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**Implementation of the Department of Defense Small Business
Innovation Research Commercialization Pilot Program:
Recent Experience and International Lessons**

25 July 2012

by

**Max V. Kidalov, J.D., LL.M., Assistant Professor,
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Graduate School of Business & Public Policy

Naval Postgraduate School

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Abstract

In Section 252 of the National Defense Authorization Act for Fiscal Year 2006, Congress adopted four wide-ranging reforms to the Department of Defense (DoD) Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs in order to increase their effectiveness for both the DoD and the defense industry. First, Section 252 directed closer alignment between R&D and acquisition goals of SBIR and STTR. Second, Section 252 authorized and funded the creation of the Commercialization Pilot Program (CPP) by the DoD and the military Departments to facilitate transition of SBIR technologies into the acquisition process. Congress conditioned the use of CPP funds on detailed evaluative reporting to Congress. Third, Congress codified into statutory law President George W. Bush's Executive Order No. 13329 (2004), which incentivized manufacturing technologies through SBIR and STTR. Fourth, Congress clarified agencies' authority to conduct testing and evaluation (T&E) of SBIR and STTR technologies in SBIR and STTR Phases II and III. The implementation requirements were specified in Section 252 and the Congressional Guidance Letter (2006) issued by the House and the Senate Small Business Committees.

This study analyzes the implementation of Section 252 (NDAA, 2006) by the secretaries of Defense, of the Army, of the Navy, and of the Air Force based on a literature review, a survey of SBIR and STTR program executives, and comparison with similar British initiatives. The study questions are based on Section 252 text and the Congressional Guidance Letter (2006) as well as on best practices identified in relevant academic and professional literature. The study finds that although the DoD and the military departments have begun implementation of the DoD SBIR CPP and other Section 252 reforms, progress is uneven. Specifically, agencies are not implementing Section 252 CPP incentives and R&D alignment requirements to the fullest extent possible. The study recommends clarifications of legislative requirements and additional review of Section 252 implementation.



Keywords: Small Business Innovation Research, SBIR, Small Business Technology Transfer, STTR, Commercialization Pilot Program, CPP, Small Business Research Initiative, SBRI, Center for Defence Enterprise, CDE, defense acquisition



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I. Introduction

The U.S. Department of Defense (DoD) spends close to \$1.5 billion a year on competitive research and development (R&D) set-asides under the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs, established under 15 U.S.C. § 638. These competitive set-asides are designed to help small firms investigate ideas for new technologies (Phase I) and develop prototypes (Phase II). Congress intended that new technologies will be commercialized either through the federal procurement process or in private markets. To encourage return on SBIR and STTR investment, Congress directed federal agencies to purchase products and services developed through SBIR and STTR to the maximum extent practicable and authorized government agencies to buy SBIR and STTR technologies from SBIR and STTR awardees (or their successor firms) on a sole-source basis. In recent years, however, both Congress and industry have grown increasingly frustrated with the low utilization of SBIR- and STTR-developed technologies in DoD acquisition, especially in major defense acquisition programs.

In Section 252 of the National Defense Authorization Act for Fiscal Year 2006, entitled Research and Development Efforts for Purposes of Small Business Research, Congress adopted four wide-ranging reforms to the DoD SBIR and STTR programs in order to increase the effectiveness of SBIR and STTR for both the DoD and the defense industry. First, Section 252 directed closer alignment between R&D and acquisition goals of SBIR and STTR. Second, Section 252 authorized and funded the creation of the Commercialization Pilot Program (CPP) by the DoD and the military Departments to facilitate transition of SBIR technologies into the acquisition process. Congress conditioned the use of CPP funds on detailed evaluative reporting to Congress. Third, Congress codified into statutory law President George W. Bush's Executive Order No. 13329 (2004), entitled "Encouraging Innovation in Manufacturing," which incentivized manufacturing



technologies through the SBIR and STTR programs. Fourth, Congress clarified the authority to conduct testing and evaluation (T&E) of SBIR and STTR technologies in SBIR and STTR Phases II and III. The implementation requirements were specified in the text of Section 252 and the Congressional Guidance Letter (2006) issued by the leadership of the House and the Senate Small Business Committees.

In response, on June 27, 2006, then-Under Secretary Kenneth Krieg issued a Memorandum to Secretaries of the Army, Navy, and Air Force directing them to implement the CPP authority:

The purpose of the CPP is to accelerate the transition of SBIR-funded technologies to Phase III – specifically into systems being developed, acquired and maintained for the warfighter. This can be done through activities that enhance the connectivity among SBIR firms, prime contractors, and DoD science & technology and acquisition communities. It can also be accomplished by improving an SBIR firm’s capability to provide the identified technology to the Department, directly or as a subcontractor. Since leveraging the SBIR program to meet identified technology needs is a goal of the Department, I request that you develop a CPP utilizing this new authority. (Krieg, 2006).

Subsequently, the DoD prepared four legislatively mandated annual reports to Congress addressing Section 252, but apparently stopped publishing such reports despite the statutory requirement to do so after the much-delayed Fiscal Year 2009 report published in the calendar year 2011 (OUSD AT&L OSBP 2007, 2008, 2009, and 2011). Further, the reports already published did not appear to fully cover all the details which the Congressional Guidance Letter (2006) intended for DoD and military departments to address as part of Section 252 implementation. Therefore, a more detailed research into the implementation of Congressional intent was necessary.

This paper analyzes the implementation of Section 252 (NDAA, 2006) by the Secretaries of Defense, of the Army, of the Navy, and of the Air Force. It reflects the results of a literature review and a survey of SBIR and STTR program executives. The study questions are based on Section 252 text and the Congressional Guidance



Letter (2006). Study questions also rely on best practices identified in relevant academic and professional literature, in innovation programs of other federal agencies such as the National Aeronautics and Space Administration (NASA), and in practices of our major North Atlantic Treaty Organization (NATO) partner, the United Kingdom's Small Business Research Initiative (SBRI). The study finds that while the DoD and the military departments have begun implementation of the DoD SBIR CPP and other Section 252 reforms, progress is uneven. Specifically, agencies are not implementing Section 252 CPP incentives and R&D alignment requirements to the fullest extent possible. The study recommends clarifications of legislative requirements and additional review of Section 252 implementation.

Section II of this report gives general background information about SBIR and STTR. The section describes the programs' objectives. It also describes firms' eligibility requirements to participate in each program. A list of participating government agencies is also included in this section. A description of each of the three phases for the programs is given at the end of this section. Neither Section II nor this study generally address the recent changes which Congress made to the SBIR and STTR Programs and the DoD Commercialization Pilot Program (now renamed the Commercial Readiness Program (CRP)) (NDAA, 2011). However, lessons from this study should inform implementation of these recent improvements.

Section III delves into the specific background of Section 252 (NDAA, 2006), including details from a National Academy of Sciences symposium report entitled *SBIR and the Phase III Challenge of Commercialization*. Following that symposium, "the Senate Committee on Small Business & Entrepreneurship proposed legislation that called for a commercialization pilot program" (NAS, 2007, p. 29, Footnote 23). The purpose of this section is to give the reader an idea of the SBIR and STTR program conditions prior to Section 252 by putting Section 252 reforms in context. After reading this section, the reader should understand the reasons that Congress adopted Section 252.



As part of this paper, Messrs. Hettinger and Gonzalez under the guidance of Dr. Kidalov conducted a survey, directed primarily at SBIR and STTR program managers and administrators within DoD agencies and military departments, that attempted to ascertain how Section 252 (NDAA, 2006) has been carried out within these specific agencies. The Survey Methodology section describes in detail the methods we used, clearly states the survey questions that were given to participants, and describes limitations identified by the survey administrators.

The Analysis section of the paper describes results from this survey. We analyzed and compared all of the respondents' answers for each question with the Section 252 (NDAA, 2006) legislation, the Congressional Guidance Letter (2006), as well as with additional sources. The survey answers, in many cases, showed inconsistencies with the intent of the legislation as well as with announced practices.

Finally, this paper analyzes the counterpart program, namely, the United Kingdom's Small Business Research Initiative (SBRI) as implemented by the Center for Defence Enterprise (CDE) and the Technology Strategy Board (TSB).

The paper concludes with answers to the research questions and the authors' recommendations for further reforms.



II. Background of the SBIR and STTR Programs

The DoD SBIR program awards contracts to qualifying small businesses that display the promise of producing cutting-edge technology for military or dual-use applications. The technology may show promise, but that technology may still be too risky for private investment due to various reasons such as a relatively low technological readiness level and no past performance history for the company (NAS, 2007). Therefore, an SBIR contract can act as initial funding to get an idea developed into a product or service. The SBIR program began pursuant to the Small Business Innovation Act of 1982. The STTR program began pursuant to the Small Business Technology Transfer Act of 1992. SBIR and STTR have no permanent reauthorization but have been periodically reauthorized since then. The main difference between SBIR and STTR is that SBIR contracts are open solely to small businesses—defined as businesses with less than 500 employees—and STTR contracts are open to small businesses that collaborate with not-for-profit research organizations such as universities and federally funded R&D centers (SBIR and STTR Policy Directives, 2002).

As stated in the Small Business Innovation Act (1982), the SBIR and STTR programs have four goals:

1. stimulate technological innovation,
2. use small business to meet federal and development needs,
3. foster and encourage participation by minority and disadvantaged persons in technological innovation, and
4. increase private-sector commercialization derived from federal R&D.
(p. 1)

The fourth objective, commercialization, is defined by the U.S. Small Business Administration as “the process of developing marketable products or services and



producing and delivering products or services for sale (whether by the originating party or by others) to Government or commercial markets” (SBIR and STTR Policy Directives, 2002).

Federal agencies with extramural R&D budgets of at least \$100 million are required to participate in SBIR. Federal agencies with extramural R&D budgets of at least \$1 billion are required to participate in STTR. Participating agencies are required to set aside 2.5% and 0.3% of their R&D budgets for SBIR and STTR programs, respectively (15 U.S.C. § 638). Within the DoD, each military department as well as the Defense Advanced Research Projects Agency (DARPA) and the Missile Defense Agency (MDA) administer their own SBIR/STTR programs. Seven agencies under the Office of the Secretary of Defense (OSD) administer the SBIR programs but not STTR; these agencies include the Defense Logistics Agency (DLA), the Defense Microelectronics Activity (DMEA), the Defense Technical Information Center (DTIC), the Defense Threat Reduction Agency (DTRA), the Chemical and Biological Defense Program (CBDP), the Special Operations Acquisitions and Logistics Center (SOALC), and the National Geospatial-Intelligence Agency (NGIA).

The DoD SBIR/STTR awards processes are divided into three phases. In Phase I, small businesses compete on SBIR/STTR topics that are published by the DoD. The DoD announces SBIR topics three times a year and STTR topics twice a year. Small businesses that earn Phase I contracts can generally be awarded up to \$150,000 (SBA 2010) while participating in SBIR and up to \$100,000 while participating in STTR (SBIR and STTR Policy Directives, 2002). The purpose of Phase I is “for determining, insofar as possible, the scientific and technical merit and feasibility of ideas that appear to have commercial potential, as described in subparagraph (B), submitted pursuant to SBIR program solicitations” (15 U.S.C. § 638). Phase I awardees can be awarded up to \$1 million for SBIR and \$750,000 for STTR in a Phase II contract. The purpose of Phase II is “to further develop proposed ideas to meet particular program needs, in which awards shall be made based on



the scientific, technical, and commercial merit and feasibility of the idea, as evidenced by the first phase and by other relevant information” (15 U.S.C. § 638).

Phase III is considered the commercialization phase. This is the step in which only non-SBIR/non-STTR funds, typically from private-sector investment or other Federal funds such as defense acquisition program funds, can be used to develop an actual product or service. In some cases, enough work can be completed in Phase I or II to satisfy a defense acquisition program office. According to the DoD SBIR/STTR Desk Reference, “Phase III refers to work that derives from, extends, or logically concludes effort(s) performed under prior SBIR funding agreements, but is funded by sources other than the SBIR Program. Phase III work is typically oriented towards commercialization of SBIR research or technology” . . . but may also include continuation of R&D. (DoD SBIR Program Office, n.d., p. 112). “Phase III work may be for products, production, services, R/ R&D, or any combination thereof.” (DoD SBIR Program Office, n.d., p. 112). Phase III projects are subject to a special preference at the prime contracting and subcontracting levels in favor of SBIR/STTR Phase II awardee (or successor in interest):

For Phase III, Congress intends that agencies or their Government-owned, contractor-operated facilities, Federally-funded research and development centers, or Government prime contractors that pursue R/R&D or production developed under the SBIR Program, give preference, including sole source awards, to the awardee that developed the technology. In fact, the Act requires reporting to SBA of all instances in which an agency pursues research, development, or production of a technology developed by an SBIR awardee, with a concern other than the one that developed the SBIR technology. (DoD SBIR Program Office, n.d., p. 113).

However, as acknowledged by the National Research Council of the National Academies, SBIR firms seeking to sell to the Federal government face significant challenges during the course of the Phase III commercialization process. Indeed, before small firms can sell their technologies through the regular government procurement process, they often lack capital and go through a “valley of death”-type experience where they lack capital to convert their R&D into marketable products or services. (NAS, 2007, pp. 5–6). The term “valley of death” defines “this challenging transition when a developing technology is deemed promising, but too new to validate its commercial potential and thereby attract the capital necessary for its development.” (NAS, 2007, p. 7). The National Research Council identified several



specific transition challenges for SBIR innovations, including barriers to entry into the procurement process:

Commercializing SBIR-supported innovation is necessary if the nation is to capitalize on its SBIR investments. This transition is, however, challenging because it requires a small firm with an innovative idea to evolve quickly from a narrow focus on R&D to a much broader understanding of the complex systems and missions of federal agencies as well as the interrelated challenges of managing a larger business, developing sources of finance, and competing in the marketplace. In cases where the federal government is the customer, small businesses must also learn to deal with a complex contracting system characterized by many arcane rules and procedures. . . . The challenge of technology commercialization includes the normal uncertainties of the development process common to all new technologies as well as unique institutional challenges found in federal procurement practices. Commercializing science-based innovations is inherently a high-risk endeavor. One source of risk is the lack of sufficient public information for potential investors about technologies developed by small firms. A second related hurdle is the leakage of new knowledge that escapes the boundaries of firms and intellectual property protection. The creator of new knowledge can seldom fully capture the economic value of that knowledge for his or her own firm. . . . Commercializing SBIR-funded technologies through federal procurement is no less challenging for innovative small companies. Finding private sources of funding to further develop even successful SBIR Phase II projects . . . is often difficult because the eventual “market” for products is unlikely to be large enough to attract private venture funding. . . . Institutional biases in federal procurement also hinder government funding needed to transition promising SBIR technologies. Procurement rules and practices often impose high costs and administrative overheads that favor established suppliers. In addition, many acquisition officers have traditionally viewed the SBIR program as a “tax” on their R&D budgets, representing a “loss” of resources and control rather than an opportunity to develop rapid and lower cost solutions to complex procurement challenges. Even when they see the value of a technology, providing “extra” funding to exploit it in a timely manner can be a challenge that requires time, commitment, and, ultimately, the interest of those with budgetary authority for the programs or systems. Attracting such interest and support is not automatic and may often depend on personal relations and advocacy skills, not on the intrinsic quality of the SBIR project. (NAS, 2007, p. 7-9).



III. Background of Section 252 of the National Defense Authorization Act for Fiscal Year 2006

The purpose of Section 252 of the National Defense Authorization Act for Fiscal Year 2006 was to reform SBIR and STTR. Section 252 mostly addresses issues within the SBIR program but does refer to STTR. At the time, the U.S. House and Senate Small Business Committees became concerned with the state of SBIR and STTR because they believed that DoD was not adequately leveraging the innovation of small businesses even though such innovation is vital for the U.S.'s national security. Both Congressional Small Business Committees also view Phase I and Phase II contract awards as investments of taxpayer dollars. Attempting to reform SBIR and STTR Section 252 added the following subsections to Section 9 of the Small Business Act:

- Subsection (x): Research and Development Focus;
- Subsection (y): Commercialization Pilot Program, language concerning implementation of Executive Order No. 13329 (2004); and
- Subsection (e)(9): language supporting testing and evaluation of SBIR and STTR technologies.

Each of these subsections is meant to address challenges that have been identified within the SBIR and STTR communities by the National Academies of Sciences 2005 Symposium on SBIR commercialization and other inputs from government and industry. These challenges include SBIR and STTR topic alignment, expediting the commercialization of SBIR and STTR projects, and assurance that Executive Order No. 13329, *Encouraging Innovation in Manufacturing* (2004), is being implemented.



A. Reform 1: SBIR Topics Generation

Subsection (x) Research and Development Focus mandates that the Secretary of Defense (SECDEF) will engage in a Quadrennial SBIR/STTR Review in order to revise and update the criteria and procedures utilized to identify R&D efforts that are suitable for SBIR and STTR programs at least once every four years. According to the Congressional Guidance Letter (2006), subsection (x) “addresses the need for a strategic, DoD-wide review of the SBIR and STTR program (conducted not less than quadrennially) based on the latest research, science, and technology plans of the DoD” and based on the Joint Warfighting Science and Technology Plan, the Defense Technology Area Plan, and the Basic Research Plan. Together, these plans represent the foundation of the Defense Science and Technology Strategy, while each of these plans has a specific emphasis: joint warfighter operations, DoD-wide acquisition program priorities, and strategically disruptive/revolutionary technologies, respectively. (DoD and JCS, 2006). Together, these plans were to focus R&D efforts within the DoD SBIR and STTR to specific areas previously identified to be of strategic importance to warfighting efforts. At the same time, Subsection (x) also mandates that program managers and program executive officers be included during topic generation. If an SBIR/STTR project is not aligned with an acquisition program to fill in technological gaps, then it is unlikely to attract those kinds of funds. Therefore, early involvement from program offices is essential.

B. Reform 2: The Commercialization Pilot Program

Next, Subsection (y) authorizes the Secretary of Defense and each military department secretary to create a CPP. The CPP’s stated intent is to “accelerate the transition of SBIR technologies into Phase III including acquisition process.” (NDAA 2006). If a department decides to create a CPP, then the department must adhere to all the requirements within Subsection (y). These requirements include that the Secretary of Defense and the secretary of each military department must identify SBIR projects that show potential for rapid transition into Phase III and certify in



writing that the identified projects will meet high priorities within that military Service. Each military department is authorized to use up to 1% of available SBIR funds to administer the CPP, but these CPP administrative funds cannot be used to award Phase III contracts. Subsection (y) also mandates that the Secretary of Defense provide an evaluative report to (1) the Committee on Armed Services and the Committee on Small Business and Entrepreneurship of the Senate and (2) the Committee on Armed Services and the Committee on Small Business of the House of Representatives. This report must contain an accounting of funds, a description of incentives and activities performed under the CPP, and results achieved under the CPP.

The origin of the CPP came from the 2005 National Academy of Sciences SBIR Transition Symposium. This symposium was a gathering of leadership from government agencies, large defense contractors (prime contractors), and small businesses. During the Symposium, representatives from each of these sectors discussed challenges of commercialization from their own point of view. Policy reform recommendations at the symposium generally fell within two categories: “(1) possible changes in agency program management, including better use of incentives for managers, roadmaps, and greater matchmaking, and (2) ways in which small businesses and the prime contractors could better align their work to improve Phase III outcomes” (NAS, 2007, p. 23).

With regards to incentives for better defense acquisition program management with regards to SBIR transition, Symposium proceedings focused on finding best ways to incentivize program managers (PMs) and program executive officers (PEOs) on major defense acquisition programs to introduce new technologies that can not only result in substantial time, cost, or performance benefits, but also can present some risk of disruption to program costs and schedules if the technologies failed. Leading government officials, industry executives, and policy experts proposed various incentives for better SBIR program



management. For example, during the Symposium, incentives were proposed in the following areas:

- **Alignment.** Entering the SBIR company into a program with which the program executive officer was already engaged is one way to better focus SBIR projects on outcomes that directly support agency programs' (and program officer) objectives. As noted by some speakers, this could allow SBIR projects to connect with Phase III activities already under way.
- **Reliability.** This involves identifying technologies that have been operationally tested and need little, if any, modification. This suggestion by a participant reflected widely held views that program executive officer involvement was critical in bringing SBIR technologies to the necessary readiness level.
- **Capacity.** As Dr. Michael McGrath, Deputy Assistant Secretary of the Navy for Research, Development, Testing, and Evaluation, noted, SBIR firms need to take steps to convince program executive officers not only that the SBIR technology works but also that small business will be able to produce it to scale and on time.
- **Budget Integration.** Some participants noted that program executive officers needed to see that the SBIR set-aside will be used to further their own missions. This calls for building SBIR research into the work and budget of program offices. By contrast, the Air Force's program offices submit a budget based on independent cost estimates. SBIR awards are then taken as a 2.5% tax out of that budget.
- **Training.** [Colonel Mark D. Stephen, Chief, Science & Technology Division, Office of the Deputy Assistant Secretary of the Air Force for Science, Technology, and Engineering (DASAF (ST&E))] noted that training program executive officers to help them understand how SBIR can be leveraged to realize their mission goals is necessary. However, Mr. [Richard] Carroll of Innovative Defense Strategies [and past Chairman of the Small Business Technology Council] noted that SBIR training had been part of the general program executive officer training curriculum for one year but had since been deleted.
- **Partnering.** As described by Carl Ray, [NASA Program Executive for SBIR and STTR], the SBIR program at NASA is forming partnerships with mission directorates aimed at enhancing "spin-in" — the take-up of SBIR technologies by NASA [major acquisition] programs.



- **Emphasizing Opportunity.** McGrath noted that the Navy’s SBIR management attempts to provide a consistent message to program executive officers and program managers—that “SBIR provides money and opportunity to fill R&D gaps in the program. Apply that money and innovation to your most urgent needs” (NAS, 2007, pp. 23–24).

With respect to the road maps, “some participants emphasized the need to coordinate small business activities with prime contractor project roadmaps.” NAS, 2007, p. 24). This is due to the complexities involved in integrating SBIR-funded candidate subsystems into large weapons systems in which prime contractors act as lead integrators. Large prime contractor representatives offered the following perspectives:

Lockheed’s Mr. [Mario] Ramirez[, F-35/Joint Strike Fighter Small Business Officer for Lockheed Martin Aeronautics,] noted that “to make successful transitions to Phase III, SBIR technologies must be integrated into an overall roadmap.” Lockheed Martin uses a variety of roadmaps to that end, including both technical capability roadmaps and corporate technology roadmaps. The Raytheon representative [John Waszczak, Director of Advanced Technology and SBIR/STTR for Raytheon Missile Systems.] added that roadmaps are important because it is necessary to coordinate the technology transition process across the customer, the supply chain, and small businesses. Coordination should include advanced technology demonstrations, which could be used to integrate multiple technologies into a complex system. (NAS, 2007, pp. 24–25)

Ultimately, all symposium participants agreed that the transition to commercialization needed to be reformed. SBIR technologies needed buy-in from program managers and prime contractors and the attitude of SBIR being a “tax” on acquisition and R&D program funding needed to change. Statements at the NAS Symposium provided examples of incentive strategies needed to effect such a change. Robert McNamara of the Navy, Program Executive Officer - Submarines, described himself as an advocate of small business and said that the centerpiece of his advocacy was the SBIR program. In his Requests for Proposals (RFPs), McNamara incentivizes primes to subcontract certain percentages of the work to small business.



