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SMALL BUSINESS INNOVATION RESEARCH

DOD's Program Has Developed Some Technologies that Support Military Users, but Lacks Comprehensive Data on Transition Outcomes

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Why GAO Did This Study

DOD relies on its research and development community to identify, pursue, and develop new technologies that improve and enhance military operations and ensure technological superiority over adversaries. The SBIR program is a key mechanism for DOD to use small businesses to meet its research and development needs; stimulate technological innovation; foster and encourage participation by minority and disadvantaged persons in technological innovation; and increase private sector commercialization of innovations derived from federal research and development funding. DOD is the largest SBIR participant in the federal government, with over $1 billion spent annually on the program.

This testimony is based primarily on a report GAO issued in December 2013 and addresses: (1) practices the military departments use to facilitate the transition of SBIR technologies, (2) the extent to which these technologies are successfully transitioning to military users, such as weapon system programs or warfighters in the field, and (3) DOD's efforts to meet fiscal year 2012 NDAA transition reporting requirements. This statement draws from the 2013 report and other work GAO has conducted on technology transition activities in DOD's science and technology programs.

What GAO Found

Transitioning technologies from defense research and technology development programs, such as through the Small Business Innovation Research (SBIR) program, to military users has been a long-standing challenge for the Department of Defense (DOD). Over the past decade, Congress and DOD have taken several steps to address transition challenges in DOD's SBIR program. For example, the military departments can offer additional SBIR funding to certain awardees to supplement or extend technology development projects in order to move them closer to transition. Additionally, each of the military departments has a network of transition facilitators who work directly with small businesses, military research laboratories, and the acquisition community to foster transition opportunities. Further, in fiscal year 2012, Congress provided federal agencies the opportunity to use more of SBIR funding (up to 3 percent) for program administrative purposes, including activities that facilitate transition. However, at times, promising technologies are not taken advantage of because their potential has not been adequately demonstrated, they do not meet military requirements, or users are unable to fund the final stages of development and testing.

GAO found that DOD's SBIR program has developed some technologies that successfully transitioned into acquisition programs or fielded systems, but the extent of transition is unknown because comprehensive and reliable transition data are not collected. The military departments collect information on selected transition "success stories" on a somewhat ad hoc basis from SBIR program officials, acquisition program officials, prime contractors, or directly from small businesses. In addition to these less formal transition tracking efforts, the military departments use, to varying degrees, two data systems—Company Commercialization Reports and the Federal Procurement Data System-Next Generation—to identify transition results program-wide. While these systems provide high-level commercialization information that the departments use to track progress in achieving overall program goals, the systems have significant gaps in coverage and data reliability concerns that limit their transition tracking capabilities. In addition, the systems are not designed to capture detailed information on acquisition programs, fielded systems, or on projects that did not transition.

The National Defense Authorization Act (NDAA) for fiscal year 2012 directed DOD to begin reporting the number and percentage of SBIR projects that transition into acquisition programs or to fielded systems, among other things. DOD acknowledged that it may need to modify its existing data systems or develop new tools to compile more complete and accurate technology transition data. At the end of 2013, DOD was still assessing how to comply with the new transition reporting requirements, and had not established a specific plan, as GAO had recommended, for how and when it would be able to meet the requirements. In a recent update, DOD officials confirmed that alternatives are still being evaluated and no plan for improving the tracking and reporting of technology transition has been completed. Without better information on technology transition outcomes, questions will remain as to whether the DOD SBIR program is providing the right technologies at the right time to users, using effective approaches to select, develop, and transition technologies, and providing tangible benefits.

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Chairman Graves, Ranking Member Velázquez, and Members of the Committee:

I am pleased to be here today to discuss the Department of Defense's (DOD) Small Business Innovation Research (SBIR) program and its efforts to transition technologies to military users, such as weapon system acquisition programs and the warfighters in the field. DOD relies on its research and development community—government research laboratories, test facilities, industry, and academia—to identify, pursue, and develop new technologies that improve and enhance military operations and ensure technological superiority over adversaries. The SBIR program is a key mechanism for the department to (1) use small businesses to meet its research and development needs; (2) stimulate technological innovation; (3) foster and encourage participation by minority and disadvantaged persons in technological innovation; and (4) increase private sector commercialization of innovations derived from federal research and development funding.[1] DOD is the largest SBIR participant in the federal government, with over $1 billion spent annually on SBIR contract awards, which are implemented across 13 military departments and defense agency components.[2]

The Small Business Administration (SBA) is responsible for establishing the broad policy and guidelines under which individual agencies operate SBIR programs. Within DOD, the Office of Small Business Programs (OSBP) oversees SBIR program activities, develops policy, and manages program reporting. This office generally relies on the components, such as the departments of the Army, Air Force, and Navy, to oversee and execute their own SBIR program activities. Each component has flexibility to tailor its SBIR program to meet its needs, including determining what type of research to pursue, which projects to fund, and how to monitor

[1] Pub. L. No. 97-219.

