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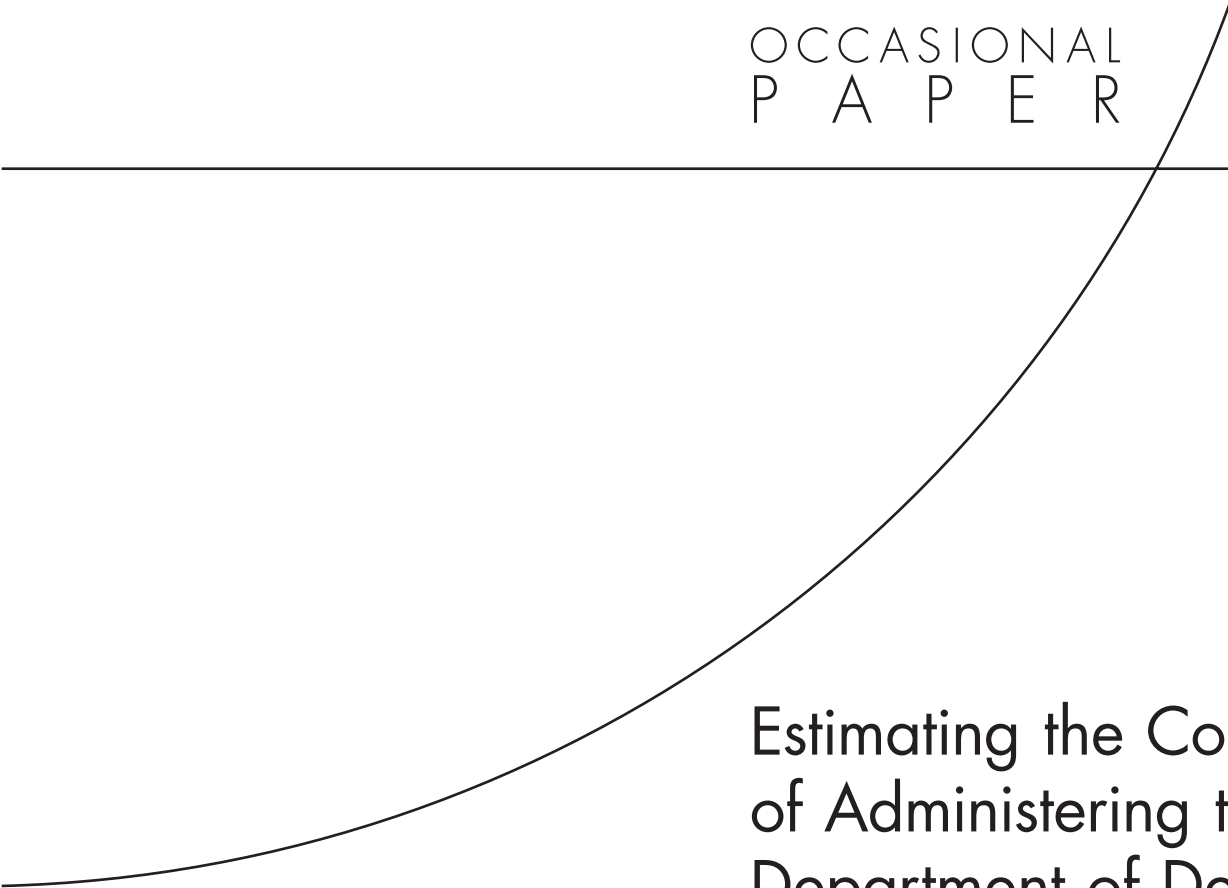
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Estimating the Cost of Administering the Department of Defense Small Business Innovation Research (SBIR) Program

Somi Seong, Kenneth Horn, Bruce Held

Prepared for the Office of the Secretary of Defense

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Preface

This occasional paper addresses the issue of the cost to administer the U.S. Department of Defense (DoD) Small Business Innovation Research (SBIR) program. The research that forms the basis for this paper is part of a study of the overall cost estimate for administering the DoD SBIR program that is being conducted for the DoD Office of Small Business Programs (OSBP).

This paper should be of interest to Congress, policymakers, senior managers, and analysts responsible for or interested in the federal SBIR program and the use of SBIR funds to help administer it.

This research was sponsored by the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD[AT&L]) and conducted within the Acquisition and Technology Policy Center of the RAND National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, the Unified Combatant Commands, the Department of the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community.