For example, McNamara contracted with General Dynamics on the Virginia-class acquisition program, demonstrating that small businesses are a high priority, and offered a million-dollar “bounty” per hull as an additional incentive fee for contractors who met small business subcontracting goals. The Navy owes it to the large prime contractors, he said, to provide real incentives for a policy considered truly important (NAS, 2007, p. 142).

Col. Stephen of the U.S. Air Force DASAF (ST&E) suggested that in order to gain buy-in, the SBIR program should be sure to focus not only on research but also on the results that program managers need—outputs that directly support agency objectives. Dr. John Parmentola, Director of Research and Laboratory Management, U.S. Army, agreed, saying that program managers want technologies that have been operationally tested and require little, if any, modification. Section 252 (NDAA, 2006) makes provisions for testing and evaluation (T&E). Opening the SBIR program to T&E is an incentive for program managers because results from T&E may be used to gauge the technology readiness level (TRL) of a SBIR project. As stated by Symposium participants, the TRL is more important to program managers than ongoing research.

This need for meaningful incentives was also reiterated by prime contractors. Prime contractors represented at the symposium stated that they have focused management attention, shifted resources, and assigned responsibilities within their own management structures to capitalize on the creativity of SBIR firms and promote greater T&E (NAS, 2007, p. 28). Lockheed Martin also intended to build more formal business relationships with its small businesses, which are critical to successful Phase III transitions. This process must begin with joint visits to customers, when both sides can discuss product discriminators, areas for further investigation, and collaboration within Lockheed’s own Independent Research and Development (IR&D) and Cooperative Research and Development Agreement (CRADA) technology culture. These relationships would also help integrate the SBIR



technologies and firms and allow Lockheed to demonstrate its successes and build formal partnerships.

During the Symposium, one of the authors of this paper, Dr. Max Kidalov, then serving as Counsel at the Senate Small Business Committee, lead a panel discussion on incentives for contracting with SBIR firms. Kidalov noted that in his experience, large prime contractors needed a champion, a corporate strategy, and incentives to continue using SBIR firms. He noted that these incentives need to go beyond the competitive advantages they provide. Kidalov asked whether the panelists saw value in a system that would allow for recognition of efforts to contract with SBIR firms, perhaps from Congress and the government agencies. All panelists agreed.

Specifically, in response, Boeing representative [Richard Hendel, Principal Specialist, Enterprise Supplier Diversity Program Office and SBIR Manager, The Boeing Company,] pointed out that incentives are built into contracts when agencies award them for many reasons, such as schedule and budget. The Boeing representative was pointing out that it should be possible to include similar incentives, such as those for working with SBIR firms. An ATK representative agreed that incentives were essential because primes, like government program managers, were risk adverse by nature. Incentives would encourage them to take those risks.

The Raytheon representative was more specific in response to the question posed by Dr. Kidalov. In particular, Mr. Wasczak stated three incentives that would help the case to use SBIR firms: First, to streamline and otherwise optimize the SBIR process, which in turn would ensure the development of many technologies needed for the long term; second, an assurance that customers have realistic plans to support the transition from Phase II through Phase III; third, an incentive that SBIR firms help meet the requirement to work with small, disadvantaged businesses (NAS, 2007, p. 82).



C. Reform 3: Encouraging Innovation in Manufacturing

Section 252 (NDAA, 2006) mandates the full implementation of the tenets of Executive Order No. 13329, *Encouraging Innovation in Manufacturing* (2004). The impact of Section 252 is that future Presidential administrations cannot ignore this order. Executive Order No. 13329 was issued on February 24, 2004, by President George W. Bush. The goal of the order is outlined in the Introduction section, which stresses the importance of the federal government's role in encouraging technological innovation in the U.S. economy. As part of that encouragement, the order specifically tasks the SBIR and SBTT programs with "helping to advance innovation, including innovation in manufacturing, through small businesses" (Executive Order No. 13329, 2004, § 1). The Executive Order required that heads of departments and agencies that have an SBIR or STTR program "give high priority within such programs to manufacturing-related research and development" (Executive Order No. 13329, 2004, § 2). The order places on department and agency heads a requirement to provide an annual report to the Small Business Administration and to the Director of the White House Office of Science and Technology Policy in which they are to report on their efforts in meeting this order.

An impact of the executive order issuance was that the U.S. Small Business Administration proposed amendments to the SBIR Policy Directive on May 19, 2005, to incorporate the goals of Executive Order 13329. (SBA, 2005). Although the amendments to the SBIR Policy Directive were not finalized, many agencies themselves established their own implementation plans.

D. Reform 4: Enhanced Testing & Evaluation

In order to address another issue that impairs SBIR projects from transitioning to Phase III, Section 252 (NDAA, 2006) clarifies the definition of what constitutes a commercial application. The clarification was necessary in order to remove barriers imposed by overly restrictive interpretations of Phase II and Phase III requirements. Therefore, through Section 252, the definition of a *commercial application* in 15



U.S.C. § 638 (2006) was expanded to include T&E of products, services, or technologies for use in technical or weapons systems, and, further, awards for T&E of products, services, or technologies for use in technical or weapons systems may be made in either Phase II or III of the SBIR and STTR programs.



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IV. Survey Methodology

A. Survey Goals

In order to assess effectiveness of Congressional SBIR/STTR reforms in Section 252 (NDAA, 2006), we designed a survey and sought answers from program managers and experts within the military departments who are involved with the Small Business Innovation Research (SBIR) program. We asked 102 individuals to complete an online survey. Our purpose in using the survey was to document the agency implementations and practice in regard to the Commercialization Pilot Program and other Section 252 (NDAA, 2006) reforms. With this information, it was then possible to identify what was being done to implement Section 252 and how each agency worked to meet the congressional intent of the CPP.

B. Survey Design

The survey focuses on seven main research questions from the Congressional Guidance Letter to Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]) Kenneth J. Krieg.

1. How did the DoD implement the new requirement in Section 252(a) (NDAA, 2006) for research focus of its SBIR and STTR programs?
2. How did the DoD and each military department plan to involve acquisition program managers and program executive offices in SBIR/STTR topic selection and management to ensure that SBIR/STTR is integrated into the DoD's mission and its acquisition framework, as contemplated in Section 252(a) (NDAA, 2006), SBIR Commercialization Pilot Program, and Section 252(c), inclusion of testing and evaluation works as part of SBIR/STTR commercialization activity?
3. How did the DoD and each military department's acquisition program managers and program executive officers plan for post-SBIR/-STTR funding, through the Program Objective Memoranda and other vehicles, to utilize SBIR/STTR technology resources in their acquisition



process, as stated in Section 252(a) (NDAA, 2006), SBIR Commercialization Pilot Program?

4. How did the DoD and each military department plan and implement the SBIR Commercialization Pilot Program, and specifically what processes did these military [departments] and defense agencies develop and implement to ensure identification of optimal SBIR/STTR Phase I–II projects for accelerated transition through this pilot program?
5. What acquisition incentives and activities did the DoD and each military department deploy to accelerate the transition of SBIR/STTR technologies into the acquisition process through the pilot program?
6. What specific reporting requirements did the DoD and each military department impose on acquisition program managers, program executive officers, and prime contractors as part of the annual evaluative report to Congress, as outlined in Section 252(a) (NDAA, 2006)?
7. How did the DoD and each military department implement Executive Order No. 13329 (2004), Encouraging Innovation In Manufacturing, codified into law as part of Section 252(b) (NDAA, 2006)?

C. Survey Scoring

We asked respondents two types of questions: those requiring a positive or negative response, and those requesting a response using a rating scale. We also gave respondents the option of choosing *don't know* or *not applicable*.

D. Survey Subjects

We asked all DoD agencies and departments participating in SBIR and STTR to participate in the survey. We sent each point of contact an e-mail with a request to participate in the survey and a link to the SurveyMonkey.com website where the online survey was posted. To refresh respondents' recollection, we supplemented the survey with the text of the act and a copy of the Congressional Guidance Letter, issued jointly by the Chair and Ranking Minority Member of the Senate Committee on Small Business and Entrepreneurship and the Chair of the House Committee on Small Business. Points of contact may have assigned additional respondents within



their agency. We asked respondents to identify their agency. We did not collect respondents' names or positions within their agency.

E. Survey Limitations

The survey was primarily intended to ask responsible agency officials to identify practices and policies related to the reforms adopted by Congress and outlined in Section 252 (NDAA, 2006).

The data collected in the survey is therefore the primary source of the conclusions presented in this report. No respondent actually completed the survey in total. This was partly by design since a large number of the survey questions were only presented to the respondent depending on the respondent's previous answer.

The conclusions we discuss in the following sections of this paper are based on results obtained when multiple responders provided the answers to the questions being asked. Where appropriate or necessary, respondents' answers were supplemented by reviews of publications and academic literature.



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V. Survey Results and Analysis

A. Response Rate and Background Results

1. Background and Participating Organizations

We asked 102 individuals to complete the online survey. Of those 102 potential respondents, we received 19 attempted responses, with the largest number of participants identified as being from Air Force organizations.

As noted above, partly as a result of the design of the survey to adjust the questions asked depending on the response to previous questions, no one participant completed all 30 questions within the survey.

The responding organizations and their completed response rates (not including respondents skipping any given question) are shown in Table 1.

Table 1. Response by Organization

Invited Participant Organization	Participated?	Number of Responses
Office of the Secretary of Defense/Office of Small Business Programs	No	0
Army	No	0
Navy	Yes	3
Air Force	Yes	4
Missile Defense Agency	No	0
National Geospatial Intelligence Agency	Yes	1
Joint Science and Technology Office for Chemical and Biological Defense	No	0
Defense Advanced Research Projects Agency	No	0
Defense Microelectronics Activity	No	0
Defense Logistics Agency	No	0
Defense Threat Reduction Agency	No	0
Office of the Deputy Under Secretary of Defense (Science and Technology)	No	0
U.S. Special Operations Command	No	0
Commercialization Pilot Program Implementing Contractor – Army	No	0
Commercialization Pilot Program Implementing Contractor - Navy	No	0
Total Responses	3	8



B. Organizational Alignment of Regulations, Policies, and Procedures With SBIR and STTR Research Focus

1. Alignment of SBIR/STTR Topics With DoD Research Plans

Given an opportunity to respond to a question regarding the adoption of regulations, policies, or procedures necessary for compliance with the requirement in Section 252 (NDAA, 2006) for alignment of SBIR and STTR research topics with those set forth in the Joint Warfighting Science and Technology Plan, the Defense Technology Area Plan, and the Basis Research Plan of the Department of Defense, 50% of the respondents for the organization responded that their organization was not in alignment with the plan (Figure 1). Of the respondents, 37.5% gave an affirmative response that their organization was in alignment with such plan or plans.

Of the respondents, 12.5% answered that they did not know if their organization had institutionalized SBIR/STTR topic alignment with the Section 252-identified DoD research plans in their organization.

When the results are broken down by organization (Figure 2), the Navy response indicated that it was more in compliance than any other agency, and the Air Force response indicated that it was the least compliant. Overall, all responding organizations indicated that they did not have the topic alignment required by Section 252 (NDAA, 2006), which was outlined previously in this paper.



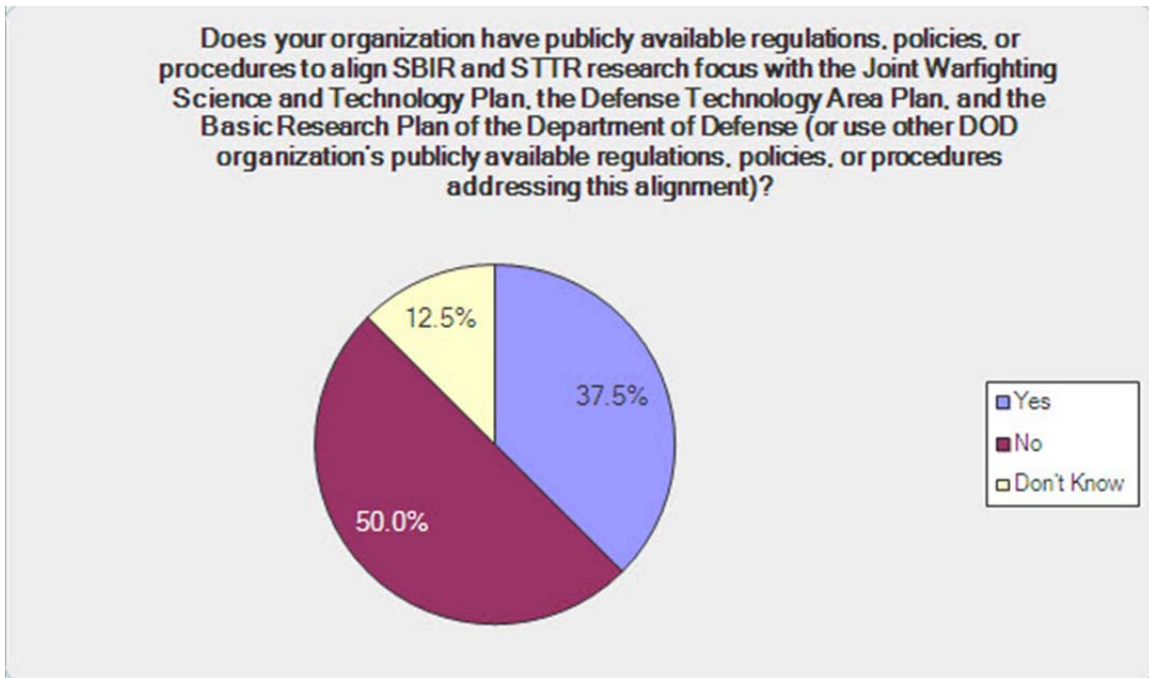


Figure 1. **SBIR/STTR Policy Alignment With DoD Research Plans**

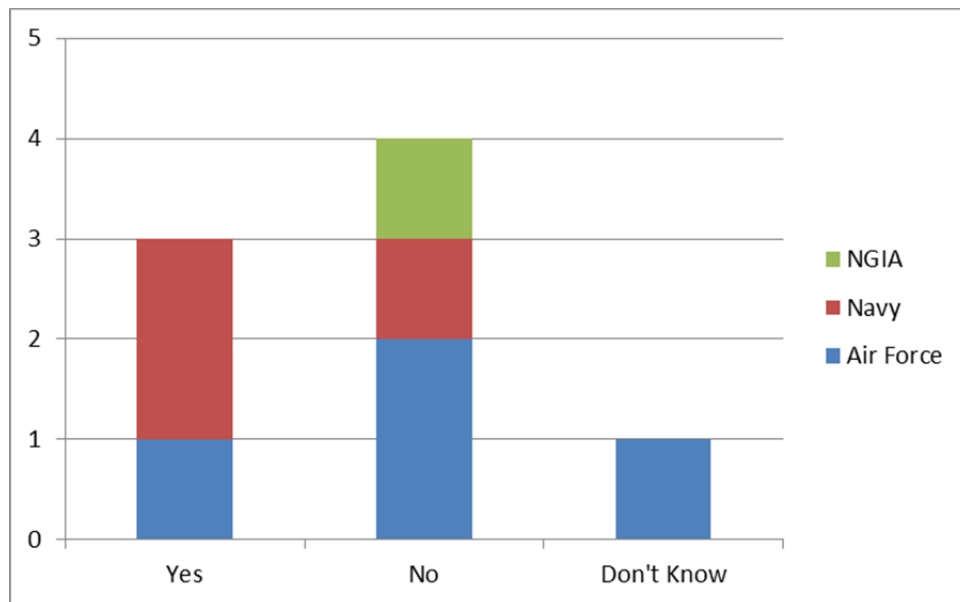


Figure 2. **SBIR/STTR Policy Alignment With DoD Research Plans, Response by Organization**

Analysis. These response results are surprising because the Research Development Testing and Evaluation (RDT&E) communities control the selection of



SBIR/STTR topics in the Air Force (with some exception for space-related systems; Government Accountability Office [GAO], 2010, p. 9) and the Army, while the Navy approaches topic generation by the program offices (DoD Inspector General [DoDIG], 2009). The Army and Air Force labs should be well aware of the defense science plans that are required for topic generation and the statutory requirements for generating those topics.

The conclusion that can be drawn from this data is that either the organizations are uninformed regarding the statutory alignment requirement or they are aware but do not put the requirements in place. Further research would have to be conducted to determine which of the two conclusions is correct.

2. Alignment of SBIR/STTR Topics With DoD Research Plans— Program Manager/Program Executive Officer Input

With a response of 50%, the plurality of respondents answered *not applicable* to the question as to whether their organizations had in place regulations, policies, or procedures to obtain input of program managers and/or program executive officers in order to determine the R&D focus areas for SBIR and STTR topics (see Figure 3).

In contrast, 37.5% of the respondents answered positively that there were regulations, policies, or procedures in place to provide input of program managers and/or program executive officers, as required by Section 252 (NDAA, 2006). There were 12.5% who answered that they did not know. As shown in Figure 4, Navy and Air Force responses showed compliance with Section 252 with regards to program manager/program executive officer input. NGIA responded that this Section 252 requirement was not applicable, while Air Force respondents also claimed lack of knowledge and lack of applicability.



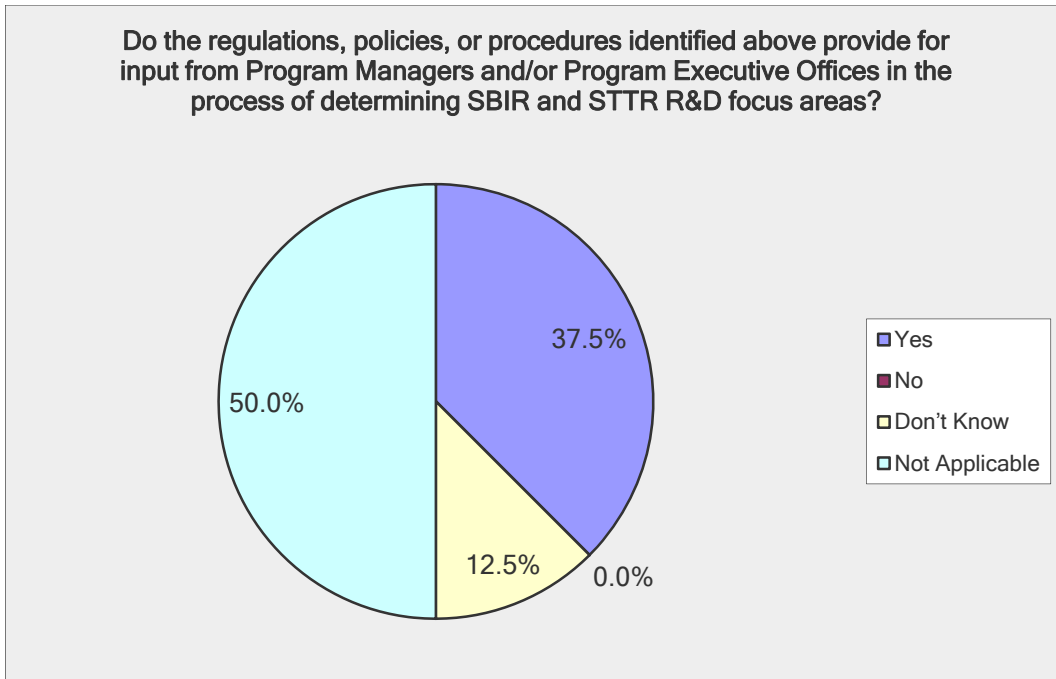


Figure 3. Program Manager/Program Executive Officer Input Into SBIR/STTR Focus Areas

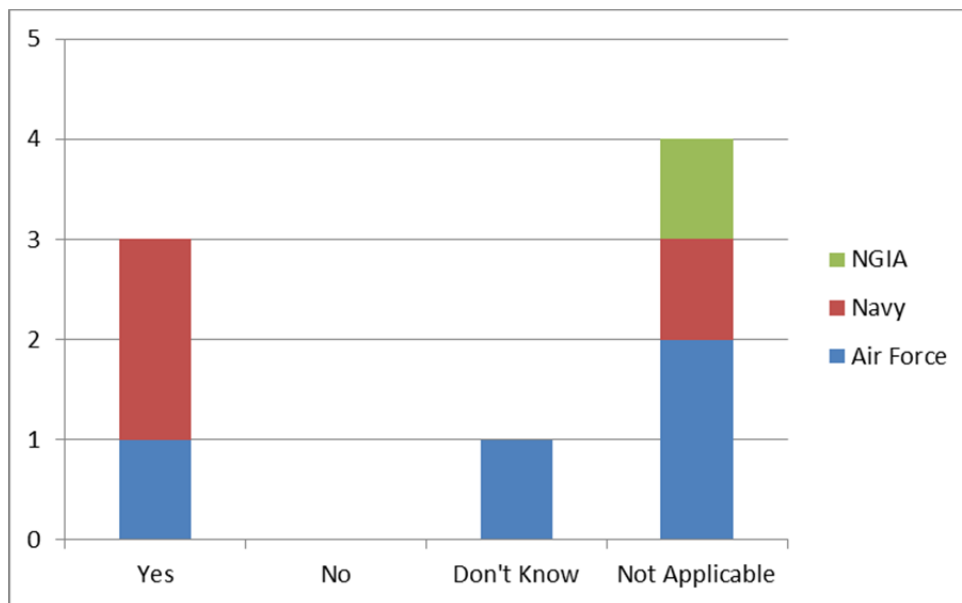


Figure 4. Program Manager/Program Executive Officer Input Into SBIR/STTR Focus Areas, Response by Organization



Analysis. However much the response of the Navy Department shows its understanding of this section of the legislation, the overwhelming response by all organizations indicated that the involvement of program managers and program executive officers in determining focus areas was not applicable to their SBIR/STTR program implementation.

This finding is also surprising, especially since a 2006 memorandum from the Office of the Under Secretary of Defense (AT&L) issued the SBIR policy requiring “at least 50% of SBIR topics [to] have acquisition community endorsement or sponsorship” (Krieg, 2006). As reported in the DoDIG report of January 30, 2009, which related the results of a Navy 2007 SBIR symposium, it was noted that the Navy writes SBIR topics that are closely aligned with the needs of the acquisition community for easier transitions of technology projects. As a result, Navy topics are less risky, and they transition to commercialization (Phase III) more easily than the topics developed by other means (DoDIG, 2009, p. 9). In addition to the success reported by the Navy, involvement of the acquisition community in topic generation was also recommended as a best practice in a Congressionally mandated SBIR study conducted by the National Academy of Sciences (2009).

As was also noted in the DoDIG report, this requirement for involving the acquisition community members in the development of topics for SBIR/STTR projects may pose a problem for DARPA because their focus is not on “urgent needs and requirements” but rather on “radical innovations that may take years to prove feasible” (DoDIG, 2009, p. 10). Consequently, an area of further research may be how an organization with a focus such as DARPA’s should participate in SBIR/STTR topic generation, and what guidelines should be provided to smooth Phase III transitions for organizations that have a similar focus?

Again, additional research would have to be conducted to determine the reasons behind these responses (i.e., ignorance of the requirement, or disregard).