[2] Every federal agency with a budget of $100 million or more for extramural research and development is required to use a portion of its budget—not less than 2.8 percent in fiscal year 2014—to establish and operate SBIR programs. The 13 DOD SBIR components include the three military departments—Air Force, Army, and Navy—as well as the Missile Defense Agency, Defense Advanced Research Projects Agency, Chemical Biological Defense, Special Operations Command, Defense Threat Reduction Agency, National Geospatial-Intelligence Agency, Defense Logistics Agency, Defense Microelectronics Activity, Defense Health Program, and the Office of Secretary of Defense.

ongoing projects. The SBIR program is structured into three phases, which are described in table 1.

Table 1: DOD Small Business Innovation Research (SBIR) Program Framework

Phases of SBIR	Typical project duration & funding	Sources of funding
Phase I: Agencies competitively select projects based on scientific and technical merit, applicant's past SBIR performance, and potential for commercial application. Focus of work conducted in this phase is on determining project feasibility and merit.	6 months, up to $150,000	SBIR program funding
Phase II: Small businesses with Phase I projects that have demonstrated potential may compete for additional awards to continue further technology development and prototyping. In general, projects should have confirmed interest in transition from a user.	2 years, up to $1 million	SBIR program funding, can include external funding
Phase III: Small businesses pursue commercialization of technology developed in prior phases. Work conducted in this phase derives from, extends, or completes an effort made under prior phases, but it is funded by sources other than the SBIR program. In this phase, businesses are expected to obtain funds from private investors, the capital markets, or government agencies.	Unlimited	Non-SBIR government or private-sector funding

Source: DOD program documentation. | GAO-14-784T

In the context of the SBIR program, commercialization is defined broadly to include the process of developing, producing, and delivering products, processes, technologies, or services for sale to, or use by, the federal government or commercial markets.[3] For DOD, a primary goal of commercialization is the transition of SBIR-developed technologies to weapon system programs or directly to warfighters in the field.

In December 2013, we reported on the practices the military departments use to facilitate the transition of technologies developed through the SBIR program, the extent to which technologies are successfully transitioning to military users, and DOD's efforts to meet transition reporting requirements established by the National Defense Authorization Act (NDAA) for fiscal year 2012.[4] My testimony today focuses primarily on the findings of our

[3] Small Business Administration, Office of Investment and Innovation, *Small Business Innovation Research (SBIR) Program: Policy Directive*, February 24, 2014.

[4] GAO, *Small Business Innovation Research: DOD's Program Supports Weapon Systems, but Lacks Comprehensive Data on Technology Transition Outcomes*. GAO-14-96 (Washington, D.C.: December 20, 2013).

2013 report, but also draws from other work we have conducted on technology transition activities in DOD's science and technology enterprise.[5] More detail on our scope and methodology is included in these issued products. The work on which this testimony is based was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Several Mechanisms Have Been Established Over Time to Help Facilitate SBIR Technology Transition

Transitioning technologies from defense research organizations and technology development programs, such as the SBIR program, to military users has been a long-standing challenge for DOD. To address technology transition challenges in DOD's SBIR program, Congress and DOD have established several program provisions and mechanisms over the past decade, including the following:

- Congress directed the establishment of the Commercialization Pilot Program, subsequently renamed the Commercialization Readiness Program, in fiscal year 2006 to accelerate the transition of SBIR-funded technologies to Phase III, especially those that lead to acquisition programs and high priority military requirements, such as fielded systems. As part of the program, Congress authorized the military departments to use up to 1 percent of SBIR funding to administer the program. This funding is used to provide assistance to SBIR awardees, including efforts to enhance networking and build relationships among small businesses, prime contractors, and DOD science and technology and acquisition communities.[6]

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[5] GAO, *Defense Technology Development: Technology Transition Programs Support Military Users, but Opportunities Exist to Improve Measurement of Outcomes.* GAO-13-286 *(*Washington, D.C.: Mar. 7, 2013); and *Best Practices: Stronger Practices Needed to Improve DOD Technology Transition Processes*. GAO-06-883 (Washington, D.C.: Sep 14, 2006).

