

GAO

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Briefing Report to Congressional  
Requesters

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# FEDERAL RESEARCH

## Small Business Innovation Research Participants Give Program High Marks



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United States  
General Accounting Office  
Washington, D.C. 20548

Resources, Community, and  
Economic Development Division

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July 27, 1987

The Honorable Dale L. Bumpers  
Chairman, Committee on Small Business  
United States Senate

The Honorable John J. LaFalce  
Chairman, Committee on Small Business  
House of Representatives

The Honorable Robert A. Roe  
Chairman, Committee on Science, Space, and Technology  
House of Representatives

The Honorable John D. Dingell  
Chairman, Committee on Energy and Commerce  
House of Representatives

As part of our continuing responsibilities under the Small Business Innovation Development Act of 1982 and under the act as reauthorized in 1986, we obtained certain information on the firms participating in the Small Business Innovation Research (SBIR) program through a questionnaire survey. This briefing report, one of a series of reports we have issued on the program in the past 2 years, presents the results of our survey. As required by the act, we will issue a report by December 31, 1988, evaluating the overall effectiveness of the program.

This report discusses

- the characteristics of SBIR recipient firms,
- the reported effects of the program on firms' operations and products, and
- firms' perceptions of the administration of the program.

The information presented in this report is based on the results of a questionnaire administered in 1986 to firms responsible for 1,405 SBIR projects. Of the 1,405 questionnaires, 1,137 were returned, yielding a response rate of 81 percent. The responses represent 79 percent of

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the SBIR projects funded in fiscal years 1983 to 1985. Because our sample was based on projects rather than firms, 162 firms received two or more questionnaires. In total, 792 firms responded to our questionnaire.

The survey findings are briefly discussed below. Sections 2 to 5 of this report provide additional details. Section 1 provides a detailed description of our methodology.

Survey responses showed that many new and emerging firms have received funding under the SBIR program. Survey data indicated that:

- SBIR projects are being undertaken by relatively new firms. More than 50 percent of the projects we sampled were being carried out by firms less than 8 years old and almost one fourth were undertaken by firms less than 3 years old. The responses also indicated that the average age of firms participating in the program was about 7 years.
- Almost 60 percent of the projects were carried out by firms that employed 25 or fewer full-time employees and more than one fourth had 5 or fewer full-time employees. Overall, SBIR firms employed an average (median) of 15 full-time employees.
- Most of the projects in our sample were carried out by firms that were relatively small in terms of revenues. Over one half of the projects were undertaken by firms that had gross revenues of less than \$1 million in fiscal year 1985, and 18 percent of the projects were being carried out by firms that had gross revenues of less than \$100,000.

Almost all survey respondents indicated that their participation in the SBIR program was worthwhile, and nearly all of the responses show that the program encouraged small businesses to participate in government research and development (R&D) programs. The small firm respondents indicated that they received a variety of benefits from participating in the SBIR program. These benefits included, but were not limited to,

- hiring more personnel as a result of the SBIR award,



- funding R&D work that was not being funded by another source, and
- improving other products as a result of R&D work on the SBIR project.

The SBIR program provided funding to many firms that had not received previous federal R&D contracts. For 43 percent of the projects we sampled, the SBIR award represented the firm's first federal R&D funding in the last 5 fiscal years. Our analysis showed that of the projects carried out by firms established between 1983 and 1986, 71 percent were carried out by firms that had not previously received a federal R&D award.

Since phase II<sup>1</sup> awards were not generally granted until fiscal year 1984, it was too early for most firms to have proceeded to the commercial marketing of project results at the time we sent our questionnaires. For this reason, we could not conclusively assess the success of SBIR project commercialization. However, survey responses show that 11 percent of the projects receiving a phase II award had completed the phase, and of these, less than half had results available for commercial sale.

Survey responses indicate that most program participants are generally satisfied with federal agencies' administration of the SBIR program. Almost all respondents who had participated in other federal R&D programs indicated that the paperwork requirements of the SBIR program and the amount of time required to prepare an SBIR proposal were about the same as or less than were required by the other federal R&D programs. The one area where more than one half of the respondents expressed considerable dissatisfaction was the gap in funding between the end of phase I award and the onset of phase II support. The gap in funding varied by

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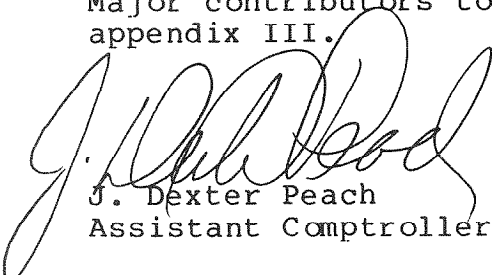
<sup>1</sup>Each year, federal agencies with SBIR programs solicit research proposals and select a limited number for phase I funding. Phase I awards are given to demonstrate the scientific and technical feasibility of an idea. All phase I awardees can compete for a phase II award, and agencies make phase II awards to those judged to be the best of the phase I awardees. Phase II work is to further develop the phase I research.

agency, and for a majority of the sampled projects the gap ranged from 3 to 12 months.

Because the funding gap was the only area with which respondents expressed a general dissatisfaction, we obtained additional information regarding the length of the funding gap from federal officials responsible for four federal agencies' SBIR programs. These four agencies accounted for about 80 percent of SBIR funding provided in fiscal year 1985. We found generally the same gap between phase I and phase II payments identified by respondents. As discussed in section 5, three of the four agencies are already taking steps to reduce the funding gap. Specifically, the Department of Energy, which initiated an early decision program and provides interim funding, has achieved the greatest success in reducing the funding gap. Techniques such as these could be useful to other agencies.

We discussed the information obtained during our review with agency program officials and have incorporated their comments where appropriate. We are sending copies of this report to the small firms who participated in this study, the federal departments and agencies that administer SBIR programs, and other interested parties upon request. Should you wish additional information on this matter, please contact Mark Nadel at (202) 634-6073.

Major contributors to this briefing report are listed in appendix III.



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ABBREVIATIONS

DOC	Department of Commerce
DOD	Department of Defense
ED	Department of Education
DCAA	Defense Contract Audit Agency
DOE	Department of Energy

DOI Department of the Interior  
DOT Department of Transportation  
EPA Environmental Protection Agency  
GAO General Accounting Office  
HHS Department of Health and Human Services  
NASA National Aeronautics and Space Administration  
NRC Nuclear Regulatory Commission  
NSF National Science Foundation  
PHS Public Health Service  
SBA Small Business Administration  
USDA Department of Agriculture



## SECTION 1

### INTRODUCTION

The capacity of business for technological innovation and the role of the federal government in fostering and utilizing commercial research and development (R&D) have been subjects of increasing congressional concern in recent years. This concern has centered on the small amount of federal R&D funds going to small firms compared with the amount of R&D funds going to large businesses, universities, and government laboratories. In the belief that small firms could produce more innovative research to meet federal agency needs, the Congress enacted Public Law 97-219, the Small Business Innovation Development Act of 1982.

Recognizing the important role small firms could play in creating technological innovation, the act seeks to strengthen the role of small, innovative firms in federally funded R&D programs. The act's purposes are to

- stimulate technological innovation,
- use small businesses to meet federal research and development needs,
- foster and encourage participation by minority and disadvantaged persons in technological innovation, and
- increase private-sector commercialization of innovations derived from federal research and development.

To achieve these aims, the act mandated the creation of a Small Business Innovation Research (SBIR) program in certain federal agencies.

The SBIR program is intended to fund R&D work in small, high technology companies by designating that a fixed percentage of an agency's annual extramural (external) R&D budget be awarded to small businesses. The act requires that each federal agency with an R&D budget of \$100 million or more establish and operate an SBIR program. Under SBIR program requirements, such agencies must designate that at least 1.25 percent of their external research expenditures for R&D projects be carried out by small businesses.

Federal agencies with SBIR programs solicit proposed research projects from small businesses to address agencies' R&D needs. Once proposals are submitted, agencies evaluate and fund them in a three-phase process. Phase I awards are given to deserving proposals to demonstrate the scientific and technical feasibility of the idea contained in the proposal. These awards are usually for \$50,000 or less and cover a 6-month work period. On the basis of the phase I results, phase I awardees can compete for a phase

II award, and agencies make phase II awards to those projects judged to be the best of the phase I awardees. Phase II work is to further develop the phase I research; awards are made for \$500,000 or less and usually cover 1 to 2 years of work. Phase III awards involve either nonfederal funding or federal, non-SBIR funding for commercial applications of the research conducted under the SBIR program.

SBIR program funds are designated for individuals and/or small businesses that at the time of award

- are independently owned and operated,
- are smaller than the dominant firms in the field in which they are proposing to carry out SBIR projects,
- are organized and operated for profit,
- have 500 or fewer employees (including employees of subsidiaries and affiliates),
- are the primary source of employment for the project's principal investigator at the time of award and during the period when the research is conducted, and
- are at least 51 percent owned by U.S. citizens or lawfully admitted permanent resident aliens.

Through the SBIR program, entrepreneurs and small companies can obtain initial funding to develop and launch innovative ideas. In our opinion, the program offers a low-risk opportunity for most small firms, since the government finances the principal R&D effort and bears the risk of failure in the research.

An amendment to Public Law 97-219 passed by the Congress in September 1986 extended the expiration provision of the act from October 1, 1988, until October 1, 1993. The amendment also requires that the Comptroller General of the United States evaluate the effectiveness of the SBIR program by December 31, 1988.

#### HOW THE SBIR PROGRAM IS ADMINISTERED

The SBIR legislation established a uniform, simplified format for operating the SBIR program. Under the act, the Small Business Administration (SBA) is required to issue policy directives for the general conduct of SBIR programs within the federal government. In September 1984, SBA issued such directives that included instructions for preparing agency SBIR program solicitations and for accepting and processing project proposals. SBA provided guidance for agencies to issue standardized, simplified, and timely SBIR program solicitations and for

minimizing the regulatory burden for firms participating in the program.

While agencies are required to follow uniform policies established for the SBIR program, they are allowed considerable flexibility in operating their individual programs to suit their own organizational needs. Agencies, for example, may determine SBIR research topics and may exercise discretion in soliciting and evaluating project proposals, selecting awardees, and administering funding agreements for SBIR projects.

#### SCOPE OF ACTIVITIES UNDER THE ACT

Since fiscal year 1983, 12 federal agencies have conducted SBIR programs. The 12 agencies are:

- The Department of Agriculture (USDA)
- The Department of Commerce (DOC)
- The Department of Defense (DOD)
- The Department of Education (ED)
- The Department of Energy (DOE)
- The Department of Health and Human Services (HHS)
- The Department of the Interior (DOI)
- The Department of Transportation (DOT)
- The Environmental Protection Agency (EPA)
- The National Aeronautics and Space Administration (NASA)
- The National Science Foundation (NSF)
- The Nuclear Regulatory Commission (NRC)

During fiscal years 1983 to 1985, federal agencies issued over 40 SBIR solicitations and received 27,000 proposals. The agencies funded about 15 percent of these proposals, or 3,827 projects. According to SBA records, 3,082 of these awards were phase I awards and 745 were phase II awards.