3. Alignment of SBIR/STTR Topics With DoD Research Plans— Quadrennial Strategic Review

Congress intended that, in order to align SBIR and STTR R&D with military priorities, DoD conduct a regular strategic review of SBIR and STTR topics:

First and foremost, this Section addresses the need for a strategic, DoD-wide review of the SBIR and STTR programs (conducted no less than quadrennially) based on the latest research, science, and technology plans of the DoD. The review should address the research priorities of the DoD (taking into account the warfighters' needs), tie these priorities with the ongoing or anticipated acquisition programs, and also address the commercialization, manufacturing, and testing and evaluation of technologies funded through the SBIR and the STTR. The strategic review process envisioned by this provision is also intended to guard the SBIR and STTR programs at the DoD against merely serving as a funding supplement to advance acquisition programs which suffer from a low level of technological maturity. (Congressional Guidance Letter, 2006).

To that end, our survey asked whether there was organizational participation in a Quadrennial Strategic Review of SBIR and STTR programs in accordance with the regulations, policies, or procedures that align topics with DoD research plans and program manager/program executive officer inputs to the same. With a combined response rate of 75%, most respondents answered *don't know* or *never participated* in such reviews (see Figure 5).

Only 25% of the respondents indicated that in either *most instances* or in *some instances*, their organization participated in these reviews as required by Section 252 (a)(1) (NDAA, 2006).



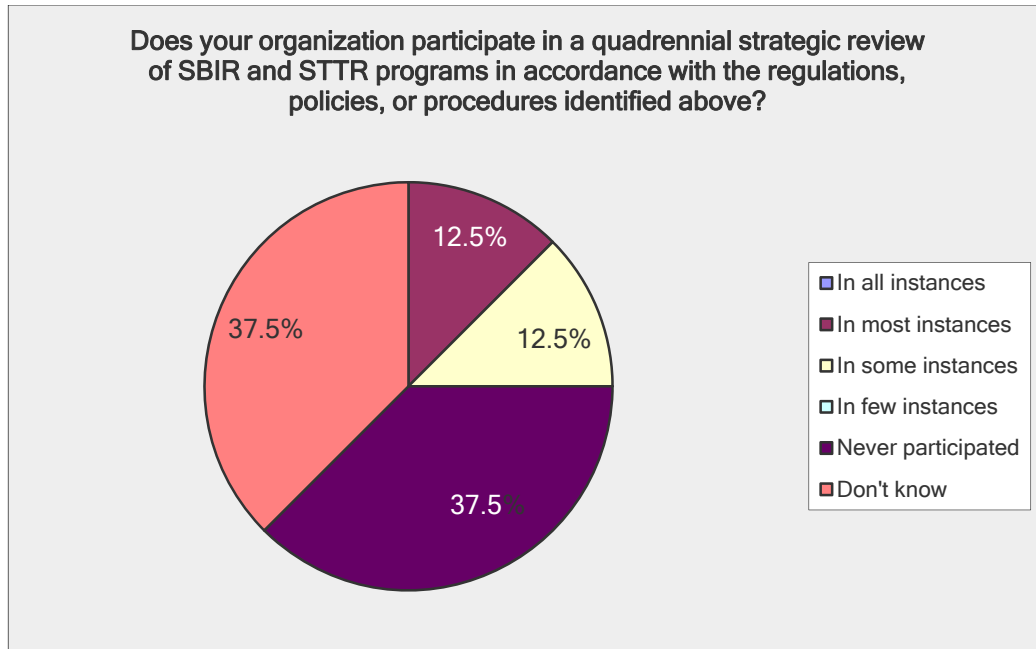


Figure 5. Response to SBIR/STTR Quadrennial Strategic Review

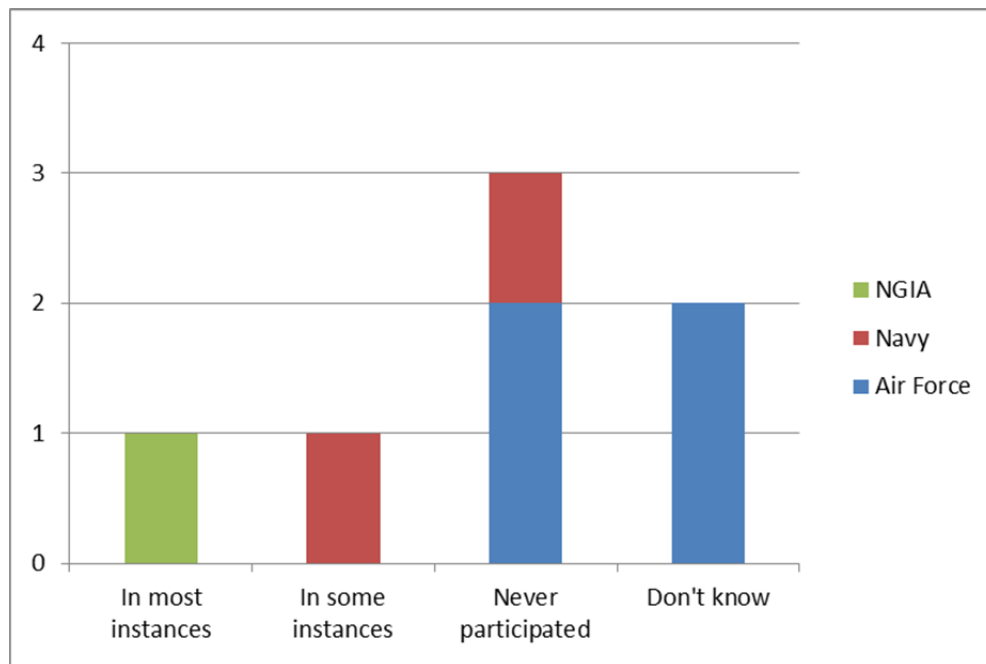


Figure 6. Response to SBIR/STTR Quadrennial Strategic Review by Responding Organization

Analysis. The organizational responses to the Quadrennial Strategic Review question, as detailed in Figure 6, were interesting. The Air Force responders either



did not participate or didn't know if their organization participated in the Secretary of Defense Quadrennial Strategic Review of SBIR and STTR topics. The Navy Department responses split between one respondent indicating that the Navy Department had participated in the Quadrennial Strategic Review in some instances, and the other respondent indicating that the Navy Department had never participated. One other Navy respondent did not provide any answer to the question.

Also of interest was the response from the NGIA, which indicated that their organization participated in most instances. This response seemingly contradicts the responses from the previous questions in which NGIA answered either in the negative or *not applicable* to those parts of the legislation that required alignment with DoD research plans and program manager/program executive officer input to the Quadrennial Strategic Review.

In any case, one can conclude from these results that the participation of the DoD organizations in the Secretary of Defense's Quadrennial Strategic Review of SBIR/STTR is low. Furthermore, during a literature review for the purposes of this report, no information was found regarding the SBIR/STTR Quadrennial Strategic Review. This may be due to the nature of the review itself or—more likely in the opinion of the authors—to the fact that the Review has not been conducted as the legislation stipulates. Since Section 252 (NDAA, 2006) was adopted, there have been two Quadrennial Defense Reviews, one in 2006 and the other in 2010, neither of which apparently had a Quadrennial Strategic Review conducted thereafter.

C. Creation and Setup of the Commercialization Pilot Program (CPP)

1. **Creation of the Commercialization Pilot Program by Military Departments**

Paragraph (y)(1) of Section 252 (NDAA, 2006) gives the Secretaries of Defense, the Army, the Navy, and the Air Force the authority to create a Commercialization Pilot Program (CPP) with the stated goal to “accelerate the



transition of technologies, products, and services developed under the Small Business Innovation Research Program to Phase III, including the acquisition process.” To that end, our survey asked whether military departments created a CPP. With a response of 62.5%, most respondents answered with an affirmative to the question as to whether their organization created the Commercialization Pilot Program (see Figure 7). However, 25% of the respondents answered in the negative that their organization had not created the CPP, while 12.5% answered that creation of the CPP was *not applicable* to their organization.

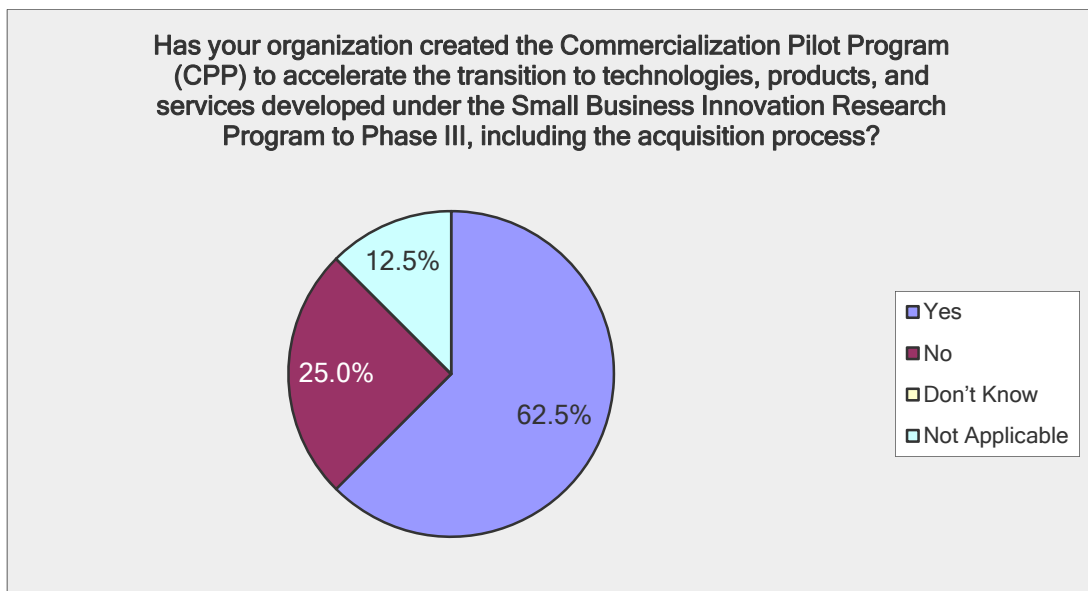


Figure 7. **Response to Creation of the Commercialization Pilot Program**



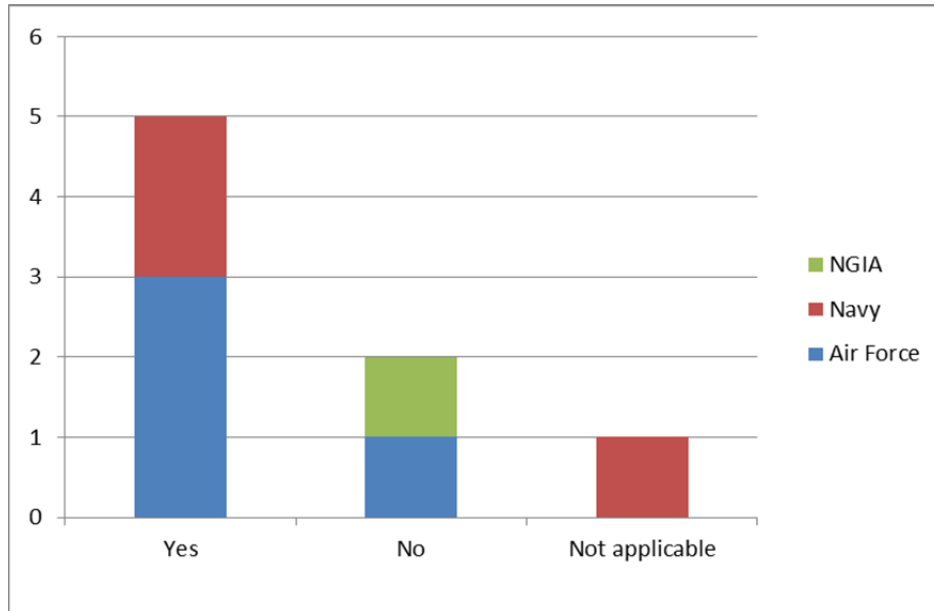


Figure 8. **Response by Service to Creation of the Commercialization Pilot Program**

Analysis. The majority of the survey respondents from the military departments indicated that they had created the CPP; the Air Force responded slightly more in the affirmative than did the Navy respondents (Figure 8).

The legislation’s language allowed the departments to create this program; they were not required to do so by the legislation. However, if they did choose to create the CPP, there were specific requirements that had to be followed because the CPP is self-funding. Whether the requirements were followed forms the basis for the next questions in this section.

In the case of the Navy, whether the CPP was created as a separate program is a subject of some conjecture. A 2008 Navy SBIR Program Office report entitled *A Report on the Navy SBIR Program: Best Practices, Roadblocks, and Recommendations for Technology Transition* stated, “One could argue that the Navy’s SBIR program already meets the intent of the CPP legislation and we should continue business as usual” (p. iii). That study stated that the Navy’s Transition Assistance Program (TAP) assists SBIR/STTR participants and helps to meet



knowledge and support gaps by providing support to these program participants within Phase II in order “to help the SBIR firm delivery [sic] a technology product to DoD and the Navy” (Navy SBIR Program Office, 2008, p. 35).

In any case, the Navy does have what it calls “Phase II.5” initiative, which includes the TAP, and to which the Navy refers to as a CPP (Navy SBIR/STTR, n.d.-a). The Navy SBIR and STTR Program Office utilizes self-funding set-asides for the CPP to pay for the TAP and has the SBIR transition manager at each System Command (SYSCOM) make the determination as to which firm gets invited to participate. In addition, each SYSCOM has its award structure and requirements to be selected for Phase II.5.

This paper does not attempt to make any determination as to whether the Navy SBIR program—with the TAP and Phase II.5 component included—does or does not comply with the Section 252 (NDAA, 2006) definition of the CPP; it is clear from the evidence presented previously that the Navy SBIR and STTR Program Office believes that its SBIR program does meet the definition. Rather, the presence of the TAP may be confused with the CPP, which is why the Navy’s response seems to contradict itself. The potential confusion, however, is more than an issue of semantics because Section 252 (NDAA, 2006) has specific conditions on the usage of CPP funds which the Navy’s TAP and Phase II.5 would otherwise have to follow.

In addition to the Air Force’s and Navy’s creation of the CPP, the Army, the Missile Defense Agency, and the Joint Science & Technology Office for Chemical and Biological Defense (JSTO–CBD) created CPPs.

2. Identification of Projects for Rapid Transitioning Through the Commercialization Pilot Program

Section 252 (y)(2) (NDAA, 2006) and the Congressional Guidance Letter (2006) called on military departments to establish processes or procedures for the identification of optimal SBIR Phase I or Phase II projects for rapid transitioning and related assistance through the CPP into Phase III and the acquisition processes.



With a response of 62.5%, most respondents answered affirmatively to the question of whether their organization had some formal processes or procedures. (see Figure 9).

Conversely, 25% of the respondents answered in the negative, i.e., that their organization did not have the processes or procedures in place, and 12.5% answered that creation of the processes or procedures was *not applicable* to their organization.

The breakdown of the responses to this question (see Figure 10) mirrored that of the previous question: namely, the Air Force led the Navy in answering affirmatively to this question; the one NGIA and one Air Force respondent answered negatively; and the one Navy respondent answered that the question was *not applicable* to his or her organization.

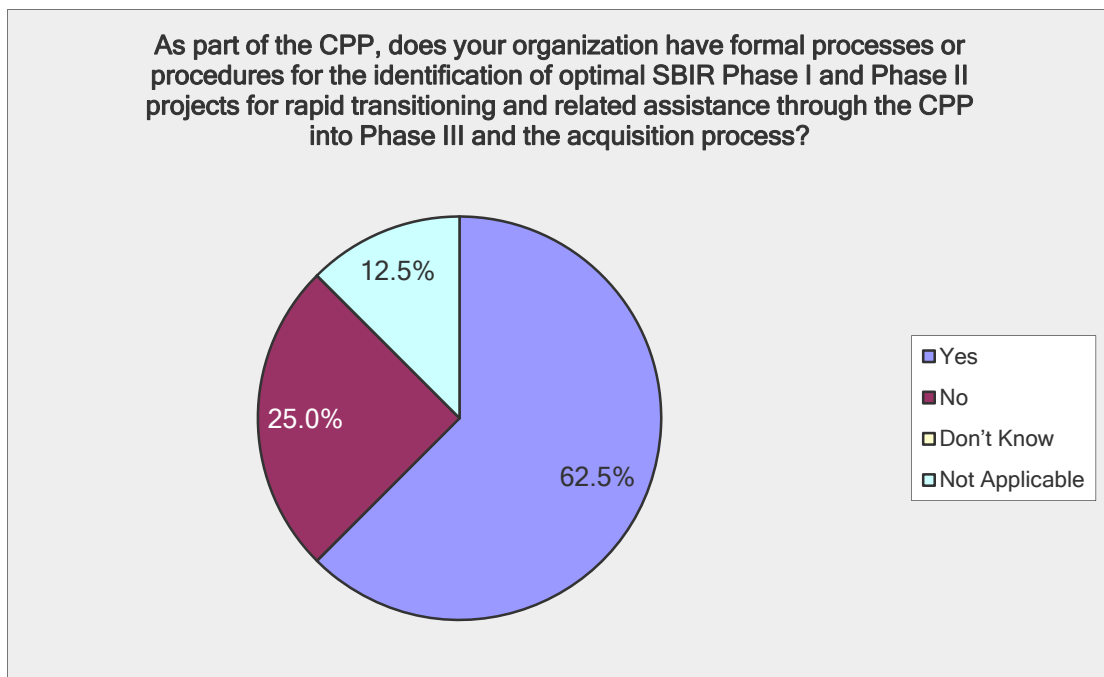


Figure 9. Responses to Formal Process for Identification of Projects for Rapid Transitioning Through the Commercialization Pilot Program



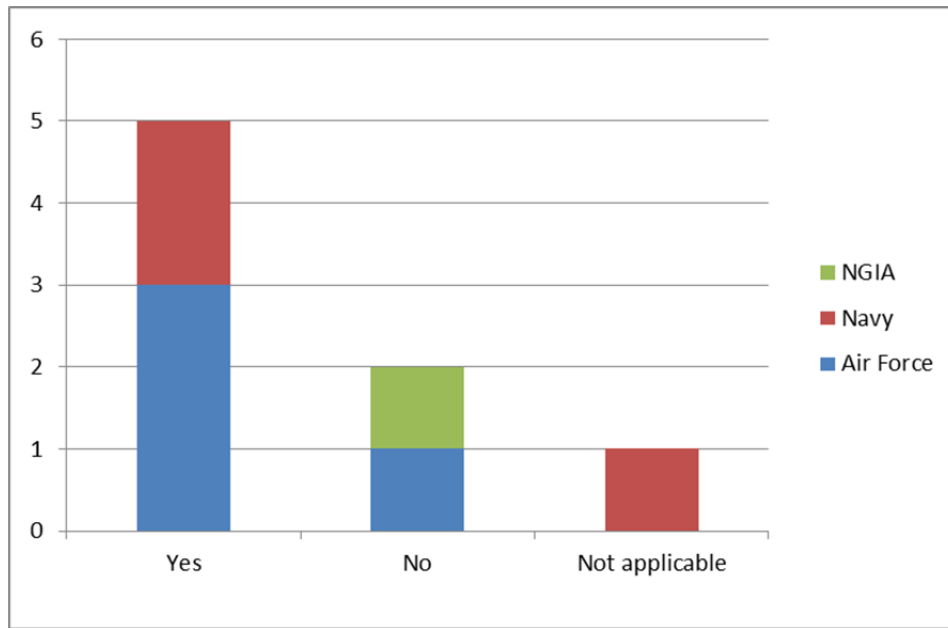


Figure 10. **Response by Service to Identification of Projects for Rapid Transitioning Through the Commercialization Pilot Program**

Analysis. On the whole, it can be concluded that most agencies that created the CPP came up with some sort of process for the identification of projects for rapid transitioning into the commercialization phase of the SBIR/STTR program. The negative responses to this question need to be viewed in the context of the previous question: namely, that the respondents either did not create the CPP in their organization, mixed up the CPP with other transition assistance programs, or were not clear about the legislative requirement.

To further understand these results, we must look at the approach to identification of transition candidate projects by the various CPPs. The Air Force approaches SBIR project identification for its CPP using two approaches: technology needs identified by an Air Force acquisition organization and technology needs identified by a single major contractor. In both approaches, data mining of DoD Phase II databases occurred by Air Force experts at the various Air Force Product Centers and at the Air Force Research Lab. The experts look for promising candidates based on program executive office needs. The results of the search are then provided to major contractors of Air Force acquisition organizations, which then



conduct interviews with the various small businesses during Industry Interchange Workshops. Then, the technical points of contact and the major contractors identify promising SBIR projects for inclusion into the CPP (Flake, 2007).

The Navy approach involves the program executive office and the SYSCOM SBIR program manager and a technical monitor to decide which Phase II programs get included into their CPP. Each SYSCOM has its own identification processes relating to its areas of interest (Navy SBIR/STTR, n.d.-a). Since 2008, the Navy has also participated with the Air Force in Joint DoD Component Industry SBIR CPP Technology Interchange Workshops, although recent resource constraints make Navy attendance in the future questionable (U.S. Air Force, 2010).

Survey responses to this question also relate to how each military department conducts initial topic selection for the SBIR program. In earlier studies conducted by the RAND Corporation and reported in a 2009 DoDIG report, the approaches to topic generation—and, as a result, projects—of the various military departments were discovered and analyzed. According to the 2009 DoDIG report, the Air Force and the Army “generated a majority of their topics in laboratories, whereas the Navy generated a majority of its topics through the acquisition program offices” (DoDIG, 2009, p. 18). The DoDIG report (2009) also concurred with the 2007 National Research Council report entitled *SBIR and the Phase III Challenge of Commercialization* that the Navy approach to topic generation “expedited the transition to commercialization” (DoDIG, 2009, p. 17). Based on the current approach of the Army and Air Force, while there may have been improvements in the transition process of the respective CPPs, the Navy model appears to provide for greater acquisition program input with regard to generating topics that will be successfully transitioned into DoD acquisition phases.



3. Commercialization Pilot Program (CPP)—Certification of Technology Projects for Assistance by Department Secretary

Section 252 (NDAA, 2006), establishes a condition selecting SBIR R&D projects for CPP commercialization assistance. Specifically, Section 252 prohibits selection of projects for such assistance “unless the Secretary of the military department concerned certifies in writing that the successful transition of the program to Phase III and into the acquisition process is expected to meet high priority military requirements of such military department.” (NDAA, 2006). With a response of 50%, the plurality of respondents answered that they did not know whether their organization required Secretarial certifications as a precondition for receiving assistance under the CPP (see Figure 11).

More than a third, 37.5%, of the respondents indicated that their organization never required the certification. Only 12.5% stated that their organization frequently requires the certification.