[6] National Defense Authorization Act for Fiscal Year 2006, Pub. L. No. 109-163, § 252 as amended by the National Defense Authorization Act for Fiscal Year 2012, Pub. L. No 112-81, § 5122(a) (2011).

- Each military department's SBIR program also has a network of transition facilitators who manage the Commercialization Readiness Program and other SBIR activities that support technology transition. The facilitators are located at military laboratories, acquisition centers, and program executive offices and work directly with government stakeholders to help ensure projects are responsive to warfighter needs. Although the roles and responsibilities vary somewhat across the military departments, in general, transition facilitators foster ties among small businesses, military research laboratories, and the acquisition community in support of transition opportunities, and monitor project progress, including outcomes. Further, the military departments conduct conferences and workshops to provide opportunities for SBIR companies to interact with users and showcase their projects. In the fiscal year 2012 reauthorization of the SBIR program, Congress authorized a pilot effort to allow the DOD SBIR program the opportunity to use more of their SBIR funds (up to 3 percent) for program administration, technical assistance, and commercialization and outreach activities.[7]

- In addition, DOD SBIR components may offer special awards that supplement or extend Phase II projects. The military departments have developed mechanisms to do this, which provide awardees additional SBIR funding to move Phase II projects closer to transition. In some cases, the military departments require formal technology transition agreements or matching funding from intended military users as a condition to receiving the additional Phase II funding. Technology transition agreements, which Air Force and Navy officials reported using, help manage project expectations and formalize stakeholder commitments by outlining cost, schedule, and performance expectations for transition to occur. Matching funds from intended users, which are required by the Navy for some projects, can help create greater buy-in for transition because the intended users have a monetary stake in the project.

- In fiscal year 2011, Congress required the Secretary of Defense to establish a program to accelerate the fielding of technologies developed pursuant to Phase II of the SBIR program, technologies developed by defense laboratories, and other innovative

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[7] Pub. L. No. 112-81, § 5141(a) (2011).

technologies.[8] As a result of this new requirement, the Secretary established the Rapid Innovation Program, which received about $430 million in fiscal year 2011 and $175-$225 million annually in subsequent years. According to DOD officials, the majority of projects awarded in the first few years of the program have been to SBIR Phase II awardees. We are currently conducting a review of the program and its transition outcomes for the Senate Armed Services Committee.

Sometimes technologies are not ready to transition when needed because they may still be too risky or costly to adopt. Further, at other times, promising technologies are not taken advantage of because their potential has not been adequately demonstrated or recognized, they do not meet military user requirements, or users are unable to fund the final stages of development and testing. As we have reported in the past on DOD science and technology programs, factors that facilitate successful transition outcomes include selecting the right projects—those that address military needs, have realistic cost and schedule expectations, and have technologies that can be matured or demonstrated—and ensuring early and sustained commitments from intended users and other key stakeholders throughout projects.[9]

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[8] Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Pub. L. No. 111-383, § 1073(a).

[9] GAO, *Defense Technology Development: Management Process Can Be Strengthened for New Technology Transition Programs*. GAO-05-480 (Washington, D.C.: June 17, 2005).

DOD's SBIR Program Has Developed Some Technologies that Support Military Users, but Lacks Comprehensive Data on Transition Outcomes

In our 2013 review, we found that the military department SBIR programs have identified some technologies that successfully transitioned into acquisition programs or fielded systems over the past several years, but the extent of transition is unknown because comprehensive and reliable transition data are not collected. The military departments collect information on selected transition "success stories" on a somewhat ad hoc basis from SBIR program officials, acquisition program officials, prime contractors, or directly from small businesses. These success stories cover a broad range of technologies and products. One SBIR transition example from the Air Force was an antenna that transitioned to an unmanned air system that was undergoing operational evaluations in Afghanistan to demonstrate identification and detection capabilities for improvised explosive devices. Another transition success reported by the Army was a sensor system for identifying structural fatigue or damage on Black Hawk helicopters that was undergoing further testing. In addition to less formal transition tracking efforts, the military departments use, to varying degrees, two data systems—Company Commercialization Reports (CCR) and the Federal Procurement Data System-Next Generation (FPDS-NG)—to identify transition results for their programs. While these systems provide high-level commercialization information that the departments use to track progress in achieving overall program goals, the systems have significant gaps in coverage and data reliability concerns that limit their transition tracking capabilities. In addition, the systems are not designed to capture detailed information on acquisition programs, fielded systems, or on projects that did not transition. Table 2 more fully describes these transition data sources and their limitations.

