-products-contract-trends-1990-2014.

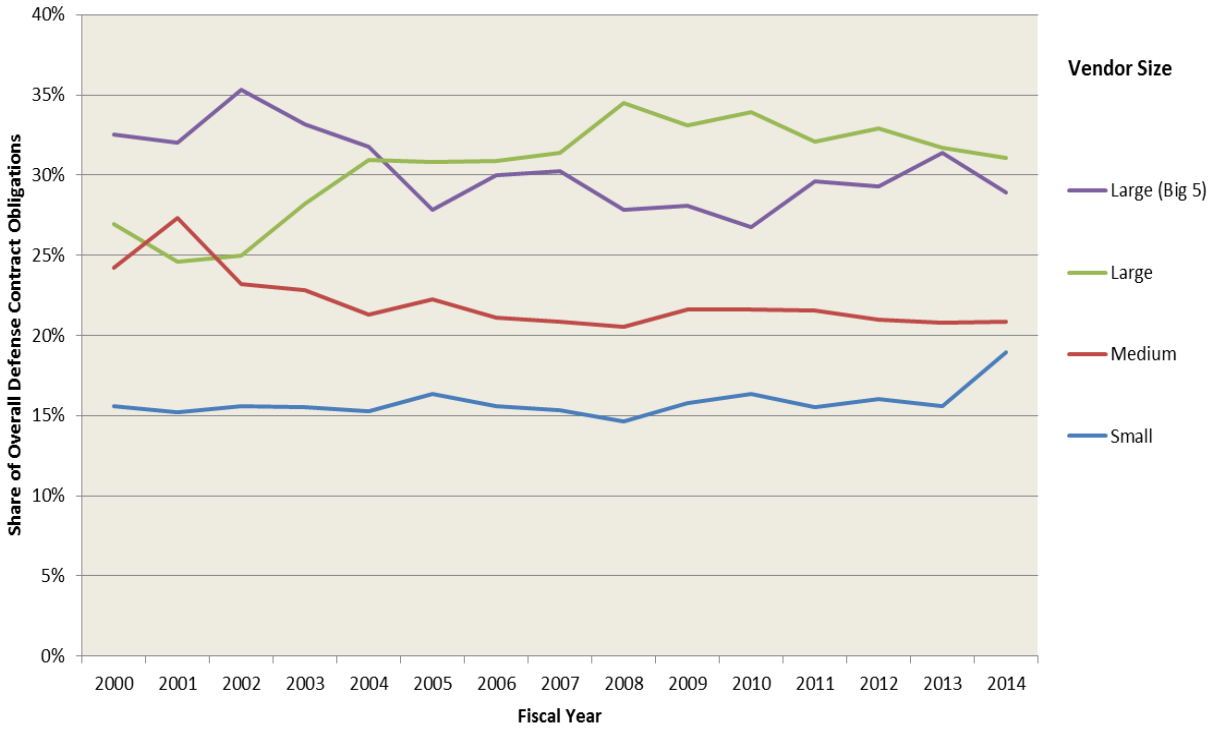
have been notable shifts in particular components within DoD, and within particular categories of the defense-contracting portfolio.

To gain visibility into these shifts in the composition of the industrial base, CSIS breaks down defense contract obligations into four categories, based on the size of the vendor receiving the award. A summary of the methodology behind this categorization schema, which is discussed in detail in the Vendor Categorization section in Appendix A.2.6, follows:

- "Small" vendors follow the government's classification for small businesses, with a couple of adjustments implemented by the study team.
- "Large" vendors are any vendors with over $3 billion in annual revenue, from all sources.
- "Medium" vendors are any vendors that are neither small nor large.
- The "Big 5" vendors (Lockheed Martin, Boeing, Northrop Grumman, Raytheon, and General Dynamics) are separated out from "Large" due to the outsized role they play in defense contracting.[70]

Figure 4-1 shows the composition of the overall defense industrial base from 2000–2014, broken down by the share of overall defense obligations awarded to each vendor size category.

Figure 4-1: Share of Defense Contract Obligations by Size of Vendor, 2000–2014



Source: FPDS; CSIS analysis.

[70] In past reports, CSIS has used the "Big 6," but with the decline of BAE as a U.S. defense contractor in recent years, and United Technologies' sale of their Sikorsky unit, there is no sixth vendor on a level comparable to the "Big 5."

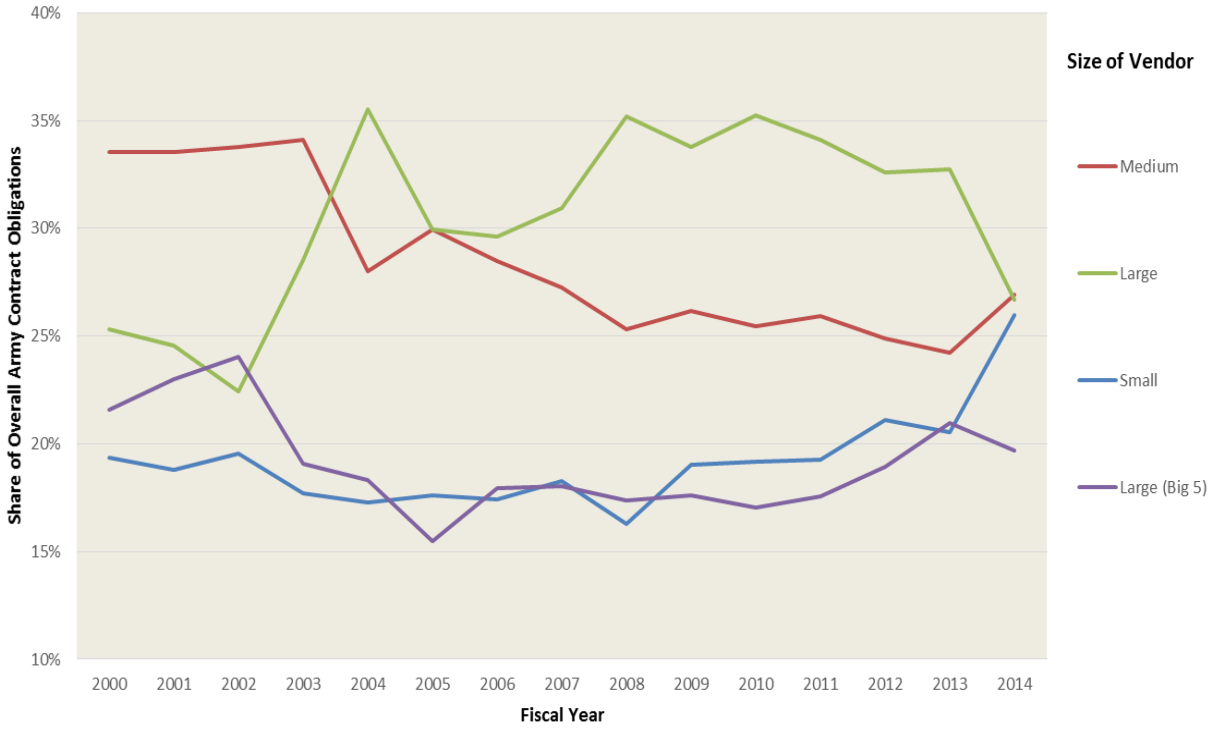
Though there were minor-to-moderate shifts in the defense industrial base in the early to mid-2000s, as large vendors gained share at the expense of medium vendors and the Big 5, the composition of the defense industrial base has been largely stable since the mid-2000s. The share of overall defense contract obligations awarded to medium vendors has remained between 21 percent and 22 percent since 2004, the share awarded to large vendors has remained between 31 percent and 34 percent over that same period, and the share awarded to the Big 5 has remained between 27 percent and 31 percent since 2005. The share of obligations awarded to small vendors has been even more stable, at between 15 percent and 16 percent in every year between 2000 and 2013.

Notably, the share of defense contract obligations awarded to small vendors rose from 16 percent in 2013 to 19 percent in 2014, the highest share in the period observed. This rise is not simply the result of obligations to small vendors declining more slowly than for other size categories—as overall defense contract obligations declined by 9 percent in 2014, obligations to small businesses rose by 11 percent. As the following analysis shows, this increase in small-business participation is broad based, with increases in most of the major DoD components. This data indicates that, despite fears that small businesses might bear a disproportionate share of cuts during the budget drawdown, sequestration, and its aftermath, the share of obligations awarded to small businesses has not only not declined, but has actually increased.

4.1.1. Army

Figure 4-2 shows the share of Army contract obligations awarded to the different size categories of vendors from 2000–2014.

Figure 4-2: Share of Army Contract Obligations by Size of Vendor, 2000-2014



Source: FPDS; CSIS analysis.

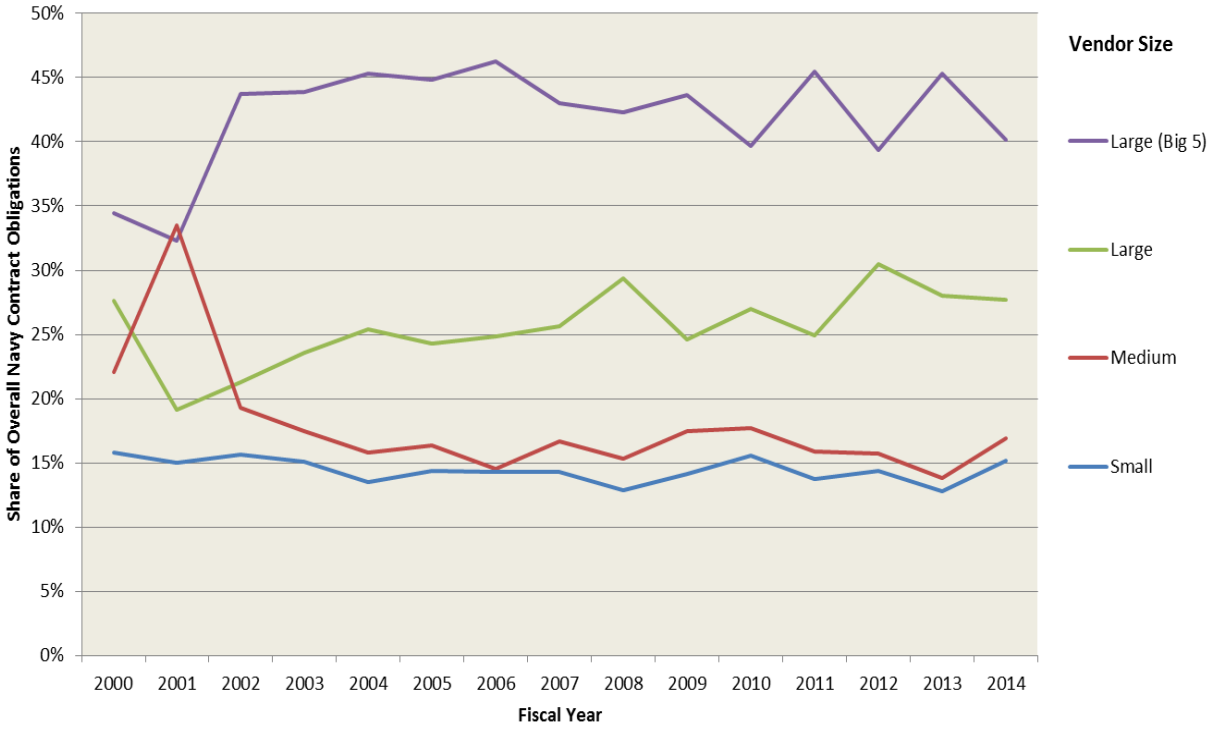
There has been significant upheaval in the Army contracting industrial base in the 2000–2014 period, primarily as a result of the rise and subsequent decline of the pace of combat operations in Iraq and Afghanistan. Medium vendors actually accounted for the largest share of Army contract obligations from 2000–2003, but were superseded by large vendors in most years since, with obligations awarded to the Big 5 also dropping off after the early 2000s. The composition of the industrial base was largely stable from 2008–2012, despite overall Army contract obligations declining by a third. The exception to this relative stability was a notable increase in the share awarded to small vendors, from 16 percent in 2008 to 21 percent in 2012, due to small vendor obligations declining at roughly one-third the rate (-12 percent) of overall Army contract obligations.

In 2014, however, there was a significant shift in the composition of the Army industrial base. As overall Army contract obligations declined by 14 percent in 2013, obligations to large vendors declined by 30 percent; as a result, the share of Army contract obligations awarded to large vendors fell from 33 percent in 2013 to 27 percent in 2014, the lowest share for large vendors since 2002. The share of obligations awarded to medium vendors also increased in 2014 (from 24 percent to 27 percent), but more notably, the share awarded to small vendors increased from 21 percent to 26 percent, the highest rate for any of the three military services in the 2000–2014 period. As with the increase for DoD overall, this rise is not simply the result of obligations to small vendors declining more slowly than for other size categories—obligations to small vendors increased by 8 percent in 2014.

4.1.2. Navy

Figure 4-3 shows the share of Navy contract obligations awarded to the different size categories of vendors from 2000–2014.

Figure 4-3: Share of Navy Contract Obligations by Size of Vendor, 2000–2014



Source: FPDS; CSIS analysis.

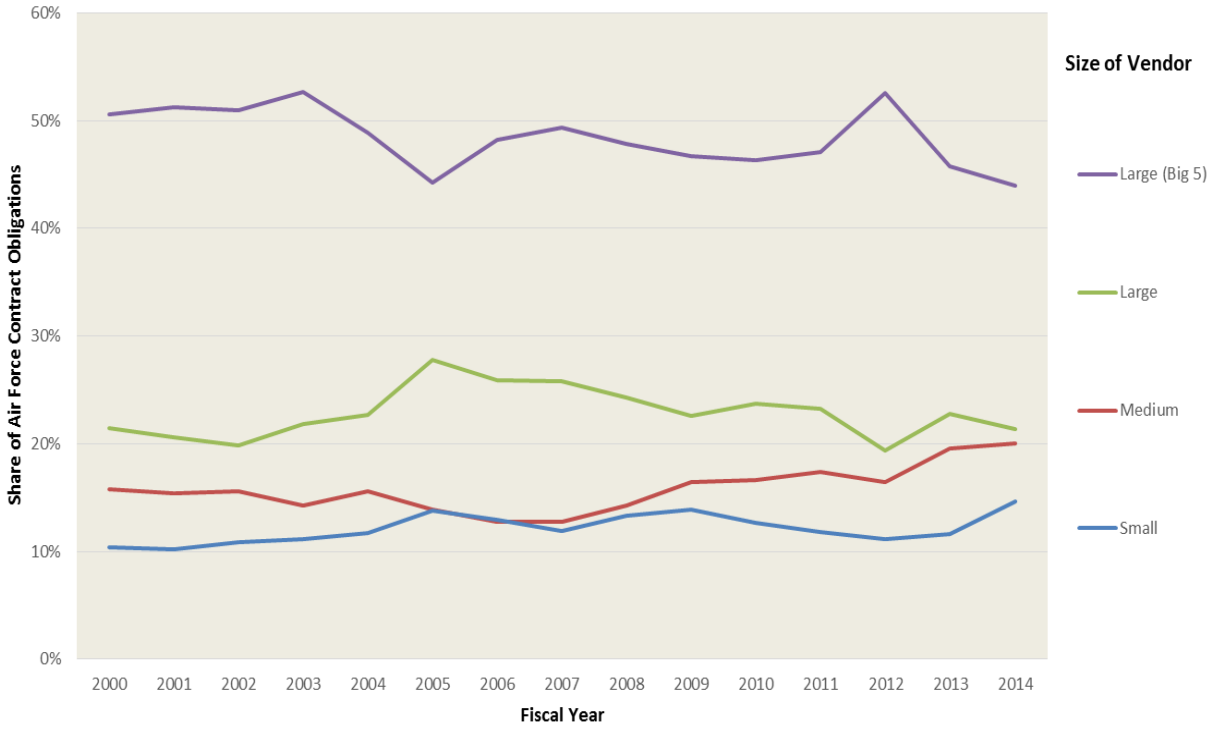
Unlike the Army, the composition of the industrial base supporting the Navy has been largely unchanged since the early 2000s. The share of Navy contract obligations awarded to small vendors has remained between 13 percent and 16 percent for the entire 2000–2014 period, while the share awarded to medium vendors has remained between 14 percent and 17 percent since 2003. The share awarded to large vendors has fluctuated between 24 percent and 30 percent since 2003, while the share awarded to the Big 5 has fluctuated between 39 percent and 45 percent since 2002.

The most notable trend in the Navy data is the significant year-to-year fluctuation in the share awarded to the Big 5, but that is primarily the result of the timing of contracts for production of major platforms such as the Joint Strike Fighter, rather than the result of any significant trend. It is also notable that, as overall Navy contract obligations declined by 11 percent in 2014, obligations awarded to small vendors increased by 5 percent, while obligations to medium vendors increased by 8 percent. As a result, the share of contract obligations awarded to small vendors increased from 13 percent to 15 percent, while the share awarded to medium vendors rose from 14 percent to 17 percent; in both cases, those shares were the highest since 2010.

4.1.3. Air Force

Figure 4-4 shows the share of Air Force contract obligations awarded to the different size categories of vendors from 2000–2014.

Figure 4-4: Share of Air Force Contract Obligations by Size of Vendor, 2000–2014



Source: FPDS; CSIS analysis.

As with the Navy, the composition of the Air Force industrial base has been relatively consistent over the 2000–2014 period, albeit with some periodic and notable year-to-year variation. Also similarly to the Navy, there has been a notable increase in the share of Air Force contract obligations awarded to small and medium vendors in 2013 and 2014. For small vendors, contract obligations declined in 2013 at a rate (-19 percent) slightly slower than overall Air Force contract obligations, and then increased dramatically (26 percent) in 2014 as overall Air Force contract obligations were stable. As a result, the share of Air Force contract obligations awarded to small vendors rose from 11 percent in 2012 to 15 percent in 2014, the highest share for the Air Force in the 2000–2014 period. Similarly, for medium vendors, contract obligations in 2013 declined at a rate (-8 percent) approximately one-third that of overall Air Force contract obligations, and then subsequently rose by 2 percent in 2014. As a result, the share of Air Force contract obligations awarded to medium vendors rose from 16 percent in 2012 to 20 percent in 2013 and 2014, the highest shares seen for the Air Force between 2000 and 2014.

4.1.4. Defense Logistics Agency

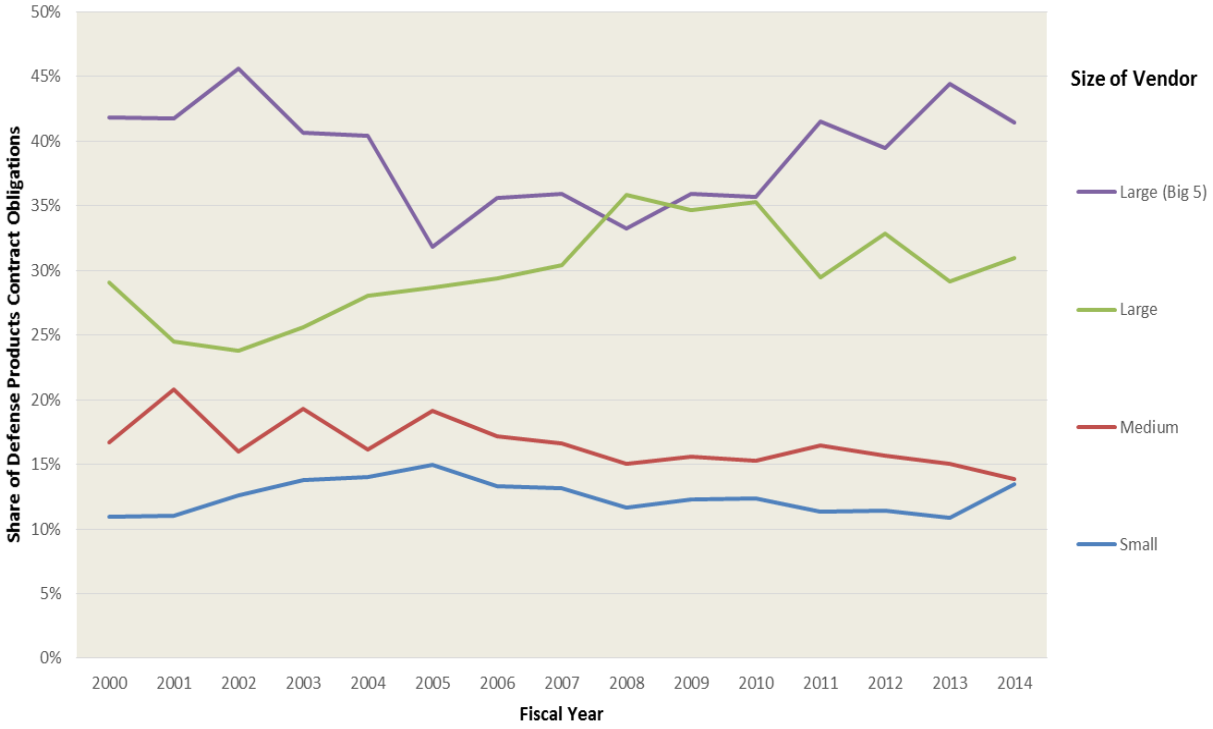
The industrial base supporting DLA has seen a majority (or significant plurality) of contract obligations awarded to large vendors throughout the 2000–2014 period, with a minimal share awarded to the Big 5, and significant shares awarded to both small and medium vendors. Since 2012, the share of DLA contract obligations awarded to small vendors has risen from 19 percent to 26 percent by 2014; after declining at less than half the rate (-11 percent) of overall DLA contract obligations in 2013, obligations to small vendors rose by 8 percent in 2014. By contrast, contract obligations to medium vendors declined by 34 percent between 2013 and 2014, nearly five times the rate of overall DLA; as a result, the share of DLA contract obligations awarded to

medium vendors fell from 32 percent in 2013 to 22 percent in 2014, the lowest share in the 2000–2014 period.