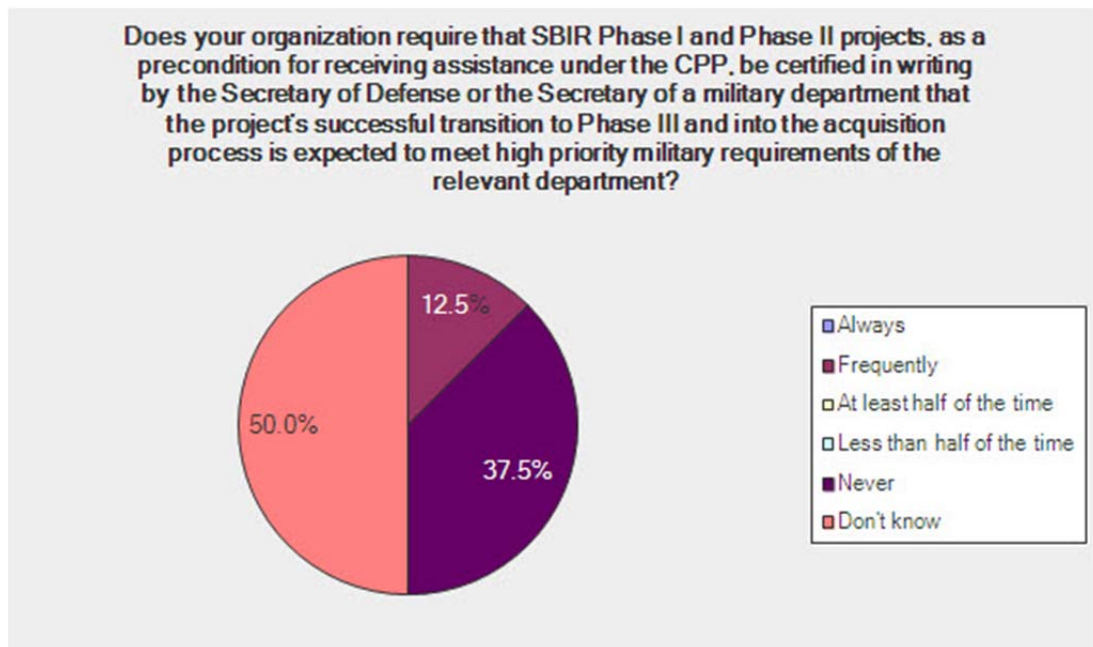


Figure 11. Response to Commercialization Pilot Program Certification of Projects by Department Secretary



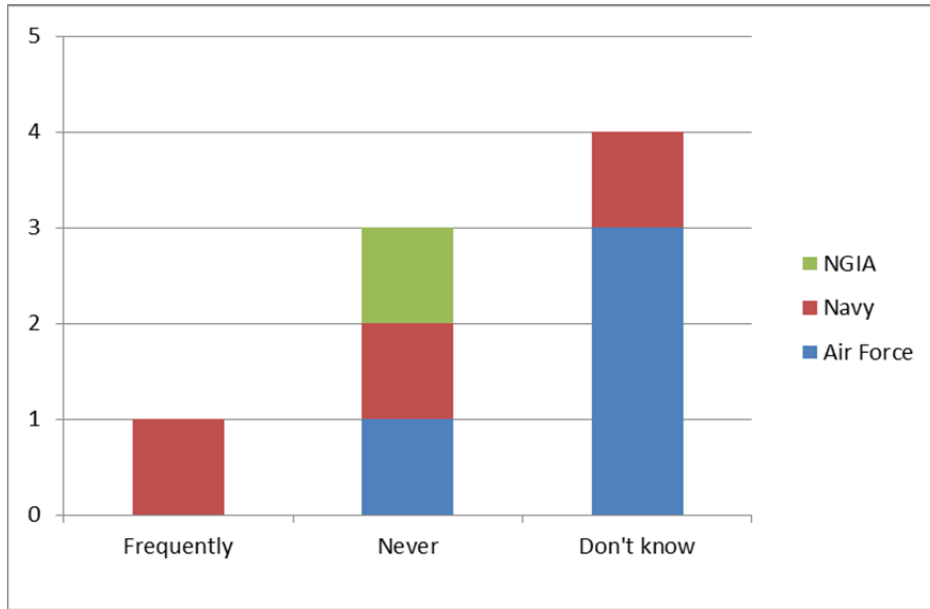


Figure 12. **Response by Service to Commercialization Pilot Program Certification of Projects by Department Secretary**

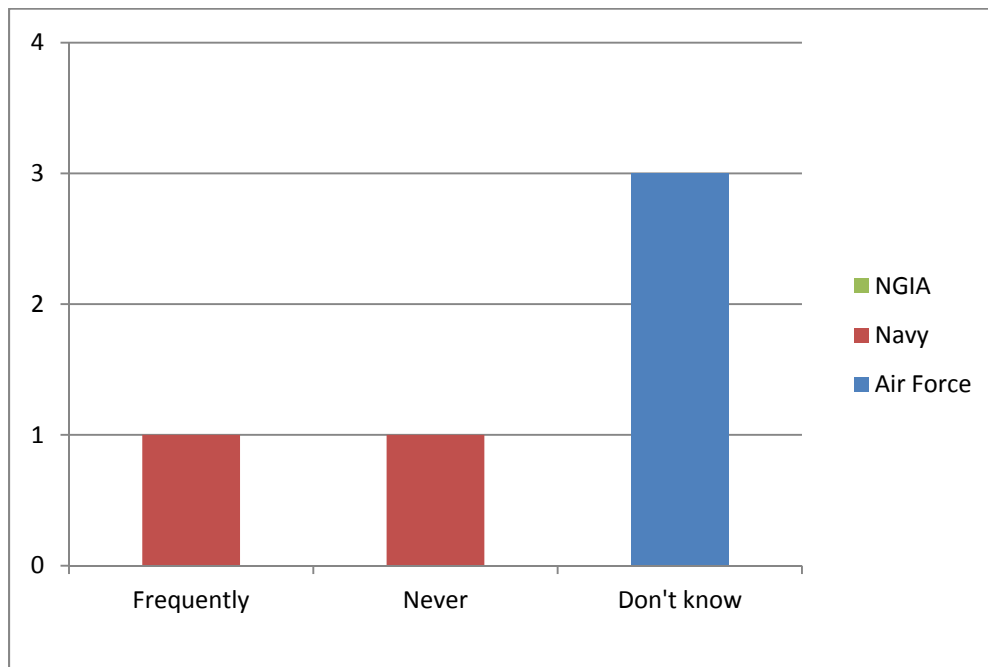


Figure 13. **Response by Service to Commercialization Pilot Program Certification of Projects by Department Secretary (Adjusted for Removal of Responders Indicating No Creation of Commercialization Pilot Program)**



Analysis. A casual look at the responses from the various military departments to the question about whether CPP assistance is conditioned on Secretaries certifications of high-priority military necessity indicates that a large portion of the respondents either do not know whether their organization is keeping this requirement or their organization never has kept it (see Figure 12).

By removing from the answers those respondents who previously answered *never* or *don't know/not applicable* to the question of whether their department or agency created the CPP, we are left with a clearer picture of actual use of Secretarial certifications (see Figure 13). These adjusted results show that the respondents from the Air Force, the department with the most frequent confirmation of creation of the CPP, the most frequent respondents confirming creation of the CPP, do not know whether the Air Force has implemented the requirement for certification in writing required in Section 252(y)(2). Other responses show that Navy respondents are split on whether Secretarial certifications are utilized within the Navy Department, with one respondent answering *frequently* and the other answering *never*. These responses indicate that further research needs to be done to determine the actual practices concerning Secretarial certifications.

It appears that the Secretarial certification of high-priority military necessity may have been replaced in practice by opinions and choices of support contractors, including those support contractors which may have a financial interest in recommending particular SBIR projects. As we previously outlined—and which we discuss in more detail later in this paper—the Air Force, Army, and certain Navy organizations utilize contractors such as MILCOM Venture Partners, MacAulay-Brown, Willcor, and Dawnbreaker to assist in SBIR- and CPP-related projects at various phases. Some of these firms assist government personnel to determine whether specific small business firms are able to participate in providing proposals to announced topics at Phase I and whether the Phase I and Phase II firms will be allowed to participate in the CPP projects. In these instances, these contractors do a “vetting” of technology needs and technology SBIR firms. The reason for the



department secretary's certification as required in Section 252 (NDAA, 2006) was to make certain that projects seeking to progress through the CPP process into commercialization phases met the "high priority military requirements" of each department (NDAA, 2006, § 252 (y)(2)). Whether contractors should be involved in making this determination is at the very least questionable since delegation of this function to contractors increases the potential for misalignment between military requirements and CPP assistance funds and makes the CPP less predictable for small business. As shown by the results to the question whether military departments condition selection for CPP on Secretarial certifications of high-priority military necessity, the Secretarial certification requirement is not being met. Further research into the role of contractors in the determination of project approvals needs to be addressed.

4. Commercialization Pilot Program (CPP)—Input by Program Managers or Program Executive Officers

The Congressional Guidance Letter (2006) calls for input of program managers and program executive officers into various SBIR commercialization efforts, such as SBIR topic selection, SBIR program management, integration with DoD mission and acquisition framework, planning for Phase III funding through Program Objective Memoranda (POMs) and similar instruments, and utilizing enhanced testing and evaluation (T&E) authority. To test implementation of this guidance, the survey asked the question as to whether military departments had formal processes or procedures for requiring program managers or program executive officers to provide input concerning SBIR topic generation and on accelerated integration of SBIR projects into the acquisition programs. With a response of 75%, a majority of the respondents answered with an affirmative to this question (see Figure 14).

The last quarter of the responses was evenly split between the respondents who answered in the negative that their organization did not have the processes or



procedures in place and who answered that creation of the processes or procedures was *not applicable* to their organization.

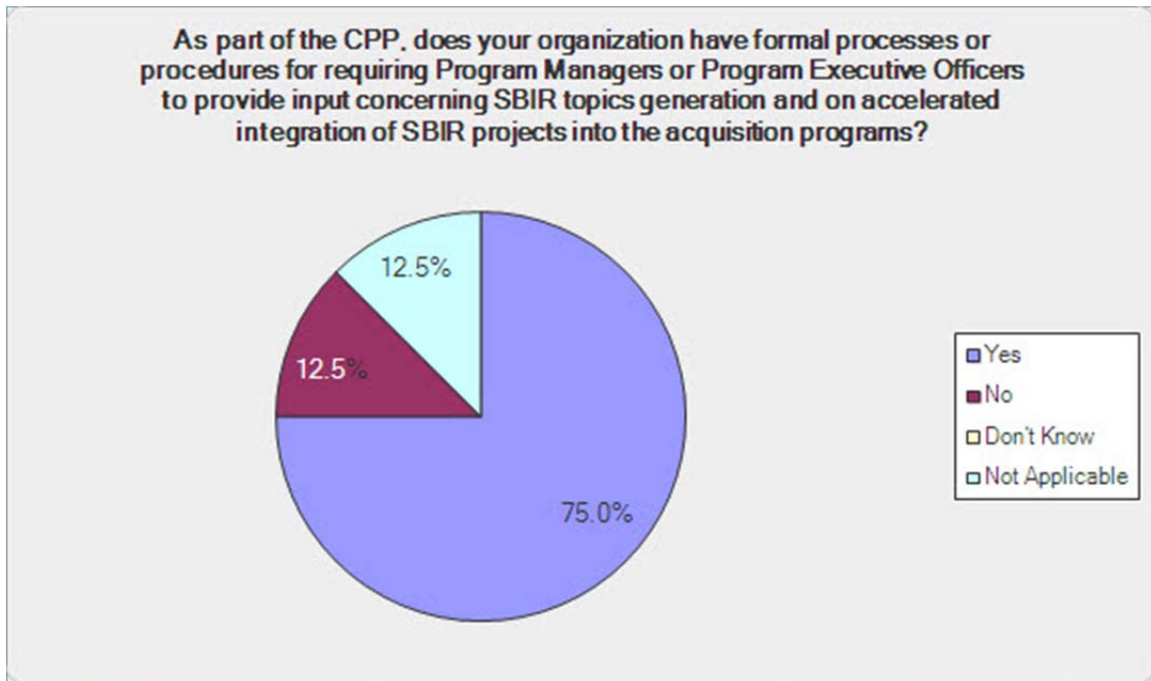


Figure 14. **Response to Commercialization Pilot Program Input by Program Managers or Program Executive Officers**



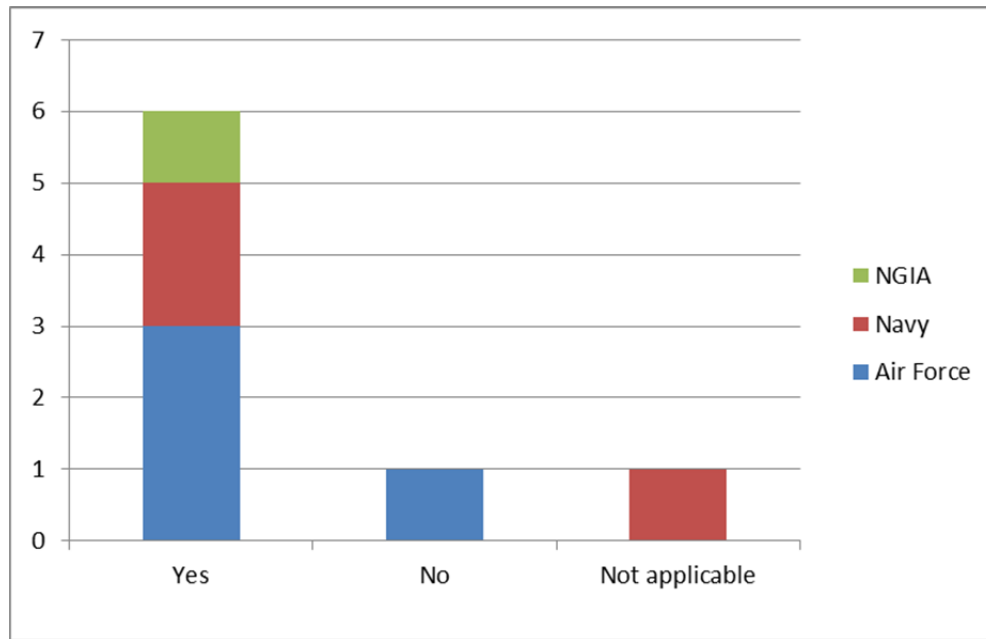


Figure 15. **Response by Service to Commercialization Pilot Program Input by Program Managers or Program Executive Officers**

Analysis. The responses by military departments to this question (see Figure 15) indicate whether the respondent’s organization is in adherence to the requirements of the statute. However, the NGIA respondent who had previously indicated that his or her organization had not created the Commercialization Pilot Program still answered affirmatively that he or she had formal processes or procedures for program manager or program executive officer input as part of the CPP.

Even when taking into account the seemingly erroneous response discussed previously, our conclusion is that the military departments and their component organizations usually, but not always, involve the program executive officers and program managers in topic generation within the context of the CPP. This is in contrast to the responses given to the question regarding program executive officer and program manager involvement in topic generation in general, reported in the section of this report titled Alignment of SBIR/STTR Topics With DoD Research Plans—Program Manager/Program Executive Officer Input. As stated in that section,



over 50% of the respondents answered that involvement of the program executive officer and program manager was *not applicable*.

The involvement of program executive officers and program managers is critical in the topic generation and identification of projects into commercialization. In a 2009 study entitled *An Assessment of the Small Business Innovation Research Program at the Department of Defense*, the National Academy of Sciences identified that “active championing (of SBIR projects) by Program Executive Officers seems to be a critical ingredient in Phase III success” (p. 182). The study also suggested having senior managers insist that all program managers “integrate SBIR fully into their acquisition programs” (p. 183). These two recommendations represent a cultural change component that Section 252 (NDAA, 2006) tried to achieve by requiring program manager/program executive officer input in identifications of areas of effort and by reporting out of the activities of the program managers, program executive officers, and prime contractors in the form of the annual evaluative report on the CPP.

Another issue that involves program managers and program executive officers is that of topic generation. According to the Government Accountability Office (GAO; 2010) report entitled *Space Acquisitions: Challenges in Commercializing Technologies Developed under the Small Business Innovation Research Program*, small businesses that were involved with SBIR projects in DoD space-related technologies related that there was limited “pull” from the acquisition programs (p. 23). According to the report, three reasons were given for this lack of pull: DoD topics in which there is no validated requirement, short tenure among DoD officials responsible for progress, and lack of SBIR knowledge among DoD officials (GAO, 2010, p. 23). Certainly, topic generation by the program managers and program executive officers should include validated requirements and be within the ability of the senior leadership to enforce. Lack of SBIR knowledge is being addressed through more SBIR-related training. Still, the issue of pull is again related



to changes in organizational culture that apparently remains difficult to accomplish within the DoD.

5. Commercialization Pilot Program—Support Contractors’ Influence on Selection of Projects for CPP Assistance

As stated above, Section 252 (NDAA 2006) conditions the selection of SBIR projects for CPP assistance upon written certification by departmental Secretaries. In contrast, review of CPP-related publications, as described below, suggested that Secretarial decisions may have been delegated to private venture capital firms or advisory and assistance contractors in whole or in part. Accordingly, this question asked whether any decisions to select SBIR Phase I or II projects for CPP assistance were made or in any way influenced by private contractors supporting the CPP program for the respondent agency or department.

With a response rate of 83.3%, most respondents answered that their organization did not make decisions to select SBIR Phase I or Phase II projects for CPP assistance based on or influenced by contractors supporting the CPP for the organization (see Figure 16).

However, 16.7% of respondents stated that their organizations’ decisions to select SBIR Phase I or Phase II projects was in some way influenced by one or more contractors supporting the CPP program for the organization.

With the exception of one respondent from the Air Force, respondents from all other military departments, including all other Air Force respondents, indicated that contractor influence on decisions to select Phase I or II projects for CPP does not occur (see Figure 17).



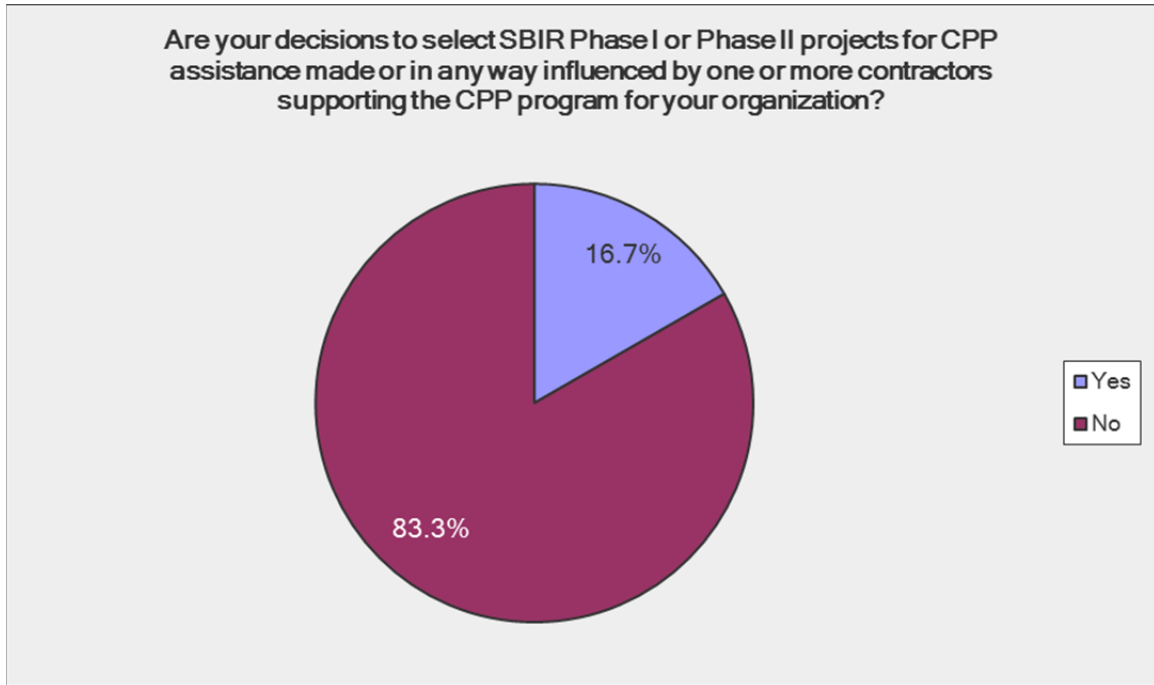


Figure 16. Response to Commercialization Pilot Program Contractor Influence

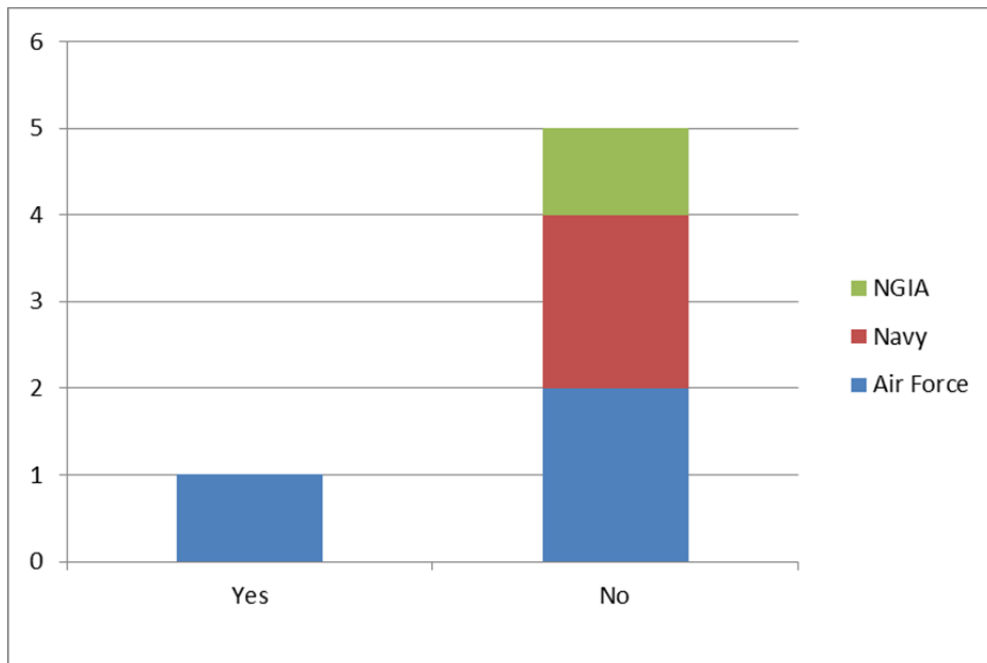


Figure 17. Response by Service to Commercialization Pilot Program Contractor Influence



Analysis. This finding is in contrast to the publically announced role of contractors in the various CPPs. With the passage of the SBIR Reauthorization Act of 2000 (Public Law 106-554), which amended Section 9 of the Small Business Act (15 U.S.C. 638), federal agencies were allowed to enter into an agreement with a vendor to provide “technical services.” The text of the section is as follows:

(q) Discretionary technical assistance

(1) In general

Each Federal agency required by this section to conduct an SBIR program may enter into an agreement with a vendor selected under paragraph (2) to provide small business concerns engaged in SBIR projects with technical assistance services, such as access to a network of scientists and engineers engaged in a wide range of technologies, or access to technical and business literature available through on-line data bases, for the purpose of assisting such concerns in—

(A) making better technical decisions concerning such projects;

(B) solving technical problems which arise during the conduct of such projects;

(C) minimizing technical risks associated with such projects; and

(D) developing and commercializing new commercial products and processes resulting from such projects.

(2) Vendor selection

Each agency may select a vendor to assist small business concerns to meet the goals listed in paragraph (1) for a term not to exceed 3 years. Such selection shall be competitive and shall utilize merit-based criteria. (15 U.S.C. § 638(q)).