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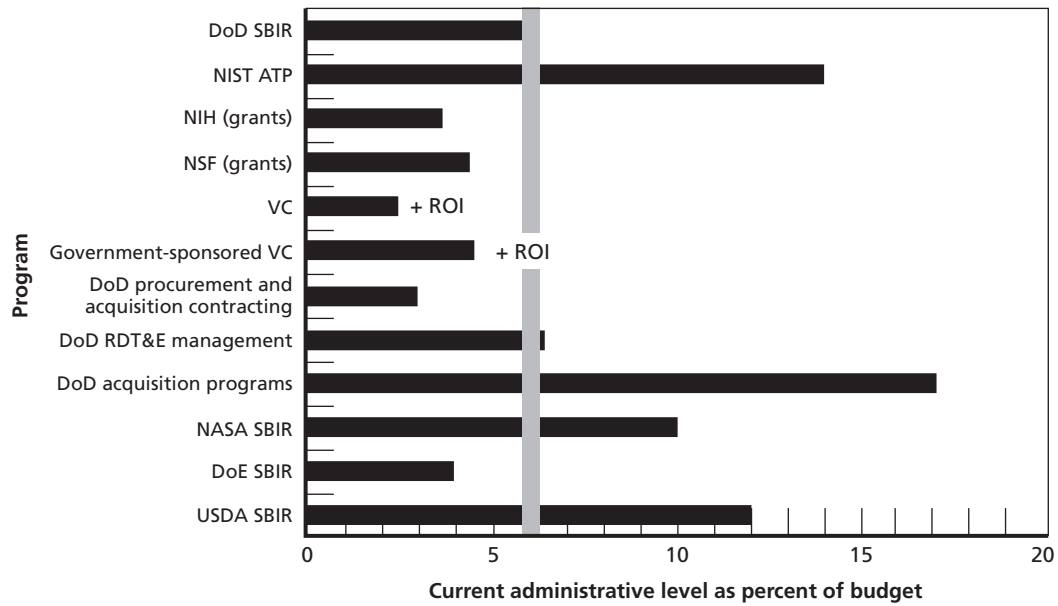
Summary

Congress is in the process of reauthorizing the Small Business Innovation Research (SBIR) program, which expires in 2008. One issue being considered in the reauthorization is whether to allow partial use of SBIR set-asides for SBIR program administration costs and, if so, at what levels. Currently, the use of SBIR funds to administer the SBIR program is prohibited, and SBIR administration must be funded from other sources.

Our analysis estimates that the U.S. Department of Defense (DoD) spends, on average, an additional 6 percent on top of the SBIR set-asides to administer its SBIR program. That percentage is higher than that for government programs that predominantly award grants (rather than contracts), equal to or lower than levels for other government R&D programs, and lower than the total compensation levels for venture-capital (VC) organizations (see Figure S.1). Further analysis is required to understand the benefits of alternative levels of administrative investments for the DoD SBIR program.

Figure S.1

Estimated Administrative Budget Levels for R&D Programs Similar to DoD SBIR



NOTES: NIST = National Institute of Standards and Technology. ATP = Advanced Technology Program. NIH = National Institutes of Health. NSF = National Science Foundation. RDT&E = research, development, testing, and evaluation. NASA = National Aeronautics and Space Administration. DoE = U.S. Department of Energy. USDA = U.S. Department of Agriculture. ROI = return on investment.

RAND OP208-S.1

Abbreviations

AFRL	Air Force Research Laboratory
AFRL/RX	Air Force Research Laboratory Materials and Manufacturing Directorate
ATP	Advanced Technology Program
CERDEC	Communications-Electronics Research, Development, and Engineering Center
DDR&E	Director of Defense Research and Engineering
DoD	U.S. Department of Defense
DoE	U.S. Department of Energy
FTE	full-time equivalent
GS	general schedule
NASA	National Aeronautics and Space Administration
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NSF	National Science Foundation
OSBP	Office of Small Business Programs
OSD	Office of the Secretary of Defense
OUUSD(AT&L)	Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics
RDT&E	research, development, testing, and evaluation
ROI	return on investment
SBID	Small Business Innovation Development Act

SBIR	Small Business Innovation Research
TAP	Transition Assistance Program
USDA	U.S. Department of Agriculture
VC	venture capital