4.1.5. Products

The composition of the DoD industrial base for products is shown in Figure 4-5.

Figure 4-5: Share of Defense Products Contract Obligations by Size of Vendor, 2000–2014



Source: FPDS; CSIS analysis.

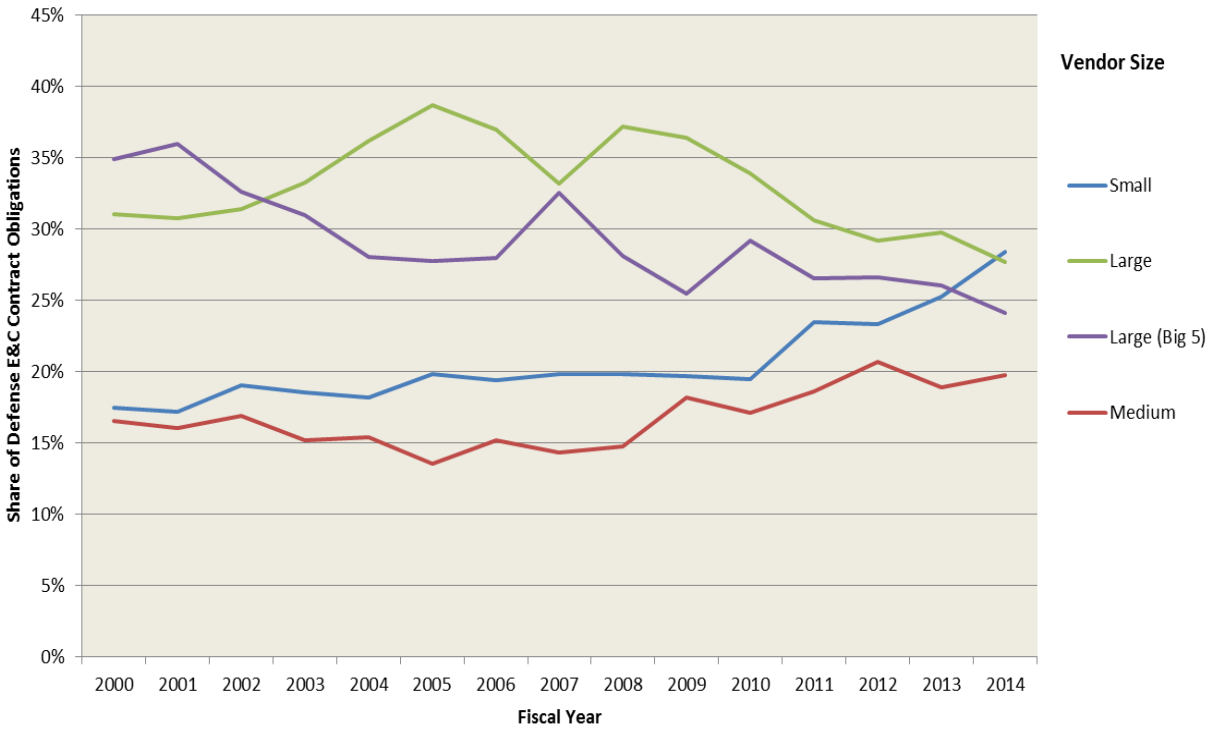
The shares of defense products contract obligations going to small and medium vendors have been relatively stable since 2008, but there has been a significant shift in the shares awarded to large vendors and the Big 5. The Big 5 were awarded the largest share of defense products contract obligations between 2000 and 2007, but were basically even with large vendors from 2008–2010, in part due to the surge in contract obligations for MRAPs, which were mostly produced by large vendors outside the Big 5. Since 2010, however, the shares for large and the Big 5 have returned to prior levels; the Big 5 accounted for 44 percent of defense products contract obligations in 2013, the highest share since 2002, while large vendors fell to 29 percent in 2013, the lowest share since 2006. Notably, this shift occurred despite the spinoff of Huntington Ingalls Industries (a large vendor that accounted for nearly 3 percent of defense products contract obligations in 2014) from Northrop Grumman (a Big 5 vendor).

In 2014, products contract obligations to both the Big 5 vendors (-20 percent) and medium vendors (-21 percent) declined more steeply than overall defense products, while obligations to large vendors (-9 percent) were relatively preserved and obligations to small vendors increased by 6 percent. As shares of overall defense products contract obligations, medium vendors declined from 15 percent in 2013 to 14 percent in 2014, the lowest share for medium vendors in

the 2000–2014 period, while obligations to small vendors increased from 11 percent to 13 percent, the highest share since 2007.

Within the defense products contracting portfolio, there has been a notable shift in the defense industrial base for Electronics & Communications (E&C) products in recent years, as shown in Figure 4-6.

Figure 4-6: Share of Defense Electronics & Communications Contract Obligations by Size of Vendor, 2000–2014



Source: FPDS; CSIS analysis.

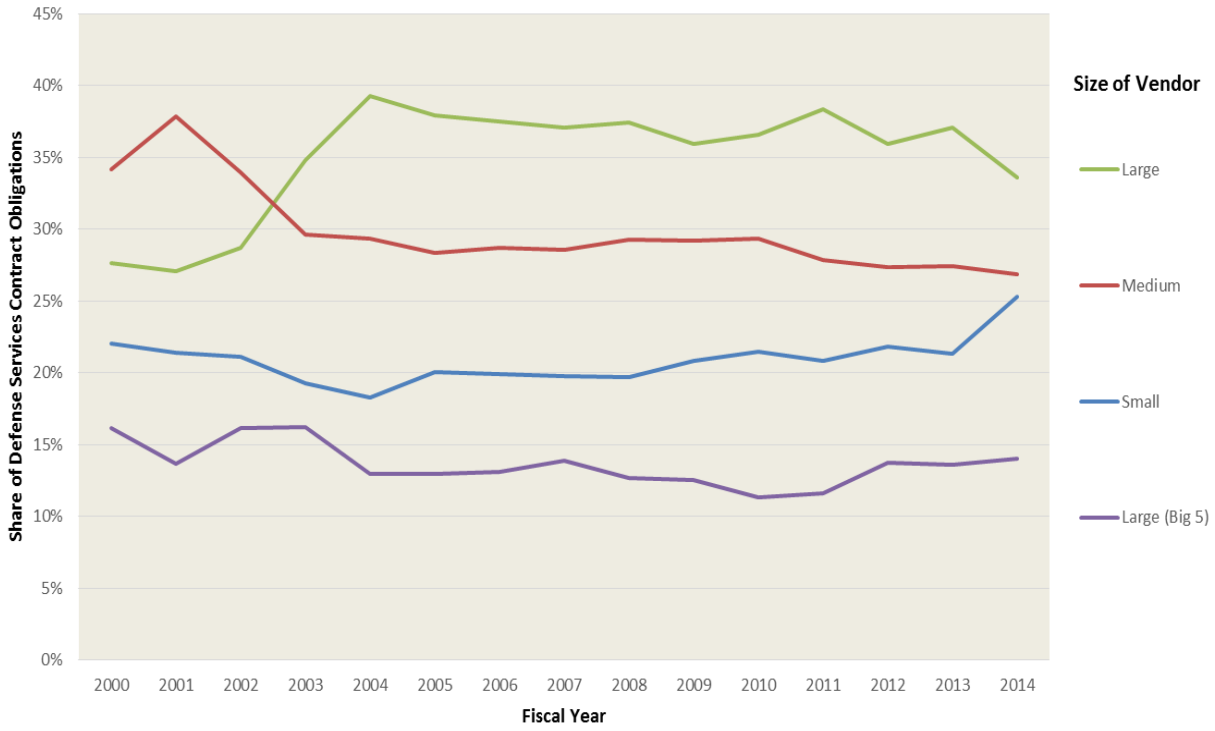
The share of E&C contract obligations going to small vendors had hovered near 20 percent from 2000–2010, but has risen dramatically in recent years, to 28 percent by 2014. Significantly, small vendors now account for the largest share of contract obligations for E&C, the only time this has happened for a non-commodities/commercial goods-based products category in the 2000–2014 period. This increase is not the result of an increase in obligations going to small vendors, however; rather, it results from E&C contract obligations to small vendors remaining stable as overall E&C contract obligations have declined by a third since 2010.

This is particularly notable, because the small vendors within the E&C industrial base likely include many of the sorts of small, high-tech, potentially innovative firms that DoD has made a concerted effort to bring into, and keep in, the defense market. While this data does not show any increase in small vendor participation in the defense E&C market in recent years, the fact that small vendors have managed to maintain their level of obligations in an extremely tough market can be seen as a success.

4.1.6. Services

Figure 4-7 shows the share of defense services contract obligations awarded to the different size categories of vendors from 2000–2014.

Figure 4-7: Share of Defense Services Contract Obligations by Size of Vendor, 2000–2014



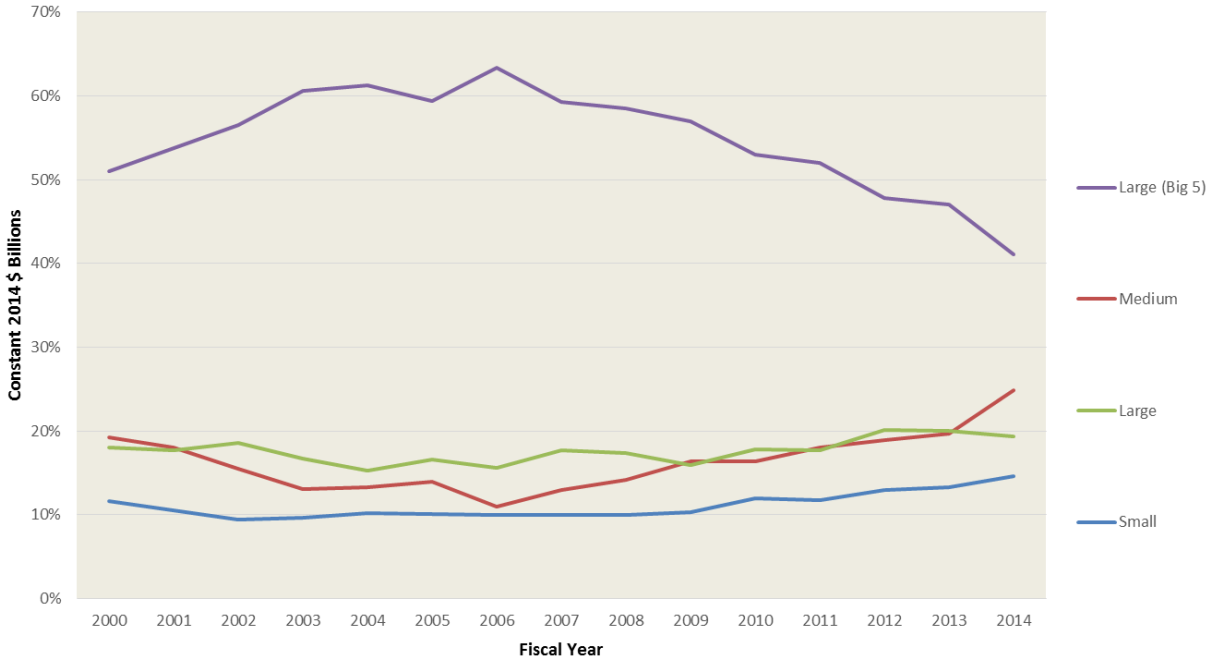
Source: FPDS; CSIS analysis.

The composition of the DoD industrial base for services has been largely stable throughout the 2000–2014 period, but as overall contract obligations for services declined by 4 percent in 2014, services contract obligations to small vendors increased by 14 percent. As a result, the share of overall services contract obligations going to small vendors rose from 21 percent in 2013 to 25 percent in 2014, the highest share in the 2000–2014 period. As will be discussed later, there has also been some significant recent mergers and acquisition activity in the services sector that falls within the large vendor category in this analysis.

4.1.7. Research and Development

Figure 4-8 shows the share of defense R&D contract obligations awarded to the different size categories of vendors from 2000–2014.

Figure 4-8: Share of Defense R&D Contract Obligations by Size of Vendor, 2000–2014



Source: FPDS; CSIS analysis.

The decline in the Big 5 share of R&D contract obligations is consistent with the declining volume of development activity associated with MDAPs noted in Chapter 2 of this report and is likely reflective of the five-year trough in the pipeline of new MDAPs.

4.2. The Present and Future Consolidation of Defense Industry

Compared to the post–"Last Supper" industry consolidation of the mid to late 1990s during the post–Cold War budget drawdown, the current budget drawdown has not seen a comparable wave of consolidation at the prime contractor level, with numerous top defense vendors either merging or exiting the defense market. Table 4-2 shows the top 20 defense vendors in 2004 and 2014, based on prime contract obligations, as well as their ranks in the previous year (2003 and 2013, respectively).

Table 4-2: Top 20 Defense Vendors, 2004 and 2014

Rank	Top 20 Contractors in 2004	Obligations in 2014 Millions	2003 Rank	Top 20 Contractors in 2014	Obligations in 2014 Millions	2013 Rank
1	Lockheed Martin	26,004	1	Lockheed Martin	24,759	1
2	Boeing	21,744	2	Boeing	17,930	2
3	Northrop Grumman	15,055	3	General Dynamics	13,269	4
4	General Dynamics	13,036	4	Raytheon	11,354	3
5	Raytheon	10,447	5	Northrop Grumman	9,096	5
Subtotal for Top 5		**86,286**			**76,408**	
6	Halliburton	9,821	7	United Technologies	5,758	8
7	United Technologies	5,827	6	L3 Communications	5,229	6
8	L3 Communications	5,195	9	BAE Systems	5,047	9
9	BAE Systems	4,420	12	Huntington Ingalls	3,818	7
10	SAIC	3,350	10	Humana	3,526	11
11	Computer Sciences Corp.	3,163	15	SAIC	3,142	10
12	Health Net	2,351	14	Health Net	3,086	13
13	ITT	2,261	16	UnitedHealth Group	2,970	38
14	Bechtel	2,224	23	Bechtel	2,697	15
15	General Electric	2,167	11	United Launch Alliance*	2,519	33
16	Electronic Data Systems	2,151	31	Booz Allen Hamilton	2,305	22
17	Bell-Boeing Joint Project Office*	1,899	28	General Electric	2,129	18
18	Honeywell	1,885	19	Bell-Boeing Joint Project Office*	2,019	20
19	URS	1,753	17	ITT	1,942	14
20	Textron	1,594	22	Hewlett Packard	1,770	26
Total for Top 20		**136,347**			**124,366**	
Total for all industry		**283,219**			**283,378**	

* Joint venture.

Source: FPDS; CSIS analysis.

An excellent basis for comparison is 2004 and 2014, because total contract obligations are nearly identical for both years. The data show that there has been a moderate decline in the concentration of the defense industry between 2004 and 2014. In 2004, the top 5 vendors accounted for 30 percent of total defense contract obligations; in 2014, the top 5 accounted for only 27 percent. Similarly, in 2004, the top 20 vendors accounted for 48 percent of total defense contract obligations; in 2014, the top 20 accounted for only 44 percent.

The composition of the top 5 has remained unchanged between 2004 and 2014, with Northrop Grumman's decline from third to fifth largely attributable to their divestiture of Huntington Ingalls Industries, which itself ranked ninth in 2014. Notably, there are three health-care vendors in the top 20 in 2014 (Humana, Health Net, and UnitedHealth Group), compared to only one in 2004 (Health Net), which illustrates the growth in health-care contract obligations by DoD over the last decade. There was moderate volatility in the rest of the top 20 in 2014, as four vendors that were not in the top 20 in 2013 rose into the top 20 in 2014: UnitedHealth Group, United Launch Alliance, Booz Allen Hamilton, and Hewlett Packard.

Rising Concern about Industry Consolidation

But over the last year, there have been significant mergers and acquisitions (M&As) among the notable prime defense vendors. The purchase of Excelis by Harris Corporation, the merger of ATK and Orbital Sciences Corporation, the merger of Computer Science Corporation government services and SRA International (forming CSRA), and the sale of United Technologies' Sikorsky business unit to Lockheed Martin all reduce the number of potential competitors in major sectors of the defense contracting portfolio. In response to the recent mergers, particularly the Lockheed/Sikorsky acquisition, Under Secretary of Defense for Acquisition, Technology, and Logistics Frank Kendall has indicated that DoD would be more

closely scrutinizing future M&A activity among prime defense vendors, particularly those responsible for major weapons systems. Kendall indicated a desire to work with Congress to give DoD more tools to intervene when an M&A threatens to significantly reduce competition for major weapons systems.[71]

This is in contrast to the preceding several years, where the trend had been one of spinoffs and divestitures, as major defense vendors attempted to refocus on their core business areas or get out of less promising/profitable business areas. The spinoff of Northrop Grumman's shipbuilding business into Huntington Ingalls Industries, the spinoff of ITT's defense business into Excelis, the spinoff of Computer Sciences Corporation's government services business, and the spinoff of Engility from L3 Communications have all changed the structure of the defense industrial base, particularly for services, but have not acted to lower the number of competitors in their respective markets.[72] Media reports have noted that other major defense vendors, including Lockheed Martin and BAE Systems, either intend to or are seriously exploring the possibility of selling or spinning off major business units. Notably, most of these major spinoffs have been in the government services sector, particularly for IT services, which would indicate significant pessimism within the defense industry for the future growth and profitability of that sector of the defense contracting market.

The potential benefit of these spinoffs is that the new companies are leaner, more focused, and possibly more efficient, having been divorced from larger parent companies with wide-ranging business portfolios and overhead structures associated with the management of complex weapon systems programs. For example, one driver of the spinoff of Engility from L3 Communications was apparently difficulty bidding for certain contracts stemming from Organizational Conflict of Interest (OCI) concerns regarding the parent company—as an independent entity, Engility would presumably be free to bid on contracts that they couldn't while still a part of L3.[73] The downside of these spinoffs is the creation of smaller companies that may be more vulnerable in a difficult contracting environment than they would otherwise have been as part of a larger, more diverse vendor.

4.2.1. Top Products Vendors

Table 4-3 shows the top 20 defense products vendors in 2004 and 2014, based on prime contract obligations, as well as their ranks in the previous year (2003 and 2013, respectively).

[71] SAIC's split into two companies (SAIC and Leidos) also warrants mentioning, though the particular circumstances preceding that split make it an imperfect comparison to the other major spinoffs in recent years.
[72] Aaron Mehta and Andrew Clevenger, "Kendall Seeks Congressional Action against Prime Mergers," *Defense News*, September 30, 2015, http://www.defensenews.com/story/breaking-news/2015/09/30/kendall-seeks-congressional-action-against-prime-mergers/73102994/.
[73] Nick Wakeman, "L-3 finishes spin out of Engility," *Washington Technology*, July 18, 2015, https://washingtontechnology.com/articles/2012/07/18/engility-day-one.aspx.