The safeguards question implicates significant public policies. For example, FAR Section 9.5 prohibits a contractor from having consultant conflicts of interest. FAR Section 9.505-1 specifically prohibits a contractor that has “provide(d) systems engineering and technical direction for a system but does not have overall contractual responsibility for its development, its integration, assembly, and checkout, or its production” from having a contract awarded to them for the system



or to be a subcontractor or consultant to a supplier of the system or any major components. (2011). Further, FAR Subpart 7.5 (2011) prohibits the use of contractors for performance of inherently governmental functions. Specifically, FAR Section 7.503 prohibits the use of contractors for the purposes of directing Federal employees, determining “Federal program priorities for budget requests,” and, “in Federal procurement activities with respect to prime contracts— (i) determining what supplies or services are to be acquired by the government . . . ; (ii) participating as a voting member on any source selection boards; (iii) approving any contractual documents, to include documents defining requirements, incentive plans, and evaluation criteria; (iv) awarding contracts; (v) administering contracts (including ordering changes in contract performance or contract quantities, taking action based on evaluations of contractor performance, and accepting or rejecting contractor products or services).” (2011).

Using the text of the law as a standard, we can examine the role of contractors in the CPP. For example, MILCOM Venture Partners is a firm that the Army selected to oversee its CPP implementation. The following information comes from MILCOM Venture Partners’ (n.d.) website and describes the company’s role in the Army CPP:

MILCOM Venture Partners (MILCOM) was selected as the Army’s contractor to help manage the CPP, and will: 1) review current SBIR Phase II projects and recommend approximately 25 projects for participation in CPP; 2) provide assistance intended to accelerate technology transition and commercialization to the projects selected for CPP participation; and 3) recommend the amount of additional funding each participating SBIR Phase II project will be allocated from the \$15 million CPP fund. In making recommendations for participation in CPP, the following characteristics will be given significant consideration by MILCOM:

1. The Phase II technology meets a high priority Army requirement;
2. The technology can be rapidly transitioned to Army acquisition and/or a commercial product; and,
3. Transition to military or commercial products will provide a significant financial return on the investment made in the technology by the SBIR



Program, in the form of non-SBIR investment in such technology and product revenue.

The Air Force has contracted with MacAulay-Brown Inc. to provide a lead role, variously described as that of SBIR/STTR program manager (Flake, 2009) or, more recently, as SBIR/STTR project lead (Air Force SBIR/STTR, n.d.). The role of MacAulay-Brown was described in their press release at the time of the contract award:

The Government-MacB Team will focus on improving the process of identifying and developing topics that address urgent warfighter needs and transition successful results to acquisition programs while strengthening awareness, involvement and advocacy of key S&T customers/stakeholders. (MacAulay-Brown, n.d.)

The Navy also involves contractors to assist in their CPP. The contractor firms Dawnbreaker Inc. and Willcor have been contracted to provide program management support, technology transition, and risk management to firms that have SBIR/STTR projects. The firms' involvement in CPP is outlined as follows:

- Willcor is under contract to the Navy to assist companies with the use of Technology Risk Identification & Mitigation Software (TRIMS) for SBIR, a web based tool for risk assessment management, the performance of independent assessments, and assistance in developing risk mitigation strategies and plans.
- Both Willcor and Dawnbreaker are under contract with the Navy to provide assistance to SBIR firms in planning their transition strategies.
- Both Willcor and Dawnbreaker are under contract to assist firms with identifying issues, preparing manufacturing plans, and conducting Manufacturing and Production Readiness assessments.
- Technology Readiness Assessments are used to assist firms in determining the development status of their technology (TRL) as well as conformance to requirements. Willcor is under contract to the Navy to provide these assessments. (Navy SBIR/STTR, n.d.-b)

Dawnbreaker's role within the Navy's Naval Air Systems Command (NAVAIR) CPP includes having



to provide Program and Technology Transition Management Support to the NAVAIR SBIR Program Office to implement a CPP which assists the NAVAIR Program Executive Officers (PEOs) and NAVAIR Acquisition Program Management Offices (PMAs) in identifying SBIR topics that meet the needs of the war-fighter, have the potential for rapid transition and to execute their transition from Phase II to Phase III and insertion into a Program of Record. (Dawnbreaker, n.d.-b)

Dawnbreaker is also the major contractor in the Navy's Transition Assistance Program (TAP). The TAP program assists Phase II SBIR/STTR awardees with “the services of a business acceleration manager, a market researcher, and others to accelerate the transition of their technology. This is accomplished through the application of a proven process and deliverables, developed collaboratively by the small business and the Navy TAP team” (Dawnbreaker, n.d.-a).

Based on these materials, it is clear that there is significant contractor involvement in the CPPs at the various military departments, and it also appears that those contractors may have opportunities to receive financial benefits from individual CPP applicants either by being hired as their discretionary technical assistance providers or by becoming their venture capital investors. What is not clear, however, is whether any real safeguards exist within CPPs to prevent support contractors' conflicts of interest or performance of inherently governmental functions. With significant support contractor involvement in the CPP and lack of evidence of safeguards, there may be some unintentional violations or abuses—and possibly the role that contractors are actively playing exceeds that of the definition of *discretionary technical assistance* that was outlined in 15 U.S.C. § 638 (2010). The conclusion here is that this is an area in which more research should be conducted.

D. Commercialization Pilot Program Incentives, Activities, and Initiatives

1. Incentivizing Within the Commercialization Pilot Program

The Congressional Guidance Letter (2006) instructs military departments to deploy “acquisition incentives and activities” in order to accelerate the transition of



SBIR/STTR technologies into the DoD acquisition process. Then-Deputy Under Secretary of Defense James Finley issued SBIR Phase III Guidance (2008) directing the use of the SBIR special acquisition preference and data rights protections during Phase III. With a response of 66.7%, most respondents answered that their organization did not develop, or deploy acquisition incentives to accelerate the transition of SBIR/STTR technologies into the acquisition process through the Commercialization Pilot Program (see Figure 18).

A third, 33.3%, of respondents indicated that their organization did develop and deploy acquisition incentives to accelerate the transition of SBIR/STTR technologies into the acquisition process as part of the CPP.

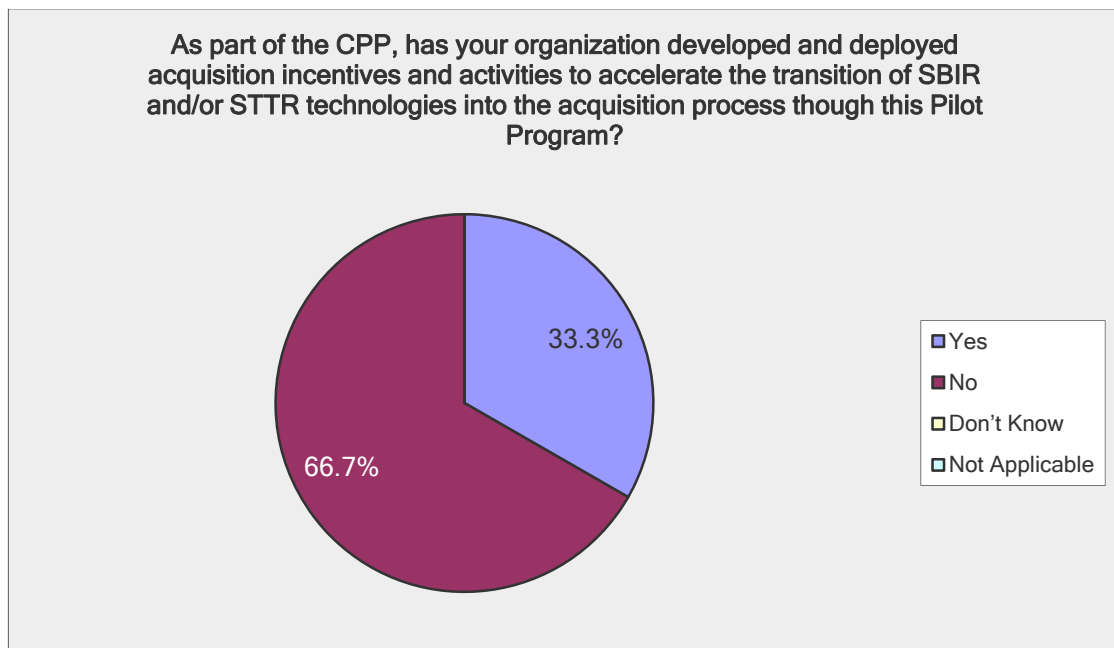


Figure 18. **Response to Acquisition Incentivizing Within the Commercialization Pilot Program**



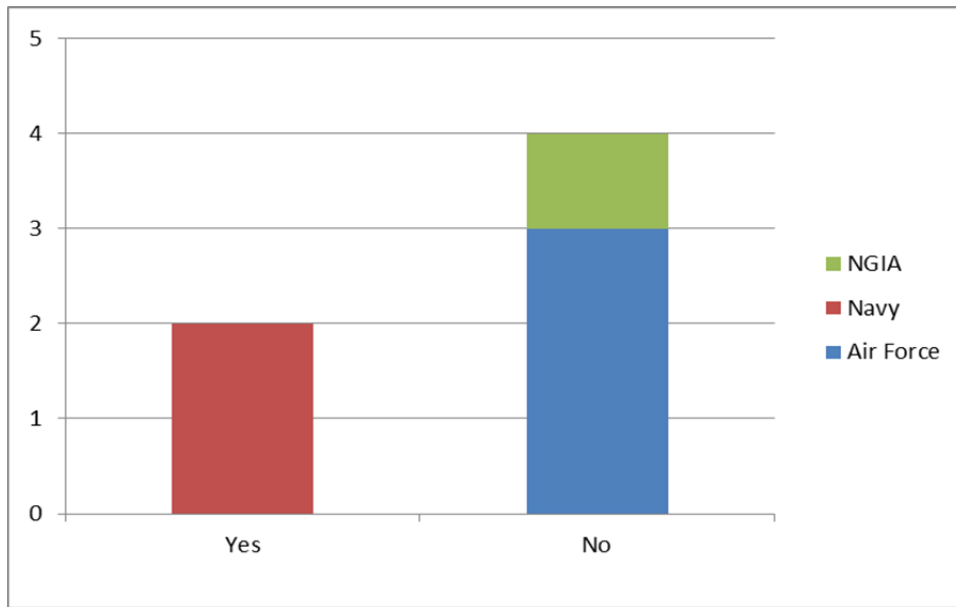


Figure 19. **Response by Service to Acquisition Incentivizing Within the Commercialization Pilot Program**

Analysis. The two Navy respondents who confirmed creation of the CPP were also the only respondents who indicated that the Navy used incentives within the Commercialization Pilot Program. The Air Force respondents indicated that the Air Force did not develop any acquisition incentives, even though this is well within the scope of the SBIR/STTR program and must be reported to Congress each year (see Figure 19).

The subject of incentives was the central topic of interest at the SBIR and the Phase III Challenge of Commercialization Symposium held on June 14, 2005. The symposium was convened by the National Academy of Sciences (2005) and focused on the commercialization of SBIR-funded innovation projects at the DoD and NASA (p. xv). The term *incentives* was used at the Symposium in a very broad sense, covering a wide range of methods and techniques designed to motivate government managers and executives as well as large prime contractor firms to transition SBIR innovations into non-SBIR DoD procurements. The suggested ideas took the form of programmatic changes to funding, training, risk reduction (for all three entities: small businesses, large prime contractors, and government), alignment with existing non-



SBIR procurement projects and defense acquisition programs, and education outreach regarding the benefits of the SBIR program. The importance as well as broad nature of incentives was stressed repeatedly by the participants of this Symposium, earning 39 references to the term across 8 chapters in the Symposium Report. (NAS, 2007). The centrality and scope of incentives were summarized at the Symposium as follows:

In this era of globalization, optimizing the ability of small businesses to develop and commercialize new products is essential for U.S. competitiveness and national security. Developing better incentives to spur innovative ideas, technologies, and products—and ultimately to bring them to market—is thus a central policy challenge. (NAS, 2007, p. 3)

To capitalize on SBIR’s potential, both better information (for small companies and large prime contractors) and supportive incentives are necessary. (NAS, 2007, p. 28)

Section 252 (NDAA, 2006) utilizes the term *incentives* specifically in paragraph (y)(5) with regard to the reporting of such in the annual evaluative report of the Secretary of Defense to the Senate committees on Armed Services and Small Business and Entrepreneurship and House committees on Armed Services and Small Business, but the Congressional Guidance Letter (2006) gives further instruction with regard to the intent of Congress to have the DoD consider issuing “binding directives, contract clauses, or regulatory amendments through the Defense Federal Acquisition Regulation Supplement (DFARS) to facilitate the requisite incentives.” This guidance merely reflected effective law and practice. Indeed, FAR Subpart 16.4 (2006), DFARS Subpart 216.4 (2006), and contemporaneous DoD practice at the time and since have treated incentives as primarily contractual and monetary, in the form of paying prime contractors either award fees based on positive qualitative performance evaluations in technical, scheduling, and other areas, or incentive fees for meeting or exceeding cost, performance, delivery targets. (GAO, 2005).

In the 2006 SBIR CPP report to Congress, the intention of the DoD to utilize incentives was made clear:



The Department is exploring a range of incentives to stimulate the transition of SBIR funded technology for promulgation throughout the Department via appropriate mechanisms. Initiatives under consideration include: extension of SBIR Phase III permissive sole-source authority to SBIR subcontracts, reinforcement of SBIR Phase III sourcing authority and data rights, formal consideration of SBIR technology transition planning during acquisition review processes, favorable treatment of proposals which employ SBIR technologies or partnerships, use of incentive or award fees for SBIR-technology sourcing; wider employment of SBIR Phase III contracts toward meeting small business sourcing goals, to include possible multiple small business credits; and encouraging individual performance bonuses for personnel affecting SBIR technology transition. The new National Security Personnel System (NSPS) in the process of being rolled-out across the Department is well suited to implement this type of performance-based compensation. It will be up to each participating component and their subcomponents to take advantage of this opportunity to set output-based goals to measure this dimension of performance for relevant program officials while ensuring the integrity of source selection activities. (OUSD AT&L OSBP, 2007, p. 13)

The lack of reported incentive usage would indicate a missed opportunity by the military departments. The different approaches to incentives as well as the level of utilization can be found in Table 2.

2. Incentivizing Within the Commercialization Pilot Program—Types of Incentives Deployed

Since the Navy respondents were the only ones who indicated the usage of incentives, all of the information in Table 2 is related to usage of the incentives within the Navy organizations, but the table also includes all of the types of incentives that could be utilized.

As shown in Table 2, the most utilized incentives were as follows:

- educational and business development assistance to SBIR firms focused on commercialization in federal and dual-use markets, and
- outreach and advocacy with large prime contractors as well as defense acquisition and program management officials.

Another type of incentive reported as having high utilization, though not a frequent as the preceding two incentives, was as follows:



- contract clauses or regulatory provisions expressly confirming SBIR data rights protections at Phase III at the prime contracting and subcontracting levels. Such clauses are set forth in FAR 52.227-20.

In contrast, the least utilized incentive method was that of contract incentive clauses and bonuses to large prime contractors that integrate SBIR and/or STTR technologies.

An area of additional research might therefore be the use of contract clauses or incentives to increase the transition of projects into Phase III as large prime contractors specially requested in the National Academies of Science SBIR Symposium (2005, p. 27). It is also worth studying whether funding currently spent in outreach and education may be more effective when redirected to these types of incentives.

Table 2. Response to Acquisition Incentivizing Within Commercialization Pilot Program Types of Incentives Deployed

Which type of incentives and activities did your organization develop and deploy as part of the CPP? (Select all that were utilized and indicate frequency of use)							
Answer Options	Always	Frequently	At least half of the time	Less than half of the time	Never	Response Count	Utilization
a. Educational and business development assistance to SBIR firms focused on commercialization in Federal and dual-use markets	1	1	0	0	0	2	Most utilized
b. Outreach and advocacy with large prime contractors as well as defense acquisition and program management officials.	1	1	0	0	0	2	Most utilized
c. Contract incentive clauses and bonuses to large prime	0	0	0	1	0	1	Least utilized



contractors that integrate SBIR and/or STTR technologies							
d. Mentor-protégé arrangements for the benefit of SBIR and/or STTR firms	0	0	1	1	0	2	Some utilization
e. Dedication of specific acquisition dollars for integration of SBIR and/or STTR technologies into major defense systems	0	0	1	1	0	2	Some utilization
f. Contract clauses or regulatory provisions expressly confirming SBIR data rights protections at Phase III at the prime contracting and subcontracting levels	1	0	1	0	0	2	Most utilized
g. Performance incentives to acquisition and program management personnel for developing and execution rapid commercialization of SBIR technologies through government contracts and subcontracts	0	1	0	1	0	2	Some utilization



VI. Conclusions and Recommendations

The overall conclusion of this paper is that while the DoD began implementation of the DoD SBIR CPP and other Section 252 (NDAA, 2006) SBIR/STTR reforms, progress is uneven. Specifically, military departments and DoD agencies participating in SBIR and STTR programs have not uniformly conformed to the mandatory Section 252 reforms. When the Departments of Defense, Army, Navy, and Air Force implemented the optional Commercialization Pilot Program, they commonly used the CPP funds to hire business development and venture capital contractors as transition assistance advisers. Although transition assistance advising is recognized by the Congressional Guidance Letter as a valuable form of assistance, the DoD and military departments seemed to disregard several other CPP elements that were expressly spelled in the statute. For instance, the departments have largely not fulfilled the condition of secretarial certification of high military priority before technologies can qualify for CPP assistance and have declined to implement the CPP incentive authorities to the maximum extent practicable. Unquestionably, the CPP informs the DoD acquisition community about valuable SBIR technologies and helps SBIR firms to engage in planning for SBIR technology insertion within the DoD. However, as currently implemented, the CPP is not likely to significantly streamline the Phase III transition process, to change the culture of major acquisition program offices with regard to SBIR, to reduce technology insertion risk, or to incentivize leading prime contractors to utilize SBIR firms in major defense systems. Legislative reforms are needed to rebalance and strengthen the CPP and other Section 252 reforms.

A. Answers to Research Questions

1. Alignment with DoD Research Plans

With regards to the question of whether the military departments have aligned their SBIR/STTR topics with DoD research plans—which would include program manager/program executive officer inputs that would couple an acquisition focus



with research needs and have these topics certified by the respective military secretaries—we conclude that such alignment has not occurred at all. This is the case even though the Section 252 (NDAA, 2006) legislation and Under Secretary of Defense SBIR policy requires that this occur. We are left to determine an explanation for why this could have been the case. Taking a positive perspective on this subject, we suggest that either there is a level of ignorance of the Section 252 statute and policy reflected in the Congressional Guidance Letter, which can be remedied by education and management actions, or that the respondents just did not know the answer to the survey questions. On the other hand, this may also suggest that there is resistance in the DoD organization to taking a new approach to topic creation. This, in turn, indicates a challenge to an organization's culture, which will be more difficult to change, but not impossible, when combined again with education and a strong influence from upper levels of management. In any case, the responses to this question would indicate that opportunities for further research exist in trying to determine why the respondents answered in the way they did and to effect change leading to alignment.

2. The Commercialization Pilot Program

The conclusion we reach as to whether the Commercialization Pilot Program was created and conducted within the requirements of Section 252 (NDAA, 2006) is a qualified yes. The military departments reported, and documentary evidence exists for the Army (which did not participate in the survey), that there has been a CPP created in each of the military departments and that there is a large degree of input by program managers/program executive officers in the selection of SBIR/STTR projects to be included in the CPP. The overall implementation of the Commercialization Pilot Program was positive but suffered from the seeming ignorance of the secretarial certification reporting requirements of the legislation, the potential inappropriate use of contractors resulting in their performance of roles that are governmental functions, and the low utilization of incentives. These findings were the negative aspects of the answer. Those military departments and defense



agencies that did implement the CPP seemed to pick and choose which requirements within the legislation they would implement.

As mentioned previously, our research has shown that there had been contractors performing some of the functions that were delegated to the department secretary, including the certification process to determine which projects are to be given assistance. Contractor participation in the certification process and the approach to use contractors as “gatekeepers” within SBIR Phase I and II projects shows that contractor influence in those military departments’ SBIR/STTR CPPs is organic—perhaps not by design but nevertheless is present throughout. This pervasive contractor influence may create issues in the CPP decision-making process, leading to misalignment of CPP resources. We suggest that additional research be performed to look at this issue and to make certain governmental functions are being performed by the proper government authorities, as well as to erect barriers to potential organizational conflicts of interest.

Our research has also shown the lack of contractual or other, non-advocacy incentives being utilized within the DoD SBIR/STTR CPP. As was noted in the DoD *Report for FY2006 to Congress on the Commercialization Pilot Program*, the DoD would undertake an exploration of the use of incentives to encourage the transition of SBIR technologies throughout the DoD. (OUSD AT&L OSBP, 2007). Four years later, our research has determined that incentive usage is almost non-existent and that it should be emphasized or re-emphasized to the Services. This is an area in which more research should be conducted to ascertain the apparent resistance of the military departments and defense agencies to incentivizing SBIR participants.

3. Promotion of Manufacturing Innovation through SBIR and STTR

Section 252 (NDAA, 2006) directed all SBIR-participating Federal agencies, including DoD, to fully implement the tenets of Executive Order No. 13329, Encouraging Innovation in Manufacturing (2004), thereby making that Order part of statutory law. Our survey did not succeed in collecting responses to how the military



departments, defense agencies, and the DoD planned to implement or actually implemented Executive Order No. 13329, *Encouraging Innovation in Manufacturing* (2004). By means of a literature review, we found that some military departments and defense agencies have posted plans or made references to plans to encourage manufacturing in their respective SBIR/STTR programs at publicly available websites. During 2011, the Executive Order No. 13329 webpage on the DoD SBIR/STTR site listed links to the Army's, Navy's, Air Force's, and DARPA's Executive Order No. 13329 (2004) Manufacturing Innovation Plans, but the links are no longer live and these organization's website do not have such Plans readily available, either. (DoD SBIR Program Office 2011).

This report does not make any conclusions regarding these efforts and suggests that further research be conducted to ascertain compliance with Section 252 (NDAA, 2006) and Congressional intent in that regard.

4. A Final Post-Survey Observation

As we compiled our findings for this section, it seemed that a possible reason for the disconnect between some of the specific items mentioned in the legislation (such as the creation of the CPP and the intent of Congress as outlined in the Congressional Guidance Letter (2006) stipulating certain types of incentives and the process for actual implementation of Section 252) may have been that the Congressional Guidance Letter was not widely disseminated among the Secretaries of military departments and DoD officials involved with SBIR and STTR. The following chronology supports this conclusion. On May, 16, 2006, the leaders of Congressional Small Business Committees wrote this Letter to the Honorable Kenneth J. Krieg, then the USD(AT&L), requesting a meeting by June 16 to discuss how the DoD was planning to implement Section 252 (NDAA, 2006) and requesting that a written status be presented at that meeting. We know of no evidence that this meeting occurred or that the written status was provided. Mr. Krieg announced his resignation on June 6, 2007, effective July 20 of the same year. What level of circulation the letter received initially and subsequently is unknown. Additional CPP



assessment may be required upon wide circulation of the Congressional Guidance Letter (2006) to determine whether this conclusion is correct. Further, to ensure full awareness of Congressional intent in regard to the desired outcomes and means to attain, those outcomes and means could be spelled out specifically in new legislation.