Introduction

Purpose of the Study

The current authorization for the Small Business Innovation Research (SBIR) program expires in 2008, and Congress is in the process of reauthorizing it.¹ One issue being considered in the reauthorization is the funding of the program administration. Currently, the use of SBIR funds to administer the SBIR program is prohibited, and SBIR administration must thus be funded from other sources. Within DoD, the Army and the Air Force rely on overhead funding to manage their SBIR programs. The Navy, on the other hand, sets aside an additional 0.1625 percent of its extramural research, development, testing, and evaluation (RDT&E) budget (amounting to 6.5 percent of the size of the Navy SBIR budget) to supplement overhead funding for SBIR program management.²

The issue being considered is whether to explicitly fund the administration of the SBIR program and, if so, at what level. The primary purpose of this paper, therefore, is to provide an estimate of current spending to administer the DoD SBIR program. Although our research did not address what the optimal level of administrative funding should be, we do provide some comparisons to those of other federal R&D programs and organizations and to venture-capital (VC) efforts.

¹ The same law authorizes the SBIR program for all federal agencies, and that law expires in 2008. This paper estimates the cost of administering the U.S. Department of Defense (DoD) SBIR program. The DoD SBIR program is the largest, and the DoD budget share of federal SBIR program funding was 55 percent in fiscal year 2006. A short discussion of the SBIR history, goals, funding, and program structure is given in the appendix.

² The set-aside funds do not necessarily reflect the actual cost of administering the Navy SBIR program. The Navy still depends on additional funding to administer the program.

Administering the U.S. Department of Defense Small Business Innovation Research Program

Administering the DoD SBIR program is a complex process. Each armed service and each defense agency with an SBIR program has stand-alone topic-generation and review processes, unique budget and overhead allocation philosophies, and different research emphases. Within these separately run programs, administration typically includes several activities, each with multistep procedures that must occur during each solicitation cycle.

Three Layers of Small Business Innovation Research Program Administration

The administration of the DoD SBIR program occurs at three management levels or tiers (see Table 2.1). The first tier is Office of the Secretary of Defense (OSD)–level SBIR management. First-tier responsibilities include generating SBIR procedures and policies and reviewing and approving the SBIR research topics to be studied.¹ The second tier consists of SBIR management offices at each of the military services and DoD agencies. Their activities include coordinating and monitoring the program, financial management, database management, and outreach efforts.² The third tier involves the services' major acquisition commands and research laboratories. The bulk—about 90 percent—of SBIR management effort occurs at this level. Each year, on average, third-tier SBIR administration activities cover about 950 research topics, more than 14,000 proposal evaluations, and monitoring about 2,100 phase I and 2,200 phase II research projects and moving these toward phase III.³

¹ The other first-tier activities include conducting all program solicitations; receiving and packaging all phase I, phase II, enhancement, and fast-track phase proposals; preparing all reports to Congress and the Small Business Administration; conducting program outreach; and developing and maintaining all registration, topic, award, and commercialization databases necessary to administer the program.

² The service-level coordinating and monitoring activities cover all stages of the program, from topic generation to technology transition.

³ The statistics are based on the averages for fiscal years 2004, 2005, and 2006. The phases are defined in the appendix. It is important to point out that, because of the different phasing and duration of the phase I and II efforts, in any given year, these SBIR activities are occurring simultaneously.

Table 2.1
Three Tiers of U.S. Department of Defense Small Business Innovation Research Program Administration

Tier	Level	Activities	Organizations
1	OSD	Topic review, proposal solicitation, policy directives	DDR&E, DoD OSBP
2	Service	Coordinating and monitoring the SBIR process	Army, Air Force, Navy, and other DoD components
3	Suborganization	Topic generation, proposal evaluation, contracting, and technical monitoring	Suborganizations in each component

NOTE: DDR&E = Director of Defense Research and Engineering. OSBP = Office of Small Business Programs.

Estimating the Cost of Administering the U.S. Department of Defense Small Business Innovation Research Program

Currently, no systematic time-accounting process is in place to record the time spent in administering the SBIR program at any military service or DoD agency. Consequently, different approaches for collecting and analyzing the cost data for administering the program are used.