Table 4-3: Top 20 Defense Products Vendors, 2004 and 2014

Rank	Top 20 Contractors in 2004	Obligations in 2014 Millions	2003 Rank	Top 20 Contractors in 2014	Obligations in 2014 Millions	2013 Rank
1	Boeing	13,793	1	Lockheed Martin	16,390	1
2	Lockheed Martin	13,212	2	Boeing	13,097	2
3	General Dynamics	7,704	3	General Dynamics	10,972	3
4	Northrop Grumman	7,146	4	Raytheon	6,781	4
5	Raytheon	6,610	5	United Technologies	4,589	6
Subtotal for Top 5		**48,464**			**51,830**	
6	United Technologies	4,121	7	Huntington Ingalls	3,638	5
7	BAE Systems	1,987	10	Northrop Grumman	2,711	7
8	General Electric	1,874	8	BAE Systems	2,342	11
9	Bell-Boeing Joint Project Office*	1,669	22	Bechtel	2,096	12
10	AM General	1,342	19	Bell-Boeing Joint Project Office*	1,974	13
11	L3 Communications	1,333	9	General Electric	1,916	14
12	Royal Dutch Shell	1,316	21	L3 Communications	1,878	10
13	Textron	1,299	11	McKesson	1,669	28
14	Honeywell	1,287	12	Royal Dutch Shell	1,587	44
15	Bechtel	1,175	34	AmerisourceBergen	1,465	16
16	Department of Energy	1,170	14	Textron	1,407	9
17	ATK	1,134	15	Cardinal Health	1,002	22
18	Oshkosh	1,047	17	ATK	986	19
19	Agility	959	171	Atlantic Diving Supply	984	25
20	ITT	882	23	Anham*	982	67
Total for Top 20		**71,059**			**78,467**	
Total for Products		**125,179**			**127,428**	

* Joint venture.

Source: FPDS; CSIS analysis

The top vendors in the defense products industrial base accounted for a larger share of the defense products market in 2014 than they did in 2004. The top 20 vendors accounted for 62 percent of defense products contract obligations in 2014, compared to 57 percent in 2004; the share captured by the top 5 vendors increased slightly as well, from 39 percent to 41 percent.

The biggest change in the top 5 was Northrop Grumman, which now ranks one place below its spinoff, Huntington Ingalls Industries. United Technologies moved up into the top 5 in 2014, but with its sale of Sikorsky to Lockheed Martin, its ranking will likely decline in the near future. There was some volatility in the rest of the top 20, with five vendors rising into the top 20 between 2013 and 2014: McKesson, Royal Dutch Shell, Cardinal Health, Atlantic Diving Supply, and Anham. Textron, which had ranked 9th in 2013, fell to 16th in 2014.

4.2.2. Top Services Vendors

Table 4-4 shows the top 20 defense services vendors in 2004 and 2014, based on prime contract obligations, as well as their ranks in the previous year (2003 and 2013, respectively).

Table 4-4: Top 20 Defense Services Vendors, 2004 and 2014

Rank	Top 20 Contractors in 2004	Obligations in 2014 Millions	2003 Rank	Top 20 Contractors in 2014	Obligations in 2014 Millions	2013 Rank
1	Halliburton	9,821	2	Lockheed Martin	4,218	1
2	Northrop Grumman	4,447	3	Northrop Grumman	3,764	2
3	Lockheed Martin	3,479	1	Humana	3,526	3
4	L3 Communications	3,432	9	Boeing	3,400	4
5	General Dynamics	3,405	4	Health Net	3,086	9
Subtotal for Top 5		**24,584**			**17,994**	
6	Computer Sciences Corp.	2,747	15	L3 Communications	3,008	8
7	Health Net	2,351	8	UnitedHealth Group	2,970	22
8	SAIC	2,280	7	United Launch Alliance*	2,430	21
9	Raytheon	2,153	6	SAIC	2,399	6
10	Electronic Data Systems	2,147	18	Raytheon	2,387	7
11	Boeing	1,875	10	BAE Systems	2,285	10
12	BAE Systems	1,643	11	General Dynamics	1,897	13
13	URS	1,617	13	Hewlett Packard	1,575	16
14	TriWest Healthcare	1,578	14	ITT	1,368	11
15	Humana	1,411	5	Booz Allen Hamilton	1,355	18
16	Global Aviation	1,186	16	Computer Sciences Corp.	1,299	14
17	Fedex	1,177	17	CACI	1,170	17
18	Parsons	1,096	19	Dyncorp International	1,142	5
19	ITT	1,058	22	URS	1,109	19
20	Bechtel	1,048	20	Fluor	875	12
Total for Top 20		**49,952**			**45,262**	
Total for Services		**119,056**			**129,500**	

* Joint venture.

Source: FPDS; CSIS analysis.

There has been a significant widening of the defense services industrial base since 2004, in a sector of the defense-contracting portfolio that was already much less concentrated than for products. The share of overall defense services contract obligations going to the top 20 vendors fell from 42 percent in 2004 to 35 percent in 2014, while the share going to the top 5 fell from 21 percent to 14 percent, which is just over one-third the share that the top 5 defense products vendors account for. This appears to be primarily the result of declining need for contractor support in overseas operations as the pace of operations has slowed—in 2004, Halliburton alone accounted for obligations roughly equivalent to the total for the top three vendors in 2014.

The other big shift between 2004 and 2014 is the increasing prominence of health-care vendors—whereas the highest-ranked health-care vendor in 2004 was seventh, by 2014 there were three health-care providers among the top seven defense services vendors. The top 20 was reasonably stable between 2013 and 2014, with only two vendors rising into the top 20: UnitedHealth Group and United Launch Alliance, which rose to the seventh and eighth ranks, respectively. Two vendors saw significant declines between 2013 and 2013: Dyncorp International fell from 5th in 2013 to 18th in 2014, while Fluor fell from 12th in 2013 to 20th in 2014.

4.2.3. Top Research and Development Vendors

Table 4-5 shows the top 20 defense R&D vendors in 2004 and 2014, based on prime contract obligations, as well as their ranks in the previous year (2003 and 2013, respectively).

Table 4-5: Top 20 Defense R&D Vendors, 2004 and 2014

Rank	Top 20 Contractors in 2004	Obligations in 2014 Millions	2003 Rank	Top 20 Contractors in 2014	Obligations in 2014 Millions	2013 Rank
1	Lockheed Martin	9,313	1	Lockheed Martin	4,150	1
2	Boeing	6,077	2	Northrop Grumman	2,621	3
3	Northrop Grumman	3,462	3	Raytheon	2,187	2
4	General Dynamics	1,927	6	Boeing	1,434	4
5	Raytheon	1,684	4	MIT	951	9
Subtotal for Top 5		**22,462**			**11,343**	
6	Joint Venture [Boeing/UTC]*	1,098	7	Booz Allen Hamilton	942	7
7	United Technologies	1,043	5	MITRE	783	14
8	BAE Systems	790	11	Johns Hopkins University	783	11
9	MIT	746	10	The Aerospace Corp.	729	8
10	Aerospace Corp.	673	9	United Technologies	671	6
11	SAIC	572	8	Alion	467	16
12	L3 Communications	430	16	BAE Systems	419	12
13	MITRE	354	19	General Dynamics	400	5
14	Computer Sciences Corp.	332	15	Wyle Laboratories	357	13
15	ITT	321	17	L3 Communications	343	15
16	Johns Hopkins APL	248	21	Leidos	263	#N/A
17	ATK	213	23	Battelle	248	19
18	Bell-Boeing Joint Project Office*	211	12	SAIC	236	10
19	General Electric	209	14	ITT	192	17
20	Pennsylvania State University	175	22	CACI	186	20
Total for Top 20		**29,875**			**18,360**	
Total for R&D		**38,978**			**26,449**	

* Joint venture.

Source: FPDS; CSIS analysis.

The defense R&D industrial base has broadened to an even greater degree than the defense services industrial base since 2004, although it remains far more concentrated than even the products industrial base. As a share of overall defense R&D contract obligations, the top 5 vendors declined from 58 percent in 2004 to 43 percent in 2014, while the top 20 declined from 77 percent to 69 percent.

The top 5 for R&D was relatively unchanged until 2014, when General Dynamics fell from 5th rank to 13th, replaced in the top 5 by MIT. The rest of the top 20 was fairly stable: MITRE rose from 14th in 2013 to 7th in 2014, while the decline of SAIC and the appearance of Leidos was the result of the split of those two companies.

4.3. Silicon Valley Participation in the Defense Industrial Base

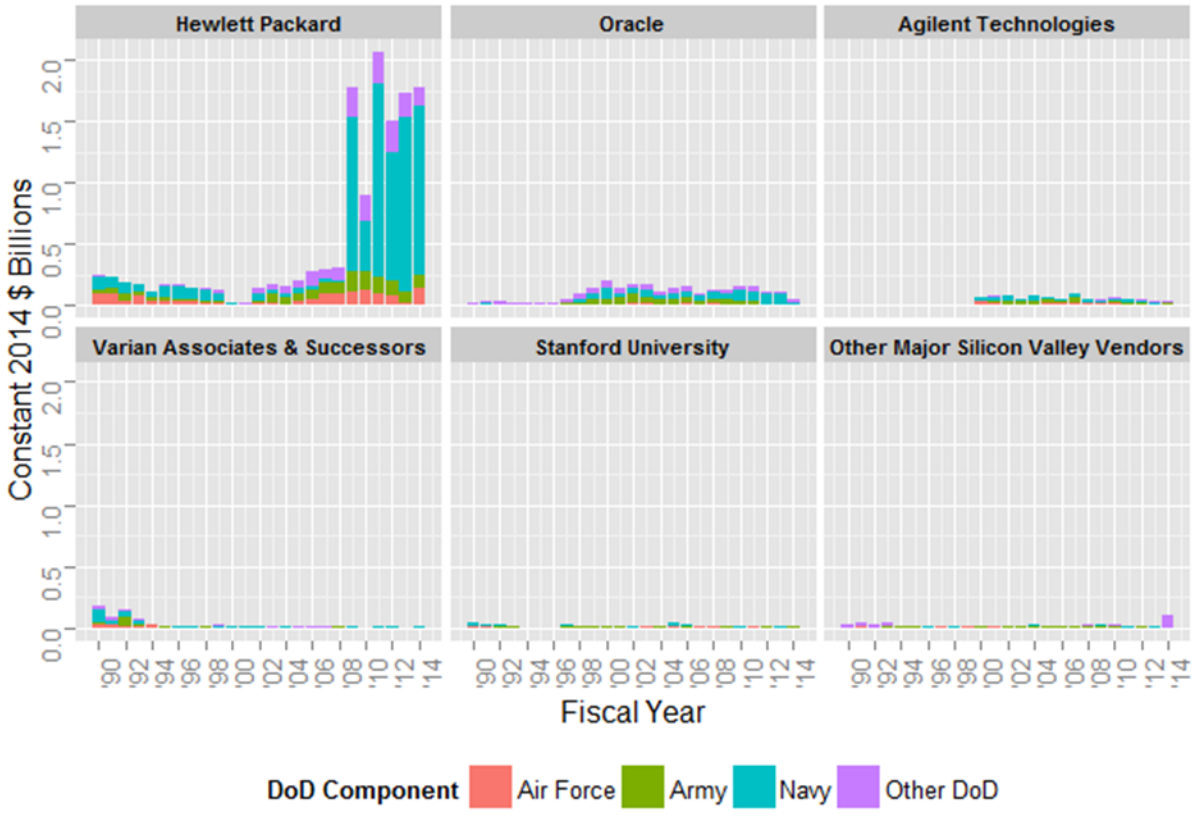
As noted in Section 2.1.2, Secretary Carter established the importance of DoD-Silicon Valley partnerships and cited a variety of success stories; however he did not provide overall metrics as to the state of the relationship. As Figure 4-9 shows, prime contract obligations top Silicon Valley vendors total less than $3 billion a year, never amounting to more than 1 percent of DoD contract spending. There was a large and sustained increase starting in 2009, driven by Hewlett Packard's acquisition of Electronic Data Systems, which had been a significant defense contractor.[74]

Beneath the top-line trends, three points stand out about the relationship between the DoD and major Silicon Valley vendors: the narrowness of the base, the persistence of the top tier but

[74] The merger was completed in August 2008 and was incorporated into CSIS's data starting FY2009, "HP Completes $13.9 Billion Acquisition of EDS," HP News Release, 2008, http://www.hp.com/hpinfo/newsroom/press/2008/080826xa.html.

tumult beneath that, and the avoidance of cuts due to drawdown or the budget caps thanks to Hewlett Packard.

Figure 4-9 Defense Contract Obligations to Major Silicon Valley Vendors, 1990-2014



Source: CSIS; FPDS analysis.

4.3.1. Narrow Silicon Valley Base

Figure 4-9 shows the contract obligations going to 30-plus vendors on this paper's Silicon Valley Index. That index is made up of publicly traded companies that made it into the top 30 Silicon Valley between 2013 and 2015, plus Stanford University.[75] If all contracts performed in Silicon Valley were included in this sample, the dominant vendor would instead be Lockheed Martin by a significant margin, but traditional defense companies are not the target of Secretary Carter's outreach effort. Of those 30-plus major vendors, only five had $250 million or more in total obligations since 1990. Hewlett Packard's dominance is further emphasized by the fact that the number three company, Agilent Technologies, spun off from Hewlett Packard in November 1999. The approximately $100 million spike in other major Silicon Valley vendors in 2014 was

[75] These companies were identified using the SV150 list published in Daniel Willis, Jeremy Owens, and Jack Davis, "SV150: Searchable database of Silicon Valley's top 150 companies for 2015," *San Jose Mercury News*, April 17, 2015 http://www.mercurynews.com/business/ci_27932727/sv150-searchable-database-silicon-valleys-top-150-companies Two sibling companies of Verian Medical Systems were also included: Varian Inc. and Varian Semiconductor Equipment. Together, these three companies are classified as Varian Associates and Successor.

driven by Cisco Systems, which if sustained could quickly allow that company to join the ranks of Oracle and Agilent Technologies.

Unsurprisingly, Silicon Valley contractors are overwhelmingly focused in electronics and communications systems (86 percent of obligations). The secondary category is other R&D and knowledge-based services (5 percent of obligations), which are the predominant service provided by Stanford University throughout the study period and the other major Silicon Valley vendors in the first half of the 1990s. Hewlett Packard had a significant presence in Facilities and Construction and Missiles and Space Systems portfolios that were largely inherited by Agilent Technologies after the spinoff. Facilities and Construction services includes management of research facilities, and so still remains in the TBPP domain and across all vendors accounts for just under 5 percent of obligations.

4.3.2. Persistence in the Top Tier, Tumult Below

Another noteworthy trend is that while companies do slowly rise and fall, there is significant stability within the top companies. Aggregated across the study period, the top five vendors accounted for more than 97 percent of total obligations. The remaining major Silicon Valley vendors had obligations of barely over $500 million over 25 years. The data also show that status as a notable DoD partner does not guarantee future business. Varian Associates obligations did begin to drop off the charts even before the company split into three parts in 1999.[76] Nonetheless, this consistency is remarkable given the dynamism and turnover in the technology sector during this period. Figure 4-9 provides one clue as to the resilience of these specific vendors: each of them is consistently selling to multiple parts of DoD, a trait that appears necessary, but not sufficient, for staying in the top tier.

This finding can illuminate the question of why Silicon Valley companies do not do more business with DoD. Secretary Carter identifies fear of DoD policies regarding intellectual property as an important issue, though he emphasized that "[w]e need the creativity and innovation that comes from start-ups and small businesses, and we know that part of doing business with them involves protecting their intellectual property."[77] This concern, which is applicable to the commercial sector as a whole, does fit with the narrowness of the base. It also may help explain why vendors like Intel, Network Appliance, VMWare, Symantec, and Synex all were obligated at least $10 million over the study period, but never became consistent DoD contractors.

Other coverage of Silicon Valley leaders and analysts echo the distrust mentioned by Secretary Carter and the broader concerns about the procurement system with a particular emphasis on the pace of operations. Art Gilliland, a CEO with a cyber security firm, said that his sector "often would like to work with the government, if not for the often intensely bureaucratic and expensive process it entails. Often, he says, selling into the government requires certifications that cost companies upwards of $100,000, and can take more than a year to receive."[78] This specific

[76] While Varian Medical Systems remains a major Silicon Valley player, its two sibling companies, Varian Inc. and Varian Semiconductor Equipment, were purchased by Agilent and Applied Materials.
[77] Ashton Carter, "Rewiring the Pentagon: Charting a New Path on Innovation and Cybersecurity," in *Drell Lecture (Stanford University)* (U.S. Department of Defense, 2015), para. 48, http://www.defense.gov/News/Speeches/Speech-View/Article/606666.
[78] Eric Markowitz, "Pentagon in Silicon Valley: What's the Government Up To?," *International Business Times*, October 15, 2015, http://www.ibtimes.com/pentagon-silicon-valley-whats-government-2141778.

complaint highlights the issue of barriers to entry. For well-capitalized vendors, $100,000 may be a relatively insignificant sum, but time is a precious commodity.

Based on the major vendors included in this study, it appears that those vendors that can at times breach $30 million to $50 million in annual obligations have overcome the procedural and cultural barriers of working with DoD. There's no theoretical or regulatory logic to that particular cutoff, but it does serve as a warning that smaller successes in Silicon Valley-DoD matchmaking will not necessarily blossom into longstanding partnerships. This pattern will be put to the test when complete obligations data are released for FY2015. In 2014, Cisco Systems burst onto the scene with nearly $100 million in obligations. If this high barrier to entry is indeed one of the main constraints on Silicon Valley vending, than that company would qualify as a top-tier DoD Silicon Valley vendor in 2015 as well.

4.3.3. Silicon Valley Avoids Drawdown and Budget Cap Cuts Thanks to HP

In aggregate, the partnership has grown during the drawdown. Average spending from 2010–2012 was over 37 percent higher than 2008–2009 levels, when the DoD budget was at its apex. Even during sequestration and its aftermath, spending was another 12 percent higher. However, a single vendor, Hewlett Packard, accounts for more than 70 percent of all obligations during the study period and is disproportionately responsible for this growth. When looking at all other vendors, the 2010–2012 period was 7 percent higher than 2008–2009 levels, but average obligations were nearly 20 percent lower in the 2013–2014 period than during the early years of the drawdown.

Figure 4-10: DoD Obligations to Major Silicon Valley Vendors by Defense Component

Source: FPDS; CSIS analysis.

When examining the trends by defense component, as shown in Figure 4-10 the trends are likewise not evenly distributed. Both Navy and Other DoD had average obligations in 2010–2012 that were nearly twice their 2008–2009 levels. The Army experienced a small increase (5 percent) while the Air Force suffered average levels shrunk by 16 percent. Under the budget caps, Navy continued to grow with a nearly 32 percent rise while all other components declined, with Other DoD experiencing the smallest decline at 13 percent.

Secretary Carter's speech did not mention Hewlett Packard by name during his speech and much of his agenda is focused on smaller vendors and startups. However, when it comes to the traditional acquisition system, the newly minted Hewlett-Packard Enterprise is likely to remain a predominant player. Similarly, the Navy's $3.5 billion Next Generation Enterprise Network (NGEN) is a bellwether for the DoD-Silicon Valley partnership, even though it is a more traditional information technology system, rather than the cyberwarfare or robotics systems on which Secretary Carter more explicitly focused.

The NGEN program is the successor to the Navy Marine Corps Intranet (NMCI), "the Department of the Navy's (DON) shore-based enterprise network in the continental United States and Hawaii. . . . NMCI represents about 70 percent of all DON IT operations and is

second only to the Internet in size."[79] Critics of the contract lambasted the approach that leased hardware and software to the government, relied on the contractor for upgrades, and included metrics that lagged behind hardware advances in the commercial sector. Hewlett Packard took over the NMCI when it acquired Texas-based Electronic Data Systems and cited high customer satisfaction rates by the end of the contract.[80] Hewlett Packard was part of a team that won the lowest price-technically acceptable competition to become the prime contractor for NGEN, which transitions ownership of the network back to the government.[81] The NGEN will be re-competed in 2018, which may prove an inflection point for the largest Silicon Valley Defense contractor.[82]

4.3.4. Implications for the Future

The contracting data illuminates the challenges that DoD will have to overcome to achieve closer partnership with Silicon Valley. The present base is dominated by a small number of vendors, and new entrants that do not win more than $30 million to $50 million in annual obligations have historically sought greener pastures rather than slowly building to greater participation. That high threshold is worrisome when headline-making companies like Google-acquired robotics maker Boston Dynamics's big breakthrough contract was for $10.8 million.[83] While Silicon Valley vendors other than Hewlett Packard did see declining average aggregate obligations, the drawdown's effect on Silicon Valley was comparatively minor.