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VII. Comparative Defense Small Business R&D Policy: Lessons from the United Kingdom Small Business Research Initiative (SBRI)

A. Introduction

Major American defense allies and defense industrial partners (but, sometimes, industrial competitors) have been conducting their own experiments with SBIR-type programs. These experiments have also taken up the challenge of enhancing commercialization of small business technologies through government procurement. In examining international lessons for the DoD SBIR program, the experience of the United Kingdom (UK) holds particular importance. The UK operates the Small Business Research Initiative (“SBRI”) modeled and branded on the example of the U.S. SBIR (Kidalov, 2011). There are several reasons that the UK experience is of key importance to U.S. policy-makers working on DoD SBIR/STTR CPP/CRP reforms.

First, the UK has a sophisticated public and defense procurement sector. At approximately \$63 billion a year, the UK has the fourth largest military budget in the world and the second largest in NATO (Stockholm International Peace Research Institute, 2011). The UK defense procurement budget grew from between £9–£10 billion as of 2003 (Taylor, 2003) to £13 billion as of 2009 (Defence Equipment & Support [DE&S], n.d., p. 3). The UK defense R&D expenditures amounted to approximately £2.6 billion as of 2006 (Ministry of Defence, 2007) but decreased to approximately £0.54 billion in 2007–2008 and budgeted for further decrease to £0.439 billion in 2010–2011 (Chuter, 2010). The UK Defence Equipment & Support agency employs a large acquisition workforce of approximately 25,5000 people (DE&S, n.d.).

Second, the UK program has a close similarity to the U.S. programs. From 2004 to 2009, SBRI required participating government departments to set aside at



least 2.5% of their R&D requirements, though in 2009 it became a discretionary initiative which government departments would take up on a case-by-case basis. (Bound & Puttick, 2010, p. 7-8). Overall, the UK SBRI program is administered by the Technology Strategy Board (TSB), a stand-alone government agency funded by the Department of Business, Innovation, and Skills (DBIS). Within the UK Ministry of Defence (MOD), SBRI is administered by the Center for Defence Enterprise (CDE) with TSB assistance. Like SBIR, SBRI is a three-phase program that has a Phase I for feasibility study, Phase II for prototype development, and Phase III, a somewhat informal phase involving procurement of a finished product, technology, or service through the open commercial market, open competitive procurements, the MOD Urgent Operational Requirements (UOR) sole-source contracts, or preferences under the so-called “innovative procurement plans” established by buying agencies (Kidalov, 2011, p. 505; Pro Inno Europe, 2010; Office of Government Commerce [OGC], n.d.). All SBRI awards are contracts rather than grants. Phase II participants are chosen through an assessment process at the end of Phase I (TSB, n.d.-b). Just like the U.S. SBIR program, the UK SBRI program has been the subject of several recent reforms and high-level government and academic assessments as further described below.

Third, SBRI is a strong tool for support of the UK defense industrial base. The importance of hi-tech defense-related small and medium-sized enterprises (SMEs) is mentioned in two key UK documents: the 2005 *Defence Industrial Strategy* and its replacement, the 2012 *National Security Through Technology: Technology, Equipment, and Support for UK Defence and Security* (Luff & Brokenshire, 2012). Furthermore, the UK treats SBRI as a form of “pre-commercial procurement” regulated under the European Union (EU) state aid framework instead of the EU procurement directives (OGC, n.d.; TSB, n.d.-b; UK House of Lords, 2010). As a result, UK authorities are able to impose stronger small business and domestic business preferences into the SBRI criteria without fear of challenge by other EU member states under the EU procurement directives or of challenges by non-EU states under the World Trade Organization Agreement on Government



Procurement (GPA) due to lack of exemption from the GPA for EU small business set-asides (GPA; Kidalov, 2011).

B. UK SBRI Program Origins: Good Intentions, False Start

The UK SBRI program was originally instituted in 2001 with the aim of boosting innovative government procurement from SMEs. It established a target of 2.5% of external government R&D to be spent with SMEs and created a website allowing R&D spending departments to advertise contracts. As of March 2005, the UK government made the 2.5% voluntary target mandatory in order to encourage departmental spending with SMEs. SBRI was intended to replicate the successes of the U.S. SBIR program (Bound & Puttick, 2010; see also Connell, n.d.). The original SBRI was a single-phase program, with individual contract awards up to £100,000.

However, as noted by the UK National Endowment for Science, Technology, and the Arts (NESTA) (Bound & Puttick, 2010) and research from the University of Cambridge (Connell, 2009), the original SBRI was an ineffective government policy. SBRI's effectiveness lagged because procuring agencies widely sabotaged the government's intent and mainly awarded SMEs consultancy contracts to write policy reports, with less than 1% of awards going to true R&D.

As a result, in 2004, a four-year-long campaign was launched to reform the UK SBRI program, including the 2005 "private member's" legislation to establish an innovation procurement program and the 2005 2.5% set-aside mandate (Connell, 2009; Bound & Puttick, 2010).

C. The 2005 UK *Defence Industrial Strategy*

In December 2005, the UK Secretary of State for Defence adopted the UK *Defence Industrial Strategy*, which addressed, among other things, the role of MOD in buying innovative technologies from SMEs and, specifically, the SBRI program. (MOD, 2005). The 2005 *Defence Industrial Strategy* was issued a full year before



the U.S. Congress passed the Section 252 (NDAA, 2006) SBIR Commercialization Pilot Program and related reforms aligning DoD SBIR with DoD research and technology priorities.

This Strategy emphasized greater insertion of innovative technologies developed by SMEs by means of “pull-through” strategies. (MOD, 2005). The Strategy noted “a shift away from platform orientated programmes towards a capability-based approach, with corresponding implications for the demand required of the traditional defence industrial base.” (MOD, 2005, p. 15). This shift includes “substantial transformation” toward maintenance, support, and upgrade of major platforms with long service life, such as aircraft carriers, Type 45 Destroyers, armored fighting vehicles, and the A400M, Typhoon, and Joint Strike Fighter Aircraft. These changing strategic imperatives created the climate involving both threats and opportunities to small UK defense firms:

This means the future business for the defence industry in many sectors will be in supporting and upgrading these platforms, rapidly inserting new technology to meet emerging threats, fulfill new requirements and respond to innovative opportunities, not immediately moving to design the next generation. In parallel, the extent of industrial rationalisation means that sustaining competition to meet domestic requirements is increasingly difficult. In several sectors, following the entry into service of major projects, there will be substantial overcapacity in production facilities in the UK defence industry in a few years’ time. . . . And as we look to non-UK sources of supply, whether at the prime or sub-systems level, we need to continue to recognise the extent to which this constrains the choices we can make about how we use our Armed Forces – in other words, how we maintain our sovereignty and national security. (MOD, 2005, p. 6).

The UK *Defence Industrial Strategy* defined this approach as “throughlife capability management,” confirming “a general shift in defence acquisition away from the traditional pattern of designing and manufacturing successive generations of platforms,” which aimed to add leaps in capability “towards a new paradigm centered on support, sustainability and the incremental enhancement of existing capabilities from technology insertions.” (MOD, 2005, p. 17). In technical terms, throughlife capability management would emphasize open, adaptive, and modular architectures



as well as system engineering competencies to support greater technology insertion. In business and legal terms, throughlife capability management will emphasize greater opportunities for industry through “longer, more assured revenue streams based on long-term support and ongoing development rather than a series of big ‘must win’ procurements.” (MOD, 2005, p. 17).

The *Defence Industrial Strategy* noted that the UK Defence Logistics Organization (now part of the UK Defence Equipment and Support [DE&S]) “and its key suppliers are already establishing innovative arrangements around key programmes to move industry’s support role away solely from supply of spares and maintenance services towards supply of asset availability and incremental upgrade of capability. . . . This requires the development of acquisition models that engage a range of industrial players including equipment design authorities (e.g. aircraft Original Equipment Manufacturers), technology inserters (such as defence electronics companies), integrators of complex systems and/or military capability integrators and innovators (e.g. niche technology companies).” (MOD, 2005, p. 27).

The UK *Defence Industrial Strategy* addressed SBRI in two discussions on the role of the UK Government: government as an investor and government as a planner. In terms of the government’s role as an investor, the *Defence Industrial Strategy* noted that investment in military technological capabilities “fits within a broader framework of Government support to science, technology and innovation. The Government’s target is to raise the overall level of research and development (R&D) investment in the UK from its current level of 1.9% of GDP to 2.5% by 2014, and our approach to this is described in the Government’s ten year Science and Innovation Investment Framework published in July 2004, and the work coordinated by the business-led Technology Strategy Board (TSB) which aims *to support the pull-through of ideas emerging from the UK’s world class science and engineering base*” (emphasis added; MOD, 2005, p. 34). As previously noted, research priorities in TSB topics are aligned with national technology priorities identified by the missions of customer agencies. As acknowledged by the UK *Defence Industrial*



Strategy, TSB aims to ensure that “the UK to be seen as a global leader in innovation and a magnet for technology-intensive companies. This also takes into account existing national strategies, for example, the aerospace research priorities identified by the National Aerospace Technology Strategy taking forward the work of the Aerospace Innovation and Growth Team” (MOD, 2005, pp. 34-35).

Where the UK Ministry of Defence would act as a planner, the *Defence Industrial Strategy* emphasized availability of information and clear lines of authority to communicate the government’s acquisition requirements:

[W]e intend to make as much information available to industry as possible, ranging from publishing information on equipment projects annually, to deeper joint planning activity where this is suitable and can realise substantial benefits on both sides without excluding other companies inappropriately. We are also, with this strategy, publishing a guide to make clearer for industry who does what within the MOD and who therefore is empowered and able to speak authoritatively to industry on particular topics. In sum, we plan to move substantially to a more open and consistent face towards industry. (MOD, 2005, p. 134)

Specifically, the *Defence Industrial Strategy* promised:

We will take action to create a strong programme management environment around our projects that will: manage the overarching portfolio of projects within a capability area, including research and technology, capability upgrade and in-service capability in a coherent manner. Programme teams will be accountable for the initiation and execution of projects, working with suppliers to reduce the likelihood of individual projects over-running and the impact on the wider acquisition budget if this is unavoidable; manage cross project issues; oversee the integration of projects and other Lines of Development into military capability; increase our capability to trade-off between performance, time and cost; and provide a focal point for underpinning industrial base issues and ensure coherent engagement with the market. This will include an intelligent approach to the structuring of the supply chain to maximise innovation and nurture the necessary systems engineering capabilities; act as overarching design authority for the capability area; to enable faster and cheaper capability upgrade; *manage the insertion of new technologies and increments; better focus on the pull-through of new technology*; exploit opportunities to reduce through-life costs by more coherent management of the total portfolio of equipment and projects; invest



in developing programme management capabilities and competence within acquisition. (MOD, 2005, p. 135)

Thus, the 2005 *Defence Industrial Strategy* not only announced the pull-through approach to buying innovative technologies that address defense needs, but it also included SBRI as an integral part of this approach.

D. The 2007 Lord Sainsbury Review and Follow-Up 2008 Reforms

In October 2007, SBRI was assessed as part of the so-called “Lord Sainsbury Review” of the UK science and innovation policies (Lord Sainsbury of Turville, 2007). Lord David Sainsbury, the former UK Science Minister, found that

The UK SBRI has so far failed to achieve anything like the success of the US scheme, even allowing for the different legal frameworks and smaller budgets it operates under. Almost every department claims to spend more than its 2.5 per cent allocation, and have done so since before the mandatory target was introduced. But the introduction of this target appears to have made no difference to departmental behaviour. SMEs are asked to tender for specific pieces of research, many of them concerned with the development of policy, rather than being asked to bring forward research projects in scientific or technical areas where the government department wants to see research take place. There is no active engagement with suppliers beyond the completion of a contract. As a result, the scheme has done little more than reproduce existing practice – with an additional bureaucratic burden. (Lord Sainsbury of Turville, 2007)

In March 2008, the agency predecessor of the UK Department for Business, Innovation, and Skills published a progress report, entitled *Implementing the Race to the Top: Lord Sainsbury’s Review of the Government’s Science and Innovation Policies*” (Department for Innovation, Universities & Skills, 2008). Both the Sainsbury review and the progress report called for reforms to the UK SBRI program building upon the foundation of the “principles of the US SBRI scheme” and with further enhancements, such as:

- requiring buying agencies’ focus “on active engagement with innovative businesses and act as intelligent customers to fulfill their



- departmental objectives” (Lord Sainsbury of Turville, 2007, p.126; Department of Innovation, Universities, and Skills, 2008, p. 38);
- simplified, up-front designation of technology areas for future projects;
 - a two-phase award structure in order to reduce innovation risks;
 - allowing SMEs to retain intellectual property;
 - excluding humanities and social sciences research and consultancy projects from SBRI;
 - requiring that “SBRI awards must take the form of contracts, not equity loans or grants—this will ensure that departmental objectives are clearly identified and met, and will enable the award of an SBRI contract to act as a ‘seal of approval’, reassuring future investors and customers of the firm’s value” (Lord Sainsbury of Turville, 2007, p.131; Department of Innovation, Universities, and Skills, 2008, p. 38).
 - giving “a central administrative role be given to the Technology Strategy Board. Government Departments should be required twice yearly to notify the Technology Strategy Board in a standard form of those technological areas where they would like to support projects. The Technology Strategy Board would then be responsible for publishing twice a year, at fixed dates, a list of those projects notified to it by Government Departments so that SMEs are readily able to find them. ” (Lord Sainsbury of Turville, 2007, p.131);
 - recommending that “[t]he awarding contracts should also be administered by the Technology Strategy Board, with assessments of proposals being made jointly with the relevant Government Departments” (Lord Sainsbury of Turville, 2007, p.131;);
 - finding that “SBRI targets for extramural departmental R&D should build up over three years, from 1.5% in the first year to 2% in the second year and 2.5% in the third year” ” (Lord Sainsbury of Turville, 2007, p.131).



In April 2009, after a pilot project in late 2008, the SBRI program was reintroduced largely along the lines recommended in the Lord Sainsbury review (Bound & Puttick, 2010, p. 3).

E. SBRI Government-Wide Framework: The Role of the Technology Strategy Board (TSB)

In its current version, the UK SBRI program is administered by the TSB, a quasi-independent executive agency under the DBIS. The TSB provides agencies with the following key incentives:

1. co-funding of SME awards;
2. market research into industry capabilities, which can be taken into account by the buying agencies in designing topics;
3. publicity, promotion, and advertising of topics for competitions;
4. assistance with evaluation of proposals, if requested; and
5. assistance with administration of SBRI awards, if requested. (TSB, n.d.-b)

TSB staff includes experts in technical areas. These experts are outside of buying agencies. Technologists from the TSB and agencies focus on problem definitions and unpacking. The TSB also administers a number of R&D programs. These programs include Collaborative R&D, resembling a cross between two U.S. programs, STTR and Technology Innovation Program (TIP) (Schacht, 2010), as well as SBRI, resembling the U.S. SBIR program. The Collaborative R&D program requires collaboration between businesses and universities. (Frankel, 2012).

The SBRI program focuses on “pre-commercial procurement,” where small business set-asides are allowed under the new EU Directives. (UK House of Lords, 2010, p. 9). “SBIR type schemes fall into the category of pre-commercial procurement. They differ from ‘standard’ procurement in that the purchase is of R&D rather than goods and services. This has advantages, for example the fact of being regulated by the State Aid framework rather than procurement directives means that



it is much easier to target benefits on a national or regional basis, but is a much smaller scale activity. Ultimately the real challenge is to unlock the potential in the 16% or so of GDP that is involved in the procurement of goods and services.” (UK House of Lords, 2010, p. 18). As of May 2011, however, the TSB issued guidance claiming that SBRI was not state aid (TSB, n.d.-c). SBRI constitutes 100% funded R&D. SBRI contract awards are deliverable-based, and neither time and materials nor cost-plus contracts are allowed. Intellectual property (IP) rights remain with the SMEs, while the government takes up license to use.

1. SBRI Program Size

Immediately prior to reforms, SBRI was assigned at least £47.7 million in contracts for 2007–2008. This amounted to 11% of the UK’s civilian R&D budget (without counting defense R&D awards; Pro Inno Europe, 2009). Following the reforms, according to a June 2010 NESTA report, total SBRI spending amounted to £27 million actual awards in 2009 (including 2008 pilots) as well as projected awards of £46.9 million to £50 million in 2010, and £96.9 million to £100 million in 2011 (Bound & Puttick, 2010). As of the time of the June 2010 NESTA assessment, SBRI, during the 2008–2009 period, involved 28 competitions by 13 government agencies with 425 contract awards; of those, £4.8 million were spent through a one-time special TSB program and 370 contracts worth £24.5 million were awarded between April 2009 and December 2009 (Bound & Puttick, 2010). SBRI are funded with a mix of procurement agency funds and TSB complimentary funds. The TSB’s “core competitions” SBRI funding was recently budgeted at £10 million for 2010 and 2011 and later reduced to £3.8 million (Bound & Puttick, 2010, n. 34). The TSB also assists agencies with promoting, coordinating, and evaluating these competitions (Bound & Puttick, 2010).

2. SBRI Technology Gap Solution Function

SBRI awards are made on the basis of open competition on any topic an agency wants. Agencies use SBRI to solve internal technology gaps. SBRI agencies are encouraged to use contract terms resembling performance-based



statements of work which should result in a “well-defined prototype” by the conclusion of Phase II. (UK OGC, 2009). SBRI functions as a market intelligence tool for its technology gaps: agencies use SBRI to find out the state-of-the-art of industry. As part of this market research process, SBRI reaches into cross-industry, cross-sector applications. Contractors are not required to provide a record of three years of past performance as they may be required to provide as part of tendering process in mainstream UK MOD procurements.

For SBRI topic definition as well as promotion and outreach, the TSB relies on itself, the buying agencies, and industry supporters such as the Confederation of British Industry. The TSB also relied on the TSB’s own civilian- and defense-focused knowledge transfer networks (KTNs; TSB, n.d.-a). KTNs are funded networks focused on specific sectors and play a significant role in the creation of technology road maps of the government, dual-use, and commercial markets for emerging SME innovations. For instance, the UK Aerospace and Defence KTN is the “custodian” of the National Aerospace Technology Strategy (NATS). NATS “was formulated through government, business and academia working collaboratively to layout the technology requirements so that the sector could by 2020 realise its vision that: ‘The UK will offer a global aerospace industry, the world’s most innovative and productive location, leading to sustainable growth for all its stakeholders.’” (TSB, n.d.-d). As NATS custodian, the KTN

works with the Aerospace Technology Steering Group (ATSG) made up of government, industry, regional and academic representatives to refresh the strategy and publish regularly updated technology roadmaps. Providing advice at a more detailed level are 10 National Technical Committees (NTCs) focusing on specific areas of research and technology, e.g. materials & structures, electrical power systems. . . . This process enables the UK aerospace sector to clearly articulate to all its stakeholders, government, regions, SMEs etc, the areas of technology and investment focus needed to ensure the UK retains its ranking as the world’s second largest aerospace economy in an increasingly globalised and competitive market. NATS provides the framework to translate science through to innovative technologies and processes, from the research base through to market. Since 2004, NATS has attracted combined Industry- Government investment



of £464 million across more than 70 projects and programmes. This includes over £230 million of government support sourced through the Technology Strategy Board's open competition, collaborative R&D vehicle and complementary support from Regional Development Agencies and Devolved Administrations. (TSB, n.d.-d)

3. The SBRI Phase I and II Process

SBRI usually takes place in two phases, although the two-phase process is not required. A typical SBRI competition requires agencies to establish an advanced procurement plan with two years of lead-time. Because government agencies take up SBRI competitions on a discretionary basis, an agency must "identify a serious operational or policy problem and work out the clearest way to communicate their need or problem to businesses" (Bound & Puttick, 2010). Operational problems are situations where agencies expect to be the ultimate customers of SBRI-developed solutions, while policy problems are situations where agencies simply expect to be demonstration customers, but the ultimate goal of the project is to fund a new technology that could be adopted in the private marketplace in furtherance of a desired social, environmental, or other policy objective (Bound & Puttick, 2010). Under general TSB guidance, Phase I concerns proof of feasibility, is valued between £20,000 to £100,000, and lasts two to nine months. Phase II concerns proof of development, is valued up to £1 million, and lasts up to two years. Phases I and II can be combined (Bound & Puttick, 2010). The SBRI proposals are typically evaluated by technical proposal assessors and financial assessors. First, five individual assessors evaluate proposals, then the proposals go to the assessment panels, and then rankings are awarded (only for prototype development). Assessment panels are focused on disruptive technologies search. SBRI features electronic proposal assessment, and the TSB has online processes and templates.

4. Phase III Ambiguity

Unlike the United States, the UK does not automatically confer a special Phase III acquisition preference at either the prime contracting or subcontracting level.



However, the UK Office of Government Contracting (OGC) *SBRI Top Level Process* guidance provides the following explanation on the Open Procurement stage after Phase II:

The Department or Public Sector Body Procures a Solution to the Challenge. A required innovative process, material, device, product or service should have been produced for the focused technology research area. This may require further work outside the SBRI funded period. It is hoped that the Department or public sector body will procure the result of their SBRI investment as a solution to the problem or issue . . . The company is free to market their innovative product to other alternative market. . . .To ensure an innovative solution is created the problem or issue needs to be defined in terms of the desired outcome. The challenge is the procurement requirement for a more innovative solution obtained through accelerated technology development. (UK OGC, 2009).

Another version of TSB guidance states that at the end of Phase II, “it is intended that what has been achieved will be manufactured and purchased by the Department [which established the need for the topic] as a way of fulfilling their procurement requirements” (Kidalov, 2011, p. 506).

F. Ministry of Defence SBRI: The Role of the Center for Defence Enterprise

The CDE’s requirement for DE&S ownership of SBRI topics and project monitoring is consistent with the overall pull-through approach of the UK *Defence Industrial Strategy* to acquisition and R&D program management.

The CDE describes itself as a one-stop-shop interface: “the first point of contact for anyone with a disruptive technology, new process or innovation that has a potential defence application. CDE is a gateway between the outside world and the Ministry of Defence (MOD), bringing together innovation and investment for the defence market, ensuring that our front-line forces have the best battle-winning technologies for the future.” (CDE, n.d.-a). Figure 20 below illustrated the structure of such one-stop-shop framework. The CDE is part of the Defence Science and Technology Laboratory (DSTL), a 3,500-plus-strong R&D arm of the UK Ministry of



Defence. On the other hand, UK defense procurement is run by the Defence Equipment and Supply (DE&S) organization (commonly referred to by the name of its headquarters, Abbey Wood), although the DSTL can provide scientific and technical support to DE&S efforts. (Defense Science and Technology, n.d. –e). The CDE variably describes itself as “a first point of contact” that can advise the industry on pre-proposal matters, as well as “a gateway to obtain proof-of-concept funding to help you to develop your idea.” (CDE, n.d.-b).

According to the CDE’s director, Dr. Helen Almey (2010), the CDE was the initiative of Lord Paul Rudd Drayson. Lord Drayson is a former engineering entrepreneur and Oxford entrepreneurship scholar who served in several senior UK government positions comparable to the U.S. positions of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]) as well as the Chief Counsel for Advocacy of the U.S. Small Business Administration. The CDE was stood up in about four months, between December 2007 and March 2008, and in April/May 2008, it launched an evaluation of proposals. According to Dr. Almey, the structure of the CDE and its process is derived from a survey/audit of MOD R&D and procurement practices conducted by CDE staff member Gavin Copeland. The survey/audit sought to answer the question of why SMEs and academics do not work with the MOD as much as the MOD would like. It must be noted that similar questions continue to be raised by the UK MOD’s 2010 Green Paper, entitled *Equipment, Support, and Technology for UK Defence and Security—A Consultation Paper* (Defence Science and Technology, 2011).