The annual total amount of SBIR awards has steadily increased. Awards climbed from \$44.5 million in fiscal year 1983 to about \$111.5 million in fiscal year 1984, and then to about \$199 million in fiscal year 1985. Over the 3-year period, awards have totaled about \$355 million.

Current estimates show that approximately \$300 million in SBIR funding was awarded in fiscal year 1986 and that about \$450 million will be awarded in fiscal year 1987. Under current projections, federal agencies are expected to provide more than \$1 billion in SBIR start-up financing to small, innovative firms in fiscal years 1983 to 1987.

## OUR PRIOR REPORTS

In an October 1985 report entitled Implementing the Small Business Innovation Development Act--The First 2 Years (GAO/RCED-86-13), we assessed the extent to which agencies established, funded, and monitored SBIR program activities. We found that in fiscal years 1983 and 1984, 11 out of the 12 federal agencies that met the criteria for creating SBIR programs had established such programs. During fiscal year 1985, all 12 eligible agencies had carried out SBIR activities. We concluded that the agencies, for the most part, were complying with the act's funding requirements but that most were not fully adhering to the act's reporting requirements.

In a May 1987 report entitled Effectiveness of Small Business Innovation Research Program Procedures (GAO/RCED-87-63), we evaluated federal agencies' procedures for making SBIR selections and awards. We found that federal agencies with SBIR activities had established evaluation and selection procedures that reasonably assured awards were based on technical merit. However, we found that less than one half of the participating agencies had awarded their SBIR phase I contracts and grants within 6 months of receiving the proposal, a goal established by SBA guidelines. Our March 1986 fact sheet entitled A Profile of Selected Firms Awarded Small Business Innovation Research Funds (GAO/RCED-86-113FS) provided information on 19 small firms participating in the SBIR program and discussed the availability of venture capital funds for commercializing results developed with SBIR awards.

## OBJECTIVE, SCOPE, AND METHODOLOGY

Our objective in this review was to obtain information on small firms participating in the SBIR program. The report discusses

- the characteristics of SBIR recipient firms,
- reported effects of the SBIR program on their operations and products, and
- firms' perceptions of how federal agencies administer the SBIR program.

To attain our objective, we sent questionnaires to firms conducting 1,405 selected SBIR projects in fiscal years 1983 to 1985, the latest years for which complete data were available. The survey was conducted between June 5, 1986, and September 30, 1986. The questionnaire asked for information about the SBIR project, firms' experiences with the SBIR program, and characteristics of the firm at which the project took place. The sampling approach and techniques we used are detailed in appendix

I. The questionnaire, summary of responses, and selected sampling errors are included in appendix II.

We interviewed SBIR program officials at DOE, DOD, NSF, and HHS in order to obtain their views about the gap between the last phase I payment and the first phase II payment. These agencies were reviewed because they accounted for about 80 percent of all SBIR dollars that were obligated or awarded in fiscal year 1985. In addition, we analyzed phase I and phase II payment dates for awards made by DOE, DOD, and NSF.



## SECTION 2

### PROFILE OF SBIR FIRMS AND R&D PROJECTS

Responses to our questionnaire indicated that small firms have submitted proposals and received SBIR funding for research in a broad range of technologies, such as computer and electronics systems, material sciences, life sciences, natural resources, and energy. As of mid-1986, when we mailed our questionnaire, the program was only in its third full year of operation and most respondents were still in the first or second phase. Therefore, few program participants had completed phase II work and had moved on to the phase III commercialization of their results.

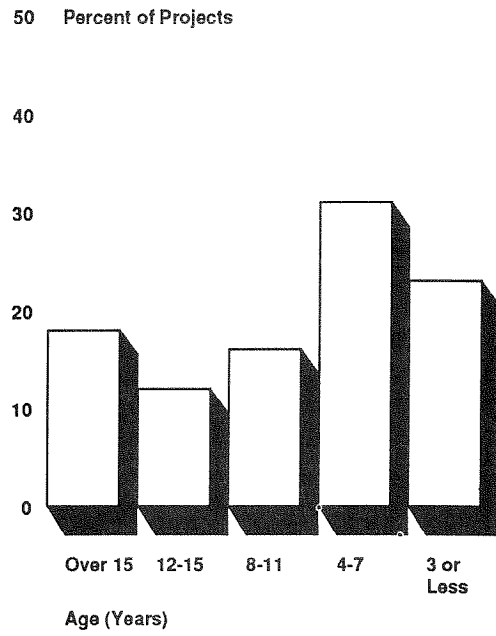
#### WHO ARE THE SBIR PROGRAM PARTICIPANTS?

When the SBIR legislation was under consideration, SBA stated in testimony before the House Science and Technology Committee that the proposed SBIR program would open up opportunities for young, innovative small firms to create new markets and jobs. Survey responses showed that most of the projects are being undertaken by relatively new firms. Figure 2.1 shows that more than 50 percent of the sample projects were being carried out by firms established since 1978, and almost one fourth were undertaken by firms established between 1983 and 1986. Survey responses indicated that the average age of firms participating in the SBIR program was about 7 years.

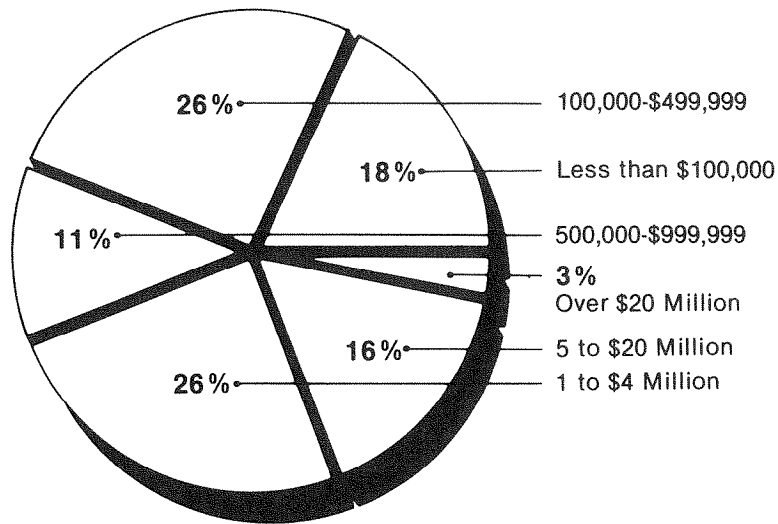
Although small businesses of various sizes are eligible for SBIR awards, responses indicated that most of the participating firms were quite small in size. Almost 60 percent of the projects were carried out by firms that employed 25 or fewer full-time employees. More than one fourth of the projects were undertaken by firms that had five or fewer full-time employees. Only 19 percent of the projects were undertaken by firms that had 100 or more full-time employees. Overall, firms with SBIR projects we sampled employed an average of 15 full-time employees. While we cannot say that the firms formed since 1983 were established because of SBIR, it can be concluded that a majority of the firms benefitting from the program are relatively new.

Most of the projects in our sample were carried out by firms that had comparatively smaller levels of gross revenues. As shown in figure 2.2, over one half of the projects were undertaken by firms that had gross revenues of less than \$1 million in fiscal year 1985, and 18 percent of the projects were being carried out by firms that had gross revenues of less than \$100,000.

**Figure 2.1: Age of Firms Carrying Out SBIR Projects**



**Figure 2.2: Gross Revenues  
in Fiscal Year 1985**



## Respondents say that research results can be used by industry

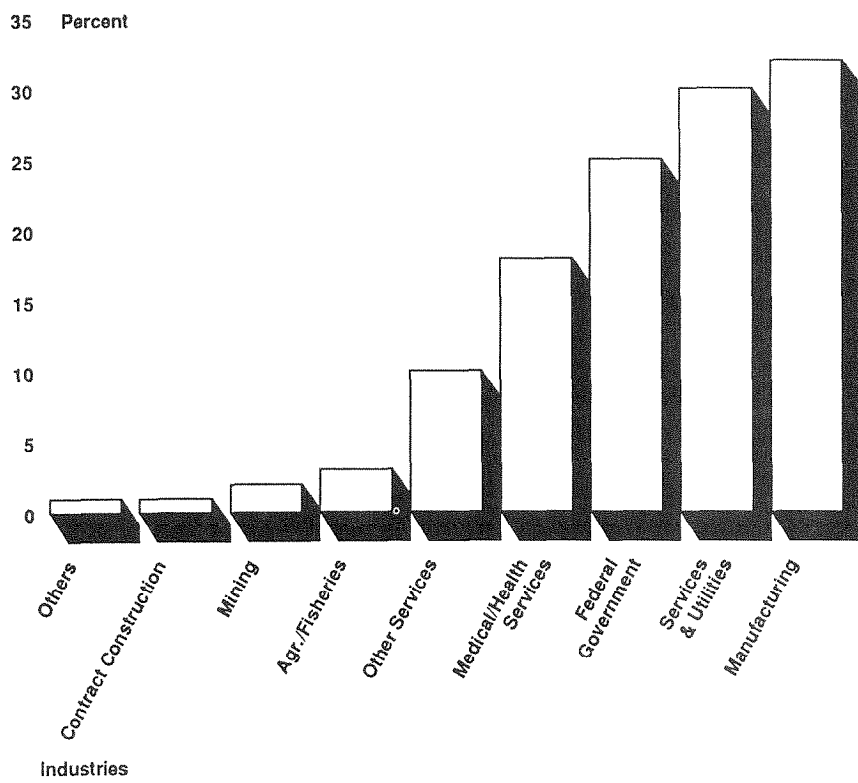
Congressional testimony on proposed SBIR legislation predicted that R&D performed by small firms would have a stimulating effect on the national economy and that such firms could convert federally funded research results into commercially viable products and services. While responses do not reveal to what extent research funded under the SBIR program has stimulated the economy, the responses did indicate that the results of federally supported research would be used by a wide variety of industries. Industries most frequently cited by respondents included manufacturing, services, and utilities. Respondents also indicated the federal government and the medical and health services industry would be major users of their SBIR results. Figure 2.3 shows the major industries identified by respondents as potential users of SBIR results.

## ONE THIRD OF PROJECTS PROCEED TO PHASE II

Federal agencies generally provide small businesses with \$50,000 during phase I to explore the scientific or technical merit and feasibility of an idea. Firms may also apply for phase II awards of up to \$500,000 to further develop ideas explored under phase I. The number of phase II awards made by federal agencies depends upon the results of phase I efforts and the availability of program funds.

While most phase I award winners submitted proposals for phase II funding, slightly fewer than one third of the projects were approved for a phase II award at the time of our survey. Firms submitted phase II proposals for about 75 percent of the phase I projects in our survey and had plans to submit a phase II proposal for another 7 percent of the projects. Firms responsible for the remaining projects gave various reasons for not submitting phase II proposals, for example: (1) firm determined in phase I that the idea was not technically feasible, (2) phase I had not been completed when our questionnaire was completed, and (3) firm immediately began to commercialize phase I results. (Commercialization of SBIR project results is discussed in section 3.) Table 2.1 summarizes responses about the status of phase II activities or plans for sample projects.

**Figure 2.3: Anticipated Industry Users of SBIR Products**



Note: Total equals more than 100 percent because respondents checked all industries that apply.