Finally, the limitations of this analysis should be emphasized. The analysis was limited to top 30 vendors in recent years and thus may miss important small-scale activity or contractors notably larger during the 1990s technology boom. In addition, grants and other non-prime contract mechanisms include important funding not captured by FPDS. The traditional defense industry has long been capable of acquiring and partnering with a range of companies as a way of bringing in technology and that partnering happens well below the prime level.

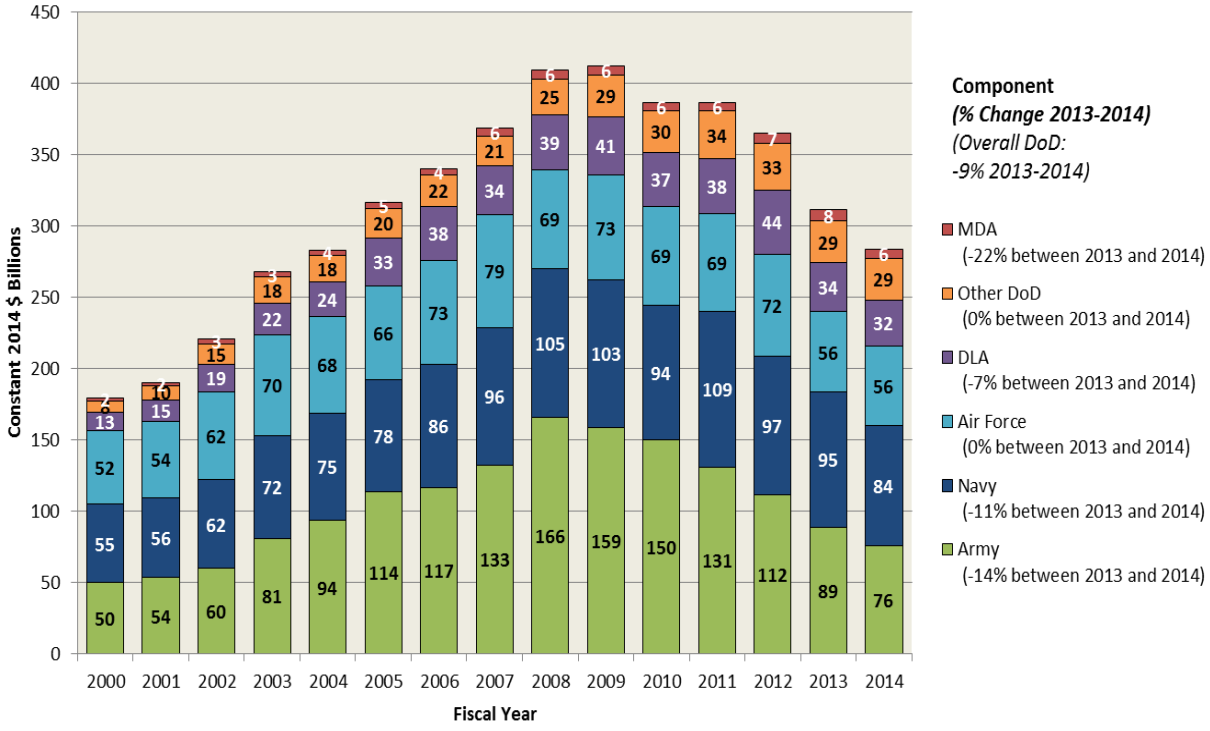
[79] Program Executive Office for Enterprise Information Systems (PEOEIS), "About NMCI," http://www.public.navy.mil/spawar/PEOEIS/NEN/NMCI/Pages/AboutUs.aspx.
[80] Noah Shachtman, "HP Holds Navy Network 'Hostage' for $3.3 Billion," *Wired*, August 31, 2010, http://www.wired.com/2010/08/hp-holds-navy-network-hostage.
[81] Sean Lyngaas, "Navy, HP tout NGEN as a model for IT services," *FCW*, September 10, 2014, https://fcw.com/articles/2014/09/10/navy-hp-it-services.aspx.
[82] Nick Wakeman, "Navy gearing up for NGEN recompete," *Washington Technology*, September 15, 2015, https://washingtontechnology.com/blogs/editors-notebook/2015/09/navy-ngen-rfi.aspx.
[83] John Markoff, "Google Adds to Its Menagerie of Robots," *New York Times*, December 14, 2013, http://www.nytimes.com/2013/12/14/technology/google-adds-to-its-menagerie-of-robots.html?_r=0.

5. What Are the Defense Components Buying?

Because contracting decisions are made within contracting elements of the major DoD components, it is important to look at contracting trends within those components, rather than just for DoD overall. This section seeks to answer two related research questions: first, how have the budget drawdown, sequestration, and its aftermath affected contract spending within the major DoD components? And second, what are the specific sources of any increases or declines in contract obligations within the major DoD components? Data for 2014 allow CSIS to evaluate if the immediate post-sequestration trends seen in 2013 were one-year anomalies, or they appear to be the beginnings of new long-term trends.

Figure 5-1 shows the trends in total obligations for each component.

Figure 5-1: Defense Contract Obligations by Component, 2000–2014



Source: FPDS; CSIS analysis.

The decline in Army contract obligations since 2009 (-52 percent) has significantly outpaced the decline in overall DoD contract obligations, reflecting the ramping down from the wartime buildup. The Navy (-19 percent), Air Force (-24 percent), and DLA (-22 percent) all declined more slowly than overall DoD. Meanwhile, contract obligations within MDA (-1 percent) and "Other DoD" (1 percent) were nearly steady, though MDA saw significant volatility within the 2009–2014 period.

In 2014, as overall DoD contract obligations declined by 9 percent, Air Force and "Other DoD" (0 percent) were able to maintain their contract obligations levels from the previous year. DLA (-7 percent) and Navy (-11 percent) saw declines comparable to those of overall DoD, while the

Army (-14 percent) and MDA (-22 percent) declined more steeply than did DoD overall. The sections that follow will examine trends in contracting for the five largest DoD contracting components, plus "Other DoD," focusing on products and services, since R&D contracting trends were discussed in detail in section 2.1.4. To facilitate this analysis, the sections that follow break down DoD's contracting portfolio below the Products/Services/R&D level. Specifically, CSIS has developed a taxonomy for both DoD services and DoD products that enables more detailed analysis. CSIS divides DoD's services contracting portfolio into five categories:

- Equipment-related Services (ERS)
- Facilities-related Services & Construction (FRS&C)
- Information & Communications Technology (ICT) services
- Medical (MED) services
- Professional, Administrative, and Management Support (PAMS) services

The CSIS taxonomy for DoD's products contracting portfolio, developed as part of a research effort performed for the Naval Postgraduate School on trends in DoD products contracting,[84] divides DoD's products contracting portfolio into 10 categories:

- Aircraft
- Ground Vehicles
- Ships
- Missiles & Space (M&S)
- Engines & Power Plants (E&PP)
- Electronics & Communications (E&C)
- Fuels
- Launchers & Munitions (L&M)
- Clothing & Subsistence (C&S)
- "Other Products"

5.1. Army

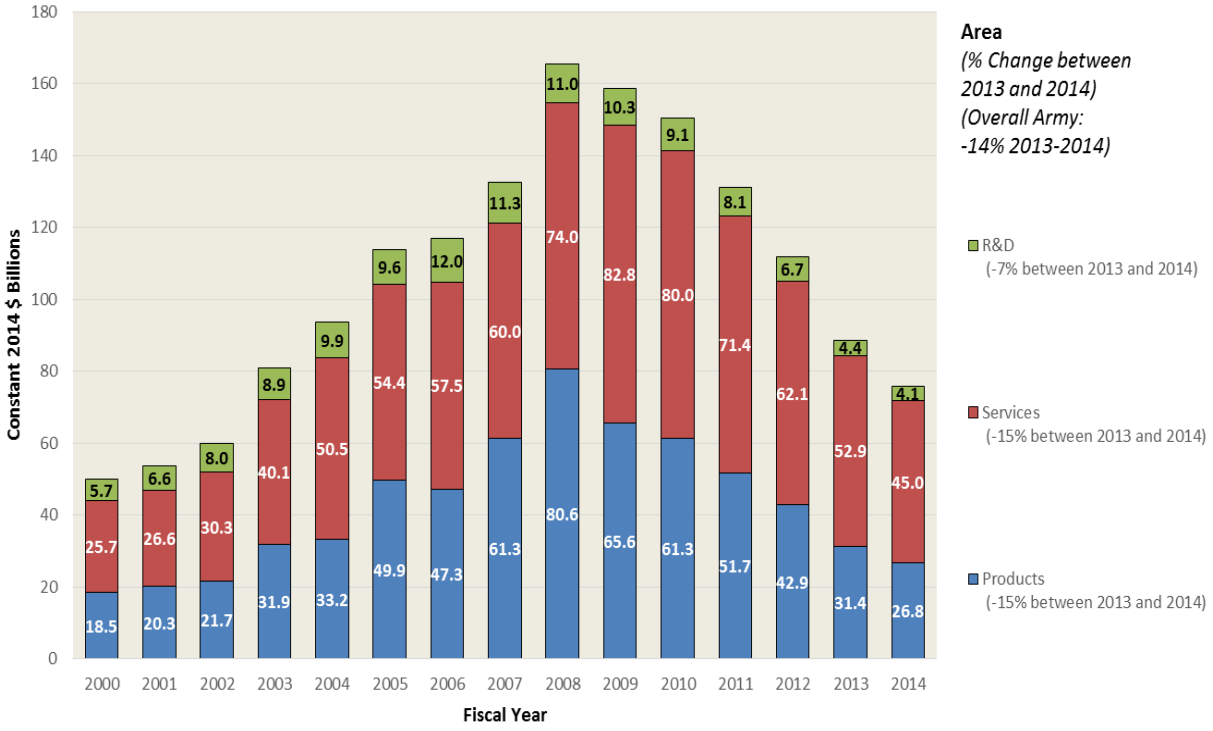
The wars in Iraq and Afghanistan had a profound effect on Army contracting, as contract obligations by the Army more than tripled between 2000 and 2008, from $50 billion to $166 billion. As operations in Iraq and Afghanistan have wound down in recent years, however, Army contract obligations have declined precipitously—since 2008, overall Army contract obligations declined by 54 percent between 2008 and 2014, to $76 billion, the lowest amount for the Army since 2002. Of that decline, 83 percent has occurred since 2010. This decline is the result of a number of factors: the aforementioned ramping down of overseas combat operations; the overall budget drawdown and fiscal uncertainty facing DoD; and the Army's recent inability to start and

[84] Ellman and Bell, *Analysis of Defense Products Contract Trends, 1990–2014*, 10.

sustain major development and procurement programs meant to replace aging and worn-down platforms.

Figure 5-2 shows Army contract obligations, broken down by what is being contracting for—Products, Services, and R&D:

Figure 5-2: Army Contract Obligations by Area, 2000–2014



Source: FPDS; CSIS analysis.

The decline in Army contract obligations since the peak in 2008 has not been evenly distributed across the Army's contracting portfolio. While products (-67 percent) and R&D (-63 percent) have fallen more steeply than overall Army, contract obligations for services have fallen significantly more slowly (-39 percent). This trend was particularly evident in 2013, the first year in which the impact of sequestration could be clearly seen—as overall Army contract obligations fell by 21 percent, obligations for products and R&D fell by 27 percent and 34 percent, respectively. Meanwhile, contract obligations for services within the Army were relatively preserved (-15 percent).

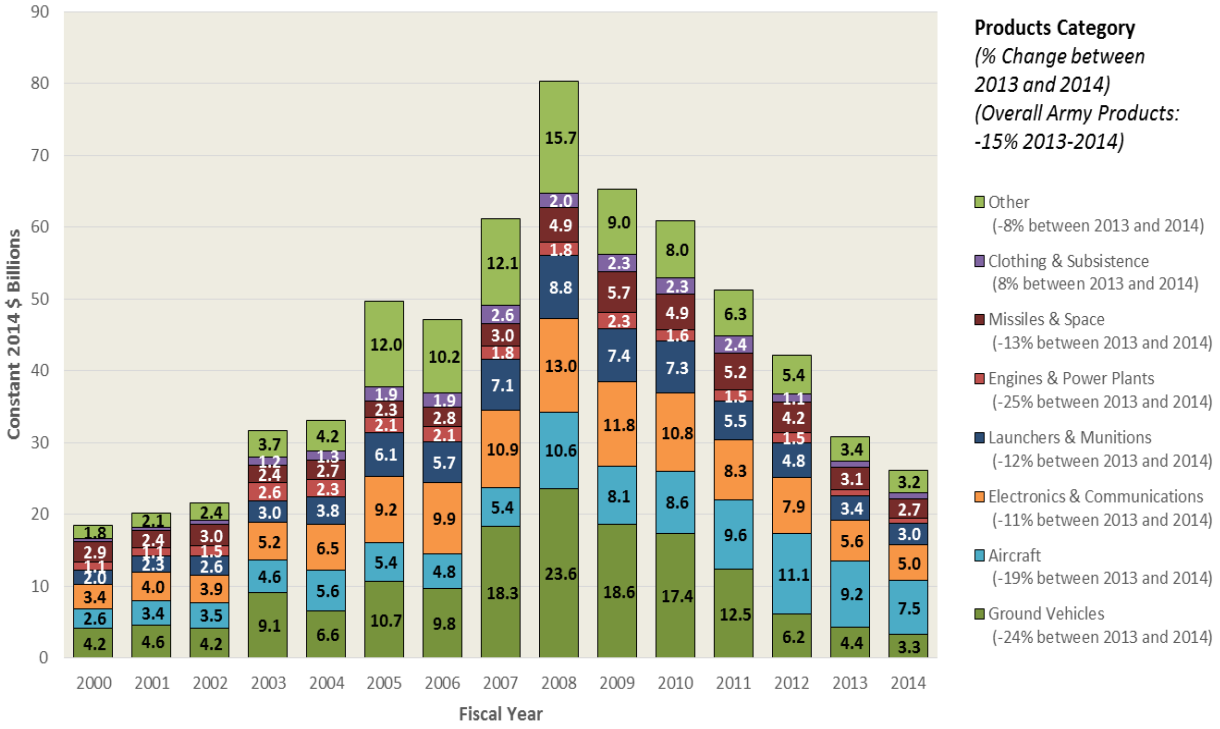
In 2014, however, this trend has altered somewhat: as overall Army contract obligations declined by 14 percent (still faster than overall DoD contract obligations), both products and services declined roughly in parallel to the overall decline within the Army (-15 percent for both products and services). By contrast, contract obligations for R&D (-7 percent) declined at less than half the rate of overall Army; this nonetheless brought obligations for Army R&D contracts to their lowest level in the 2000-2014 period.

The following sections will examine the specific sources of decline within Army's products and services contract portfolios, as well as other notable trends in Army contracting.

Army Products

Figure 5-3 shows contract obligations for Army products contracts, broken down by category of products.

Figure 5-3: Army Products Contract Obligations, by Products Category, 2000–2014[85]



Source: FPDS; CSIS analysis.

As overall Army products contract obligations fell by two-thirds between 2008 and 2014, obligations for Aircraft (-30 percent), Missiles & Space (-45 percent), and Clothing & Subsistence (-54 percent) fell notably more slowly. Meanwhile, obligations for "Other" products (-80 percent) and Ground Vehicles (-86 percent) plummeted from their wartime peaks. The remaining products categories either declined at rates comparable to overall Army products or had minimal obligations during the 2008–2014 period.

Between 2013 and 2014, as overall Army products contract obligations declined by 15 percent, obligations for Ground Vehicles fell by 24 percent, to their lowest level in the 2000–2014 period. The main sources of the decline were a $700 million decline in obligations for "Trucks and Truck Tractors, Wheeled" and a $400 million decline in obligations for "Combat Assault and Tactical Vehicles, Wheeled." Similarly, obligations for E&PP declined by 25 percent, with a $200 million decline in obligations for "Gas Turbines & Jet Engines, Aircraft."

Most other categories of products declined at rates comparable to the overall rate of decline for Army products contract obligations, with two exception: C&S, which saw an 8 percent increase

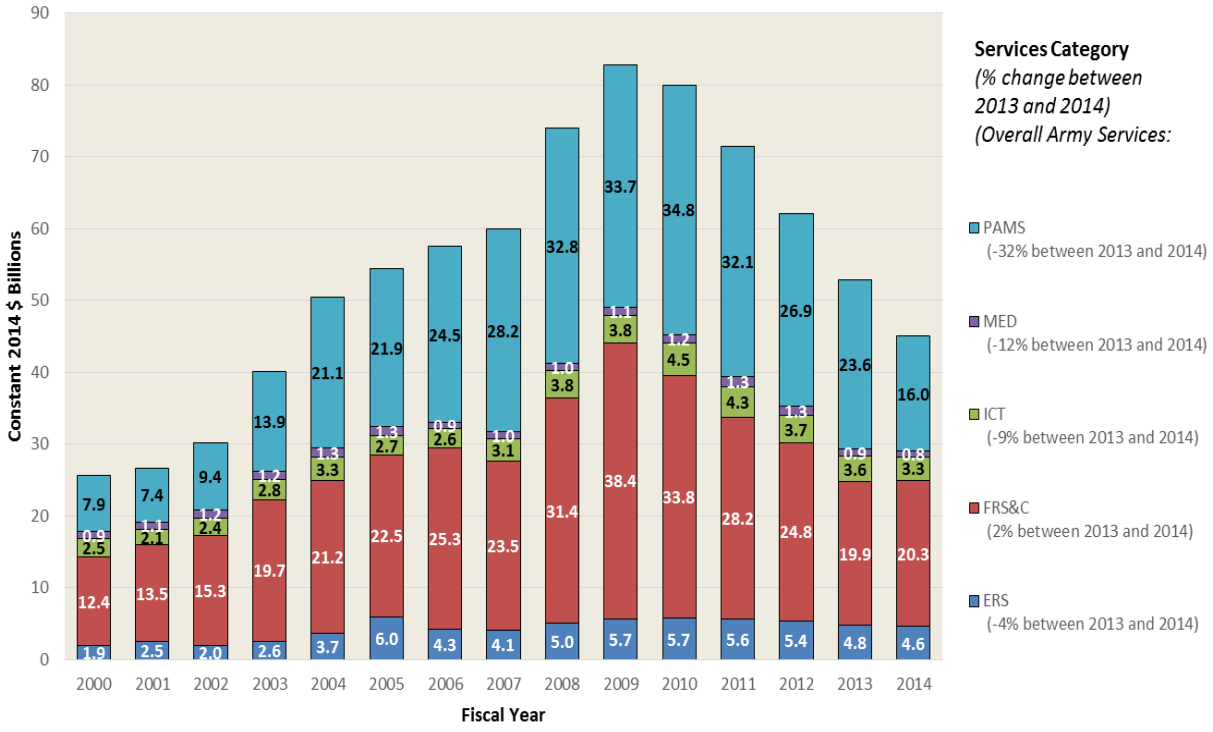
[85] Two products categories (Fuels and Ships) are excluded from this chart because they accounted for minimal amounts of obligations during the period observed.

in 2014, and "Other" products, which declined by only 8 percent, after declining by 37 percent in 2013.

Army Services

Figure 5-4 shows contract obligations for Army services contracts, broken down by category of services.

Figure 5-4: Army Services Contract Obligations, by Services Category, 2000–2014



Source: FPDS; CSIS analysis.