The CDE is present among the science and technology companies by virtue of being based at a so-called “innovation triangle,” the Harwell Science and Innovation Campus in Oxfordshire. It has a skeleton staff of less than 10 and is largely virtual in its operations. The CDE is not a call center, and it is open to visitors from industry and academia who would like to schedule an appointment. The CDE is largely a virtual institution and operates mostly through its secure proposals portal: http://www.science.mod.uk/engagement/the_portal.aspx.



The CDE's goal is to evaluate and fund all proposals through a 15-day transparent cycle: 10 days of assessing, and five days of contact with the offeror. The CDE operates on a one-stop-shop principle in that it is able to pull together funding from different sources and programs. Any technology funded through the CDE must have the MOD acquisition market either through prime contracts or subcontracts with major defense firms as its commercialization target. Proposal calls balance the needs for previously identified and requested priority technologies, procured through "themed calls," and brand new, out-of-the box technologies that have not been previously identified or requested by Abbey Wood are procured through a "standby open innovation call." This standby call for open innovations funds proposals on any idea relevant to the MOD out of a £3 million (\$5 million) fund. Upon positive assessment, the CDE provides additional funding on most applications. The CDE typically receives 20–40 proposals a month under an open call. Themed calls are conducted with the intent of awarding funds received from Abbey Wood organizations, approximately £300,000 (or about \$500,000) per call. Phase I SBRI results must be delivered within 100 days, forcing speedy pace by the industry.

As of August 2010, the CDE conducted over 50 seminars and conferences. The TSB assisted the CDE with publicity and promotion. Often, the seminars are linked to calls, and major prime contractors offer to pay for the venues from time to time. SMEs may receive face-to-face opportunities in 30-minute slots.

To succeed for CDE funding, all SBRI proposals must be evaluated according to the following factors:

1. Operational potential for the idea;
2. Potential for exploitation;
3. Support of UK supplier base (a critical factor);
4. Scientific quality; and
5. Scientific risk.



To ensure ownership of SBRI topics and technologies, the CDE utilizes a so-called embedding process. This embedding process works in both directions: MOD DSTL scientists are embedded at the Abbey Wood headquarters of the DE&S, while frontline users are embedded into CDE assessment teams and Abbey Wood DE&S managers manage SBRI projects. Some themed calls involve uniform military on deployment in Afghanistan advising the technology developers and buyers. CDE calls are not restricted to SMEs, although the TSB supports the awards to SMEs.

Defense technologies funded through the CDE SBRI face three choices (Defence Science and Technology, n.d.-c). First, “successful concepts which are relatively immature technology” may receive financial support through the MOD research program under the UK Defence Technology Plan (Defence Science and Technology, n.d.-b). Second, “[m]ore mature technology could be considered for entry into the mainstream equipment program and discussed with military customers and the MOD’s Defense Equipment & Support organization.” Third, “technologies with high immediate operational impact” can be bought on a sole-source, expedited basis through the Urgent Operational Requirements (UORs) process. UORs are an exception to the general European Union rule of competition in government procurement. (MOD, 2011). The UORs process is combined equivalent to “other than full and open competition” under FAR Part 6.302-1, Only One Responsible Source and No Other Supplies or Services Will Satisfy Agency Requirements, and FAR 6.302-2, Unusual and Compelling Urgency. In its effect, therefore, the UORs process for SBRI innovations is similar to the Phase III special acquisition preference, although its use is not connected per se to the contractors’ status as SBRI winner.

CDE SBRI awards typically fall within the following ranges: (1) up to £30,000 for “simple” T&E or demonstration of proof of principle; (2) up to £100,000 for “initial feasibility investigation or proof of concept work” with the expectation of a phased program including at least one review point; (3) between £100,000 and £250,000 for a phased program of technology growth or development including at least one



review point; and (4) between £250,000 and £1,000,000 for a phased program of technology application and demonstration including several review points (Defence Science and Technology, n.d.-d). The CDE notes that “[t]hese [funding] guidelines are not prescriptive, and we are open to proposals outside or in between the ranges below.” (Cooper, n.d.).

The CDE offers four services to the industry: (1) open calls for unsolicited proposals; (2) themed calls; (3) seminars and workshops; and (4) so-called “surgeries” or proposal coaching sessions. (Almey, 2010). CDE guidance states that applicants

can submit a CDE research contract proposal online—we have designed this process to be quick and easy. You are also welcome to come and talk to us at the CDE before submitting a proposal. There is a team permanently based at the CDE in Harwell and they are available to talk to you about your innovation. Once your proposal application is submitted you can track its progress online. Proposals can be assessed in as little as 15 days.(CDE, n.d.-c).

According to the CDE,

successful applicants could benefit from: Proof-of-concept funding in the form of a research contract; Support from our military scientists and engineers; MOD trials and testing facilities; A mentoring service ensuring a single point of contact within the MOD; and a unique customer insight into both UK and non-domestic defence markets.(Defence Suppliers Service, n.d.).

To incentivize industry participation, the CDE employs standard contractual terms and conditions. SBRI contractors generally retain intellectual property rights (IPR) while providing the UK MOD with the licensed use of IPR in accordance with the UK MOD Defence Condition (DEFCON) 705 (Defence Science and Technology, n.d.-a). The CDE provides industry with the following assurances: “We consider the best person to exploit and develop an innovation is the inventor. . . We will not seek, or are interested in an equity stake in your business.” (CDE, n.d.-b).

The CDE undertakes a number of initiatives and incentives to further develop technology readiness levels (TRL) of SBRI technologies. Where appropriate, the



CDE provides SBRI applicants with access to MOD trials and testing facilities (if applicable). The CDE also provides mentoring and support, including technical advice prior to submission, assignment of “single point of contact within the MOD” for successful applicants, and technical support access from MOD scientists and engineers. (CDE, n.d.-b). For example, the CDE is able to facilitate access of SBRI firms to innovation centers of major prime contractors, such as BAE Systems and General Dynamics. The CDE also facilitates access of SBRI firms to Defence Technology Centres (DTCs). DTCs are MOD consortia with industry and academia funded generally on a 50-50 basis and focused on specialized research areas contributing to the UK defense equipment program.

Many of the DTCs fund 'open calls' for research proposals from outside the members of DTC consortium - please see the individual DTC websites for further information. The two way partnership allows the MOD to access research from industry, and industry to exploit knowledge from defence research.(Defense Science and Technology, n.d.-f).

Furthermore, the CDE assists SBRI firms with obtaining security clearances.

The CDE also undertakes to act as an internal and external advocate of SBRI innovation. Specifically, the CDE staff “ensure that the right people inside MOD get to know of your ideas and assess their long term potential. These include military users, technical experts and programme managers in our Defence Equipment and Support (DE&S) organisation.” (CDE, n.d.-b). Furthermore, with agreement of SBRI firms, the CDE “can help promote your innovation to the relevant decision-makers in MOD, defence prime contractors and investors.” (CDE, n.d.-b).

CDE guidance further states that CDE exists to engage “the broadest possible audience of science and technology providers” including small businesses and academia (CDE, n.d.-b), and to help them understand key defense challenges. (CDE, n.d.-a).



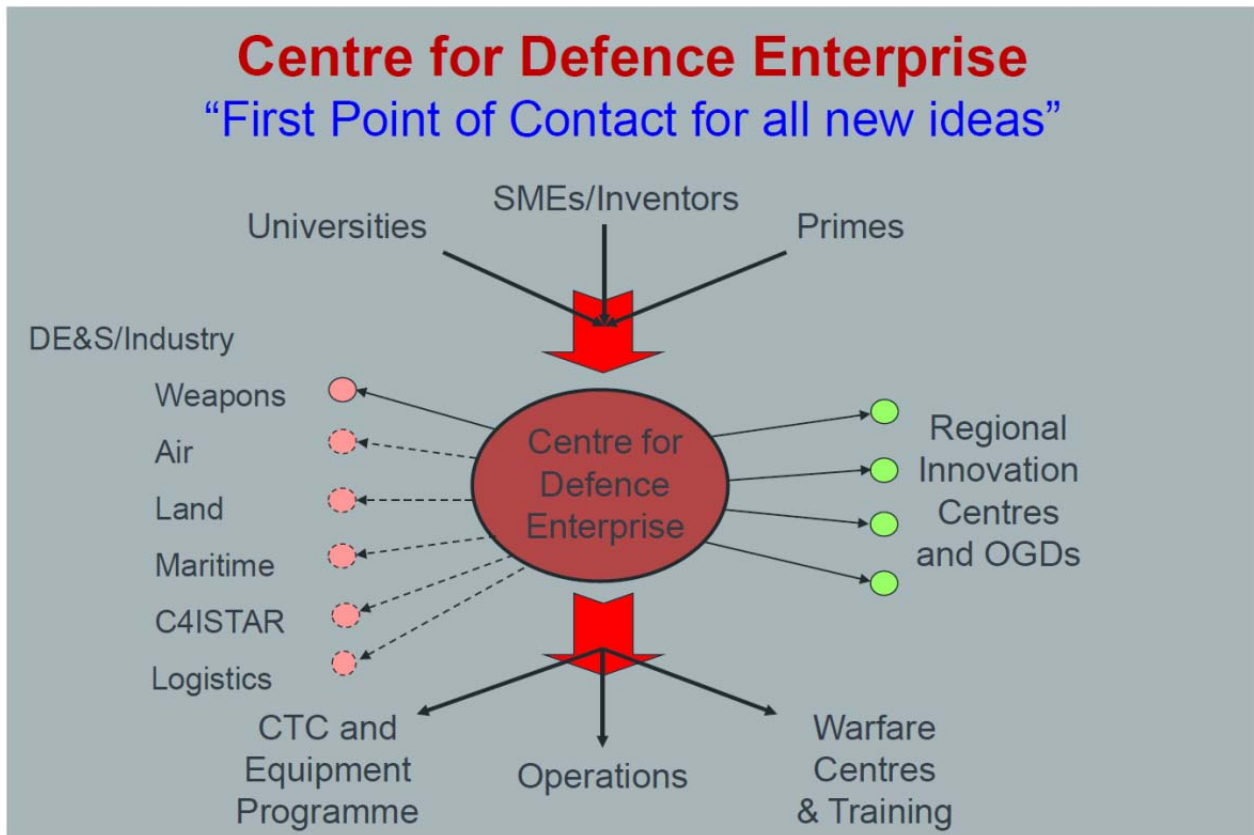


Figure 20. **Center for Defence Enterprise SBRI One-Stop-Shop Model**

(Almey, 2010)

G. The 2012 White Paper, *National Security Through Technology*, and the CDE Initiatives of the Minister for Defence Equipment, Support, and Technology

In February 2012, Peter Luff, the new UK Minister for Defence Equipment, Support, and Technology (Min DEST), and James Brokenshire, Minister for Crime and Security, issued the new White Paper entitled *National Security Through Technology*. This document created a combined military/law enforcement/homeland security industrial strategy for the UK. It subordinated the defense industrial policy to several principles: (1) the military principles of operational advantage and freedom of action; (2) the economic policy principle of fostering economic growth, especially through innovative SMEs; and (3) the international trade objective of creating the UK Security industrial brand.



With regard to planning, the White Paper confirmed the commitment

to greater openness and recognise the benefit that business gains from clarity of plans, especially investment priorities, . . . important, particularly for pull-through from research into utilisation. However, we seek innovation, so the Government will not be specifying technology solutions. We will publish our defence and security priority themes annually, providing supporting strategies for defence and security science & technology. This will provide more clarity on our funded technology priorities and programmes than in previous published strategies and plans. In particular for defence technologies, these will replace the on-line Defence Technology Plan and supersede the Defence Technology Strategy 2006. (Luff & Brokenshire, 2012, p. 36)

The White Paper emphasized that “[t]he organisations responsible for defence and security within the Government enjoy important strategic relationships with the Research Councils, the Technology Strategy Board, and the UK Space Agency, which are responsible for funding research and for innovation and technology development in business. These relationships facilitate access to the full spectrum of the UK’s technology capabilities. Mechanisms to achieve this include the Knowledge Transfer Networks (KTNs)—through the Aerospace, Aviation and Defence KTN—and the Small Business Research Initiative (SBRI), which together with the new network of elite Technology and Innovation Centres will ensure we make full use of technologies developed for civilian applications and invest in the development of defence and security uses for them” (Luff & Brokenshire, 2012, p. 38–39).

The White Paper placed extensive emphasis on SMEs. It noted that “SMEs are a vital source of innovation and flexibility in meeting defence and security requirements . . . [and] are hugely important to the UK economy.” (Luff & Brokenshire, 2012, p. 55). The ministers affirmed their determination “to increase SMEs’ share of public procurement, and have an aspiration that 25% by value of Government contracts should benefit small businesses, including in supply chains” and reported that “[i]n the year to March 2011, an estimated 42% of MOD contracts were placed directly with SMEs, representing some £953m or 13.2% by contract



value.” (Luff & Brokenshire, 2012, p. 56). The White Paper noted a variety of pro-SME measures, including

appointment of a ‘Crown Representative’ for SMEs to build a more strategic dialogue and launch SME ‘Product Surgeries’ to enable selected companies to ‘pitch’ innovative products and services, and coordination of departmental action plans to help achieve our aspiration for 25% of contracts to be placed with SMEs. (Luff & Brokenshire, 2012, p. 56).

The White Paper also noted a variety of procurement simplification measures, “a dedicated SME group in the new Defence Suppliers Forum, chaired by a MOD Minister, to provide a better ‘voice’ for small suppliers,” and greater IP protections through a “revised . . . approach to enable the submission of tenders in a way which helps protect the tenderer’s innovative proposals.” (Luff & Brokenshire, 2012, p. 56).

The White Paper extensively addressed the CDE SBRI. It dubbed the CDE

a gateway between the outside world and the MOD for anyone with a disruptive technology, new process, or innovation that has a potential defence application. It brings together innovation and investment for the defence market, ensuring that our front-line forces have the best battle-winning technologies for the future. (Luff & Brokenshire, 2012, p. 39).

The White Paper also noted greater involvement of CDE and SBRI in support of homeland security/counter-terrorism priorities. With regards to the CDE SBRI, the White Paper noted that the CDE

remains our first point of contact for anyone who wishes to submit a research idea to the MOD. . . . Building on CDE’s success in providing efficient access to innovation, we will broaden its remit to cover both the defence and security domains. (Luff & Brokenshire, 2012, p. 39)

Specifically, the White Paper promised that

we will seek ways for CDE to provide more support to small and medium-sized enterprises in understanding how MOD operates, the development of routes to market for potential defence and security products, and to enhance exploitation mechanisms between CDE and our suppliers. (Luff & Brokenshire, 2012, p. 39)



The White Paper also noted that it wants to draw in the expertise of non-traditional contractors on government-funded and independent R&D,

not just in large specialist defence and security firms, but in small- and medium-sized enterprises and universities too. Both enhancement of CDE and the role of DSTL in formulating and delivering the MOD's science & technology programme will be critical to achieving this. (Luff & Brokenshire, 2012, p. 40)

H. The 2012 Min DEST Reforms: An Expanded Role for SBRI and the CDE

In March 2012, Min DEST Peter Luff visited the CDE and made a major policy announcement concerning SBRI and the CDE (Luff & Brokenshire, 2012). For context of this announcement, Table 3 provides an up-to-date chronology of SBRI reforms. Min DEST Luff noted that the CDE continues to fulfill its three-fold mission: (1) to provide visibility of the MOD's requirements; (2) to inform and support new supply networks; and (3) to widen the MOD's supplier base (Luff & Brokenshire, 2012). He further noted that, as of March 2012, the CDE received over 3,000 proposals and awarded over £23.5 million in contracts.



Table 3. UK Defense SBRI Major Milestones

UK Defense SBRI: Major Milestones		
Year	Agency/Leader/Organization	Action/Reform
2001	UK Government	SBRI created as a single-phase program with awards up to funded with a voluntary 2.5 set-aside target of agency R&D funds
2004	Industry and academia, especially David Connell of Cambridge University	SBRI reform campaign commenced
March 2005	UK House of Commons	Private members' legislation
March 2005	UK Government	SBRI 2.5 percent set-aside target established as a mandate
December 2005	UK Ministry of Defence (including Lord Drayson)	<i>Defence Industrial Strategy</i> White Paper published
October 2007	Lord David Sainsbury	Lord Sainsbury Review published
March 2008	UK Department of Business, Innovation, and Skills	Implementation Report
May 2008	Lord Drayson, Minister for Defense Equipment and Support (Min DES)	Center for Defense Enterprise established and commences SBRI awards
April 2009	UK DBIS	SBRI program re-introduced as a two-phase program co-funded by TSB and buying agencies designed to solve agency mission challenges
May 2010	Prime Minister David Cameron and the UK Coalition Government	Coalition government formed with the plan to introduce an "aspirational" target of awarding SMEs 25% of government procurement contracts
June 2010	National Endowment for Science, Technology, and the Arts (NESTA)	<i>Buying Power? Is the SBRI for Procuring R&D Driving Innovation in the UK?</i> report published
June 2010	EU Commission, Directorate General of Enterprise and Industry, Pro Inno Europe	<i>Peer Review of SBRI</i> pilot report published
February 2012	Peter Luff, Minister for Defence Equipment, Support, and Technology (Min DEST), and James Brokenshire, Minister for Crime and Security	<i>National Security Through Technology</i> White Paper published (replaced the 2005 <i>Defence Industrial Strategy</i>)
March 2012	Peter Luff, Min DEST	CDE speech announcing the three-part reforms



On the policy side, Min DEST Luff (2012) reaffirmed the call of the *National Security Through Technology White Paper* to “enhance the role of the CDE, such that it works more closely with the SMEs that it funds, including the facilitation of opportunities to engage with prime contractors to increase the likelihood of exploitation of the most innovative outputs.” The Min DEST explained that

This means taking CDE to the next level . . . [i]n broadening the reach of CDE to address both defence and security markets, as well as deepening its support to new entrants into the defence. Or, in the words of the White Paper ‘enhancing exploitation mechanisms between CDE and our suppliers.’ We will do this with an active focus on SMEs, and on implementing an active ‘SME friendly’ engagement programme. (Luff, 2012).

The Min DEST then announced a detailed, three-part CDE SME initiative where “CDE will be focusing much more clearly on SMEs in its future work.” The first part of the CDE SME initiative consists of continuing “CDE’s role as an entry point to Defence” and “another function - as a bridge linking the SMEs and the main defence suppliers, as well as investors and wider Government.” (Luff, 2012). The CDE will be “facilitating networks” and “launching a series of market place events . . . designed for SMEs to showcase their project outputs to Defence Primes; the venture capital investment community and innovation initiatives across government within other government departments such as the Technology Strategy Board.” (Luff, 2012). The second part of the CDE SME initiative

will be the introduction of nine new ‘Open Engagement’ events to increase awareness of opportunities within the Defence research and development market. Some of these will be working jointly with industry bodies and knowledge transfer networks, as well as specific industry sectors—such as Transport and Healthcare. (Luff, 2012).

The goal of this part is to encourage deployment of dual-use technologies. The third part of the CDE SME initiative “will involve CDE mentoring SMEs - in order to guide and help their approach to maximise opportunities for exploitation. CDE will be a promoter - giving SMEs the opportunity to present their innovations to leading defence and other suppliers and users.” (Luff, 2012).



With regard to technology transition, the Min DEST arranged for the assignment of approximately four additional staff members within both the CDE and the DE&S each toward “helping CDE’s clients access the acquisition programmes of MoD much more effectively.” (Luff, 2012). These additional personnel shall serve as “the Sherpas who help make good ideas real, . . . ensure CDE’s clients can reach the summit of their ambition, . . . [and] so help solve more of MoD’s equipment challenges.” (Luff, 2012). At the same time, the Min DEST emphasized his commitment to maintain the CDE’s strength of “fleetness of foot, born of a small, unbureaucratic structure.” (Luff, 2012).

The new CDE SME initiative involves additional funding. Previously, CDE SBRI Phase 1 awards were funded by a mix which included MOD DSTL funding and “up to £1.5 million a year” in TSB SBRI funding, while Phase 2 and subsequent awards were funded solely from MOD funds. (Luff, 2012). Under the terms of this new initiative, the TSB stepped in with additional funding of up to £2 million a year toward CDE SBRI Phase 2 projects.

At the same time, the Min DEST announced an effort with DBIS to help SME proposals that do not have clear military applications for further civilian uses in government or industry.

Finally, at the request of large and small businesses, the Min DEST also announced greater transparency in CDE event programs as well as the CDE SBRI contract awards. These measures include an online program of events with six months of advance notice as well as future online publication of SBRI contract awards.

I. Lessons from the UK SBRI Experience

The UK experience with SBRI offers policy-makers in the U.S. with several important lessons for the SBIR and STTR programs, including CPP/CRP. First, the TSB model of supplementing agency funds provides a real incentive for government buyers to engage with SMEs. Second, the UK CDE SBRI one-stop-shop model



offers a real alternative to the complicated, complex maze of technology transition assistance programs within the DoD. However, the U.S. SBIR program compensates for complexity with transparency of rules and selection criteria. The UK SBRI also provides for stronger mentoring opportunities through proposal “surgeries.” In the U.S., these services are typically provided by the Procurement Technical Assistance Centers. Most important, the UK model offers real ownership of SBRI topics by the buying agencies and user evaluations. In contrast, the U.S. SBIR program suffers from perception as a “tax” and only a 50% minimum topic ownership requirement.



VIII. Recommendations for CPP Reforms

Based on the examination of Section 252 (NDAA, 2006) legislative text, SBIR-related proceedings of the National Academies of Sciences Symposium, the Congressional Guidance Letter on Section 252, best practices available internationally, and the DoD-wide survey of SBIR and STTR managers, we make the following recommendations for action by the Secretaries of Defense and the military departments and, where appropriate, by Congress.

A. Create a Streamlined One-Stop-Shop Process for Assisting SBIR/STTR Firms With Technology Transition, Including Development, Testing & Evaluation, and Procurement

It is clear from research reported in this paper that one of the main obstacles to successful technology transition in the DoD is confusion and lack of information on available assistance programs within government managers and small businesses/industry alike. This confusion and lack of information forces small firms to spend much time navigating the DoD bureaucracy for technology funding sources and introduces uncertainty that discourages acquisition program managers and program executive officers from planning for insertion of technologies developed by small firms. A streamlined one-stop-shop process for SBIR/STTR firms set up within each military department and/or within the Office of the Secretary of Defense could reduce bureaucratic barriers for small firms and interested program managers and program executive officers. If an SBIR/STTR technology looks promising but would require planned and/or targeted assistance with development, testing, or evaluation, the one-stop shop could help tailor the appropriate funding mechanisms and assist with technology road mapping, leading to procurement by the DoD under contracts or by major prime contractors under subcontracts. The one-stop shop could reduce or altogether eliminate the need for private advisory and assistance contractors,



including venture capitalists, to act as gatekeepers for Phase III procurements and as intermediaries between defense acquisition programs and SBIR firms.