Approaches

Three interrelated approaches were used to collect and help analyze the data. First, each service's reference manuals, process manuals, and other SBIR documents were reviewed to identify the SBIR processes, structures, activities, and people at each tier and to understand differences among services. Second, teleconference calls with each service's SBIR program office staff were made to collect labor-hour data at the second-tier level and to sample a few subagencies to help estimate the third-tier-level cost of administering the program. Third, structured interviews with SBIR coordinators and other staff involved in the SBIR process were conducted at third-tier subcommand levels to understand management activities and to collect data on time allocation, unit costs, and other costs involved.

Collection of Labor Costs

Labor-hour data were collected from DoD personnel performing second- and third-tier SBIR management activities in the Army, Air Force, and Navy.¹ Data for overhead costs (e.g., facilities, materials, printing, travel, conferences, and events) were not collected, but some are accounted for when labor hours are converted into burdened dollars.

On average, the three services accounted for 74 percent of the DoD SBIR budget and 75 percent of the SBIR solicitation topics for fiscal years 2003–2006. Table 3.1 shows the organizations that participated in the labor-hour data collection process and also the fraction of the DoD SBIR program that the third-tier organizations represent. On average, these third-tier organizations accounted for 30 percent of the total program budget and 31 percent of the total program topics on average for fiscal years 2003–2006.

¹ First-tier labor costs represent a very small part of the total SBIR management effort and can be explicitly included in the overall estimate when actual budget data for relevant staff and organizations are provided.

Table 3.1
Organizations That Provided Labor-Hour Data

Service	Tier	Organization	Budget Share (%) ^a	Topic Share (%) ^b
Army	2	Army SBIR management office		
	3	CERDEC	4	5
	3	Medical Research and Material Center	2	2
Air Force	2	Air Force SBIR management office		
	3	AFRL/RX	2	3
	3	AFRL Information Technology Directorate	3	3
	3	AFRL Human Effectiveness Directorate	3	3
Navy	2	Navy SBIR management office		
	3	NAVAIR	10	7
	3	NAVSEA	6	8
Subtotal			30	31

^a The budget share is the average fraction of the third-tier organization's SBIR budget relative to the total DoD SBIR budget for fiscal years 2003–2006.

^b The topic share is the average fraction of the third-tier organization's topic count relative to the total number of DoD SBIR topics for the same period.

NOTE: CERDEC = Communications-Electronics Research, Development, and Engineering Center. AFRL/RX = Air Force Research Laboratory Materials and Manufacturing Directorate. AFRL = Air Force Research Laboratory. NAVAIR = Naval Air Systems Command. NAVSEA = Naval Sea Systems Command.

Through interactions with the participating organizations, a list of administrative activities for the program was created. At the highest level of aggregation, the activities were classified by different phases of the program, such as topic generation, phase I, phase II, and phase III. Each phase was then disaggregated into midlevel activities.²

Labor-hour data were collected at the most detailed level of activity. Since the various organizations participated on a voluntary basis, it was necessary to accommodate their preferred way of providing cost data. Some organizations collaborated to generate data from scratch, while others provided an update of previous data-collection efforts.

To collect the third-tier-level administrations' labor-hour data, individuals at each organization were interviewed, including SBIR coordinators, contracting officers, and scientists and engineers who generate topics, evaluate proposals, and monitor the projects' progress.³ In some cases, SBIR coordinators and contracting officers at the participating third-tier organizations collected labor-hour data from various individuals and passed that data to the study team.

² For example, phase I involves proposal review, proposal selection, and contracting. Each activity cluster was then disaggregated into working-level activities. For example, proposal review includes identifying evaluation teams, training technical points of contact, and evaluating proposals. At the lowest level of aggregation, the list of activities varies among organizations.

³ Labor hours for a given task often vary widely among different individuals' estimates. In those cases, extreme outliers were omitted from the averaging process.

Estimating the Administrative Costs

Second-tier administration cost is measured in full-time equivalent (FTE) person years for fiscal year 2006. Administration efforts at the second tier are similar for the Air Force and the Army. The Navy contracts out its Transition Assistance Program (TAP) at a level of 15.5 FTE but is otherwise similar.⁴ Each service requires about two FTE government employees and five to eight FTE contractors per year to run the program at the second-tier level.