FRS&C and PAMS have accounted for the largest shares of the Army's services contracting portfolio throughout the period observed, but obligations in those two categories more than tripled and quadrupled, respectively, as the pace of operations in Iraq and Afghanistan increased. Obligations for FRS&C (-35 percent since 2008) have declined roughly in parallel with the overall decline in Army services contract obligations since 2008, while obligations for PAMS have fallen more steeply, declining by more than half (-51 percent). Over that same 2008–2014 period, contract obligations for MED (-20 percent), ICT (-12 percent), and ERS (-8 percent) were relatively preserved within the Army. The relatively small rate of decline for ERS is particularly noteworthy, reflecting the large amount of repair and maintenance work the Army has needed to do on its aging vehicle fleet to bring it back to readiness after the wear-and-tear of nearly a decade of continuous combat operations.

Between 2013 and 2014, Army contract obligations for PAMS fell particularly sharply, declining by 32 percent, over twice the rate of overall Army services. The main sources of this decline were a $4 billion decline in obligations for "Logistics Support Services" and a $1.5 billion decline in obligations for "Engineering and Technical Services." MED (-12 percent) and ICT (-9 percent) fell somewhat less steeply than overall Army services, while ERS (-4 percent) fell at

slightly more than one-fourth the rate of overall Army services. Meanwhile, Army contract obligations for FRS&C actually increased by 2 percent between 2013 and 2014.

Competition for Army Contract Obligations

The rate of effective competition for Army contract obligations has been on the rise in recent years—after hovering near 50 percent between 2004 and 2011, the rate of effective competition rose to 57 percent by 2013, and was 56 percent in 2014.

Contract Pricing Mechanism Use in Army Contracting

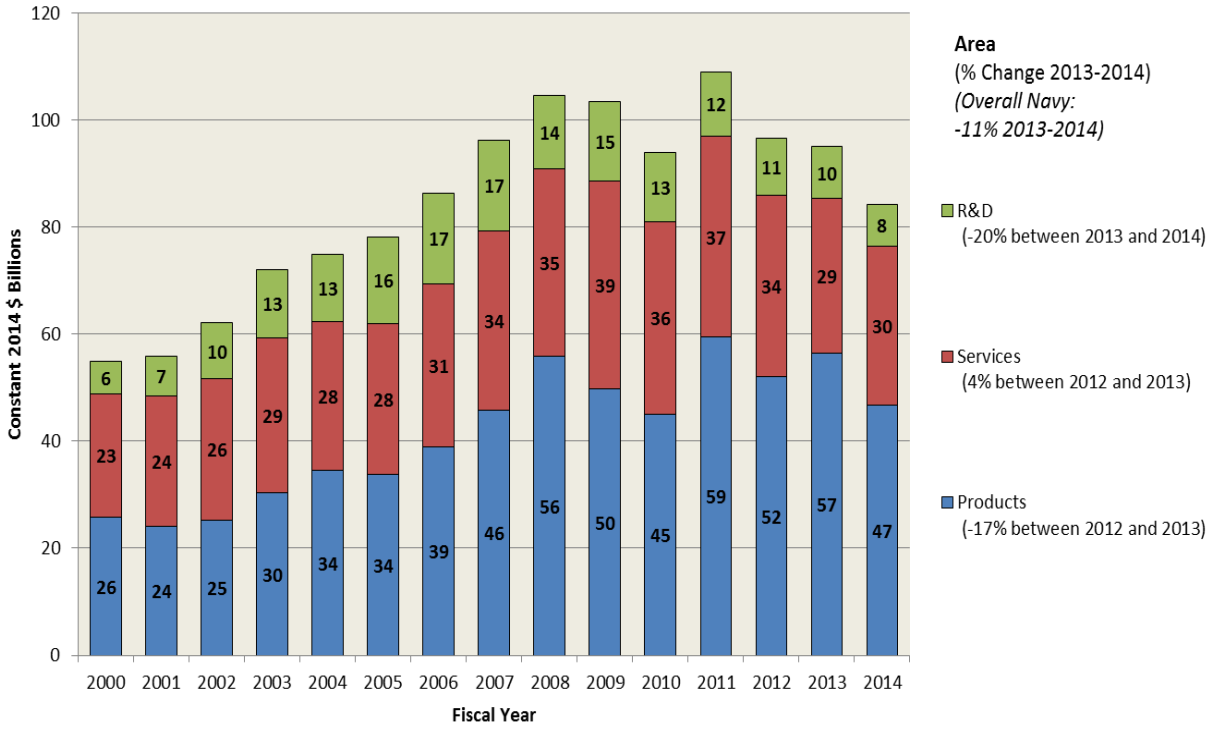
Between 2013 and 2014, there was a notable shift in the use of contract pricing mechanisms in Army contracting. The share of Army contract obligations awarded under fixed-price contract types rose from 68 percent in 2013 to 74 percent in 2014, the highest share in the 2000–2014 period. In parallel, the share awarded under cost reimbursement contract types declined from 28 percent in 2013 (the highest share since 2004) to 23 percent in 2014. This shift comes as a result not of a large increase in obligations under fixed-price contract types, but rather a large decrease in obligations under cost reimbursement contract types–contract obligations under cost reimbursement contract types declined by 28 percent between 2013 and 2014, twice the rate of overall Army contracts. Meanwhile, obligations under fixed-price contract types declined by only 7 percent, half the rate of overall Army. The shift primarily occurred with the Army's services contracting portfolio—the share of Army services contract obligations awarded under fixed-price contract types rose from 60 percent in 2013 to 72 percent in 2014.

5.2. Navy

Though the Navy did not see the same growth in contract obligations as Army during the 2000–2008 period, Navy contract obligations still nearly doubled over the period, from $55 billion in 2000 to $105 billion in 2008. Navy contract obligations have fluctuated up and down in the years since, largely based on the timing of contracts for large programs such as the Joint Strike Fighter (JSF) and the DDG-51 destroyer. By 2014, overall Navy contract obligations were 19 percent below 2008 levels, at $84 billion, the lowest level since 2005.

Figure 5-5 shows Navy contract obligations, broken down by what is being contracting for—Products, Services, and R&D.

Figure 5-5: Navy Contract Obligations by Area, 2000–2014



Source: FPDS; CSIS analysis.

As overall Navy contract obligations declined by 19 percent between 2008 and 2014, both products (-17 percent) and services (-15 percent) declined at roughly similar rates. In both cases, however, that decline was not consistent or smooth. Navy contract obligations for products fell from $56 billion in 2008 to $45 billion in 2010, but then spiked to $59 billion in 2011. Products obligations levels have fluctuated since, largely due to the timing of contracts for procurement of major aircraft and ship platforms. For services, obligations levels fluctuated between 2008 and 2011, peaking at $39 billion in 2009, but declined by 23 percent between 2011 and 2013, to $29 billion, the lowest total for Navy services since 2005.

In 2014, Navy contract obligations for products declined by 17 percent, after actually increasing by 9 percent in 2013. By contrast, Navy services, which saw a 15 percent decline in 2013 (as overall Navy contract obligations declined by only 2 percent), saw a 4 percent increase in 2014.

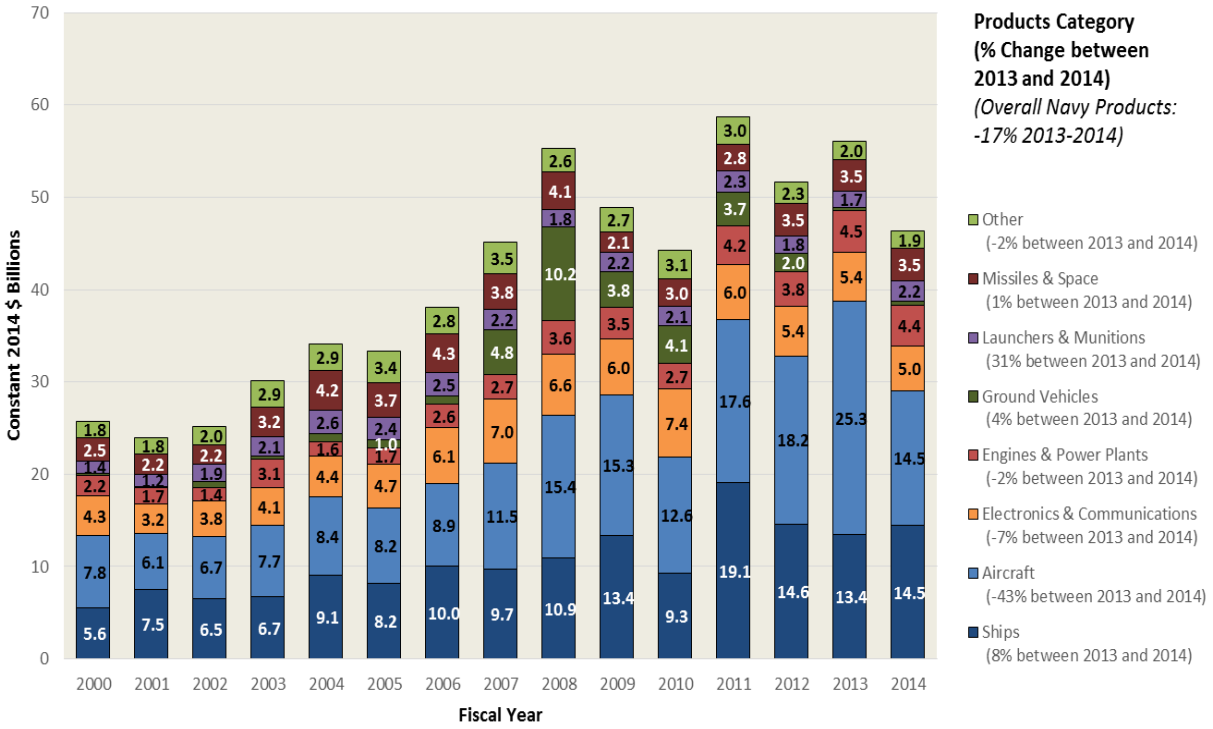
Navy contract obligations for R&D peaked at $17 billion in 2006 and 2007, but have declined fairly steadily since, to under $8 billion in 2014, the lowest level since 2001. The sources of this decline were discussed in detail in Chapter 2.

The following sections will examine the specific sources of decline within Navy's products and services contract portfolios.

Navy Products

Figure 5-6 shows contract obligations for Navy products contracts, broken down by category of products.

Figure 5-6: Navy Products Contract Obligations, by Products Category, 2000–2014[86]



Source: FPDS; CSIS analysis.

Though overall Navy products contract obligations have declined by 17 percent compared to 2008 levels, there has not been the sort of consistent downward trend seen in Army products contracting. Rather, Navy contract obligations for products have fluctuated in recent years primarily based on the timing of contracts for the development and procurement of large aircraft and ship programs. For example, the nearly 33 percent increase in Navy products contract obligations between 2010 and 2011 is primarily due to the timing of contracts for major programs such as the JSF, the DD(X) next-generation destroyer, and the DDG-51 destroyer, rather than representing a significant change in contracting behavior within the Navy. The major exception is in Ground Vehicles, where the winding down of operations in Iraq and Afghanistan has led to a 96 percent decline in contract obligations between 2008 and 2014, returning obligations to levels seen in the early 2000s.

That same caveat must be kept in mind when looking at changes in obligations for Navy products between 2013 and 2014. Contract obligations for Navy Aircraft declined by 43 percent in 2013, around two-and-a-half times the magnitude of the decline in overall Navy products, after increasing by 39 percent in 2013. But that fluctuation is primarily the result of the timing of contracts for JSF—obligations for the aircraft increased by nearly $7.5 billion between 2012 and 2013, before declining back to below 2012 levels in 2014. Similarly, the 8 percent increase in obligations for Navy Ships in 2014 can be traced back to the timing of contracts for the Virginia-

[86] Two product categories (Fuels and C&S) are excluded from this chart because they accounted for minimal amounts of obligations in most years.

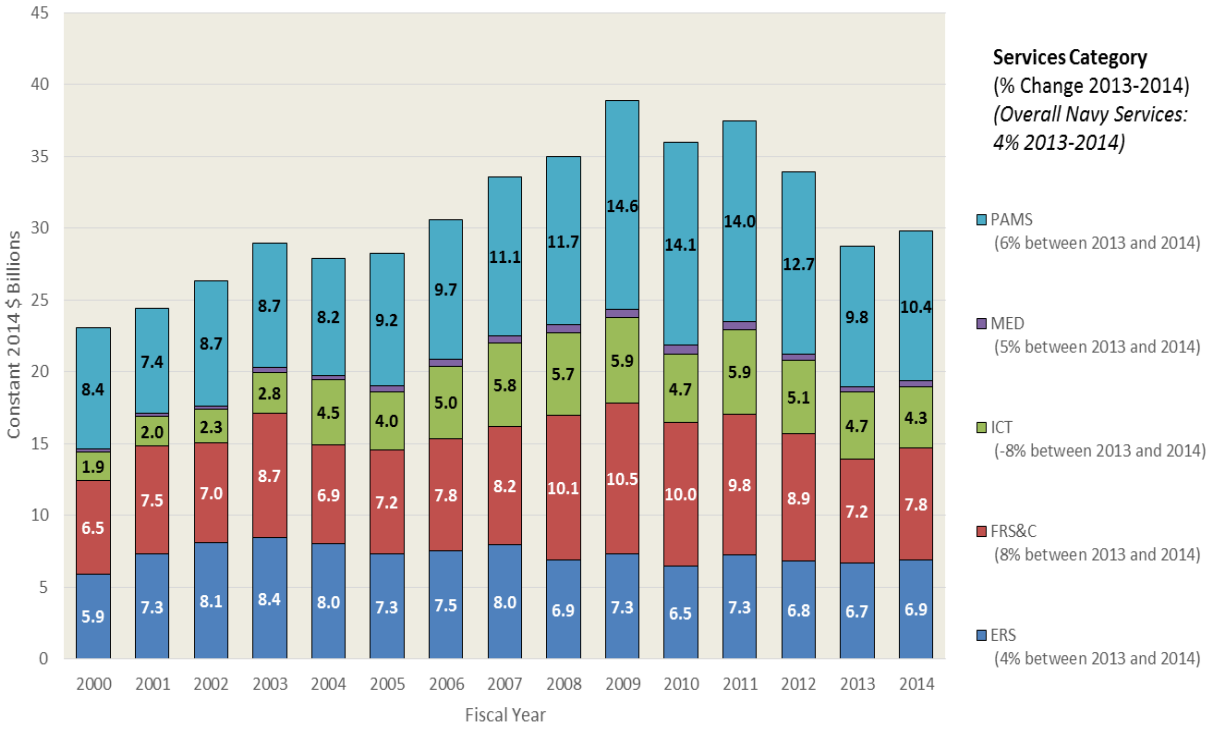
class submarine, where obligations doubled from just over $3 billion in 2013 to $6 billion in 2014.

Other categories of Navy products have seen obligations levels largely preserved, if not increased, in the aftermath of sequestration. Navy contract obligations for E&C, though nearly a third below their peak level in 2010, have declined by only 8 percent since 2012, slightly slower than the rate of decline for overall Navy products. Obligations for M&S have been virtually unchanged between 2012 and 2014, while obligations for E&PP (17 percent) and L&M (21 percent) have increased notably, despite the budgetary pressures facing the Navy. Those increases are attributable to increased obligations for "Nuclear Reactors" and "Fire Control Equipment–Except Aircraft," respectively.

Navy Services

Figure 5-7 shows contract obligations for Navy services contracts, broken down by category of services.

Figure 5-7: Navy Services Contract Obligations, by Services Category, 2000–2014



Source: FPDS; CSIS analysis.

Navy contract obligations levels for ERS have been largely steady since 2008, with moderate year-to-year fluctuation hovering around $7 billion. FRS&C had been largely stable from 2008–2011, but obligations levels have declined since, and for the period, Navy FRS&C contract obligations declined by 23 percent. ICT saw somewhat more volatility, but has seen a similar decline over the last few years, and obligations levels have fallen by 25 percent compared to 2008 levels. PAMS has consistently been the largest category within the Navy's services contracting portfolio, peaking at nearly $15 billion in 2009. But PAMS contract obligations have

declined by -28 percent since 2009, falling back to mid-2000s levels. MED has never accounted for more than $660 million in contract obligations within the Navy in the 2000–2014 period.

In 2014, ERS (4 percent), MED (5 percent), and PAMS (6 percent) all increased at a rate comparable to that of overall Navy services. The increase in PAMS contract obligations is particularly notable, given that PAMS within the Navy declined by 22 percent in 2013. About a third of the decline in 2013 was due to the ending of a two-year effort (or group of efforts), totaling over $1 billion a year in 2011 and 2012, categorized as "Special Studies/Analysis–Technology"; the rest of the decline was broad-based across the range of services categorized as PAMS.

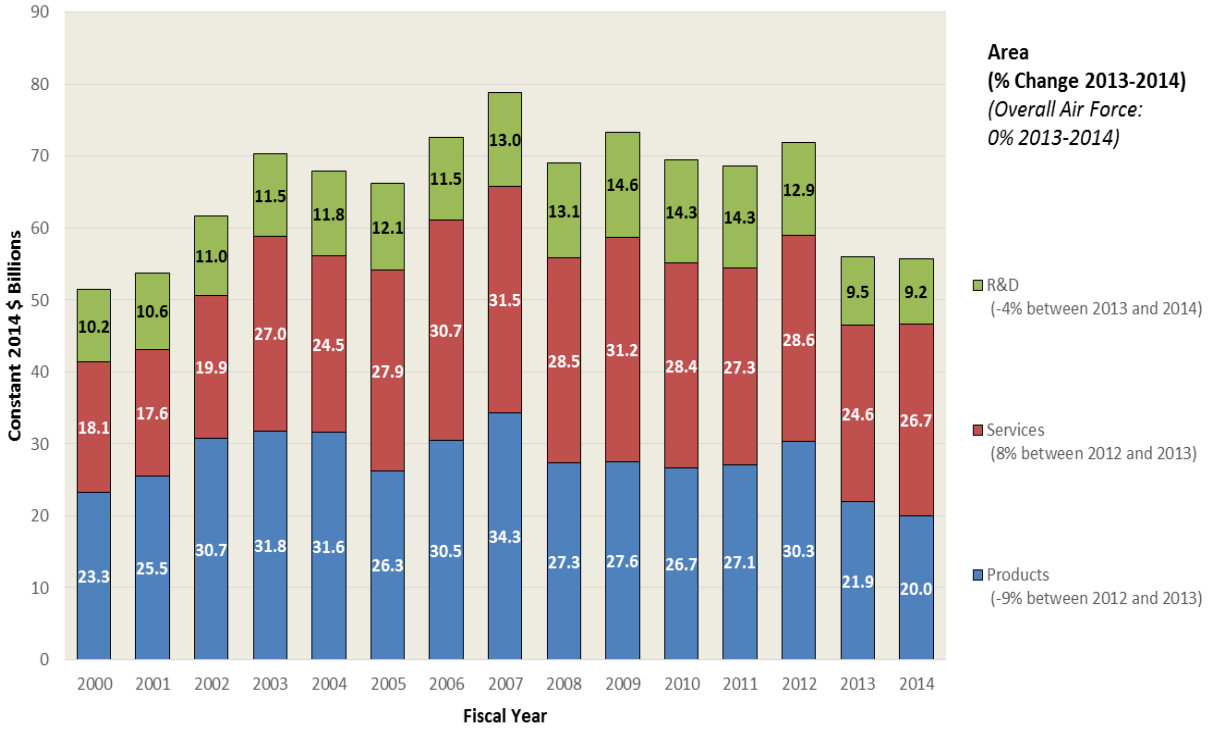
Navy contract obligations for FRS&C increased in 2014 by 8 percent, twice the rate of growth for overall Navy services, after declining by 19 percent in 2013. The increase was broad-based, but the most notable source of growth was a $300 million increase in obligations for "Construction of Other Airfield Structures." ICT contract obligations, meanwhile, have declined by 8 percent in each of the last two years; the main sources of that decrease were a $900 million decline in obligations for "Maintenance/Repair of Communications Equipment" since 2012, and a $500 million decline in obligations for "IT and Telecom–Integrated Hardware/Software/Services Solutions" between 2013 and 2014.

5.3. Air Force

Compared to the Army and Navy, the Air Force saw a much less significant decline in overall contract obligations in the peak years of combat operations in Iraq and Afghanistan. Overall Air Force contract obligations increased by a relatively modest 53 percent between 2000 and the peak year 2007. Subsequently, Air Force contract obligations fluctuated near $70 billion from 2008–2012, before declining significantly in 2013, to $56 billion.