Table 2.1: Status of Phase II Activity

<u>Status</u>	<u>Percentage</u>
Did not apply for phase II	27
Phase II proposal pending approval	20
Phase II proposal rejected	23
Received phase II award	30

Differences among agencies  
in phase II funding

DOD and HHS, the two agencies with the largest SBIR programs, made over one half of the phase II awards to projects in our sample. DOD made the largest proportion of phase II awards, funding 37 percent of the projects sampled. HHS funded 17 percent. Figure 2.4 shows the percentage distribution of phase II awards made by federal agencies.

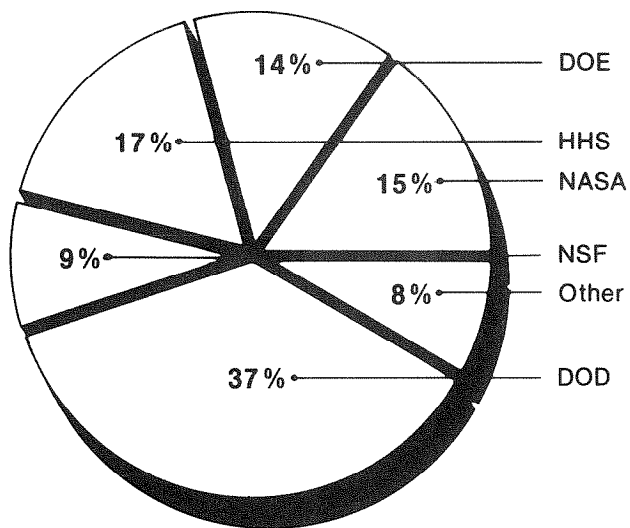
The agencies varied moderately in the proportion of phase I projects they selected for phase II funding. NSF had the highest proportion of projects selected for phase II awards; 68 percent of NSF phase I projects received a phase II award. HHS-funded projects received the least phase II awards--only 47 percent of the HHS phase I projects were selected for phase II funding. Figure 2.5 shows the frequency with which federal agencies selected phase I projects for phase II funding.

Survey responses indicated wide differences among the agencies in the proportion of phase II projects completed. Fifty percent of the NSF-funded projects were completed, making NSF the agency with the highest percentage of completed phase II projects. Conversely, small firms had completed none of the NASA-funded projects in our sample. Overall, small firms had completed 11 percent of the phase II projects sampled, but it was early in the phase II cycle when the questionnaires were completed.

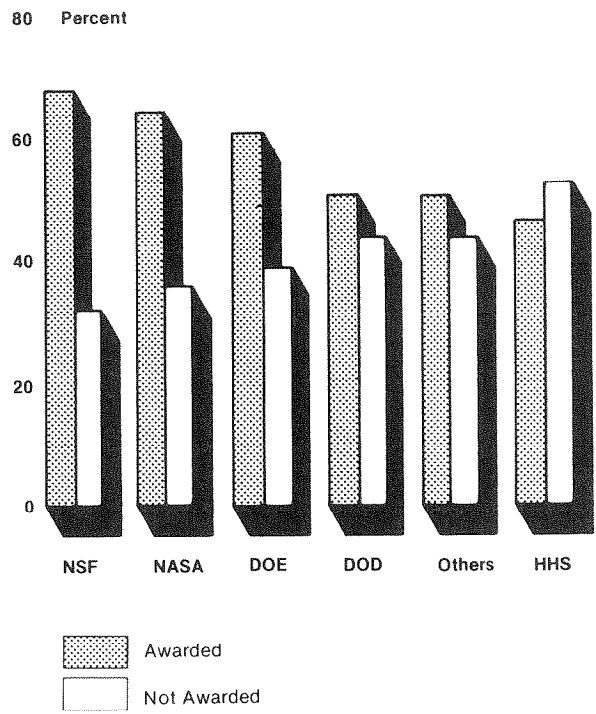
WHO ARE THE PHASE II AWARDEES?

We analyzed responses to identify key characteristics of firms successfully advancing to the crucial second phase of the SBIR program. The responses showed that phase II awardee firms were typically somewhat older and larger than nonawardee firms. The typical phase II awardee firm was established between 1979 and 1982, had from 6 to 25 full-time employees, and received gross revenues of \$1 million to \$4 million in fiscal year 1985. Phase II awardees were also more likely to have received a previous federal R&D award. Typical nonawardee firms were established after 1982, had five or fewer full-time employees, and received gross revenues of less than \$100,000 or over \$20 million in fiscal year 1985.

**Figure 2.4: Phase II Awards Distribution  
by Federal Agencies**



**Figure 2.5: Phase II Awards Frequency  
by Federal Agencies**



Small firms with 26 to 99 full-time employees were more successful in receiving a phase II award. Sixty-two percent of the projects undertaken by such firms obtained phase II awards. Figure 2.6 shows the percentage of successful phase II proposals submitted by firms of other sizes.

Survey data indicated that firms with incomes of less than \$100,000 in fiscal year 1985 were less successful in obtaining a phase II award. Only 46 percent of such firms' projects were approved for phase II funding. Firms with incomes over \$20 million were more successful in obtaining a phase II award, since 71 percent of the projects undertaken by such firms were approved. The highest proportion of phase II awards was made to firms with gross incomes of \$1 million to \$4 million. This income group received 29 percent of the phase II awards. Figure 2.7 shows the 1985 gross revenues of firms that obtained or did not obtain phase II awards.

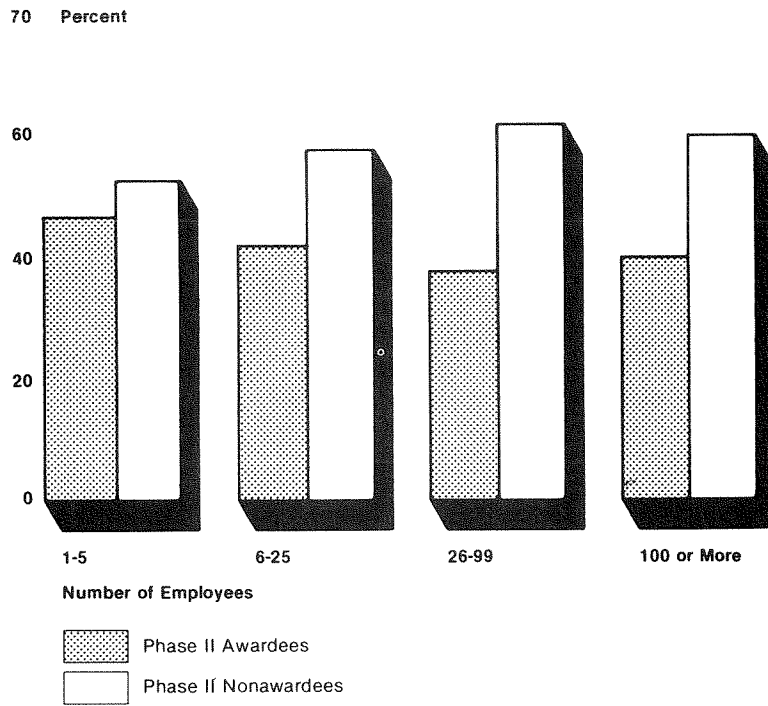
Our data also indicated that relatively older firms were slightly more successful in obtaining a phase II award than newer firms. Over 60 percent of the projects undertaken by firms established before 1974 received phase II awards. In comparison, 45 percent of the projects undertaken by firms established between 1983 and 1986 were approved for phase II funding. Figure 2.8 shows age data for phase II awardee and nonawardee firms.

#### Impact of prior federal R&D experience

One of the objectives of the Small Business Innovation Development Act of 1982 was to increase the role played by small businesses in meeting federal R&D needs by bringing in new firms that had not previously held federal R&D contracts. To assess this aspect of the program, we determined how firms with no prior federal R&D experience fared in relation to more experienced firms in advancing to phase II.

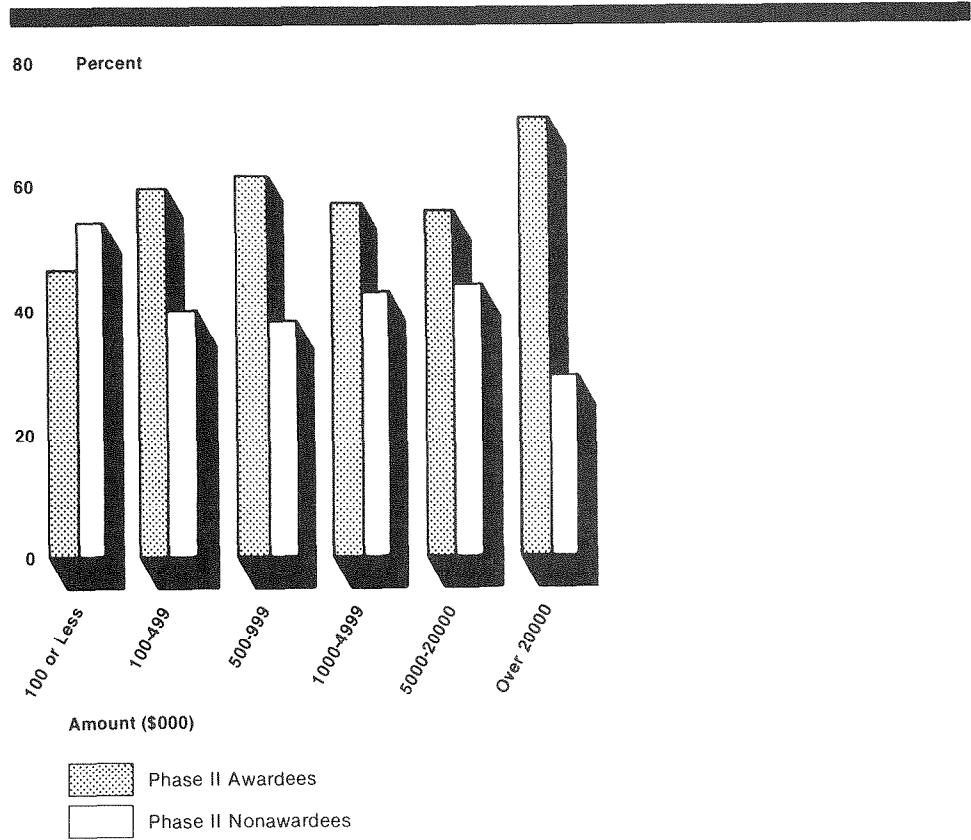
We found that prior experience with the federal government through a previous R&D program slightly enhanced a small firm's chance of submitting a successful phase II proposal. As shown in figure 2.9, respondents with prior federal R&D experience in fiscal years 1982 to 1986 received phase II funding for 60 percent of their projects. In comparison, respondents with no prior federal R&D experience in the same period received phase II funding for 52 percent of their projects. Overall, 65 percent of the phase II projects were being carried out by firms that had completed other R&D work for the federal government in fiscal years 1982 to 1986.