Third-tier administration costs are measured in labor hours per unit activity, such as hours per topic, hours per proposal, or hours per award, over the life cycle of the SBIR program, from topic generation to the end of the phase II contract and beyond.⁵ Estimating third-tier administration costs across services requires managing data heterogeneity. Within each service, however, the labor-hour data were more or less homogeneous.⁶

A weighting scheme was used to extrapolate the third-tier labor estimates to the service level. Conversion factors for the number of topics, proposals, and awards were then developed from four-year DoD averages, making it possible to estimate the average amount of labor required per SBIR topic.⁷

Typical results for various third-tier activities are shown in Table 3.2. It is important to note that the bulk of the time is spent by the technical points of contact on phase I proposal evaluations and award selections (24 percent) and on technical monitoring of phase I and II research (40 percent). When making considerations about whether to fund SBIR administrative activities, how to fund them, and how much that funding should be, such considerations often revolve around more typical management activities, such as those found in SBIR program management and contracting offices. In reality, though, the bulk of the effort to administer the DoD SBIR program occurs at the technical level, to ensure that promising projects are selected and quality research occurs; to perform other monitoring routines, such as reviewing the reports; and to identify and manage possible application opportunities for the SBIR results.

The third-tier administrative labor hours per SBIR topic shown in Table 3.2 are based on Army data. The data collected for the other services are similar in terms of workload distribution but not necessarily in terms of the number of hours spent on each activity. Consequently, third-tier SBIR-administration efforts vary widely among the services ranging from 410 hours to 1,270 hours per topic. The Navy spends much more time than the other services do on evaluating phase I proposals, approving phase I awards, selecting phase II awards, and monitoring phase II efforts. Navy acquisition officials also spend significantly more time administering the SBIR program than do their Army and Air Force counterparts.

⁴ The Navy's TAP aims to facilitate DoD use of the SBIR technologies and to assist SBIR companies to commercialize their SBIR phase II results.

⁵ Note that the SBIR activities for third-tier administration are based on the program's life cycle. For example, the technical-monitoring effort for a phase I contract is measured over a six-month contract period, while that of a phase II contract is measured over a two-year contract period.

⁶ NAVSEA data were an exception. They were provided in dollars and not in labor hours. The estimated costs in dollars were based on internally negotiated prices, which do not necessarily reflect labor hours and hourly rates. The data also exclude some of the costs for the technical points of contact. Due to the unique format of the NAVSEA data, they were used only in comparing and cross checking the NAVAIR data.

⁷ The length of the SBIR program life cycle from topic generation to the end of phase II is estimated as approximately four years.

Table 3.2
Time Devoted to Performing Various Third-Tier SBIR Activities

SBIR Activity	Time Devoted (hours per topic)	Time Devoted (percent of total)
Topic generation	20	4
Interactions with small business	34	6
Phase I proposal evaluation and award selection	131	24
Phase I contracting	25	5
Phase I technical monitoring	80	14
Phase II proposal evaluation and award selection	15	3
Phase II contracting	14	2
Phase II technical monitoring	146	26
Debrief to losing offerors	5	1
Other	83	15

Second- and third-tier cost estimates were aggregated using a common metric.⁸ When this was done, the third-tier efforts were shown to account for about 90 percent of the total administration hours of the second and third tiers.

Finally, labor-hour data were converted into dollar equivalents to estimate the overall effort required to administer the DoD SBIR program. To convert labor hours into dollars, the pay level of an average DoD SBIR administrator was assumed to be that of a general schedule (GS) 14. The corresponding burdened hourly rate was calculated at this salary level plus a 40 percent fringe-benefit rate.⁹

Based on these assumptions, we estimate the labor cost of administering the DoD SBIR program to be valued as *approximately 6 percent of the size of the DoD SBIR budget*.

⁸ Using a model that assumes that SBIR budgets and activities are stable over the years, the administration burden in a fiscal year is similar to that of a full solicitation cycle. This helps justify adding the second- and third-tier cost data.

⁹ The burdened salary was calculated based on several data sources for fiscal year 2006, including salaries and wages from U.S. Office of Personnel Management (OPM, undated), civilian fringe-benefit rates published by the DoD comptroller (U.S. Department of the Air Force, 2006), and Air Force instruction 65-503 (U.S. Department of the Air Force, 1994, Table A26-1).