Figure 5-8 shows Air Force contract obligations, broken down by what is being contracting for—Products, Services, and R&D.

Figure 5-8: Air Force Contract Obligations by Area, 2000–2014



Source: FPDS; CSIS analysis.

Overall Air Force contract obligations have declined by 29 percent since their peak in 2007, though over two-thirds of that decline took place between 2012 and 2013. Air Force products bore a disproportionate share of that decline, falling by 42 percent since 2007; as with overall Air Force products, over two-thirds of that decline took place between 2012 and 2013. By contrast, contract obligations for Air Force services fell by only 15 percent between 2007 and 2014, though that is partially due to an increase in services contract obligations between 2013 and 2014; prior to the increase in 2014, services contract obligations had declined by 22 percent from 2007–2013.

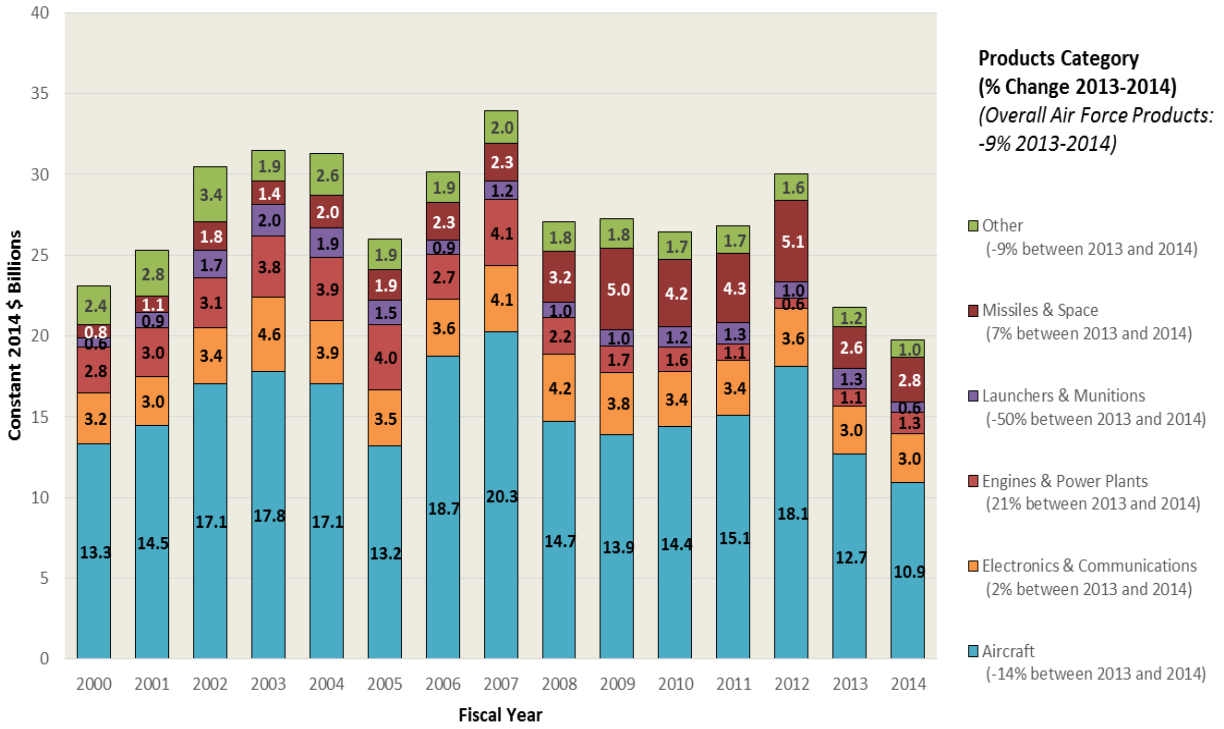
R&D contract obligations within the Air Force peaked in 2009, and held steady through 2011, before declining sharply in 2012 and 2013; in total, Air Force R&D contract obligations declined by 37 percent between 2009 and 2014. The sources of this decline were discussed in detail in Chapter 2.

The following sections will examine the specific sources of decline within Air Force's products and services contract portfolios, as well as other notable trends in Army contracting.

Air Force Products

Figure 5-9 shows contract obligations for Air Force products contracts, broken down by category of products.

Figure 5-9: Air Force Products Contract Obligations, by Products Category, 2000–2014[87]



Source: FPDS; CSIS analysis.

Contract obligations for Air Force products were relatively stable from 2008–2011, after a one-year spike in 2007, despite the budgetary pressures facing DoD. This stability did not extend across all categories of products within the Air Force's contracting portfolio, however. Obligations for Aircraft were relatively steady from 2008–2011, spiked upward by 20 percent in 2012, and have dropped by 40 percent since. Air Force contract obligations for E&C (-28 percent) have declined fairly steadily since 2008, while obligations for "Other" products were relatively stable until sharp declines in 2013 and 2014. Similarly, obligations for L&M were stable from 2008–2013, but dropped by half in 2014. Obligations for E&PP fell by 71 percent between 2008 and 2012, and though obligations levels have rebounded since, they are still around half the amount obligated in 2008. And contract obligations for M&S declined sharply in 2013, but that is the result of a data anomaly (over $2 billion obligated for space launches were reclassified from being a product to being a service within FPDS) rather than an actual trend.

In 2013, overall Air Force contract obligations declined by 28 percent; as noted in the study team's prior report on DoD contract trends through FY2013, the main drivers of the decline "are cuts related to the C-17A (-$3.5 billion) . . . and a $3 billion decline for uncategorized fixed-wing aircraft that the study team believes to be related to the F-35 Joint Strike Fighter,"[88] along with the aforementioned reclassification of obligations for space launches.

[87] Four product categories (Fuels, C&S, Ships, and Ground Vehicles) are excluded from this chart because they accounted for minimal amounts of obligations during the period observed.

[88] By system equipment code, the Air Force has less than $30 million in contract obligations categorized under the F-35 between 2010 and 2014 combined, an obvious data error resulting from the system equipment code field being

In 2014, Air Force products contract obligations declined by only 9 percent, and that cut appears to be more widely dispersed than in 2013, where the cuts were concentrated in major aircraft platform programs. Obligations for Aircraft declined by 14 percent, with a nearly $800 million increase in obligations for the C-130J transport plane offset by a $1.5 billion decline in obligations for uncategorized fixed-wing aircraft that the study team believes to be related to the F-35 Joint Strike Fighter, as well as a $400 million decline in contract obligations for "Miscellaneous Aircraft Accessories & Components." By contrast, contract obligations for E&PP increased by 21 percent in 2014 and by 67 percent since 2012, due to a doubling of contract obligations (from ~$550 million to $1.1 billion) for "Gas Turbines & Jet Engines–Aircraft."

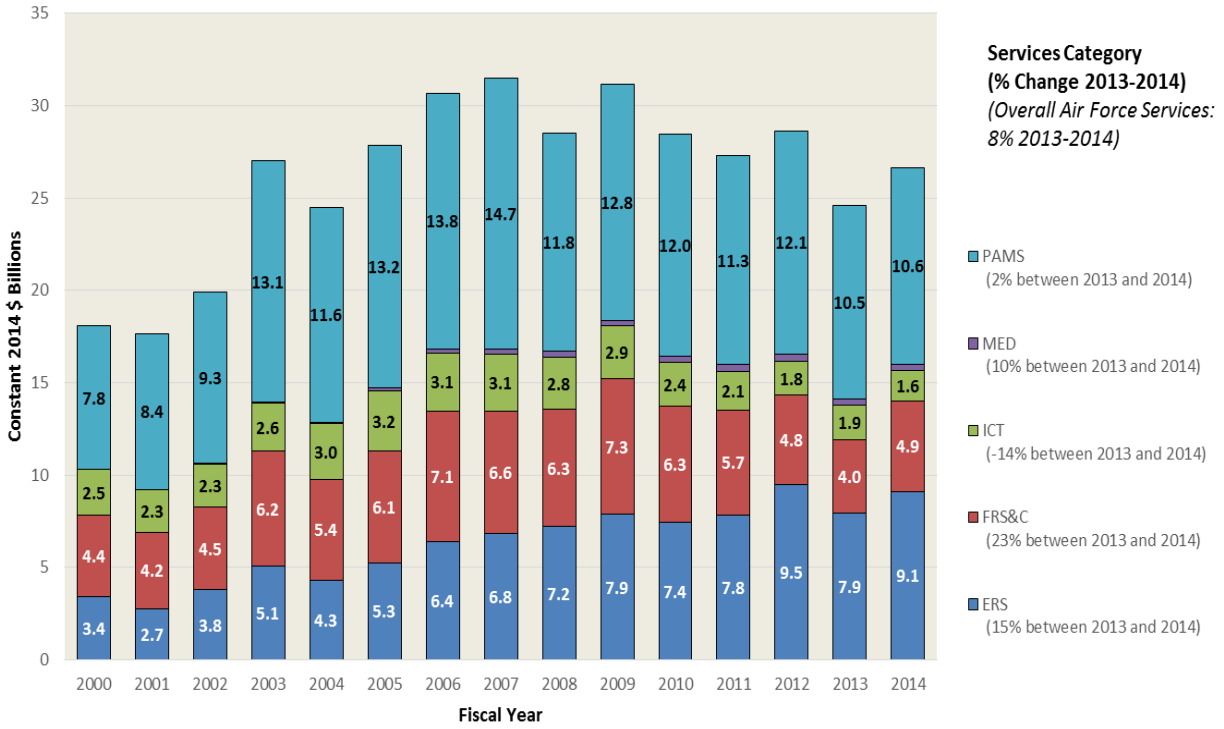
Air Force obligations for L&M declined by 50 percent in 2014, due primarily to a $500 million decline in obligations for "Bombs." And while obligations for M&S increased by 7 percent in 2014, there was significant volatility within specific programs: obligations for the Advanced Medium-Range Air-to-Air Missile (AMRAAM) program declined by nearly $400 million, while obligations significantly increased for the Joint Air-to-Surface Standoff Missile (JASSM) cruise missile ($400 million), NAVSTAR GPS satellite ($400 million), and the Space-Based Infrared System (SBIRS) High satellite ($250 million).

Air Force Services

Figure 5-10 shows contract obligations for Air Force products contracts, broken down by category of products.

left blank. Oddly, over the last two years, FPDS shows that the Air Force has obligated over $3 billion for fixed-wing aircraft categorized under the system equipment code for the Shillelagh missile, an Army antitank missile program from the 1960s and 1970s. CSIS urges Air Force policymakers to emphasize greater attention to proper FPDS data entry for the system equipment code data field, reinforced by the publishing of a system equipment code book that avoids code reuse.

Figure 5-10: Air Force Services Contract Obligations, by Services Category, 2000–2014



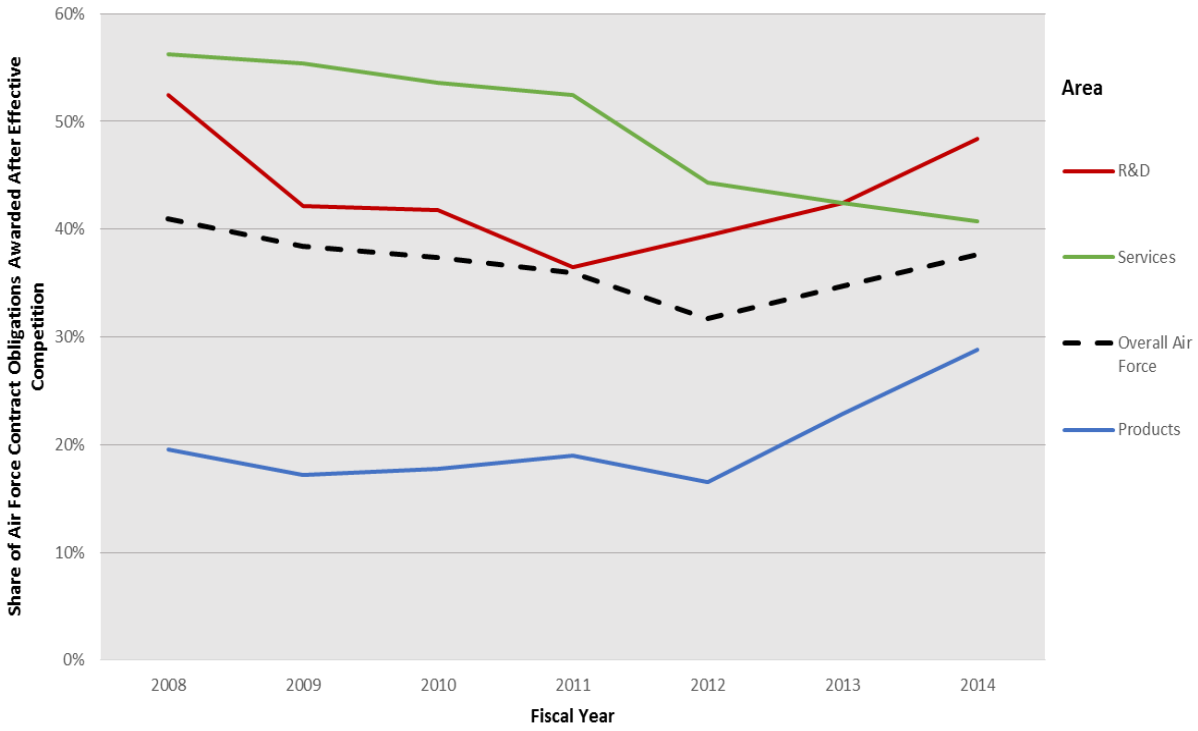
Source: FPDS; CSIS analysis.

Air Force contract obligations for services were relatively stable between 2008 and 2012, before declining notably (-14 percent) in 2013. As with Air Force products, however, this pattern of decline was not uniform across all categories of services within the Air Force's contracting portfolio. The overall pattern holds true for Air Force PAMS contract obligations, which have consistently been the largest category of services contracts within the Air Force—PAMS contract obligations were steady from 2008–2012, before declining by 13 percent in 2013. Contract obligations for ERS were relatively stable from 2008–2011, and have spike up and down in the years since. Obligations for FRS&C increased by 15 percent between 2008 and 2009, but have declined steadily since, falling by 45 percent between 2009 and 2013. Similarly, contract obligations for ICT have declined consistently through the drawdown period, falling by 44 percent between 2009 and 2014.

In 2014, Air Force ERS contract obligations rose by 15 percent, though this was primarily an artifact of the continuing reclassification of space-launch contracts from products to services. FRS&C contract obligations increased by 23 percent in 2014, the result of a broad-based increase across the Air Force FRS&C portfolio. ICT contract obligations fell by 14 percent, declining to the lowest level in the 2000–2014 period. Meanwhile, contract obligations for PAMS rose by only 2 percent, one-fourth the rate of overall Air Force services. The PAMS contract obligation levels seen in 2013 and 2014 are the lowest since 2002.

Competition for Air Force Contract Obligations

Figure 5-11: Rate of Effective Competition for Air Force Contract Obligations, by Area, 2008–2014



Source: FPDS; CSIS analysis.

For Air Force overall, the rate of effective competition for contract obligations fell from 41 percent in 2008 to 32 percent in 2012, the lowest rate for the 2000–2014 period, before rebounding to 38 percent by 2014. Within the Air Force contracting portfolio, the rate of effective competition for products, which hovered at or slightly below 20 percent from 2008–2012, has risen to 29 percent in 2014, the highest rate for Air Force products since 2002. This is not, however, an indication that the Air Force is actually getting more competition for its products; rather, it is the result of declining obligations for production of major platforms such as the C-17A, the F-15, and the Wideband Gapfiller satellite in 2013 and 2014. Since production contracts for major platforms are almost universally sole-source, this decline in obligations related to production of major platforms has led to an increase in the share of Air Force products contract obligations awarded after effective competition.

What does appear to be a real trend, however, is the decline in competition for services contracts within the Air Force. The rate of effective competition for Air Force services contract obligations has declined from 56 percent in 2008 to 41 percent in 2014. This is particularly noteworthy, because for DoD overall, approximately two-thirds of services contract obligations have been awarded after effective competition in every year from 2008–2014. This means that the rate of effective competition for services contracts within the Air Force, which was already 10 percentage points below the DoD average in 2008, is now 25 percentage points below the rate for DoD overall.

The study team recently put out a report examining the sources of this steep decline in Air Force services contract obligations.[89] The report concluded that, while 4 to 5 percentage points of the decline were due to factors such as data reclassification and shifts in the Air Force's services contracting portfolio (i.e., spending more on types of services that traditionally get less competition), the remainder of the decline appears to be real. Specifically, the rate of effective competition for Air Force PAMS has declined from 44 percent in 2010 to 36 percent in 2014 (compared to 58 percent for DoD overall in 2014), while the rate for Air Force ERS has declined from 52 percent in 2010 to 27 percent in 2014 (compared to 56 percent for DoD overall). Moreover, the report identifies specific types of PAMS and ERS, such as Engineering & Technical Services, Logistics Support Services, Maintenance/Repair of Aircraft, and Maintenance/Repair of Aircraft Components, where the Air Force shows declining rates of effective competition and/or rates of competition well below levels seen for those types of services contracts DoD-wide.

These results were somewhat surprising to CSIS, given the widespread view among DoD officials and industry experts that the Air Force was ahead of the other major DoD components in improving tradecraft in services acquisition. FPDS data do not provide the study team with sufficient visibility to conclusively state why this decline is taking place, but the study team is confident that this is a real decline that warrants increased attention from policymakers.

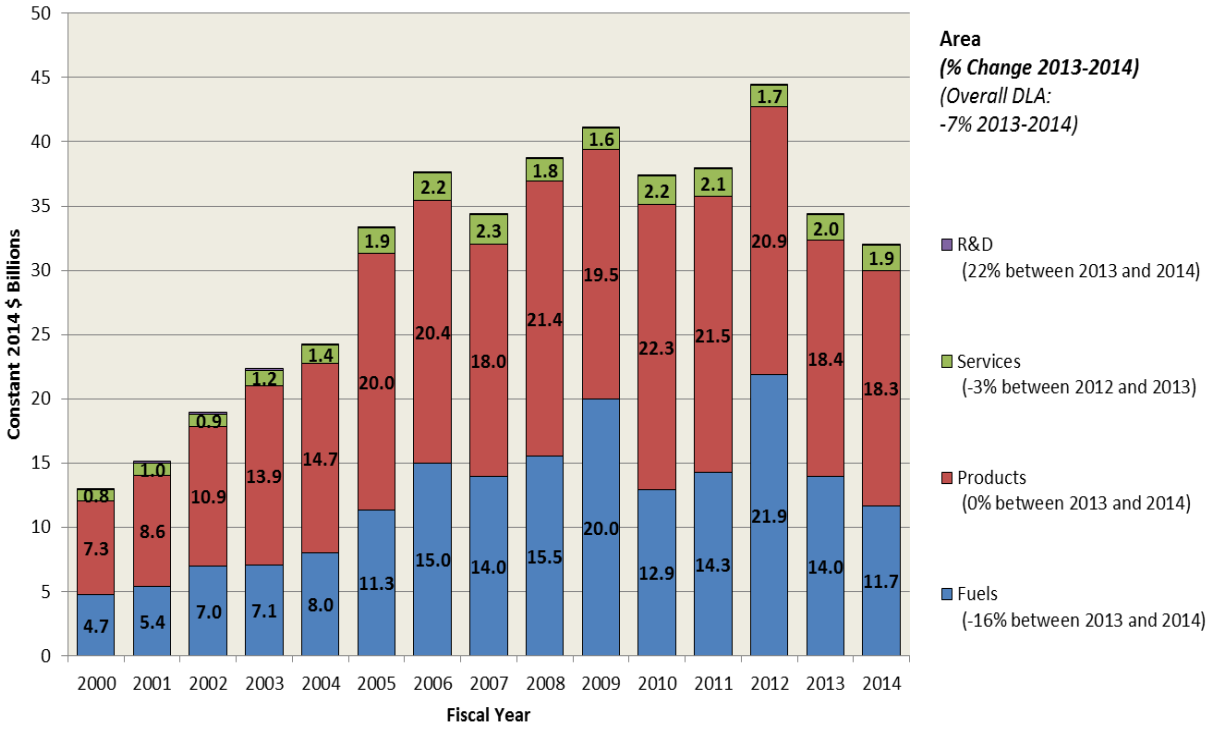
5.4. Defense Logistics Agency

DLA contract obligations more than tripled between 2000 and 2009 as the agency supported ongoing combat operations in Iraq and Afghanistan. Total DLA contract obligations increased from $13 billion in 2000 to $41 billion in 2009. After declining in 2010 and 2011, to between $37 billion and $38 billion, obligations rose dramatically in 2012, to over $44 billion. This one-year spike was the artifact of the timing of fuels contracts being concentrated in FY2012, rather than an actual increase in contracting activity. Obligations levels have declined significantly over the last two years, to just under $32 billion in 2014, the lowest level observed since 2004.