Table 2: DOD Small Business Innovation Research (SBIR) Program Transition Data Sources Overview

Transition data source	Description	Data limitations
Company Commercialization Reports (CCR)	• DOD SBIR database derived from commercialization reports submitted by small businesses as part of applications for new DOD SBIR awards. Companies report on their commercialization history for prior Phase II awards received, including sales resulting from, and investments associated with the awards (non-SBIR funds). DOD-specific commercialization activities are also reported. • Reported commercialization results used by SBIR program management when evaluating future awards to previous SBIR participants (i.e., as a gauge of a firm's ability to commercialize products).	• Do not capture all commercialization data. Only small businesses seeking additional SBIR awards are requested to report Phase III commercialization; data for past SBIR participants that do not pursue new awards is limited. • Self-reported data poses reliability and completeness challenges because of the potential for misreporting. • Collection of data on the specific military user of the technology is inconsistent, at best. Specific users include acquisition programs, such as the F-35 Joint Strike Fighter.
Federal Procurement Data System-Next Generation (FPDS-NG)	• FPDS-NG is the primary government-wide contracting database that provides information on all government contracting actions. • System includes a data field through which contracting officers can identify contracts with SBIR associations. • It can be used to identify Phase III commercialization awards that result in government contracts.	• Does not capture all commercialization data; limited to government contracts. • Not designed to provide commercialization data for subcontracting between a prime contractor and a SBIR recipient; DOD officials indicated this type of commercialization is prevalent. • Contract miscoding of SBIR lineage can cause over- or under-reported commercialization results; DOD officials indicated that contracting officers have challenges in correctly coding contracts, including contracts sometimes being wrongly associated with SBIR as well as contracts failing to be acknowledged as SBIR-related. • Does not directly collect data on the specific military user of the technology. Specific users include acquisition programs, such as the F-35 Joint Strike Fighter.
Agency-specific SBIR transition documentation activities	• To varying degrees, military department programs track status and completion of SBIR projects via internal management systems and input from transition agents, users, and small businesses. • Programs also collect success stories for a select amount of projects and make them available using tools such as annual reports and web-accessible databases.	• Do not capture all commercialization data; SBIR programs tend to track subsets of Phase II projects, such as Commercialization Readiness Program and Phase II Enhancement projects. • Tracing SBIR lineage to technologies is a stated challenge because it is resource-intensive and technologies evolve over time. • Data collection is somewhat ad hoc and internal tracking tool use is varied.

Source: GAO analysis of DOD SBIR systems and program documentation. | GAO-14-784T

DOD is in the Early Stages of Developing a Plan to Improve Technology Transition Reporting

New reporting requirements in the NDAA for fiscal year 2012 directed DOD to begin reporting new SBIR-related transition information to SBA, which is to be included in SBA's annual report to designated congressional committees.[10] This requirement includes reporting on the number and percentage of Phase II SBIR projects that transitioned into acquisition programs or to fielded systems, effectiveness of incentives provided to DOD program managers and prime contractors, and additional information specific to the transition of projects funded through the Commercialization Readiness Program. This type of information is not currently captured by the existing data sources described in table 2.

At the time of our 2013 review, DOD was still assessing how to comply with the new transition reporting requirements directed by Congress, and no specific plan that included a time line for meeting the requirements had been established. DOD acknowledged that it may need to modify its existing data systems or develop new tools to compile more complete and accurate technology transition data, but cited several challenges to obtaining better data. One challenge we found in 2013 was that the military departments and components define technology transition differently—with definitions ranging from any commercialization dollars applied to a project, to only when a technology is actually incorporated into a weapon system or in direct use by the warfighter—and no consensus had been reached on a standard definition to use. We recommended that DOD establish a common definition of technology transition for all SBIR projects as a key step to support annual reporting requirements. Additionally, according to DOD SBIR officials, tracking transition outcomes can be challenging because of the sometimes lengthy period that can occur between SBIR project completion and transition to a DOD user. In some cases, the time lag can be several years and make it difficult to track projects and obscure a project's SBIR linkages. Time lags can occur because of delays in funding availability, additional development or testing needs before transition, or schedule delays encountered by intended users. Officials also stated that limited resources for administrative activities constrain the SBIR program's ability to effectively follow up on the transition outcomes for completed projects. Conversely, military users, such as weapon system acquisition programs, often do not dedicate resources to monitor or track SBIR projects and their likelihood to transition.