Administrative Costs in Comparable R&D Programs

The levels of administrative costs of the DoD SBIR program estimated in Chapter Three are not necessarily optimal relative to measures of effectiveness. Our study estimated the DoD administrative costs but not the effectiveness per se of these activities or the effect on benefits of higher or lower administrative investments. It is insightful, however, to compare these estimates to the levels of administrative costs expended in other federal R&D programs and organizations and in VC efforts to gain some perspective on what levels of administrative investments are warranted.

Table 4.1 shows administrative costs as a percentage of R&D funding for the DoD SBIR program and 10 other programs and organizations that have some characteristics similar to those of the DoD SBIR program. The analysis of the cost estimates for the other programs and organizations is not as detailed as that performed for the DoD SBIR program. As noted in Table 4.1, the fidelity of the data of the various programs and organizations varies considerably.

The National Institute of Standards and Technology's (NIST's) Advanced Technology Program (ATP) is similar to SBIR in that it provides funds for private-sector R&D projects and that these projects are competitively selected, with half of the ATP awards going to small companies.¹ Funding to administer the fiscal year 2004 ATP, however, is more than twice that of the DoD SBIR program.²

The National Institutes of Health (NIH) and the National Science Foundation (NSF) are organizations that provide primarily R&D grants, as opposed to R&D contracts.³ R&D grants, as assistance mechanisms, typically require less oversight than do R&D contracts that require the delivery of some goods or services. It is reasonable, therefore, to expect the funds required to administer grants to be lower than that of the DoD SBIR program.

Comparisons between VC organizations and the SBIR program are less direct because they have different structures and goals. However, VC organizations are included because SBIR is often thought of as a form of VC. The literature suggests that the operating costs for commercial VC organizations are around 5 percent of the funds they manage (Murray and Marriott, 1998). Their management fees, however, are likely to be lower than their true

¹ ATP award size varies widely from \$434,000 to \$31 million. On average, ATP awards are much larger (\$2.9 million) than SBIR awards, while the number of ATP awards per year is much smaller (less than 100 per year) than that of the DoD SBIR.

² The fiscal year 2004 effort was chosen because the program started phasing down in fiscal year 2005 and was discontinued in 2007.

³ In addition, NIH manages an in-house R&D capability.

Table 4.1
Cost to Manage Comparable R&D Programs

Program	Overhead Cost to Administer Program (Percent of Budget)
DoD SBIR	6
NIST ATP ^a	14
NIH ^b	3.7
NSF ^c	4.4
VC ^d	2.5 + ROI
Government-sponsored VC ^d	4~5 + ROI
DoD procurement and acquisition contracting ^d	3
DoD RDT&E management ^e	6.3
DoD acquisition programs in concept and technology development and system design and demonstration phases ^f	17
NASA SBIR ^g	10
DoE SBIR ^g	4
USDA SBIR ^g	12

^a The NIST ATP budget data were obtained from the ATP program office through email exchanges and teleconferences. Administrative costs include labor and other expenditures, such as travel and contractors for economic evaluation. This figure is based on data from the fiscal year 2004 budget. We chose 2004 because ATP started phasing down in fiscal year 2005 and was discontinued in 2007 by P.L. 110-69.

^b NIH budget data were obtained from the NIH budget office through email exchanges. NIH runs both intramural and extramural R&D. For extramural R&D, grants are the most common funding mechanism. The R&D management cost is the sum of salaries and expenses for center directors, administrative staffs, and scientific-program managers for managing both intramural and extramural R&D for fiscal year 2005.

^c Program administrative cost is based on fiscal year 2005 budget data (NSF, 2006). Since NSF is a grant-awarding institution, R&D management costs are estimated as the NSF budget remaining after removing award money.

^d Held et al. (2006).

^e Based on average RDT&E management support costs (DoD budget category 6.6) relative to the remainder of the RDT&E budget for fiscal years 2005, 2006, and 2007 (OUSD[C], 2006).

^f Compilation of management and support costs for 32 randomly selected acquisition programs in the concept and technology development phase or the system design and demonstration phase of system acquisition. Data obtained from Exhibit R-3, Project Cost Analysis Sheets in the Air Force, Army, and Navy budget documentation for fiscal year 2007. See U.S. Department of the Air Force (2006), U.S. Department of the Navy (2006a, 2006b).

^g Results of an unpublished NASA survey provided via private communication with the authors.

operating costs.⁴ As a result, VC management fees are about half of what is proportionally spent to manage the DoD SBIR program.