Figure 5-12 shows DLA contract obligations, broken down by what is being contracting for—Products, Services, R&D, and Fuels, which is broken out from Products on this chart due to the large share of DLA contract obligations it accounts for.

[89] Jesse E. Ellman, "Air Force Faces Puzzling Decline in Competition for Services," CSIS Defense-Industrial Initiatives Group, October 2015, http://csis.org/files/publication/150925_Ellman_AirForceFacesPuzzlingDecline.pdf.

Figure 5-12: DLA Contract Obligations by Area, 2000–2014



Source: FPDS; CSIS analysis

DLA contract obligations for fuels have seen significant spikes in both 2009 and 2012, but those are likely due to anomalies in the timing of large contracts. In the remaining years since 2008, contract obligations for fuels have been relatively stable, before declining in 2014. Obligations for non-fuels products have fluctuated significantly from year-to-year, hovering near $20 billion but rising or falling by 10–15 percent in most years. Services, which did not account for more than 6 percent of DLA contract obligations in any year from 2008–2014, have seen similar year-to-year fluctuation, hovering near $2 billion through most of the 2008–2014 drawdown.

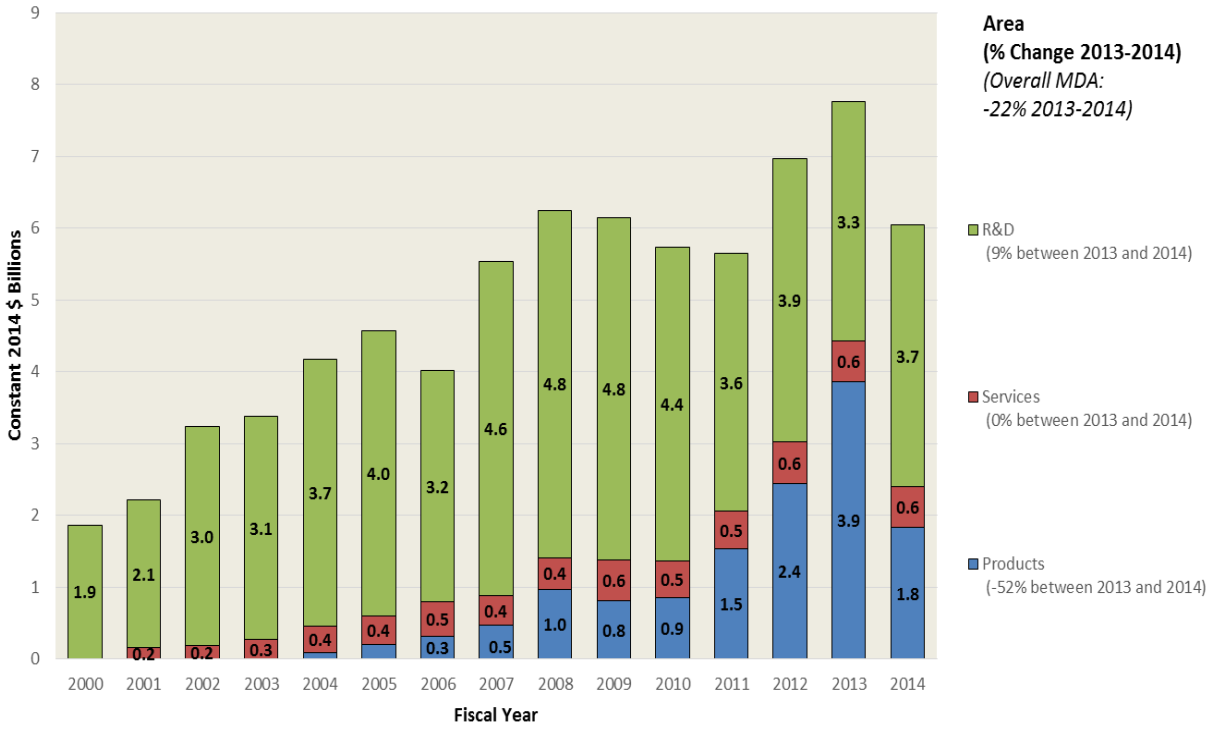
In 2014, as overall DLA contract obligations declined by 7 percent, contract obligations for fuels declined by 16 percent, falling to their lowest levels since 2004. Obligations for non-fuels products were stable (0 percent), while obligations for services decline by 3 percent.

5.5. Missile Defense Agency

MDA, which accounted for only $1.9 billion in contract obligations in 2000, has seen steady growth in its contracting portfolio, rising throughout the period observed to account for a peak of $7.8 billion in contract obligations in 20143, before declining sharply in 2014.

Figure 5-13 shows MDA contract obligations, broken down by what is being contracting for—Products, Services, and R&D.

Figure 5-13: MDA Contract Obligations by Area, 2000–2014



Source: FPDS; CSIS analysis.

As can be seen in Figure 5-13, throughout the 2000s, most of the contracting activity within MDA has gone for R&D. R&D contract obligations peaked at $4.8 billion in 2008 and 2009, but fell off steadily in the subsequent years, declining by 30 percent between 2009 and 2013. Products, which had accounted for small shares of MDA contract obligations prior to 2008, rose sharply in the early 2010s, and peaked in 2013 at $3.9 billion, largely related to the THAAD missile defense system.

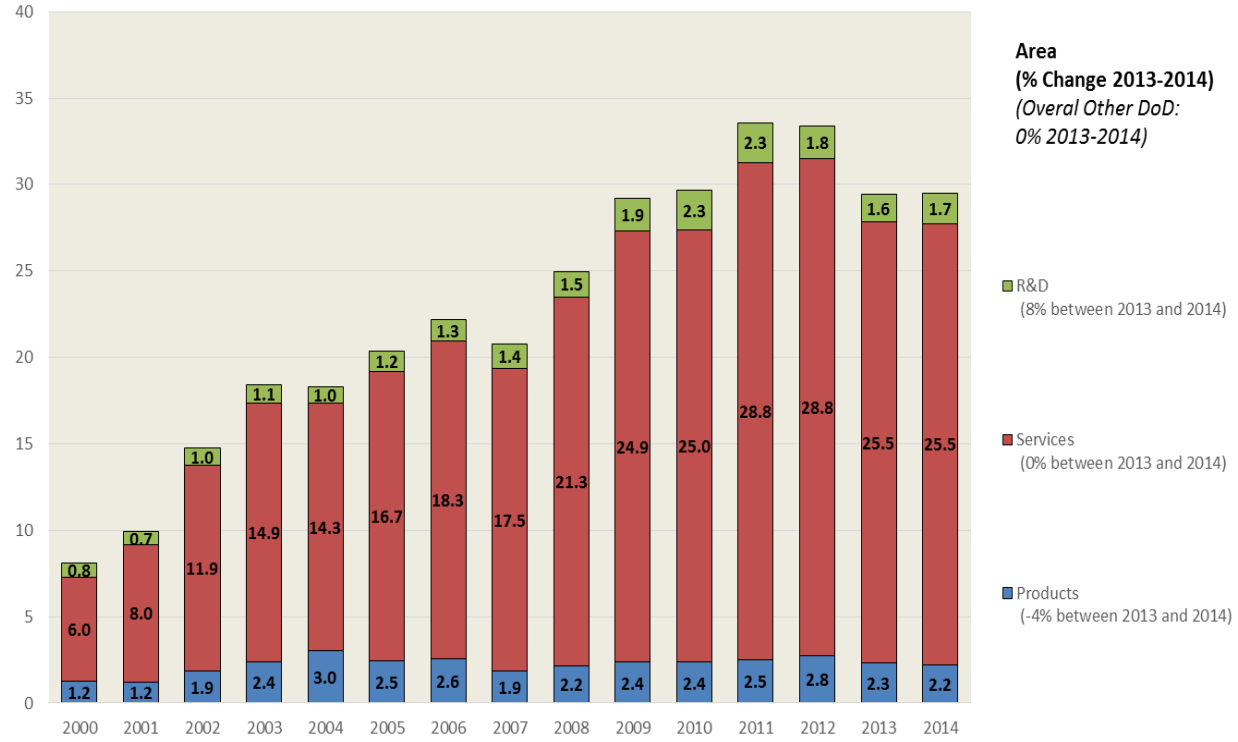
In 2014, MDA products contract obligations declined by 52 percent, while obligations for R&D grew by 9 percent.

5.6. Other DoD

Other DoD, which includes all contracting entities within DoD not included under the other five components, saw consistent growth in its contracting portfolio throughout the 2000s and into the 2010s, rising from $8.1 billion in 2000 to a peak of $33.6 billion in 2011.

Figure 5-14 shows Other DoD contract obligations, broken down by what is being contracting for—Products, Services, and R&D:

Figure 5-14: Other DoD Contract Obligations by Area, 2000–2014



Source: FPDS; CSIS analysis.

The vast majority of contracting activity in the contracting entities comprising Other DoD is for services, with the majority of that being for MED. MED, which accounted for only $1.9 billion in contract obligations in 2000, rose to account for as much as $12.8 billion by 2009, and has accounted for around $12 billion in every year since. The increase in services contract obligations in 2010 and 2011 is primarily the result of U.S. Transportation Command contract obligations for air and sea freight services of equipment out of Iraq and Afghanistan.

In 2014, contract obligations for Other DoD were stable (0 percent).

6. Conclusion

What Is DoD Buying?

What are DoD's top acquisition priorities, and how have those priorities been implemented?

There has been concern among policymakers that DoD would be forced to sacrifice R&D for future projects in order to protect R&D tied to current projects. However, under sequestration and its aftermath, early-stage R&D has been relatively preserved compared to later-stage R&D. From 2009 to 2014, contract obligations for basic and applied research (6.1 and 6.2) declined by 22 percent, approximately half the rate of overall DoD R&D contract obligations. As a result, the share of R&D contract obligations going to basic and applied research rose from 27 percent in 2009 to 38 percent in 2014. In other words, DoD has prioritized protection of its "seed corn" during the drawdown and has seen declines in early-stage R&D contracts much less than those among contracts generally.

How have the drawdown and budget caps changed what DoD is buying?

The enormous decline in system development & demonstration funded contracts (6.5) is telling, and speaks to the larger trend in DoD R&D contracting—over the last several years, as R&D programs related to MDAPs have either been canceled or matured into production, DoD has been largely unable to start and sustain new development programs, either due to budgetary pressures or programmatic difficulties. The overall decline in R&D contract obligations thus represents a five-year trough in the pipeline of new major weapons systems. This decline is especially notable for the Army, which, in the wake of the failure of the Future Combat Systems, has been largely unable to start and sustain new major development programs.

How Is DoD Buying It?

What major reform efforts are currently underway?

There are two major acquisition reform efforts currently underway: one internal to DoD, BBP 3.0, and one external, the reform efforts underway on Capitol Hill. BBP 3.0 is the latest iteration in the Better Buying Power series that aims to "do more with less" in the defense acquisition system. The new guidance within BBP 3.0 emphasizes initiatives aimed at maintaining U.S. technological superiority such as leveraging existing DoD and commercial-sector R&D investments, modular open-system approaches, and improving communication between industry and DoD.

Meanwhile, Congress is making some of the largest changes to defense acquisition statutes since the Federal Acquisition Streamlining Act of 1994. Most notably, the 2016 National Defense Authorization Act (NDAA) consolidated authority and accountability for MDAPs with the military services. It created new authorities and mandated the creation of new processes to accelerate the acquisition of innovative technologies. The 2016 NDAA also included improvements for the acquisition workforce, and streamlined existing processes and authorities, and eased the acquisition of commercial and non-developmental items. Senator McCain and Representative Thornberry, who led the past effort, have also promised to include additional reforms in the 2017 NDAA.

CSIS research on the outcomes of previous reform efforts provides strong evidence that the effect of these reforms will take several years to begin to manifest, will likely not result in

predictable or necessarily uniform change from year to year or across DoD components, and that individual reforms are not likely to lead to substantial changes in system performance. In short, there are no silver bullets in acquisition reform. At the same time, policy changes can and do lead to some measurable change in system performance, particularly in defense agencies, and there is evidence that some policy changes can improve system performance.

How have DoD contracting approaches changed over time and what causes can be identified?

Recent research has led the Department of Defense to place more emphasis on contract incentive structures rather than solely on contract type. Throughout the drawdown there has been a notable rise in fixed-price incentive contracts while other types of fixed-price contracts declined. The same is not true, however, for cost-plus incentive fee contracts. In fact, cost-plus fixed fee contracts grew during the drawdown while other cost-based contracts declined. Disfavored incentive types such as award fee, however, have declined significantly. In September 2014, Better Buying Power 3.0 emphasized the use of contracts with objective incentive structures. The FY2015 data may show a further increase in both types of incentive contracts and a reversal of the growth in cost-plus fixed fee contracts.

Even with the drawdown, and despite consistent emphasis on competition in each iteration of Better Buying Power, CSIS research thus far has found no groundbreaking shifts in competitiveness of the defense industrial base, so it is likely that small shifts will continue to occur from year-to-year.

What can data about contract outcomes tell us that the headlines may miss?

Recent CSIS work has overcome a notable limitation of FPDS, namely the difficulty of deriving any data on contract outcomes. By measuring the frequency and magnitude of contract cost ceiling breaches and terminations, this research demonstrates that risk in the acquisition system is asymmetric. Although the vast majority of contracts are relatively small and short, the vast majority of ceiling breaches and terminations occur on contracts that are either large, long, or both. These factors serve as indicators for complexity. The data demonstrate that the system handles non-complex acquisition contracts with relative ease, and that the problems of concern to policymakers are in fact almost exclusively a feature of more complex acquisitions. That said, there is still greater risk inherent in fixed-price contracts when they experience trouble, as the rate of termination for those contract types is consistently twice that of cost-based contracts. Based on these findings, any attempts to rebuild the system from the ground up may be misdirected, as problems are focused where challenges are greatest, rather than endemic throughout the system. The current policy of offering greater flexibility below certain dollar thresholds and focusing management attention instead on larger contracts are justified not just because, as Willie Sutton said, “that’s where the money is,” but also because this is where the actual problems lie.

Whom Is DoD Buying From?

How has the composition of prime vendors changed during the drawdown and what causes can be identified?

In recent years, the composition of the industrial base, as measured by size of the vendor, has been relatively stable. However, in 2014, there was a notable shift with small vendors increasing their share as a percentage of contract obligations from 16 percent in 2013 to 19 percent in 2014, the highest share in the observed period (2000–2014). Moreover, while overall defense contract

obligations declined by 9 percent in 2014, obligations for small vendors actually increased by 11 percent. The increased share for small vendors was primarily seen in electronics & communications (E&C) products, with small vendors accounting for the largest share of contract obligations within the product category. This is particularly notable because the small vendors within the E&C industrial base likely include the high-tech, innovative firms that DoD has made a concerted effort to bring into the defense market.

Who are the top vendors and what do they tell us about industrial base consolidation?

While the Big 5 defense vendors (Lockheed Martin, Boeing, Northrop Grumman, Raytheon, and General Dynamics) have consistently accounted for the largest share of defense R&D contract obligations, their share declined significantly in recent years (63 percent in 2006 to 41 percent in 2014) to its lowest point in the observed period. This decline is largely explained by the cancellation or maturation of large development programs in recent years, as well as the lack of new major development programs being started or sustained over that same period. However, for the Air Force, this trend will likely reverse in the next few years with the beginning of several large contracts for major weapons systems. The Navy should similarly begin ramping up development work, though the lengthened timelines for programs like the Ohio-class replacement lessen the expected increase in defense R&D contract obligations. For the Army, the reversal of this trend is uncertain given the lack of major development programs in the pipeline. However, there is risk that budget constraints will make the plan to substantially increase development programs in the 2020s impractical.

Over the last year, there have been significant mergers and acquisitions (M&A) among the notable prime defense vendors with particular activity occurring among services contractors and in the mix of services offered by the traditional prime contractors. Though the current budget drawdown has not seen a wave of consolidation at the prime contractor level comparable to the post–Cold War "Last Supper," this M&A activity has prompted statements of concern from USD AT&L Frank Kendall. This contrasts the preceding several years, where the trend was one of spinoffs and divestitures, as major defense vendors attempted to refocus on their core business areas or get out of less promising/profitable business areas.

What's the baseline for DoD outreach for Silicon Valley?

DoD generally and each of its major acquisition components already do a relatively small, but by no means insignificant, amount of contracting in Silicon Valley. The current base of activity is characterized by a solid base of a few firms such as Hewlett Packard and Lockheed Martin that consistently work with DoD joined from year to year by a frequently changing mix of smaller companies. The relative stability at the top of this list and the relative churn below the top suggests that smaller suppliers in Silicon Valley are stymied not just by barriers to entry, but by barriers to remaining involved in defense acquisition. To the extent that DoD's policy initiatives can help sustain the participation of smaller Silicon Valley firms in defense, real progress appears possible. Secretary Carter's plan for more cooperation between the two focuses on three steps. The first step, focusing on reforming the hiring process to make DoD more competitive, is crucial to any effort of incorporating Silicon Valley experts into the Department. Additionally, DoD must continue to make significant improvements to intellectual property efforts, as this is one of the concerns, if not the main concern, for persons considering working with the government. Lastly, similar to how it is in Washington, Silicon Valley highly values interpersonal relationships and networking with peers. Secretary Carter has made significant

efforts to meet with the heads of many Valley companies in order to strengthen interpersonal relationships. Maintaining and building on these current efforts to strengthen relationships between DoD and Silicon Valley should be considered for the baseline during the new administration.

What Are the DoD Components Buying?

How have the budget drawdown, sequestration, and its aftermath affected contract spending within the major DoD components?

The magnitude of the budget drawdown in recent years dictates that almost all DoD components have had a fundamentally similar experience with a significant reduction in their contract spending. Overall DoD contract obligations declined 31 percent from 2009–2014. However, each component's individual experience of the drawdown is also unique. In the case of the Army, which between 2009 and 2014 saw its contract obligations decline 52 percent, the experience is of the rapid cessation of buying war-related materiel and support services, and decreases in other contract spending to help fund other priorities in the Army budget such as maintaining force structure. As a general matter, the Army's contract spend for services was less affected. In the case of the Navy, the decline in contract obligations was much less, only 19 percent, and the shift within its portfolio is dominated by several major aircraft investment programs such as the F/A-18 and P-8, concluding even as shipbuilding programs continue. For the Air Force, contract obligations declined 24 percent, almost entirely as a result of sequestration and its aftermath. Spending on services by the Air Force was less affected, and with a few major acquisition programs recently awarded or on the horizon, a recovery appears likely. DLA's experience reflects the war draw down (-22 percent) while MDA (-1 percent) and "Other DoD" (1 percent) were nearly steady.

Final Thoughts

This report largely documents the significant challenges in acquisition caused by the double whammy of the war-related drawdown and sequestration and its aftermath as well as the persistent challenge of improving the performance of the defense acquisition system. At the same time, it also demonstrates the likelihood that defense acquisition is at an inflection point that simultaneously creates the opportunity for change. The acquisition system is at or close to the bottom of a five-year defense drawdown, and 2016 and beyond hold the prospect for increased investment, albeit the likelihood is of a very slow recovery in investment spending. Efforts to improve the acquisition system in recent years are starting to show initial effects and additional improvements have the potential to build on earlier progress. The Department of Defense and its partners in industry have established a clear priority on technological superiority, are aggressively pursuing investment, outreach, and reform efforts to enable innovation, and may now be poised to back the effort with significant investments. Even the Army, clearly the most challenged component of DoD when it comes to modernization, has for this very reason a unique opportunity to rethink its approach to equipping and supporting land warfare in the future. This report seeks to reinforce the potential for a data-driven approach to turning these opportunities into accomplishments. As an annual publication, it will also provide an opportunity to assess progress in this effort over time.