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[10] Pub. L. No. 112-81, § 5122(a) (2011).

In 2013, DOD officials indicated that addressing the transition reporting requirements would be a long-term effort because of data collection challenges such as those identified in table 2. As a first step, DOD initiated an assessment last year of different options for enhancing transition data, which included examining whether CCR or other existing DOD data sources could be modified to improve reporting, such as Selected Acquisition Reports—annually required for major defense acquisition programs. In addition, opportunities to build more SBIR awareness directly into acquisition program activities were being considered, such as including SBIR-specific provisions in acquisition strategy documents or formal program reviews. Despite these activities, DOD had not established a plan for how and when it would be able to meet the reporting requirements and begin to provide the technology transition information expected by Congress. As such, we recommended in 2013 that DOD develop a plan to meet new technology transition reporting requirements that will improve the completeness, quality, and reliability of SBIR transition data, and report this plan to Congress, including specific steps for improving the technology transition data. In a recent update to our 2013 work, DOD officials confirmed that alternatives are still being evaluated and no plan for how and when it would improve the tracking and reporting of technology transition has been completed.

While we recognize there are challenges to improving transition data, we continue to believe it is important for DOD to develop and implement a plan for obtaining more comprehensible and reliable measures of transition. Without better information on technology transition, questions will remain as to whether the DOD SBIR program is providing the right technologies at the right time to users, using effective approaches to select, develop, and transition technologies, and providing tangible benefits. As we have reported in the past through other work on DOD science and technology activities, tracking technology transitions and the impact of those transitions, such as cost savings or deployment of the technology in a product, provides key feedback that can inform the management of programs. In particular, we found that leading commercial companies tracked technology transition not only to enable them to measure success, but also to assess their processes and determine what changes are necessary to improve transition rates. In addition, we found a few examples of unique efforts within DOD where transition outcomes were being effectively monitored and documented. The Navy, for instance, uses a Transition Review Board to assess whether projects in

its Future Naval Capabilities technology development program are being utilized in systems that support Navy warfighters.[11] For example, the Navy determined that of the 155 technology products the Future Naval Capabilities program delivered to acquisition programs between fiscal years 2006-2011, 21 percent were subsequently deployed to fleet forces, 35 percent were still with the acquisition programs, and 44 percent failed to deploy. For projects that did not successfully deploy, the board assessed whether there were other benefits achieved, such as whether technologies were leveraged for follow-on science and technology work. The board also identifies obstacles to transition, such as loss of interest by the user or inadequacy of funding. These findings are then used to inform the Navy's annual review process and inform future science and technology investment decisions.

Overcoming the challenges to obtaining better technology transition information may ultimately require closer collaboration between the DOD SBIR and acquisition communities. While incremental improvements may be possible by modifying the existing CCR and FPDS-NG data systems and increasing SBIR program managers' capacity to track projects, greater insights into transition outcomes and the benefits the technologies provide to military users may not be achieved without additional information obtained from users, such as acquisition program managers. In an environment of declining budgets, it is important that information on technology transition outcomes for SBIR projects be improved for DOD to identify the extent to which the program is supporting military users and determine whether existing monitoring and transition efforts are working effectively. We recognize that the goal is not to transition all technologies funded through SBIR, because not all technologies will be demonstrated successfully. Nonetheless, it is important to ensure that the right technologies are transitioning and to not allow these technologies to fail for the wrong reasons.

Chairman Graves, Ranking Member Velázquez, and Members of the Committee, this completes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

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[11] The Future Naval Capabilities program is a key Navy technology development activity, for which nearly $450 million was budgeted in fiscal year 2013 to develop a broad range of technologies. The program, which was initiated in 1999, seeks to provide the best technology solutions to address operational requirements, delivering technology products to acquisition programs that enhance capabilities within a 5-year time frame.