Government-run VC is not as focused on return on investment (ROI) but usually has other socioeconomic goals. Moreover, these programs are not normally required to find private investment resources. As a result, it is not surprising that government VC—administering

⁴ This is because commercial VC firms expect to earn a share (roughly 20 percent) of any ROI and because they need to attract investors who would likely be less interested in investing in a firm with high management fees (Waddell, 1995; Sahlman, 1990).

organizations command a commitment of resources that is comparable to that of DoD's SBIR program.

The average management effort spent on all DoD procurement and acquisition contracts is less than that required for the DoD SBIR program. This is also reasonable, since R&D contracts require a higher level of government interaction with the contractor than do contracts for most goods and services. Since a relatively small proportion of total DoD contracts are for R&D, the average level of effort for all contracts should be smaller than for R&D contracts alone.

The administrative costs tied explicitly to DoD RDT&E contracts were also examined. Here, the percentage of funding set aside for management is similar to that spent on the DoD SBIR program. If one considers only DoD acquisition programs still in the concept and technology development phase and system design and demonstration phase of acquisition, these programs have nearly three times the management expenditure as a percentage of program cost than is currently spent to administer the DoD SBIR program. These programs are analogous to the commercialization phase of SBIR programs because they must transition R&D into useful products.⁵

Finally, we note that the estimated cost to administer the DoD SBIR program falls in the range of SBIR programs managed by other agencies (e.g., National Aeronautics and Space Administration [NASA], U.S. Department of Energy [DoE], U.S. Department of Agriculture [USDA]).

⁵ Of course, the research phases of the acquisition programs are much larger and more complex than the SBIR ones, so they are not directly comparable.

Concluding Remarks

The cost of administering today's DoD SBIR program is estimated to be approximately 6 percent of the value of the total DoD SBIR budget. This amount is not necessarily the optimal level of what the administrative funding should be. Earlier RAND research noted that technology transition was not occurring as frequently as one would have hoped and that further improvements in technology transition may require additional funding (Held et al., 2006).

Small Business Innovation Research Program

Program History and Goals

The Small Business Innovation Development Act of 1982 (P.L. 97-219) (SBID) created the SBIR program.¹ The SBID outlined four congressional goals for the SBIR program:

- Stimulate technological innovation.
- Use small business to meet federal R&D needs.
- Foster and encourage participation by minority and disadvantaged persons in technology innovation.
- Increase the private-sector commercialization of innovations derived from federal R&D.

In addition to the legislative goals for the program, DoD aims to use its SBIR program “to harness the innovative talents of our nation’s small technology companies for U.S. military and economic strength” (DoD, 2007).

Funding Scale

The SBIR program sets aside 2.5 percent of the extramural² R&D budget of federal agencies that annually award more than \$100 million in RDT&E contracts and directs these funds to small businesses.³ Since DoD has the largest extramural federal R&D budget by far, it also has the largest SBIR program in the federal government, accounting for about half of the \$2 billion SBIR program.

Program Structure

The DoD SBIR program is structured into three phases: feasibility (phase I), principal R&D (phase II), and commercialization (phase III). Phase I contracts are awarded competitively,

¹ The SBID and subsequent amendments are codified in 15 USC 638.

² With some exceptions, extramural RDT&E budgets are defined as “The sum of the total obligations for RDTE minus amounts obligated for RDTE activities by employees of a Federal agency in or through Government-owned, Government-operated facilities” (SBA, 2002, §3[j]).

³ The definition of a small business varies from industry to industry, reflecting industry differences. For details of the small-business definition, see SBA (undated).

based on the scientific, technical, and commercial merit of the proposals. Phase I awards, usually up to \$100,000, last for six months. Phase II awards are based on phase I results and normally run for two years at a funding level of usually up to \$750,000.⁴ In phase III, product development for commercial or military markets is performed.⁵ The SBIR program provides no funds in this phase.

⁴ The phase II funding can go over the \$750,000 ceiling for special cases.

⁵ The phase III commercialization concept is defined in statute. We have interpreted it broadly. In addition to private-sector sales, commercialization includes military markets—sales either to DoD acquisition programs or to the associated DoD prime contractors. *Commercialization* is also interpreted as including follow-on, non-SBIR research contracts and additional investment in technology or corporate development traceable to the SBIR work.

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