Appendix A: Methodology

For nearly a decade, the Defense-Industrial Initiatives Group (DIIG) has issued a series of analytical reports on federal contract spending for national security across the government.[90] These reports are built on FPDS data, presently downloaded in bulk from USAspending.gov. DIIG now maintains its own database of federal spending, including years 1990–2014, that is a combination of data download from FPDS and legacy DD350 data. For this report, however, the study team primarily relied on FY2000–2014. Data before FY 2000 require mixing sources and incurs limitations discussed in section A.1.

The biggest change for past readers of these reports is that the category of the largest defense vendors has been reduced to the "Big 5." In past years, BAE Systems, and then United Technologies, have held the role as the sixth company. However, merger and acquisition activity described in section 4.2 will soon change the vendor in the sixth spot yet again. This lack of stability defeats the point of tracking the largest vendors as a separate category, and so, going forward, CSIS will focus on the five largest defense vendors: Lockheed Martin, Boeing, General Dynamics, Raytheon, and Northrop Grumman.

Inherent Restrictions of FPDS

Since the analysis presented in this report relies almost exclusively on FPDS data, it incurs four notable restrictions.

First, contracts awarded as part of overseas contingency operations are not separately classified in FPDS. As a result, we do not distinguish between contracts funded by base budgets and those funded by supplemental appropriations.

Second, FPDS includes only prime contracts, and the separate subcontract database (Federal Subaward Reporting System, FSRS) has historically been radically incomplete; only in the last few years have the subcontract data started to approach required levels of quality and comprehensiveness.[91] Therefore, only prime contract data are included in this report.

Third, reporting regulations require that only unclassified contracts be included in FPDS. We interpret this to mean that few, if any, classified contracts are in the database. For DoD, this omits a substantial amount of total contract spending, perhaps as much as 10 percent. Such omissions are probably most noticeable in R&D contracts.

Finally, classifications of contracts differ between FPDS and individual vendors. For example, some contracts that a vendor may consider as services are labeled as products in FPDS and vice versa. This may cause some discrepancies between vendors' reports and those of the federal government.

Constant Dollars and Fiscal Years

All dollar amounts in this data analysis section are reported as constant FY 2014 dollars unless

[90] This appendix draws from numerous past Defense Contracting and Federal Services Contracting Reports. See http://csis.org/program/methodology for the latest version of this methodology. When the methods are drawn from new research within this past year, the specific source is noted in the footnotes.

[91] For more on the current quality and comprehensiveness of FSRS, see Nancy Y. Moore, Clifford Grammich, and Judith Mele, "Findings from Existing Data on the Department of Defense Industrial Base," RAND Corporation, 2014.

specifically noted otherwise. Dollar amounts for all years are deflated by the implicit GDP deflator calculated by the U.S. Bureau of Economic Analysis, with FY2014 as the base year, allowing the CSIS team to more accurately compare and analyze changes in spending across time. Similarly, all compound annual growth values and percentage growth comparisons are based on constant dollars and thus adjusted for inflation.

Due to the native format of FPDS and the ease of comparison with government databases, all references to years conform to the federal fiscal year. FY2014, the most recent complete year in the database, spans from October 1, 2013, to September 30, 2014.

Included Agencies

This report tracks all contracting activity managed by DoD components with exceptions noted here. The civilian portion of U.S. Army Corps of Engineers contracting is also incorporated. However, contracts funded by DoD but managed by other agencies, such as the General Services Administration, are not included except in budget-related charts where DoD *funded* contracts are explicitly referenced. Finally, in FY2013, the Defense Commissary Agency (DeCA) stopped reporting most of its contract obligations (approximately $5 billion) into FPDS. Because this creates a significant data discrepancy that distorts trend analysis, CSIS has excluded DeCA from the dataset throughout the study period.

Data Reliability Notes and Download Dates

Any analysis based on FPDS information is naturally limited by the quality of the underlying data. Several Government Accountability Office (GAO) studies have highlighted the problems of FPDS (for example, William T. Woods' 2003 report "Reliability of Federal Procurement Data," and Katherine V. Schinasi's 2005 report "Improvements Needed for the Federal Procurement Data System—Next Generation").

In addition, FPDS data from past years are continuously updated over time. While FY2007 was long closed, over $100 billion worth of entries for that year were modified in 2010. This explains any discrepancies between the data presented in this report and those in previous editions. The study team changes over prior-year data when a significant change in topline spending is observed in the updates. Tracking these changes does reduce ease of comparison to past years, but the revisions also enable the report to use the best available data and monitor for abuse of updates.

Despite its flaws, the FPDS is the only comprehensive data source of government contracting activity, and it is more than adequate for any analysis focused on trends and order-of-magnitude comparisons. To be transparent about weaknesses in the data, this report consistently describes data that could not be classified due to missing entries or contradictory information as "unlabeled" rather than including it in an "other" category.

The 2014 data used in this report were downloaded in February 2015.

A.1 Notes on Use of Contracting Data from 1990–1999[92]

To provide greater historical context to recent trends, CSIS has integrated FY1990–1999 contracting data into some graphs for this study. All data from FY2000–2014 are drawn from the publicly available Federal Procurement Data System (FPDS) through the USASpending.gov portal. Due to a lack of pre-2000 data available through USASpending.gov, and how unwieldy it

[92] This section is adapted from Ellman and Bell, "Analysis of Defense Products Contract Trends, 1990–2014," 8–9.

is to get the full range of relevant study variables for the entire department using the FPDS.gov web tool, CSIS is using archival DD350 data[93] for the 1990–1999 period.[94] The adoption of archival DD350 data for 1990–1999 poses challenges discussed below, of which CSIS is aware and has worked diligently to mitigate and standardize.

Use of archival DD350 data for the 1990–1999 period carries some cost in data quality, as there are notable differences in coding schema and granularity between the DD350s and the modern FPDS architecture. The most notable issues:

- DD350 data for FY1990–1999 reflect pre-FY2004 reporting thresholds, which did not require DoD to report more than summary information on contracts below $25,000.
- FY1990 has a significant percentage of data left blank or otherwise unclassifiable, mostly in the fields used for competition, pricing mechanism, and vehicle.
- FY1994 data had a serious data issue, where nearly all Army contracts were improperly classified under other components. CSIS has been able to partially correct this issue, and is continuing to seek a full solution, but Army contract obligations for 1994 remain understated.
- The DD350 does not include the "Statutory Exemption to Fair Opportunity" field, which CSIS uses for greater precision on levels of competition for Indefinite Delivery Vehicle (IDV) contracts.
- Prior to FY1997, DD350 data did not reliably differentiate between numbers of offers greater than two (such that most contracts receiving two or more offers had "2" listed under number of offers). As such, pre-1997 competition data have reduced granularity in terms of number of offers.

Attempts to use data from FPDS.gov to address these issues have been hampered by a more serious data gap: for 1990–1994, the total DoD contract obligations in FPDS are approximately $20 billion per year lower than in the data contained in the DD350s, representing about a sixth of total DoD contract obligations for those years. Upon further investigation, the study team found that a number of large contracts in the DD350 dataset are either completely missing from FPDS or have vastly lower obligation levels associated with them. CSIS has engaged with policymakers inside DoD to raise awareness of this issue, identify the source of the data gap, and work toward a solution, but no readily apparent remedy has come to light.

Though these are serious data-quality issues, CSIS nonetheless believes the overall quality and reliability of the dataset is more than sufficient to perform meaningful trend analysis.

A.2 Detailed Methods

The prior sections apply to all DoD contracting data or the data for years 1990 to 1999. The sections below are specific to only selected graphs or tables that posed additional technical challenges.

[93] Form DD350 was the main contract information-gathering mechanism for DoD contracting data until the exclusive adoption of FPDS. Though archival DD350 data were, at one time, available online through DoD sources, at present they are available primarily through the National Archives.
[94] Past CSIS work has at times included 1990–1999 data extracted from the FPDS.gov web tool, but that approach did not allow for examining vendor size or examining more than one variable at a time.

A.2.1 Comparison between Contract Obligations and Total Obligations

Data for total DoD obligations were obtained from the Financial Summary Tables available for each fiscal year on the website of the Under Secretary of Defense (Comptroller), specifically the "Obligations and Unobligated Balances by Appropriations Account" table.

There is, however, a complication to using these data: the "Total Obligations" column double counts reimbursable activity (such as obligations through a Working Capital Fund, WCF), because it captures both the money obligated by the WCF and the money obligated by customers into the WCF. This is no small issue, because "Reimbursable Obligations" have totaled $150–$200 billion in most years during the period observed. To account for this issue, the study team subtracted "Reimbursable Orders" in each fiscal year from "Total Obligations," to produce a new total that CSIS calls "Total Net DoD Obligations." This total allows CSIS to capture the money obligated out of WCFs (which includes significant contracting activity), while eliminating the double-counting from "Reimbursable Orders," which represents the money paid into the WCFs.[95]

Obligations for the Army Corps of Engineers (ACE) and foreign military sales through the Defense Security Cooperation Agency (DSCA) are not included in the totals referenced above, but significant contracting activity is performed under those two agencies. To allow for a true like-to-like comparison of contract obligations to total obligations, total net obligations for the ACE and DSCA are added to and included in "Total Net DoD Obligations." While ACE accounted for roughly $8 billion to $12 billion in net obligations during the period, DSCA net obligations varied widely from year to year, accounting for over $20 billion in one year, and as little as -$5 billion in another (due to reimbursements outweighing obligations).

A.2.2 Competition[96]

The study team followed DoD methodology and calculated competition by using two fields: extent of competition, which is preferred for contract awards; and fair opportunity, which is preferred for task and delivery orders under most indefinite delivery vehicles (IDVs). In the vast majority of cases, competitive status is classified for the entire contract duration. Thus, if a contract had a duration of three years and was competed in the first year, it qualifies as competed for the entire duration. This also extends to single-award indefinite delivery contracts, which are classified based on whether the original vehicle was competed rather than consistently treated as only receiving an offer from the single awardee. However, for some other vehicles, such as multiple-award IDVs, the number of offers is instead tracked separately for each task order.

To better evaluate the rate of "effective competition," the study team categorizes competitively awarded contracts by the number of offers received.[97] CSIS focuses on the number of offers for competed contracts because it reveals information about the request for proposals. A solicitation that only has a single respondent indicates some combination of three factors: thinness in the

[95] Note that the totals for "Reimbursable Orders" and "Reimbursable Obligations" are not equal in a given fiscal year, due to time discontinuities between obligations by the WCF and orders by the WCF's customers.
[96] This section is adapted from Sander, *Avoiding Terminations, Single-Offer Competition, and Costly Changes with Fixed-Price Contracts*.
[97] CSIS defines effective competition as a competitively sourced contract awarded after receiving two or more offers.

underlying market; a failure to notify or give adequate response time to potential competitors; or a contract that is unappealing to vendors.

The focus on the number of offers also has a basis in the regulation known as the Single Offer rule (DFARS 215.371), which addresses competitive acquisitions in which only one offer is received. This rule was rewritten in 2012 to add a policy section that shifts emphasis away from an analysis of whether the circumstances described at FAR 15.403-1 (c)(1)(ii) (determining adequate price competition) are present, to whether statutory requirements for obtaining certified cost or pricing data are met and if the price is fair and reasonable. The revised rule also emphasizes the need to extend the period of solicitation when only one offer is received, to see whether a longer response period can elicit additional bids. Essentially, the new standard suggests that if you cannot get two bidders, you must evaluate whether proceeding with one bid can be done while protecting the interests of the government.

A.2.3 Contract Initial Duration and Size[98]

When contract initial duration and size become factors, the dataset used is limited to contracts reported in FPDS that were initially signed no earlier than FY2007 and completed by FY2013. Determining when contracts are completed is the most challenging portion of compiling the dataset. Contracts closed out or terminated by the end of FY2013 are included even if their current completion dates run into the next fiscal year. However, many contracts in FPDS and in the sample are never marked as closed out or terminated in the Reason for Modification field. In these cases, completion status is based on the current completion date of the most recent transaction in FPDS. This method could accidentally include contracts that have not reached their ultimate conclusion dates and are merely dormant. However, the FY2013 sample end date means that any such contracts would have to be inactive for an entire fiscal year, which is unlikely.

FPDS raw data are available in bulk from USAspending.gov starting in FY2000. However, data quality steadily improves over that decade and a half, particularly in the commonly referenced fields of interest to this study. In most cases, unlabeled rates topped out at 5 to 10 percent. The critical exceptions are the Base and All Options and Base and Exercised Options fields, which report contract ceilings. Prior to FY2007, these fields are blank for the majority of contracts. When that field is not available, calculating the extent of ceiling breaches is impossible. In addition, this study classifies contract size by original ceiling and not total obligations because the latter figure is dependent on contract performance.

Because a key dependent and independent variable are not available prior to FY2007, the study team chose to set FY2007 as the start date rather than risk sample bias by including only those earlier contracts that were properly labeled. This restriction poses a significant limitation in that no contracts of more than seven years in duration can be included and five-year contracts are only in the study period if they started by October 1, 2007, or were closed out early.

[98] This section is adapted from Sanders, *Avoiding Terminations, Single-Offer Competition, and Costly Changes with Fixed-Price Contracts*.

A.2.4 Terminations[99]

Contract termination is determined through the Reason for Modification field in FPDS. A contract is considered terminated if it has at least one modification with the following values:

- "Terminate for Default (complete or partial)"
- "Terminate for Cause"
- "Terminate for Convenience (complete or partial)"
- "Legal Contract Cancellation"

These four categories and the "Close Out" category are used to mark a contract as closed. As discussed above, many contracts well past their current completion date never have a transaction marking them as closed; however, a termination is an active measure that mandates reporting, unlike the natural end of a contract, which can go unremarked.

The four different values of contract termination provide useful granularity, but even a termination for convenience indicates that something has likely gone awry. Thus, given the already low number of terminations, the study team treats a contract as either terminated or not, rather than subdividing by type.

A.2.5 Change Orders and Ceiling Breaches[100]

Similar to contract terminations, change orders are reported in the Reason for Modification field. There are two values that this study counts as change orders: "Change Order" and "Definitize Change Order." For the remainder of this report, contracts with at least one change order are called Changed Contracts.

There are also multiple modifications captured in FPDS that this current study will not investigate as change orders. These include:

- Additional work (new agreement, FAR part 6 applies)
- Supplemental agreement for work within scope
- Exercise an option
- Definitize letter contract

The Number of Change Orders refers to the number of FPDS transactions for a given contract that lists one of the two change order categories as their Reason for Modification. The vast majority of contracts do not receive change orders, but changed contracts are still far more common than terminations.

The study team calls when the total potential cost of a contract increases due to a change order ceiling breach. In federal acquisition, the government usually sets a "cost ceiling" of contracts that limits the total amount of funds it may obligate on a single contract. This maximum cost ceiling can serve as a target for vendors looking to maximize their revenue under a contract. However, cost ceilings can be raised, meaning that they do not represent true maximums. When work under a contract is set to exceed the contract ceiling for any reason, the government is

[99] Ibid.
[100] Ibid.

forced to breach these cost ceilings. "Ceiling Breaches" represent output indicators, because they indicate that either the real cost of a contract or its true scope of work was not fully understood at the time of contract award.

This study uses changes in the Base and All Options Value Amount as a way of tracking the potential cost of change orders. The Base and All Options Value Amount refers to the ceiling of contract costs if all available options were exercised. The alternative ceiling measure, Base and Exercised Value Amount, is not used because contracts are often specified such that the bulk of the eventually executed contract, in dollar terms, is treated as options. In these cases, the all-inclusive value provides a better baseline for tracking growth.

The Obligated Amount refers to the actual amount paid to vendors. This study team does not use this value for the analysis because spending for change orders is not necessarily front-loaded. For example, a change to a contract in May 2010 could easily result in payments from May 2010 through August 2013.

The Extent of Ceiling Breach is calculated as follows:

$$Extent\ of\ Ceiling\ Breach = \frac{Base\ \&\ All\ Options\ Value\ Increases\ from\ Change\ Order\ Modifications}{Base\ \&\ All\ Options\ Value\ Amount\ for\ Original, Unmodified\ Transaction}$$

A.2.6 Vendor Categorization

Small, Medium, and Large Vendors

To analyze the breakdown of competitors in the market into small, medium, and large vendors, the CSIS team assigned each vendor in the database to one of these size categories. Any organization designated as small by the FPDS database—according to the criteria established by the federal government—was categorized as such unless the vendor was a known subsidiary of a larger entity. Due to varying standards across sectors, an organization may meet the criteria for being a small business in certain contract actions and not in others. The study team did not override these inconsistent entries when calculating the distribution of value by vendor size.

Vendors with annual revenue of more than $3 billion, including from nonfederal sources, are classified as large. This classification is based on the vendor's most recent revenue figure at time of classification. For vendors that have gone out of business or been acquired, this date may be well before 2014. A joint venture between two or more organizations is treated as a single separate entity, and organizations with a large parent are also defined as large. Due to their system integrator role and consistent market share, the study team placed the five largest defense contractors (Lockheed Martin, Boeing, Raytheon, Northrop Grumman, and General Dynamics) into a separate category called "Big 5 defense vendors." Any vendor assigned a unique identifier by FPDS but is neither small nor large is classified as "medium."

To identify large vendors, the study team investigated any vendor with total obligations of $500 million in a single year or $2 billion over the study period. Determining revenues is the most labor-intensive part of the process and involves the use of vendor websites, news articles, various databases, and public financial documents. When taken together, all of this work explains the increase in the market share of large vendors versus some older editions of this report. While large vendors are, on rare occasions, reassigned into the middle tier, the vast majority of

investigations either maintain the status quo or identify small or medium vendors that should be classified as large.

Handling of Subsidiaries and Mergers and Acquisitions

To better analyze the defense industrial base, the study team made significant efforts to consolidate data related to subsidiaries and newly acquired vendors with their parent vendors. This results in, among other things, a parent vendor appearing once on CSIS's top 20 lists rather than being divided between multiple entries. The assignment of subsidiaries and mergers to parent vendor is done on an annual basis, and a merger must be completed by the end of March in order to be consolidated for the fiscal year in question. This enabled the study team to more accurately analyze the defense industrial base, the number of players in it, and the players' level of activity.

Over the past seven years, the study team has applied a systematic approach to vendor rollups. FPDS uses hundreds of thousands of nine-digit DUNS (Data Universal Numbering System) codes from Dun and Bradstreet to identify service providers. A salutary benefit of this standardization is that FPDS now provides parent vendor codes. These parent codes track the current ownership of vendors but are not backward looking. Thus, a merger that happened in 2010 would not affect parent assignments in 2000. This prevents the study team from adopting these assignments in their entirety. The study team investigates vendors that receive $250 million of total contract revenue or more than $1 billion in obligations between 2000 and 2014, no matter how much they receive in any individual year. We have reinforced these manual DUNS number assignments with automated assignments based on vendor names. Qualifying for an automated assignment by name requires three criteria: 1) a standardized vendor name that matches with the name of a parent vendor, 2) that the name has been matched to the parent vendor by the CSIS or the Parent DUNS number field, and 3) there are no alternative CSIS assignments with that vendor name. This process is not immune to error, but it reduces the risk that a DUNS code is considered large in one year but overlooked in another. As an error-checking mechanism, the study team investigated contradictions by comparing our assignments to those made by Parent DUNS numbers for every DUNS number with $500 million in annual obligations or $2 billion in total obligations.

A.2.7 Silicon Valley Vendors

The list of Silicon Valley vendors was generated by using a published list of the top 150 Silicon Valley Publicly Traded Companies.[101] The study team culled a list of companies that reached the top 30 from 2012 to 2014.

[101] Varian Inc. and Varian Semiconductors were also included despite not being in the top-30 list. There ranks were unavailable in the 2013 to 2015 period because they were acquired by sample vendors Agilent and Applied Materials, respectively. In addition, these two firms were once part of Varian Associates along with the top 30 contractor Varian Medical Systems. Because this analysis is primarily interested in Silicon Valley participation and not their merger and acquisition structure, these companies are included for the little over a decade in which they were independent. The creation of the Silicon Valley sample is discussed in greater detail in the methodology section.

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