B. Raise Military Department Acquisition Community Sponsorship of SBIR/STTR Topics From at Least 50% to at Least 75%, Seek Prime Contracts' Recommendations of Topics for Military Department Acquisition Community Sponsorship, and Publicly Designate the Existence of Sponsorship in the Solicitation

As our study confirms, the key technology transition best practice in the United Kingdom and the United States is market pull for the technology at issue that occurs when the technology addresses an identified need of a defense acquisition program. For this reason, the UK CDE does not fund SBIR topical competitions unless the topics are requested by the Defence Equipment & Supply organization (even when SBIR topics end up receiving additional technology development funding and not acquisition program funding at the conclusion of SBIR contract performance). Likewise, NASA has attempted to fundamentally reform its SBIR/STTR programs by ensuring that all of its SBIR/STTR topics meet identifiable acquisition needs. In contrast, the DoD has never gone above its 50% topic sponsorship policy. Although there is a need for some SBIR/STTR topics that will further the long-term research interests of the DoD (e.g., DARPA topics and topics addressing the needs of military department R&D communities), it is clear that the majority of SBIR/STTR topics must have DoD acquisition program sponsorship. Raising the DoD sponsorship policy from 50% of SBIR/STTR topics to at least 75% of topics, seeking SBIR/STTR topic recommendations from major prime contractors for military departments' acquisition community sponsorship, and requiring a public designator of topic sponsors in the R&D or acquisition communities as part of SBIR/STTR solicitations should address any disconnect between the SBIR/STTR solicitations and the needs of defense acquisition programs. It should also provide clearer notice to small firms concerning the possibility of any future procurement prospects for their technologies.



C. Confirm the Overall Authority of Military Department Offices of Small Business Programs, Small Business Specialists, and Small Business Technical Advisers Over SBIR/STTR Transition Assistance and Incentives

Our study's findings show that a major part of the DoD SBIR Commercialization Pilot Program, as implemented by the military departments, involved contracting for consultants, including venture capitalists and technical assistance vendors, to serve as "transition agents" and evaluators of SBIR firms seeking Phase III contracts or enhancements to Phase II contracts. These private advisory contractors essentially act as source selection "gatekeepers" for Phase III procurements (e.g., by pre-selecting candidates presented to Army acquisition program managers for Army CPP funding and procurement assistance, thereby making initial eligibility and responsibility determinations) or as intermediaries between defense acquisition programs and SBIR firms (e.g., within the Air Force and the Navy).

However, the current CPP approach duplicates existing responsibilities of OSD agency and military department Directors of Offices of Small Business Programs (OSBP), as well as their small business specialist and small business technical advisers embedded in buying commands and activities. The OSBP directors and their small business acquisition workforce oversees and advocates for an increase in small business prime contracting and subcontracting participation under the existing legal and regulatory framework, such as 15 U.S.C. § 644(k), FAR 19.201, DFARS 219.201, and DFARS PGI 219.201. The current CPP approach also ignores the recommendations of the National Academies of Sciences to support SBIR Phase III efforts by using existing incentives for subcontracting with small firms. The Phase III Commercialization Symposium highlighted the experience of the Navy Program Executive Office for Submarines (PEO Subs) in utilizing existing subcontracting incentives.



Therefore, it is recommended that overall authority for CPP activities be conferred in the military department and OSD agencies' OSBPs and that small business specialists and technical advisers be funded and encouraged to conduct outreach to program managers/program executive offices and prime contractors, engage in SBIR technology road map development, facilitate inclusion of SBIR/STTR technology transition goals into prime contractors' subcontracting plans, and facilitate T&E funding assistance to small firms as well as subcontracting incentives for large prime contractors.

D. Realign the Commercialization Pilot Program to Facilitate Pull of Technologies Into Defense Acquisition Through Secretarial Instructions That Clearly Define Criteria for High Military Priority of SBIR Projects as Well as Commercialization Pilot Program Eligibility and Responsibility of SBIR Firms in Each DoD Agency and Military Department

The essence of the CPP structure is to realign the DoD SBIR technology acquisition process from a “push” by SBIR firms trying to convince the DoD to purchase their products and services to a pull of SBIR technologies by DoD acquisition programs (both at the government and the prime contractor level). This realignment is necessary to reverse the attitude inside the DoD that SBIR set-asides are a “tax” against mission-focused DoD acquisition and RDT&E funds. The study indicates that CPP eligibility criteria are not well defined by the DoD and the military departments. They appear to be left to the discretion of the CPP contractors, including private venture capitalists. Thus, the focus of evaluation shifts to whether an SBIR firm has already developed on its own a profitable government acquisition market, not whether the technology is a priority for the DoD or a military department and one or more of its acquisition program executive officers or program managers.

Moreover, the current poorly defined CPP eligibility criteria appear to violate the Small Business Act ban on excluding small firms from contracts without



Certificates of Competency. Under the Small Business Act, government contracting officers are not allowed to deny small businesses the awards of any contracts for perceived lack of any “elements of responsibility, including, but not limited to capability, competency, capacity, credit, integrity, perseverance, and tenacity...without referring the matter for final disposition” and a Certificate of Competency to the Small Business Administration (15 U.S.C. 637(b)(7)(A), 2011). Phase III contracts to SBIR firms are not excluded from this requirement for a CPP determination.

Secretarial instructions should clearly provide for (1) secretarial certifications of high military priority for SBIR technologies before such technologies are selected for the CPP and (2) a process for evaluation of SBIR firms’ business, financial, and manufacturing capabilities that may provide for assessment by business development contractors as well as appeal to the SBA for a Certificate of Competency.

E. Publish Results of Quadrennial Strategic Reviews Concerning SBIR/STTR Topic Alignment With DoD R&D Plans and Program Manager/Program Executive Officer Inputs

Our study suggests that few SBIR/STTR agencies have conducted the periodic Quadrennial SBIR/STTR topics review. This review has the potential to improve the usefulness of SBIR/STTR set-asides and encourage greater Phase III awards by aligning SBIR/STTR focus areas with DoD R&D Plans (e.g., the Defense Technology Area Plan, Basic Research Plan, and Joint Warfighting Science and Technology Plan) as well as acquisition programs’ inputs and the DoD Quadrennial Defense Review.

The OSD and military departments should conduct such a review and publish its results.

F. Expand the Commercialization Pilot Program to the STTR Program to Enable Access to Military Department Testing



and Evaluation Facilities, Including Naval Warfare Centers and DoD Academic Institutions, Such as the Naval Postgraduate School

To the extent that SBIR and STTR technologies suffer from the risk of insufficient testing, one major incentive would involve greater access of SBIR and STTR firms to military testing facilities and funding for T&E at these facilities. Such facilities would include the elements of the Naval Warfare Centers Enterprise such as the Naval Surface Warfare Center and the Naval Undersea Warfare Center, as well as military postsecondary academic institutions such as the Naval Postgraduate School, the Air Force Institute of Technology, and the military Service academies.

Specifically, the Small Business Act should be amended to (1) provide for eligibility of the military postsecondary academic institutions to participate in the STTR program on the same terms as federally funded research and development centers (FFRDCs) and (2) confirm the ability of SBIR and STTR CPP firms to use CPP assistance for T&E activities at military T&E facilities and military postsecondary academic institutions.

G. Expressly Describe Authorized Acquisition Incentives and Other Types of Incentives in Commercialization Pilot Program Legislation

It seems clear from the study that the DoD and military department SBIR and STTR managers do not fully comprehend the full range of incentives that are authorized under the CPP. This appears to be due to lack of awareness of the Congressional Guidance Letter and the proceedings of the SBIR Phase III Symposium at the National Academy of Sciences. As a result, the DoD and military departments have focused on hiring business advisory and assistance contractors to conduct business evaluations, outreach, and advocacy of small firms. Education and business development incentives are only one category of incentives among seven possible types of incentives listed in the Congressional Guidance Letter. Congress should expressly list all such incentives in amended CPP legislation, or



the military departments should spell out all such incentives in their FAR supplements.

H. Establish Clear Policies Concerning Technical Assistance Vendors' Investment in SBIR/STTR Firms, Organizational Conflicts of Interest, and Performance by Such Vendors of Inherently Governmental Functions

The current CPP model appears to provide insufficient assurances against organizational conflicts of interest (OCIs) and performance of inherently government functions (IGF) by government contractors. Specifically, there is a potential for venture capital contractors to recommend for Phase III those SBIR firms that are open to future venture capital investments by the recommenders. There is also a potential for business advisory and assistance contractors to recommend only firms that utilize their business development assistance services authorized under 15 U.S.C. 638(q), Discretionary Technical Assistance, which allows SBIR and STTR agencies to contract with vendors for advisory services for individual SBIR and STTR awardees where the awardees will use part of their SBIR and STTR awards to pay for such advisory services. Under FAR 9.505 (2011), contracting officers must structure acquisitions with the goal of “preventing the existence of conflicting roles that might bias a contractor’s judgment...[and] unfair competitive advantage.” Under FAR 9.504 (2011), the contracting officer issuing a solicitation (or any solicitation-type CPP invitation for future Phase III or Phase II Enhancement awards) must recommend a plan to the head of contracting activity for resolving any significant potential conflicts of interest. Moreover, under the FAR, Congress, the OSD, and the military departments should absolutely and unequivocally prohibit contractors that are or may be involved in advising or investments to SBIR or STTR firms from participating as advisors on CPP evaluation (including any Phase II enhancements or Phase III awards).



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IX. Appendix

Congress of the United States

Washington, DC 20510

May 15, 2006

The Honorable Kenneth J. Krieg
Under Secretary of Defense
for Acquisition, Technology, and Logistics
3000 Defense Pentagon
Washington, DC 20301-3000

Re: Section 252 of the National Defense Authorization Act for
FY2007 - Congressional Guidance and Status Reporting Request

Dear Under Secretary Krieg:

As leaders of the Senate Committee on Small Business and Entrepreneurship and the House Committee on Small Business, we write concerning the critical issue of developing and transitioning new technologies through the Small Business Innovation Research Program by the Department of Defense (DOD) and its four component military Departments. The DOD spends approximately \$1.1 billion a year on SBIR Phase I and Phase II competitive, merit-based awards given directly to small innovative firms. These research investments, in turn, were commercialized through approximately half a billion dollars in DOD SBIR Phase III prime contracts as well as in subcontracts on major defense acquisition systems. Technological projects fostered by the DOD from invention to commercialization have made our Nation more secure by providing our warfighters with unmanned aerial vehicles (UAV), training simulators for operations involving urban combat and improvised explosive devices (IEDs), submarine components, and language translation aids, to name a few.

We would like to hold a meeting between your staff and the staffs of the Senate Committee on Small Business and Entrepreneurship and the House Committee on Small Business by June 16, 2006 to receive the Department's written status report concerning implementation of Section 252 of the National Defense Authorization Act for Fiscal Year 2006. We are particularly interested in the following questions:

- (1) How the DOD plans to implement the new requirement in Section 252(a) for research focus of its SBIR and STTR programs?
- (2) How the DOD and each military department plan to involve acquisition program managers and program executive offices in SBIR/STTR topic selection and management and to ensure that SBIR/STTR is integrated into the DOD's mission and its acquisition framework, as contemplated in Section 252(a), SBIR Commercialization Pilot Program, and Section 252(c), inclusion of testing and evaluation work as part of SBIR/STTR commercialization activity?
- (3) How the DOD's and each military department's acquisition program managers and program executive officers will plan for post-SBIR/STTR funding, through the Program Objective Memoranda and other vehicles, to utilize SBIR/STTR technology



resources in their acquisition process, as contemplated by Section 252(a), SBIR Commercialization Pilot Program?

- (4) How the DOD and each military department will plan for and implement the SBIR Commercialization Pilot Program, and specifically what processes these military services and defense agencies will develop and implement to ensure identification of optimal SBIR/STTR Phase I - II projects for accelerated transition through this Pilot Program?
- (5) What acquisition incentives and activities will the DOD and each military department be deploying to accelerate the transition of SBIR/STTR technologies into the acquisition process through this Pilot Program?
- (6) What specific reporting requirements do the DOD and each military department intend to impose on acquisition program managers, program executive officers, and prime contractors as part of the annual evaluative report to Congress contemplated by Section 252(a)?
- (7) How will the DOD and each military department implement Executive Order 3329, *Encouraging Innovation In Manufacturing*, codified into law as part of Section 252(b)?

In answering these questions, we ask that you follow the following Congressional guidance on Section 252. First and foremost, this Section addresses the need for a strategic, DOD-wide review of the SBIR and the STTR programs (conducted not less than quadrennially) based on the latest research, science, and technology plans of the DOD. The review should address the research priorities of the DOD (taking into account the warfighters' needs), tie these priorities with the ongoing or anticipated acquisition programs, and also address the commercialization, manufacturing, and testing and evaluation of technologies funded through the SBIR and the STTR. The strategic review process envisioned by this provision is also intended to guard the SBIR/STTR programs at the DOD against merely serving as a funding supplement to advanced acquisition programs which are suffering from low levels of technological maturity. We expect that the quadrennial SBIR/STTR review document will be promptly shared with our committees.

With regard to incentives called for in Section 252, proceedings before the National Academies of Sciences pursuant to the Congressionally-mandated SBIR study highlighted at least four types of such incentives which the DOD must pursue: (a) educational and business development assistance to SBIR firms, uniquely focused on encouraging early focus on commercialization in Federal and dual-use markets; (b) outreach and advocacy with large prime contractors, as well as defense acquisition and program management officials; (c) legal and contractual incentives ranging from clauses and bonuses to large prime contractors that integrate SBIR technologies, to mentor-protégé arrangements for the benefit of SBIR firms, to dedication of specific acquisition dollars for integrating SBIR technologies into major defense systems; and (d) performance incentives to acquisition and program management personnel for developing and executing rapid commercialization of SBIR technologies through government contracts and subcontracts. We also wish to emphasize the especially crucial role that SBIR data rights protection, both at the prime contracting and the subcontracting levels, plays in incentivizing SBIR participation. The SBIR Policy Directive is clear that data rights protection is the obligation of each agency participating in the SBIR program. We ask that the DOD consider issuing binding directives, contract clauses, or regulatory amendments through the Defense Federal Acquisition Regulation Supplement



(DFARS) to facilitate the requisite incentives.

With regards to the evaluative report contemplated by Section 252(a), Congress intended that it would address incentives and activities undertaken by the program managers, program executive officers, and prime contractors to advance rapid commercialization of SBIR technologies. By requiring reporting on the number of small business concerns assisted (including dollars awarded towards SBIR technologies) and the number of SBIR technologies commercialized, Congress intended that the Pilot Program be extended as broadly as possible. Finally, we are specifically interested in the emphasis that the DOD intends to place on hi-tech manufacturing as part of the SBIR Commercialization Pilot Program created in Section 252(a).

In dispersing the responsibility for the Commercialization Pilot Program between the Secretary of Defense and the Secretaries of the Army, the Air Force, and the Navy, Congress intended to create a competition among the various defense agencies and the Armed Services for a more effective SBIR commercialization approach. However, as the Under Secretary of Defense for Acquisition, Technology and Logistics, you will be expected to provide the strategic direction and leadership on this important legislation to ensure that SBIR/STTR-funded technology is inserted into the DOD's and each military department's acquisition process as quickly and successfully as possible. We look forward to working with you on the successful implementation of Section 252.

Should you have any questions, please contact Max Kidalov of the Senate Committee on Small Business and Entrepreneurship at 202-224-8495, Nigel Stephens of the Senate Committee on Small Business and Entrepreneurship or Nelson Crowther of the House Committee on Small Business at 202-225-9777.

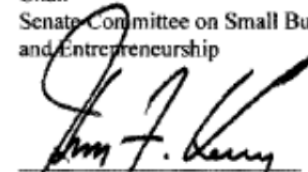
Sincerely,



OLYMPIA J. SNOWE
Chair
Senate Committee on Small Business
and Entrepreneurship



DONALD MANZULLO
Chairman
House Committee on Small Business



JOHN F. KERRY
Ranking Minority Member
Senate Committee on Small Business
and Entrepreneurship

cc: Frank Ramos, Director, Small Business Programs, Office of the Secretary of Defense



(2) **MANUFACTURING EXTENSION PARTNERSHIP PROGRAM.**—The term "Manufacturing Extension Partnership Program" means the Manufacturing Extension Partnership Program of the Department of Commerce.

(3) **SMALL BUSINESS INNOVATION RESEARCH PROGRAM.**—The term "Small Business Innovation Research Program" has the meaning given that term in section 2500(11) of title 10, United States Code.

Subtitle E—Other Matters

SEC. 51. COMPTROLLER GENERAL REPORT ON PROGRAM ELEMENT STRUCTURE FOR RESEARCH, DEVELOPMENT, TEST, AND EVALUATION PROJECTS.

(a) **REPORT REQUIRED.**—The Comptroller General shall prepare a report containing assessments of—

(1) the current program element structure and content used to account for projects carried out, or proposed to be carried out, using amounts for research, development, test, and evaluation activities; and

(2) the effectiveness of such program elements, and related budget justification materials, in providing necessary information for budget transparency and oversight by the congressional defense committees.

(b) **RECOMMENDATIONS.**—The report required by subsection (a) shall also include such recommendations as the Comptroller General considers to be appropriate regarding program element size and content, budget justification material content, and appropriate reprogramming authorities within and between program elements, particularly in connection with highly complex research and development programs that employ the system-of-systems concept.

(c) **SUBMISSION.**—The report required by subsection (a) shall be submitted to the congressional defense committees not later than February 1, 2007.

SEC. 52. RESEARCH AND DEVELOPMENT EFFORTS FOR PURPOSES OF SMALL BUSINESS RESEARCH.

(a) **IN GENERAL.**—Section 9 of the Small Business Act (15 U.S.C. 638) is amended by adding at the end the following new subsections:

"(x) **RESEARCH AND DEVELOPMENT FOCUS.**—

"(1) **REVISION AND UPDATE OF CRITERIA AND PROCEDURES OF IDENTIFICATION.**—In carrying out subsection (g), the Secretary of Defense shall, not less often than once every 4 years, revise and update the criteria and procedures utilized to identify areas of the research and development efforts of the Department of Defense which are suitable for the provision of funds under the Small Business Innovation Research Program and the Small Business Technology Transfer Program.

"(2) **UTILIZATION OF PLANS.**—The criteria and procedures described in paragraph (1) shall be developed through the use of the most current versions of the following plans:

"(A) The Joint Warfighting Science and Technology Plan required under section 270 of the National Defense Authorization Act for Fiscal Year 1997 (Public Law 104-201; 10 U.S.C. 2501 note).



"(B) The Defense Technology Area Plan of the Department of Defense.

"(C) The Basic Research Plan of the Department of Defense.

"(3) INPUT IN IDENTIFICATION OF AREAS OF EFFORT.—The criteria and procedures described in paragraph (1) shall include input in the identification of areas of research and development efforts described in that paragraph from Department of Defense program managers (PMs) and program executive officers (PEOs).

"(y) COMMERCIALIZATION PILOT PROGRAM.—

"(1) IN GENERAL.—The Secretary of Defense and the Secretary of each military department is authorized to create and administer a 'Commercialization Pilot Program' to accelerate the transition of technologies, products, and services developed under the Small Business Innovation Research Program to Phase III, including the acquisition process.

"(2) IDENTIFICATION OF RESEARCH PROGRAMS FOR ACCELERATED TRANSITION TO ACQUISITION PROCESS.—In carrying out the Commercialization Pilot Program, the Secretary of Defense and the Secretary of each military department shall identify research programs of the Small Business Innovation Research Program that have the potential for rapid transitioning to Phase III and into the acquisition process.

"(3) LIMITATION.—No research program may be identified under paragraph (2) unless the Secretary of the military department concerned certifies in writing that the successful transition of the program to Phase III and into the acquisition process is expected to meet high priority military requirements of such military department.

"(4) FUNDING.—For payment of expenses incurred to administer the Commercialization Pilot Program under this subsection, the Secretary of Defense and each Secretary of a military department is authorized to use not more than an amount equal to 1 percent of the funds available to the Department of Defense or the military department pursuant to the Small Business Innovation Research Program. Such funds—

"(A) shall not be subject to the limitations on the use of funds in subsection (f)(2); and

"(B) shall not be used to make Phase III awards.

"(5) EVALUATIVE REPORT.—At the end of each fiscal year, the Secretary of Defense shall submit to the Committee on Armed Services and the Committee on Small Business and Entrepreneurship of the Senate and the Committee on Armed Services and the Committee on Small Business of the House of Representatives an evaluative report regarding activities under the Commercialization Pilot Program. The report shall include—

"(A) an accounting of the funds used in the Commercialization Pilot Program;

"(B) a detailed description of the Commercialization Pilot Program, including incentives and activities undertaken by acquisition program managers, program executive officers, and prime contractors; and

"(C) a detailed compilation of results achieved by the Commercialization Pilot Program, including the number



of small business concerns assisted and the number of projects commercialized.

"(6) SUNSET.—The pilot program under this subsection shall terminate at the end of fiscal year 2009."

(b) IMPLEMENTATION OF EXECUTIVE ORDER NO. 13329.—Section 9 of the Small Business Act (15 U.S.C. 638), as amended by subsection (a), is further amended—

(1) in subsection (b)—

(A) in paragraph (6), by striking "and" at the end;

(B) in paragraph (7), by striking the period at the end and inserting "; and"; and

(C) by adding at the end the following:

"(8) to provide for and fully implement the tenets of Executive Order No. 13329 (Encouraging Innovation in Manufacturing)";

(2) in subsection (g)—

(A) in paragraph (9), by striking "and" at the end;

(B) in paragraph (10), by striking the period at the end and inserting "; and"; and

(C) by adding at the end the following:

"(11) provide for and fully implement the tenets of Executive Order No. 13329 (Encouraging Innovation in Manufacturing)"; and

(3) in subsection (o)—

(A) in paragraph (14), by striking "and" at the end;

(B) in paragraph (15), by striking the period at the end and inserting "; and"; and

(C) by adding at the end the following:

"(16) provide for and fully implement the tenets of Executive Order No. 13329 (Encouraging Innovation in Manufacturing)";

(c) TESTING AND EVALUATION AUTHORITY.—Section 9(e) of the Small Business Act (15 U.S.C. 638(e)) is amended—

(1) in paragraph (7), by striking "and" at the end;

(2) in paragraph (8), by striking the period at the end and inserting "; and"; and

(3) by adding at the end the following:

"(9) the term 'commercial applications' shall not be construed to exclude testing and evaluation of products, services, or technologies for use in technical or weapons systems, and further, awards for testing and evaluation of products, services, or technologies for use in technical or weapons systems may be made in either the second or the third phase of the Small Business Innovation Research Program and of the Small Business Technology Transfer Program, as defined in this subsection."

SEC. 253. REVISED REQUIREMENTS RELATING TO SUBMISSION OF JOINT WARFIGHTING SCIENCE AND TECHNOLOGY PLAN.

(a) BIENNIAL SUBMITTAL.—Section 270 of the National Defense Authorization Act for Fiscal Year 1997 (Public Law 104-201; 10 U.S.C. 2501 note) is amended—

(1) by striking "ANNUAL" in the section heading and inserting "BIENNIAL"; and

(2) by striking "(a) ANNUAL PLAN REQUIRED.—On March 1 of each year" and inserting "Not later than March 1 of each even-numbered year".



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