**Figure 2.6: Number of Employees Comparison for Phase II Awardees and Nonawardees**

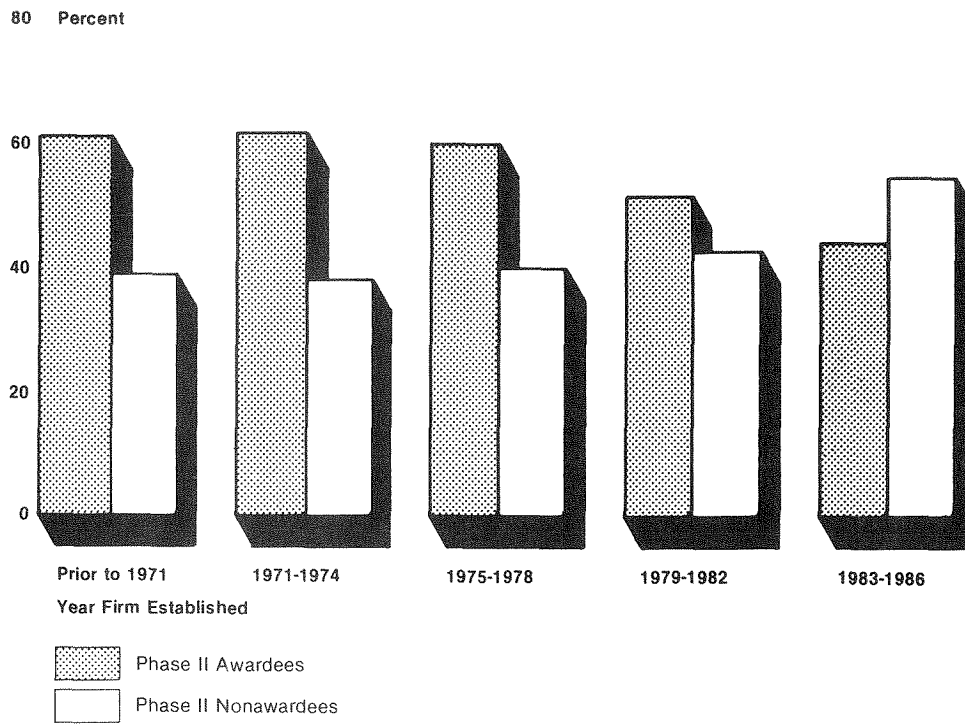




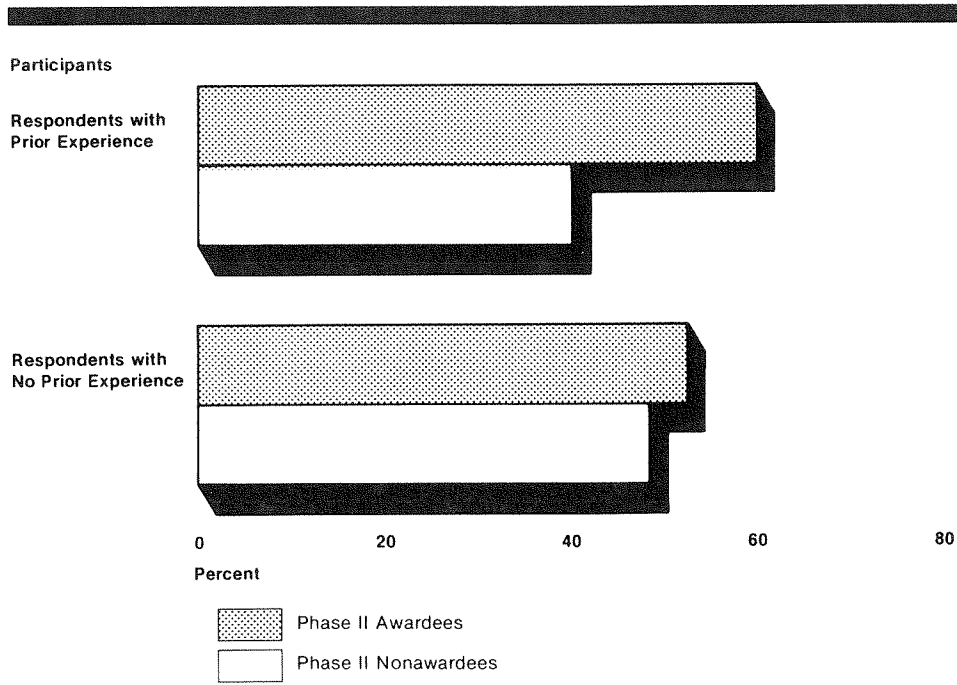
**Figure 2.7: Gross Revenue Comparison for Phase II Awardees and Nonawardees**



**Figure 2.8: Age Comparison for Phase II Awardees and Nonawardees**



**Figure 2.9: Participation in Other Federal R&D Programs**



### SECTION 3

#### MOST SMALL FIRMS BENEFITTED

##### FROM THE SBIR PROGRAM

Almost all survey respondents indicated that participating in the SBIR program was worthwhile, and nearly all of the responses showed that the program encouraged small businesses to participate in government R&D programs. The responses also indicated that small firms received a variety of benefits from participating in the SBIR program, and most emphasized such benefits as the

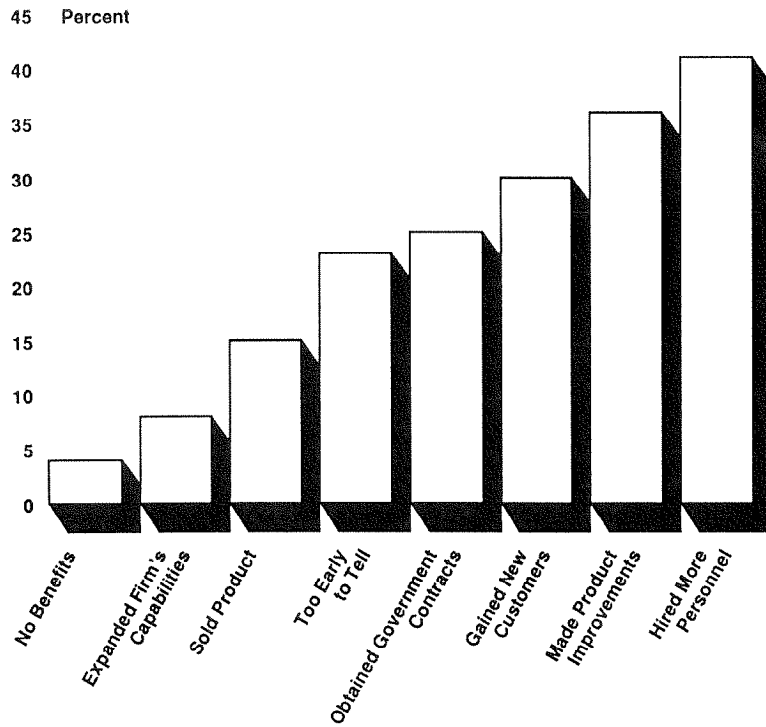
- financial reward of participating in the SBIR program,
- new opportunity to do R&D work for the government, and
- possibility for commercial sale of SBIR results.

##### FINANCIAL BENEFIT OF PARTICIPATING IN THE SBIR PROGRAM

The SBIR program has been a primary source of initial funding for R&D work by many small, innovative science- and technology-based companies. Responses from firms carrying out 79 percent of the sample projects indicated that firms applied for SBIR funding before seeking financing from another source. The remaining responses indicated that firms initially sought financing from another government R&D program, private industry, or internal company funds before seeking SBIR funding.

Officials of firms carrying out about 30 percent of the sample projects commented favorably about SBIR program funding. The most frequent comment was that the program funded R&D work that was not being financed by another source. The respondents also reported that the program provided needed financial assistance, which enabled some firms to stay in business. As shown in figure 3.1, over 40 percent of the responses indicated that the program provided funds for hiring more personnel as a result of the SBIR award, and almost 40 percent indicated that the award enabled the firm to improve other products.

**Figure 3.1: Benefits Derived from SBIR Project**



Note: Total equals more than 100 percent because respondents checked all benefits that apply.

## Adequacy of SBIR funding level

Most respondents believe that the funding level of phase I and phase II awards was generally sufficient to cover R&D expenses incurred during each phase. Officials of firms carrying out more than one half of the projects indicated no additional funding was needed to complete phase I work, and three fourths of the phase II respondents indicated that the phase II award covered all or most of their phase II expenses. Responses indicated that small firms were more likely to use internal company funds to complete R&D work than to obtain funding from another outside source. Table 3.1 shows the other funding sources used to finance work on the SBIR projects we sampled.

Table 3.1: Source of Additional Funding Used To Complete SBIR Project

<u>Source</u>	<u>Phase I</u>	<u>Phase II</u>
	-----(Percentage)-----	-----
Internal funds	93	86
Venture capital	3	5
Bank	1	5
Other private investors	4	14
Other funding sources	7	29

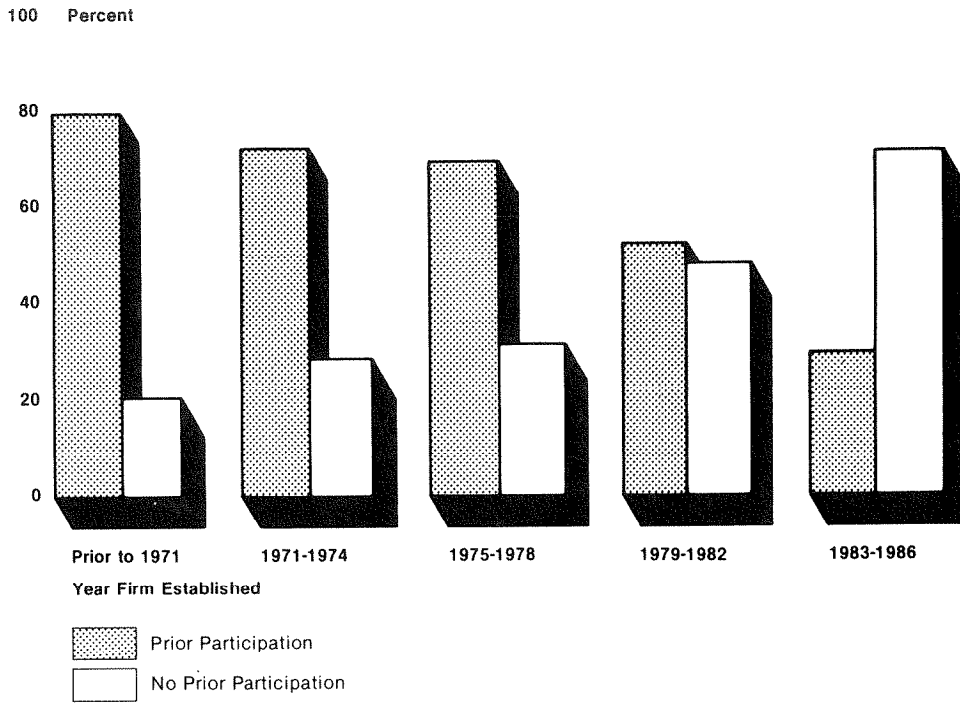
## NEW OPPORTUNITY TO DO GOVERNMENT R&D WORK

The SBIR program has successfully resulted in many firms that lacked previous experience with federal R&D contracts obtaining SBIR awards. For 43 percent of the projects sampled, the SBIR award represented the firm's first federal R&D funding in the last 5 fiscal years.

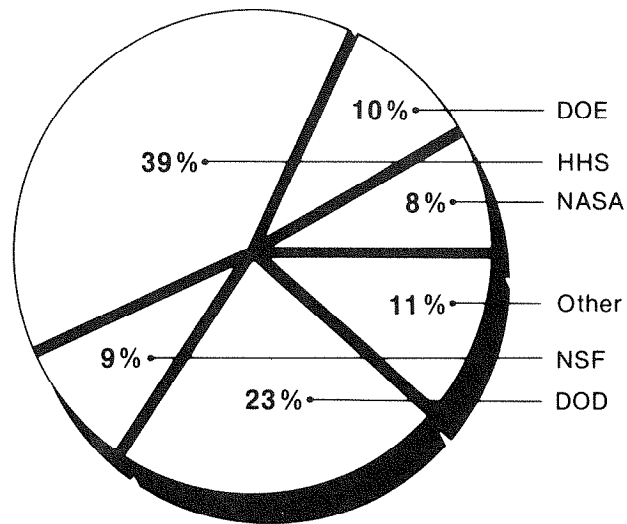
Particularly with newer firms, the SBIR award represented their first federal R&D award. Our analysis showed that of the projects carried out by firms established between 1983 and 1986, 71 percent were carried out by firms that had not previously received a federal R&D award. As shown in figure 3.2, small firms of different ages had various degrees of experience with federal R&D programs.

The SBIR program in HHS attracted the most new firms. The agency funded almost 40 percent of the projects undertaken by firms receiving federal R&D funding for the first time in the last 5 fiscal years. DOD made almost one fourth of such first-time awards. The remaining first-time awards were distributed by the other 10 federal agencies. Figure 3.3 shows, by federal agency, the distribution of SBIR awards to respondents who had not previously received a federal R&D award in fiscal years 1982 to 1986.

**Figure 3.2: Participation in Other Federal R&D Programs**



**Figure 3.3: Agency Distribution Based on no Prior R&D Experience**





SUCCESS OF COMMERCIALIZATION  
OF SBIR PROJECT RESULTS STILL UNKNOWN

One of the main purposes of the Small Business Innovation Development Act of 1982 was to increase the private-sector commercialization innovations derived from federal research and development. During the third phase of the SBIR program, firms must obtain the use of private or non-SBIR federal funding to commercialize their SBIR project results.

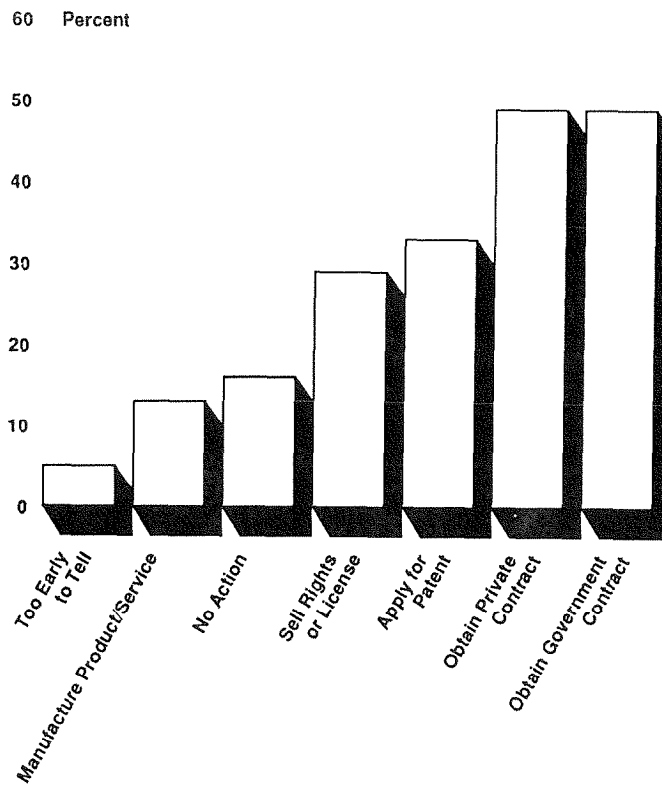
Phase II awards were not generally granted until fiscal year 1984; consequently, it was too early for most firms to have proceeded to the commercial marketing of project results at the time we sent our questionnaires. For this reason, we could not conclusively assess the success of project commercialization. However, we were able to obtain preliminary data on commercialization from the small percentage of respondents who indicated that their project results were available for commercial sale.

Survey responses show that 11 percent of the sample projects receiving a phase II award had completed the phase and, of these, less than half had results available for commercial sale.

We asked all respondents to indicate what actions they had taken or planned to take to market their SBIR project results. Respondents for about one half of the projects indicated that they would obtain a contract with the federal government or with a private company. As shown in figure 3.4, other actions cited by respondents included applying for a patent and selling the rights or license to the SBIR results. Only 16 percent of the respondents indicated that their firms would take no action to market their SBIR project results.

A higher percentage of respondents with plans to market their results to the government received awards from DOD than from any other federal agency. DOE made a higher percentage of awards to firms that will seek a contract with a private company than any other federal agency. HHS made the least number of awards to firms that will seek a contract from the government or from a private company.

**Figure 3.4: Plans for Commercialization of SBIR Projects**



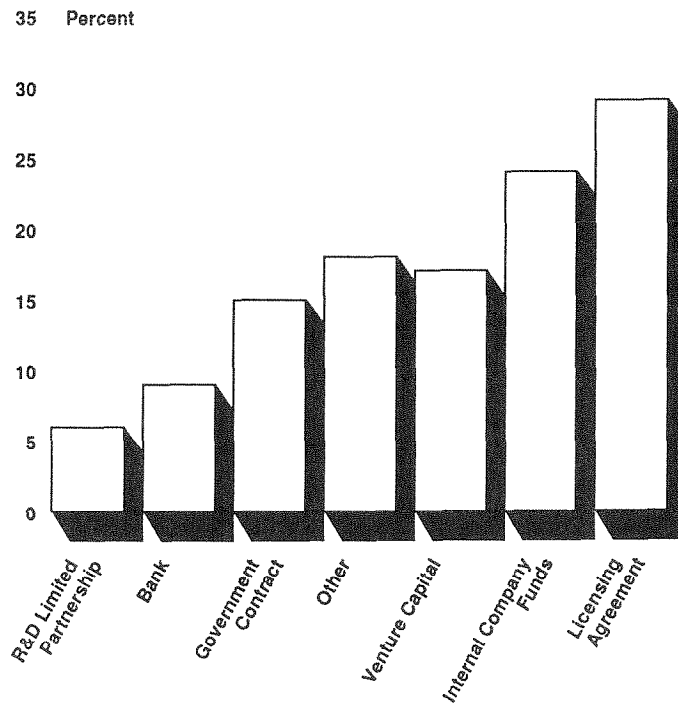
Note: Total equals more than 100 percent because respondents checked all sources that apply.

### Obtaining follow-on financing for SBIR projects

Research performed with SBIR grants has also created opportunities for small companies to acquire follow-on funding needed to convert innovations into new products and services. About one fourth of the respondents indicated that their firms had obtained commitments for follow-on funding needed to advance their SBIR projects to phase III. Some respondents indicated that it was difficult for small firms to obtain start-up R&D funds from the private sector, and they indicated that obtaining an SBIR award made it easier for a company to obtain follow-on financing.

Small firms participating in the SBIR program obtained follow-on funding commitments from many sources. For example, respondents for over one fourth of the projects indicated that a licensing agreement with a larger manufacturer would be primarily used for commercializing SBIR project results. Other respondents indicated that follow-on funding would come from other sources, for example, internal company funds, venture capital financing, and non-SBIR government contracts. Figure 3.5 shows the major types of follow-on funding commitments respondents identified.

**Figure 3.5: Source of Follow-on Funding Commitments**



Note: Total equals more than 100 percent because respondents checked all funding commitments that apply.

## SECTION 4

### SMALL FIRMS VIEW MOST AREAS OF PROGRAM ADMINISTRATION AS SATISFACTORY

SBA's policy directives implementing the act encourage federal agencies to establish a simplified and uniform format for the SBIR program's operation. Responses indicate that SBA's efforts to minimize the program's regulatory burden have been largely successful. Almost all respondents who had participated in other federal R&D programs indicated that SBIR's paperwork requirements and the amount of time required to prepare an SBIR proposal were about the same as or less than were required by other federal R&D programs. In addition, responses indicated that agencies are fairly consistent in administering the program and that program participants are generally satisfied with federal agencies' administration of the program.

#### MOST RESPONDENTS EXPRESSED SATISFACTION WITH CERTAIN ASPECTS OF PROGRAM ADMINISTRATION

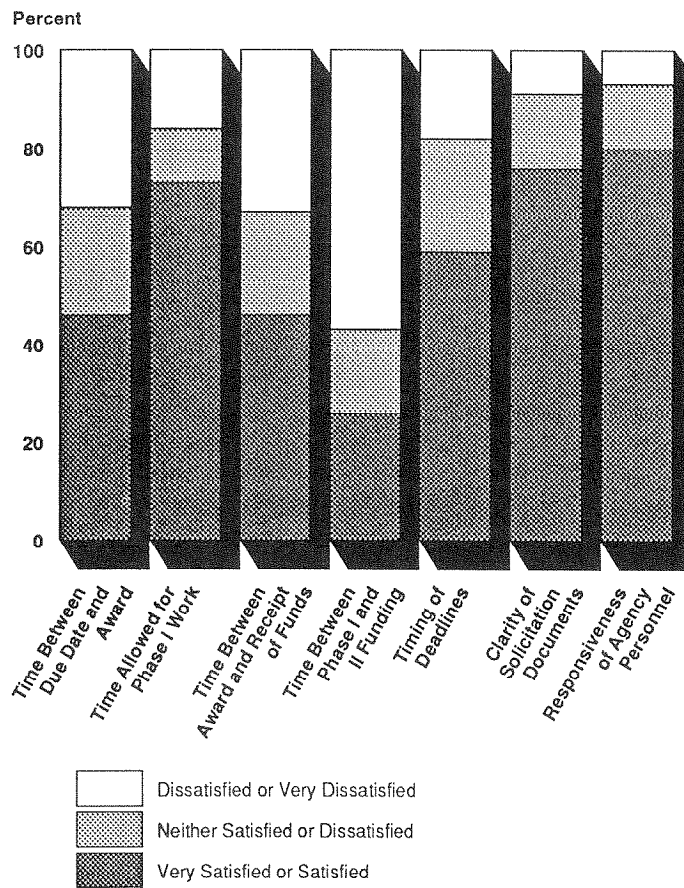
Respondents were generally satisfied with the following aspects of federal agencies' administration of the SBIR program:

- The responsiveness of agency personnel to inquiries about SBIR.
- The clarity of solicitation documents.
- The time allowed for phase I work and the timing of program deadline dates.
- The amount of SBIR paperwork requirements compared with other R&D paper requirements.

The one area where more than one half of the respondents expressed considerable dissatisfaction with SBIR program administration involved the timing in funding between the end of the phase I award and the onset of phase II support. Figure 4.1 shows the level of satisfaction respondents expressed regarding federal agencies' administration of the SBIR program.

We ranked responses from program participants using the results of seven questions to compose a 30-point scale to determine how satisfied the respondents were with various aspects of each agency's administration of the SBIR program. Overall, there was very little difference in respondents' perceptions of the different funding agencies; the scores ranged between 23 and 26.

**Figure 4.1: Level of Satisfaction With Program Administration**



### Responsiveness of agency personnel

Most respondents were generally satisfied with agency responsiveness to inquiries about the SBIR program. About 80 percent expressed satisfaction with the responsiveness of agency personnel, while only 7 percent expressed dissatisfaction.

As might be expected, respondents receiving phase II awards were the most satisfied with the responsiveness of agency personnel. Eighty-seven percent of such respondents expressed satisfaction and only 3 percent expressed dissatisfaction. Respondents for more than two thirds of the projects that did not receive phase II funding indicated project officials were satisfied with the responsiveness of agency personnel. Only 12 percent expressed dissatisfaction.

### Clarity of solicitation documents

Federal agencies are required to publish annual solicitations describing the areas of research they will fund under the SBIR program. Each solicitation contains information on the agency's R&D objectives, research topics, the preparation and submission of SBIR proposals, proposal due dates, and deadlines. SBA also publishes a quarterly SBIR Pre-Solicitation Announcement providing summary information on all agency solicitations scheduled for release during the following 3-month period and the topics that will be covered in forthcoming agency solicitations.

Responses from 76 percent of the projects expressed satisfaction with the clarity of the SBIR solicitations, compared with 10 percent that indicated dissatisfaction.

### Adequacy of timing deadlines

In its policy directives, SBA recommended that agencies allow small businesses 6 months to work on phase I projects and 24 months to work on phase II projects, subject to negotiations between the firm and the awarding agency. SBA policy directives also require federal agencies to set firm schedules for receiving SBIR proposals, but allow each agency flexibility in setting proposal deadlines. Agencies have adopted individual policies for setting program deadlines, but most have set a single deadline for phase I proposals.

Responses from more than one half of the projects expressed satisfaction with the timing of SBIR deadlines set by federal agencies. Eighteen percent of the respondents expressed dissatisfaction with program deadlines. More than two thirds of the phase II awardees expressed satisfaction with the timing of SBIR deadlines and 12 percent indicated they were dissatisfied. Fifty-five percent of the respondents who did not receive phase II

awards expressed satisfaction with the adequacy of SBIR deadlines and 22 percent were dissatisfied.

#### SBIR paperwork requirements

We asked survey respondents to compare SBIR program paperwork requirements with the requirements of other federal R&D programs in which they had participated. Sixty-two percent of the respondents who have participated in other federal R&D programs reported that the SBIR program requires less paperwork than is required by other programs, and 33 percent indicated that the requirement is about the same. Approximately one half of the respondents indicated that preparing an SBIR proposal takes less time or much less time than is required to prepare other federal R&D proposals, and 40 percent indicated that it takes about the same amount of time.

Among federal agencies, NSF had the highest proportion of respondents who favorably compared its SBIR paperwork requirement and the time required to prepare SBIR proposals with the requirements of other federal R&D programs. Responses from 74 percent of the NSF projects that had previously received other federal R&D funding indicated that the SBIR paperwork requirement was less than that required for other federal R&D programs. Fifty-four percent of these respondents felt it took less time to prepare the NSF SBIR proposals than it took to prepare a proposal for other federal programs.

HHS had the highest percentage of respondents who unfavorably compared its SBIR paperwork requirement and the time required to prepare SBIR proposals to the requirements of other federal R&D programs. Responses from 9 percent of the HHS projects that had received funding from federal R&D programs other than the SBIR program indicated that the agency's SBIR program required more paperwork than was required for other federal R&D programs. Nineteen percent of such respondents felt it took more time to prepare the SBIR proposals for HHS than it took to prepare proposals for other programs.

#### FUNDING GAP CREATES PROBLEMS FOR SMALL FIRMS

Survey responses indicated that the amount of time that elapsed between receipt of the last phase I payment (which is usually at the completion of phase I work) and the first phase II funds averaged about 8 months for SBIR program participants. This is the only administrative aspect of the SBIR program most respondents were dissatisfied with. Responses from firms carrying out 57 percent of the projects expressed dissatisfaction with the amount of time elapsing between phase I and phase II funding.



Among federal agencies, the amount of elapsed time between phase I and phase II payments for a majority of the projects ranged from about 3 months for DOE to about 12 months for NSF.<sup>2</sup> Respondents receiving NSF and NASA awards expressed the most dissatisfaction with the amount of elapsed time. Responses from firms carrying out about 75 percent of the NSF and NASA projects expressed dissatisfaction with the amount of time elapsing between phase I and phase II funding. Conversely, only 28 percent of the DOE respondents expressed dissatisfaction with the elapsed time. Figure 4.2 shows the average amount of time between the last phase I payment and the first phase II payment for the agencies with SBIR programs.

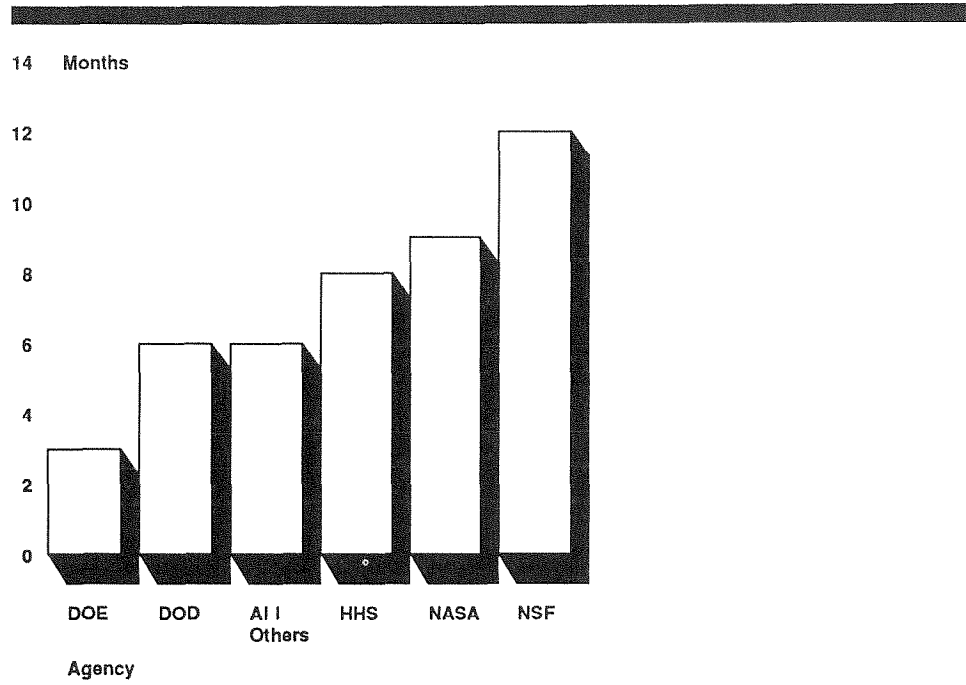
Several small firms identified problems caused by the gap between phase I and phase II funding. Some of the problems cited included:

- o The long gap between phase I and II projects made it impossible to maintain continuity of research and personnel.
- o It was difficult to stop work after phase I funding ended and start up again when phase II funding began. The work had to be continued at a great financial hardship to the company.
- o The time between the completion of phase I and start of phase II created a great disorder in the allocation of resources and personnel.
- o The gap in funding between phase I and II caused a severe loss of momentum.
- o The delay between phase I and phase II is a burden on any company, especially a small business. It is also an extremely inefficient use of personnel since the funding gap is often twice or more the length of the total phase I program.
- o The slow timing of the funding, particularly between the end of the phase I and the beginning of the phase II, is problematic. For example, when research is going well and strong, it is unfortunate to have to end it when the phase I money runs out. Also, it is difficult to plan to have available the capable technical staff when and if the phase II funding is granted.

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<sup>2</sup>NSF officials said that the elapsed time was due in part to the fact that NSF allows a number of proposals to be submitted after the announced deadline. Therefore, the funding gap is lengthened because the evaluation process for phase II starts later than it otherwise would. NSF's position is discussed in greater detail in section 5.

Figure 4.2: Time Between Phase I and II Payment<sup>a</sup>



<sup>a</sup> Period shown represents elapsed time between funding for a majority of projects.

Because most respondents expressed general dissatisfaction with the gap between payments, we examined selected agency performance regarding this issue. The results of our review are presented in section 5.

## SECTION 5

### OUR ANALYSIS OF THE FUNDING GAP ISSUE

Because the funding gap was the only area of the questionnaire that respondents expressed a general dissatisfaction with, we sought to obtain additional information regarding the length of the funding gap from federal officials responsible for the program. We interviewed SBIR program officials at DOE, DOD, NSF, and HHS in order to obtain their views of the funding gap issue. In addition, we analyzed phase I and phase II payment dates that were made to SBIR contractors at DOE, NSF, and, to a more limited extent, DOD.<sup>3</sup> We performed this analysis in order to balance respondents' perceptions concerning the length of the funding gap with agency records that were provided to us. HHS was not able to provide us with sufficient payment data to conduct a thorough funding gap analysis. According to SBA's annual report to the Congress, these four agencies accounted for about 80 percent of all SBIR dollars that were obligated or awarded to SBIR contractors in fiscal year 1985.<sup>4</sup>

#### DOE'S USE OF INTERIM FUNDING SHORTENS PAYMENT GAP

DOE officials stated that in order to minimize both funding interruptions between phases I and II and delays in contractor phase II award notification, the department had (1) initiated an early decision program for phase II, (2) provided interim funding to all phase II contractors between phases, and (3) extended the length of phase I contract performance from the 6 months suggested by SBA to 6-1/2 months.<sup>5</sup>

DOE officials indicated that the agency's early decision program is open to phase I contractors who submit their phase II proposals 6 weeks before the end of the contract performance period in order to maintain funding continuity between phases. They also told us that those phase II proposals that are judged by DOE to be "outstanding" are allowed to continue phase I research into phase II and are provided interim funding.<sup>6</sup>

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<sup>3</sup>The dates of SBIR phase I and II payments were provided to us by the federal agencies.

<sup>4</sup>See SBA's report to the Congress entitled Third Year Results under the Small Business Innovation Research Act of 1982, June 1986.

<sup>5</sup>SBA has not approved or condoned DOE's extension of the phase I contract performance period.

<sup>6</sup>The option to continue phase I work into phase II is a part of every phase I contract.

According to DOE officials, for fiscal year 1984, about one half of the phase II proposals were awarded in the early decision program, while in 1985 about 30 percent received early notification.

DOE officials said its interim funding is intended to be used by contractors to pursue work begun in phase I into phase II while the phase II contract is being negotiated. The maximum amount of interim funding that can be used by the contractor to offset phase II-related costs while the phase II contract is being negotiated is \$83,000, which is about one sixth of the maximum amount of the phase II research award (interim funding can last a maximum of 120 days).

We analyzed DOE's award and payment data to compute the gap between completion of a phase I contract and contractor receipt of interim funding. We found that the remainder of the phase II awardees experienced a 6-month funding gap in 1984 and a 3-month gap in 1985. The shorter 1985 funding gap apparently resulted from DOE imposing a shorter final deadline for submitting phase II proposals.

#### FUNDING GAP AT DOD

We interviewed SBIR program officials at DOD's research units and service headquarters in order to obtain their views about the funding gap issue. Generally, we found that DOD's program personnel attributed the delay between the last payment of phase I and the first payment for phase II to two factors.

First, DOD officials said that the relatively small dollar amount of an SBIR award has resulted in SBIR contracts being given a lower administrative priority as compared with DOD's larger R&D contracts. According to Air Force and Army officials, there is often a "crunch" toward the third quarter of the fiscal year as the agency attempts to obligate its contract funds before the end of the fiscal year. As a result, according to DOD contracting officers, they try to make DOD's "big ticket" contracts final during this period, and SBIR contracts are given a lower administrative priority.

Second, federal procurement regulations require that a phase II contractor's accounting standards be acceptable to the agency and subject to an audit by the Defense Contract Audit Agency (DCAA). According to headquarters personnel, the Competition in Contracting Act of 1984 (Public Law 98-369), which states that contractors "shall certify that to the best of their knowledge and belief that submitted cost and pricing data are accurate, complete, and current," requires DOD to perform a financial audit of firms awarded phase II contracts. DOD officials said that the DCAA performs the audit to determine whether the firm has

acceptable accounting standards in place and, generally, that the audits take 45 to 90 days to perform.

Federal procurement regulations related to the validity of contractor cost and/or pricing data were also cited by DOD officials at both field research units and service headquarters as being partially responsible for funding gap delays.

#### DOD initiatives to reduce funding gap

DOD personnel said that they were also concerned with the length of the funding gap and had unsuccessfully tried to reduce its length by submitting to SBA a revised phase I program solicitation for fiscal year 1988. DOD had attempted to move up its program solicitation for phase I from an opening date of October 1, 1987, to September 1, 1987. DOD officials said that moving the program solicitation to an earlier date would allow phase I contractors to get into the SBIR cycle earlier, thereby resulting in earlier receipt of phase II proposals, which would then result in their processing during a less harried time for contracting staff.

SBA, however, in its role as SBIR program overseer, has not allowed this movement of DOD's program solicitation date. According to SBA officials, it could not allow DOD to move the solicitation date up because SBA is required by law to keep agency solicitation dates "spread out" so that a phase I contractor can apply to several agencies during the fiscal year without difficulty.

DOD headquarters officials told us that they also have been encouraging the use of interim funding between phases in order to reduce the funding gap. However, we found that the use of these "bridging" funds at the services' research units was rare. The Army's SBIR personnel said that they were trying to administratively "institutionalize" the use of interim funds, starting with the fiscal year 1987 phase I solicitation. To date, the Army had one research unit that was using interim funds for phase I projects awarded in fiscal year 1986.

#### FUNDING GAP AT NSF

Our analysis of NSF's payment data shows a funding gap of about 17 months for those phase II projects awarded in fiscal years 1984 and 1985. NSF officials gave three reasons for the length of time between the end of phase I and payment for phase II.

- NSF has followed a policy of relaxing deadlines for phase II proposals when circumstances make it difficult for SBIR firms to submit them on time. Because firms are given more time to submit phase II proposals, the amount of time

between phase I and phase II payments is necessarily lengthened.

- NSF has experienced delays in getting peer reviews of SBIR proposals. A number of factors have contributed to these delays, including (1) the low priority given the SBIR program by many NSF program officers (who arrange for the peer reviews), (2) the substantial turnover among the program officers due to reorganizations, which hinders their knowledge of potential reviewers, and (3) the general problems of enlisting qualified and unbiased peer reviewers because its peer review pool is called on a great deal to review proposals without compensation and because there are very few qualified and unbiased reviewers in some of the specialized and highly technical areas covered by SBIR.
  
- Because NSF defers its decision on a phase II proposal while the firm seeks a follow-on funding commitment, this policy adds time to NSF's phase II approval process and contributes to its funding gap. (NSF strongly encourages SBIR firms to get follow-on funding commitments for their proposed phase II projects.) As specified in the act, the follow-on commitments are used to break ties between phase II proposals of approximately equal merit. NSF stresses the follow-on commitments because the act's basic objective is the commercialization of research results, and NSF believes that such commitments provide the best assurance of a project's commercial potential. According to NSF program officials, most SBIR participants do not realize the importance of the follow-on commitments. Accordingly, they are reluctant to pursue the commitments until NSF encourages them to do so and until they are fairly sure that NSF plans to give them a phase II award.

In 1986, the Director of NSF instituted a policy that NSF would strive for decisions on phase II awards within 6 months of proposal receipt. The Director also required that NSF use commercial merit as a formal evaluation factor for SBIR projects (both phases I and II). Both of these changes are currently being implemented, according to program officials.

#### FUNDING GAP AT HHS

Although HHS did not provide us with enough payment data to conduct an independent analysis of its funding gap, we did interview Public Health Services (PHS) officials in order to obtain their views on the funding gap issue. PHS' subunits obligate over 90 percent of HHS' SBIR funds. PHS officials said

there were three administrative practices in place that contributed to the funding gap. These were the following:

- PHS allows phase II grant proposals not selected for an award but judged to be meritorious to compete with other phase II proposals in a subsequent cycle within the same fiscal year. Thus, grant proposals can be kept active for as long as three review cycles.
- PHS allows SBIR firms up to three consecutive receipt dates following the end of phase I to submit their phase II grant proposals (i.e., if a company elected to submit its phase II proposal on the third receipt date, it would be almost a year from the time its phase I grant ended).
- PHS' proposals that contain research to be performed on animal or human subjects are required to comply with federal regulations governing the filing of assurances of compliance with and obtaining the approval of appropriately constituted review committees within the applicant organizations.



METHODOLOGYSAMPLING

The sample of projects we used was drawn from lists of projects for the 12 federal agencies that sponsor SBIR projects. Questionnaires were sent to all firms having projects except for projects funded by the Departments of Energy, Health and Human Services, and Defense and the National Science Foundation. For those agencies, a sampling fraction was used as shown in table I.1. Also, all phase II projects received questionnaires. Appropriate weights were assigned during the data analysis to account for the agency of the project and whether or not phase II was complete. Table I.1 shows the sample size for each agency and the weighted number of projects for each agency in our analysis.

The sample was designed to have sampling errors of no more than 5 percent at the 95-percent confidence level (sampling errors for subsets of the sample could be higher). Appendix II shows sampling errors in parentheses for selected key variables.

QUESTIONNAIRE PROCEDURES

We developed the questionnaire after discussions with agency officials, a public accounting firm, and small business interest groups. We conducted three sets of pretests with 12 companies in California and Texas that participated in SBIR projects. During each session, an individual respondent filled out the questionnaire in the presence of two GAO observers. After each set of pretests, the questionnaire was revised as necessary to increase clarity and ease of response.

Questionnaires were mailed to the principal investigator of each project in the sample. Because our sample was based on projects rather than companies, 162 companies received two or more questionnaires. A total of 792 companies responded to our questionnaire.

On July 7, 1986, we sent follow-up letters to nonrespondents, including a second copy of the questionnaire. On August 1, 1986, we sent a final reminder to nonrespondents to encourage them to return their questionnaires.

SURVEY RESULTS

We received 1,137 completed questionnaires out of 1,405 that were mailed, yielding a response rate of 81 percent. These

responses represent 79 percent (2,555 projects) of the universe of projects funded in fiscal years 1983 to 1985.

Answers to open-ended questions were coded according to a list of codes developed by reading a subset of the questionnaires. Coding was checked for consistency among coders in their use of the coding descriptions. Responses were merged as appropriate with the answers to the close-ended questions to provide additional data for our analysis in two ways. If an answer was volunteered that was very similar to a category in our question, the answer was changed to reflect the close-ended category. Answers that were different from the categories provided were used to supplement our original categories, thereby increasing the number of categories analyzed for a question.

Table I.1: Sampling Plan

<u>Department/ Agency</u>	<u>Universe</u>	<u>Sample</u>	<u>Returned</u>	Estimated number of projects represented by questionnaires <u>returned</u>
NASA	380	189	156	314
Commerce	7	7	7	7
Agriculture	53	53	43	43
Interior	21	21	18	18
Transportation	53	53	46	46
EPA	40	40	36	36
Education	34	34	26	26
NRC	22	22	19	19
Energy	318	177	140	246
HHS	802	263	207	627
NSF	333	244	199	259
DOD	<u>1,178</u>	<u>303</u>	<u>240</u>	<u>913</u>
Total	<u>3,241</u>	<u>1,406</u>	<u>1,137</u>	<u>2,555*</u>

\*Estimate of total does not correspond due to rounding.



**U.S. GENERAL ACCOUNTING OFFICE**  
**SURVEY OF SMALL BUSINESSES' INVOLVEMENT IN THE**  
**SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM**

**GENERAL INSTRUCTIONS**

The U.S. General Accounting Office is developing information on the Small Business Innovation Research (SBIR) program's effect on small high technology firms. This questionnaire is being sent to a sample of small businesses that have received SBIR awards. Questions are grouped into sections dealing with information about your SBIR project, your firm's participation in this and other federal programs, and general information about your firm.

All questions can be answered by simply checking a box or writing in a small amount of information. A person familiar with your firm's experience under the program should be able to complete the questionnaire in about 20 minutes. The questionnaire is based on our discussions with several small businesses, and we have attempted to provide a format that will be readily adaptable to all firms. In the event that the format for any question does not fit your situation, however, we would appreciate any additional comments required to properly describe your experience. We have provided room at the end of the questionnaire for additional comments or explanations.

Please complete the questionnaire and return it in the enclosed envelope within 14 days of receipt if possible. If you have questions about any specific items in the questionnaire, please call Bill Williams collect at (415) 556-6200. In the event that the envelope is misplaced, please return your completed questionnaire to:

Mr. Mark V. Nadel  
 U.S. General Accounting Office  
 Room 4064  
 441 G Street, N.W.  
 Washington, D.C. 20548

<sup>a</sup> Survey results are weighted to account for disproportionate sample strata. Reported N's reflect projections to the universe of SBIR projects appropriate to each question.

<sup>b</sup> Numbers in parentheses represent sampling errors.

Thank you for your cooperation in making our review as complete and accurate as possible.

Please fill in the name, title, and phone number of the person completing all (or most) of this form.

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Phone number: \_\_\_\_\_

**A. INFORMATION ON SBIR PROJECT**

NOTE: AGENCY RECORDS SHOW THAT YOUR FIRM RECEIVED THE FOLLOWING SBIR AWARD. ALTHOUGH YOU MAY HAVE RECEIVED ADDITIONAL SBIR AWARDS, PLEASE BASE YOUR RESPONSES TO QUESTIONS 1-22 ON YOUR EXPERIENCE WITH THIS ONE PROJECT.

NASA	12.3	N=2555 <sup>a</sup>
DOE	9.6	
HHS	24.5	
NSF	10.2	
DOD	35.7	
OTHER	7.6	

1. Did you try to fund this project before seeking funding through SBIR? If so, how? (CHECK ONE.)

N=2546 (6)

- 1. 78.8% No (2.0) <sup>b</sup>
- 2. 21.2% Yes. Please describe. \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

APPENDIX II

2. If any additional funding was used to complete Phase I, what was the funding source? (CHECK ALL THAT APPLY.)  
 N=2536 (7-12)  
 1. 53.5% No additional funding used.  
 Of those using additional funds (N=1178)  
 2. 92.9 Company's own internal funds.  
 3. 2.6 Venture capital.  
 4. 1.3 Bank.  
 5. 3.7 Other investors.  
 6. 7.0 Other funding source. (SPECIFY.)  
 \_\_\_\_\_
3. Did your firm submit a Phase II proposal for this project? (CHECK ONE.)  
 N=2550 (13)  
 1. 73.3% Yes (SKIP TO QUESTION 5.) (2.2)  
 2. 26.7 No (CONTINUE WITH QUESTION 4 AND (2.2) THEN SKIP TO QUESTION 12.)
4. Why didn't your firm submit a Phase II proposal? (CHECK ALL THAT APPLY.)  
 N=677 (14-17)  
 1. 10.1% Firm determined that idea was not feasible.  
 2. 0.7 Federal agency advised that idea was not feasible.  
 3. 1.5 Went immediately into sale of product/process/service.  
 4. 88.2 Other (SPECIFY.) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NOTE: SKIP TO QUESTION 12 AFTER ANSWERING QUESTION 4.

5. Did your firm receive a Phase II award for this project? (CHECK ONE.)  
 N=1356 (18)  
 1. 56.7% Yes (CONTINUE WITH QUESTION 6.) (3.5)  
 2. 43.3 No (SKIP TO QUESTION 12.) (3.5)

<sup>c</sup> Reported sampling errors for Question 8 may be underreported due to the low incidence of those completing Phase II for three of the agencies.

APPENDIX II

6. How do you categorize the objective of your Phase II work? (CHECK ONE.)  
 N=756 (19)  
 1. 59.9% To develop prototype.  
 2. 23.5 To develop new process.  
 3. 1.6 To propose new service.  
 4. 15.0 Other. (SPECIFY.) \_\_\_\_\_  
 \_\_\_\_\_
7. Approximately how many months elapsed from when you received your last Phase I funds until you received your first Phase II funds? (ENTER NUMBER OF MONTHS.)  
 N=707  
 \_\_\_\_\_ Months (20-21)  
 Median=7
8. <sup>c</sup> Have you completed Phase II? (CHECK ONE.)  
 N=764 (22)  
 1. 10.9% Yes (CONTINUE WITH QUESTION 9.) (2.0)  
 2. 89.1 No (SKIP TO QUESTION 12.) (2.0)
9. What was the result of your Phase II project? (CHECK ONE.)  
 N=83 (23)  
 1. 36.1% Result available for commercial sale.  
 2. 1.2 Firm determined that idea was not feasible.  
 3. 41.3 Firm determined that idea merited further research and development.  
 4. 21.4 Other. (SPECIFY.) \_\_\_\_\_  
 \_\_\_\_\_

10. Did the SBIR award cover all or most of your firm's expenses for Phase II? (CHECK ONE.)  
 N=83 (24)  
 1. 75.0% Yes. (SKIP TO QUESTION 12.)  
 2. 25.0 No. (CONTINUE WITH QUESTION 11.)

11. What was the source of additional funding used to complete Phase II? (CHECK ALL THAT APPLY.) N=21 (25-29)

- 1. 85.6% Company's own internal funds.
- 2. 4.8 Venture capital.
- 3. 4.8 Bank.
- 4. 14.4 Other investors. N=2141
- 5. 28.9 Other funding source. (SPECIFY.)

12. Do you have a follow-on funding commitment for this SBIR project? (CHECK ONE.) N=2532 (30)

- 1. 25.9% Yes (CONTINUE WITH QUESTION 13.) (2.1)
- 2. 74.1% No (SKIP TO QUESTION 14.) (2.1)

13. What are the sources of your follow-on funding commitment? (CHECK ALL THAT APPLY.) N=657 (31-36)

- 1. 8.7% Bank.
- 2. 18.6 Venture capital.
- 3. 6.3 R&D limited partnership.
- 4. 29.0 Licensing agreement with a larger manufacturer.
- 5. 13.9 Follow-on government contract.
- 6. 43.4 Other (SPECIFY.) \_\_\_\_\_

14. Did you sell a share of your company to obtain additional funding for this or other SBIR projects? If so, how much? (CHECK ONE.) N=2530 (37)

- 1. 94.1% No.
- 2. 5.2 Yes, sold 50% or less of firm.
- 3. 0.7 Yes, sold over 50% of firm.

15. What actions, if any, have you taken or do you plan to take to market the results of your SBIR project? (CHECK ALL THAT APPLY.) N=2533 (38-43)

- 1. 15.5% No action. Of those with actions (N=2141)
- 2. 33.0 Apply for patent.
- 3. 29.0 Sell rights or license.
- 4. 49.2 Obtain contract with federal government.
- 5. 49.4 Obtain contract with private company.

6. 33.2 Other. (SPECIFY.) \_\_\_\_\_

13.1 Manufacture product/service

16. What industry do you anticipate will use the results of your SBIR project and how will they use it? N=2555 (44)

93.4% responded

APPENDIX II

APPENDIX II

17. Do you believe that the results of your SBIR project are innovative? If so, please explain. (CHECK ONE.)  
 N=2543 (45)
1. 1.3% No.
  2. 10.8 Not able to determine.
  3. 88.0 Yes. Please explain.

18. We're interested in finding out how the SBIR program compares with other federal R&D programs for small businesses. In the last 5 fiscal years, has your firm received a federal R&D grant, contract, or cooperative agreement other than the SBIR award? (CHECK ONE.)  
 N=2545 (46)
1. 57.0% Yes (CONTINUE WITH QUESTION 19.) (2.3)
  2. 43.0 No (SKIP TO QUESTION 20.) (2.3)
19. Is the amount of time required to prepare the proposal and the paperwork requirements for your SBIR project, more, less, or about the same as the requirements of other federal R&D programs in which you have participated? (CHECK ONE BOX PER LINE.)

FACTOR	<table border="1" style="display: inline-table; transform: rotate(-45deg);"> <tr> <td>Much more</td> <td>More</td> <td>About the same</td> <td>Less</td> <td>Much less</td> <td>NO BASIS TO JUDGE</td> </tr> </table>						Much more	More	About the same	Less	Much less	NO BASIS TO JUDGE	
	Much more	More	About the same	Less	Much less	NO BASIS TO JUDGE							
1	2	3	4	5	6								
a. Amount of time to prepare proposal for SBIR. N=1413		2%	7%	40%	36%	15%	(47)						
b. Amount of paperwork required by SBIR. N=1414	1	4	33	37	25		(48)						

d Category not included in final analysis.

20. Based on your experience with this SBIR project, how satisfied or dissatisfied are you with the following aspects of the SBIR program? (CHECK ONE BOX PER LINE.)

ASPECTS OF SBIR PROGRAM	<table border="1" style="display: inline-table; transform: rotate(-45deg);"> <tr> <td>Very satisfied</td> <td>Satisfied</td> <td>Neither satisfied nor dissatisfied</td> <td>Dissatisfied</td> <td>Very dissatisfied</td> <td>NOT APPLICABLE</td> </tr> </table>						Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	NOT APPLICABLE	
	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	NOT APPLICABLE							
1	2	3	4	5	6								
a. Time between proposal due date and award notification. N=2527	7%	39%	22%	24%	8%		(49)						
b. Time allowed for Phase I work. N=2537	13	60	11	14	2		(50)						
c. Time between Phase II award notification and receipt of funds. N=735	10	36	21	21	12		(51)						
d. Time between Phase I and Phase II funding. N=757	e	5	21	18	33	25	(52)						
e. Timing of deadlines (eg., for completion of Phase I, submission of Phase II proposal). N=2433	(1.1)	(3.7)	(3.7)	(4.2)	(4.1)		(53)						
f. Clarity of program solicitation documents. N=2520	9	50	23	14	4		(54)						
g. Responsiveness of agency personnel to inquiries. N=2458	24	52	15	7	3		(55)						
	37	43	13	6	1		(2.5)(2.6)(1.8)(1.3)(.6)						

e Reported sampling errors for category one of Question 20d may be underreported due to low incidence of this category in two agencies.

21. If you would like to briefly explain why you are satisfied or dissatisfied with aspects of the SBIR program please use the space below.

N=2555 (56)

60.8% gave comments

**B. GENERAL COMMENTS ON SBIR PROGRAM**

23. In your opinion does the SBIR program encourage small business participation in government R&D programs? If not, why not? (CHECK ONE.)

N=2555 (65)

1.92.0% Yes

2. 5.5 Uncertain

3. 2.5 No. Why not? \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

22. What benefits, if any, has your firm received as a result of this SBIR project? (CHECK ALL THAT APPLY.)

(57-64)

- 1. 20.2% Sold product or technology developed with SBIR funding.
- 2. 33.0 Obtained additional government contracts. N=1936
- 3. 53.9 Hired more personnel.
- 4. 39.2 Gained new customers.
- 5. 47.2 Enabled us to improve other products.
- 6. 23.2 No benefits received, have not participated in program long enough. N=2534
- 7. 4.3 No benefits received.
- 8. 34.4 Other (SPECIFY.) \_\_\_\_\_ N=1936

\_\_\_\_\_  
 \_\_\_\_\_

24. Overall, in your opinion was it worthwhile for your firm to participate in the SBIR program? Please explain. (CHECK ONE.)

N=2549 (66)

1.94.7% Yes

2. 4.0 Uncertain

3. 1.4 No

Please explain. \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

C. GENERAL INFORMATION

25. When was your firm established? (ENTER MONTH AND YEAR.) N=2518  
 \_\_\_\_ - \_\_\_\_ Median Year 1979(67-70)  
 Month Year
26. How many full time equivalent employees currently work for your firm? (ENTER NUMBER OF EMPLOYEES.) N=2512  
 \_\_\_\_ Employees Median=15 (71-73)
27. How many patents, if any, did your firm apply for from the beginning of FY 1983 through the present? (ENTER NUMBER.) N=2427  
 \_\_\_\_ Patents Median=less than 1
28. Prior to FY 1983 did your firm receive an award under the National Science Foundation (NSF) and/or Department of Defense DESAT small business innovation research programs? (CHECK ONE.) N=2519 (77)
1. 81.3% No, did not receive an award under either program.
  2. 9.7 Yes, received an award under the NSF program only.
  3. 3.8 Yes, received an award under the DESAT program only.
  4. 5.2 Yes, received awards under both programs.

29. What was the gross revenue for your firm during FY 1985? (CHECK ONE.) N=2475 (78)
1. 17.8% Less than \$100,000.
  2. 26.3 \$100,000 to \$499,999.
  3. 11.0 \$500,000 to \$999,999.
  4. 25.8 \$1 million to \$4,999,999.
  5. 16.2 \$5 million to \$20 million.
  6. 2.9 Over \$20 million.
30. If you have additional comments on any items in the questionnaire or any related topics, please write them below. Your comments are greatly appreciated. N=2555 (79)
- 35.5% gave comments

(80-85)

1 (86)



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