U.S. Small Business Administration


# SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

# ANNUAL REPORT – FY 2003

**Office of Technology**
**U.S. Small Business Administration**

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# OVERVIEW

This is the 21th annual report on the SBIR program, which summarizes program activities and results for FY 2003. The Small Business Innovation Development Act of 1982, Public Law 97-219, directs the U.S. Small Business Administration (SBA) to establish policy for monitoring, evaluating, and reporting on accomplishments of the Small Business Innovation Research (SBIR) program.

Public Law 97-219 was signed on July 22, 1982 and is set forth in section 9 of the Small Business Act. Congress reauthorized the SBIR program in 1986, and again in 1993, extending it to October 1, 2000. This reauthorization also increased the percentage of research and development (R&D) funds that participating Federal agencies must direct to small businesses under the program from 2 percent to 2.5 percent. On December 21, 2000, Public Law 106-554 was signed reauthorizing the SBIR program through September 30, 2008.

In FY 2003, the SBIR program continued to demonstrate that with focused program support from the Federal Government, small high-tech firms could convert basic ideas and research into commercial products. In doing so, these firms increase national productivity, and contribute to American leadership in the competitive international marketplace.

Over a 20-year period, Federal agencies participating in the SBIR program have awarded more than 76,000 awards worth over $15.1 billion to thousands of small high-tech companies. The innovative small businesses that have received awards have applied their ingenuity and inventiveness to fulfilling Federal R&D requirements and to creating profitable commercial products. These products encompass a wide range of industries and technologies.

SBIR program highlights since FY 1983 include the following:

- Successful commercial sales arising from SBIR awards come from an ever-broadening range of technologies and industries such as laser manufacturing, medical research, robotics and military decision-making.

- New products and techniques emerging from SBIR awards support America's competitiveness worldwide, and improve the lives of people here and abroad.

- Research projects have been funded by SBIR awards relating to anti-terrorism such as detection and identification of foreign odors in grains, ultraspectral imager (missile identifier), the use of biofilms to counter bioterrorism, and robotic control for unmanned vehicles.

- Surveys by SBA and the General Accounting Office indicate that at least 25 percent of SBIR award recipients have reported commercial success of SBIR-supported product(s) within 4 years of receiving a Phase II award.

- Small disadvantaged and women-owned businesses have received a significant portion of SBIR awards.

As the company profiles and statistics in this report suggest, an increasing number of firms are succeeding in commercializing new products, processes and services derived from SBIR awards.

In administering and managing the SBIR program, SBA's Office of Technology encourages small, high-tech companies to respond to solicitations from Federal agencies participating in the program. A number of small businesses continue to win multiple awards reflecting their persistent spirit of innovation.

# INTRODUCTION

## Legislative Background

Public Law 97-219 required that each Federal agency having an extramural research and research and development (R/R&D) budget in excess of $100 million in FY 1982, or any year thereafter, set aside a portion of such requirements for competitive award under the SBIR program. Through a 4-year phase-in period, civilian agencies were required to increase the percentage of their R/R&D set-asides from 0.2 percent in FY 1983 to 1.25 percent in FY 1986. The Department of Defense was allowed 5 years to phase in its increase from 0.01 percent in FY 1983, to 1.25 percent in FY 1987.

The Small Business Research and Development Enhancement Act of 1992 (Public Law 102-564) extended the SBIR program to October 1, 2000. It also incrementally increased the percentage of annual extramural R/R&D funds that participating Federal agencies must direct to small high-tech firms from 1.25 percent to 2.5 percent.

Public Law 102-564 also sought to:

- Expand and improve the SBIR program.
- Emphasize increased private-sector commercialization of technology developed under the program.
- Increase small business participation in Federal research and development.
- Improve dissemination of SBIR program information to encourage participation of women-owned and socially and economically disadvantaged small businesses.

Public Law 106-554 sought to:

- Continue the SBIR program through September 30, 2008.
- Clarify data rights pertaining to SBIR Phase I, Phase II, and federally-funded Phase III awards.
- Establish databases – one for the public and one for Government use – to collect and maintain in a common format information that is necessary to assist small business concerns and assess the SBIR program.
- Require agencies with an SBIR budget of over $50,000,000 for fiscal year 1999 to enter into an agreement with the National Academy of Sciences for the National Research Council to conduct a review of each agency's SBIR program.
- Require SBIR agencies to report to SBA on the calculation of the agency's extramural budget.
- Establish the Federal and State Technology Partnership (FAST) Program to strengthen the technological competitiveness of small business concerns.
- Extend the Rural Outreach Program through September 30, 2005.

## Participating Federal Agencies

Pursuant to the Small Business Act, the following Federal agencies are required to participate in the SBIR program:

- Department of Agriculture (DOA)
- Department of Commerce (DOC)
- Department of Defense (DOD)
- Department of Education (ED)
- Department of Health and Human Services (HHS)
- Department of Transportation (DOT)

- Environmental Protection Agency (EPA)
- National Aeronautics and Space Administration (NASA)
- Department of Energy (DOE)
- National Science Foundation (NSF)
- Department of Homeland Security (DHS)

## SBIR Program Structure

The SBIR program is structured in three phases:

- Phase I: Awards up to $100,000 are for research projects designed to evaluate the feasibility, and the scientific and technical merit of an idea. Phase I awards are for a period of up to 6 months.

- Phase II: Phase I projects with the most potential are funded for further development of the proposed idea. Phase II funding of up to $750,000 may be awarded over a period of up to 2 years.

- Phase III: No SBIR funds may be used in this phase. Private-sector investment and support must be used to bring an innovation to market. However, as appropriate, Phase III funds may include follow-up contracts with Federal agencies for production of Phase II innovations.

## SBA Authorities and Responsibilities

SBA has authority and responsibility to:

- Develop, coordinate, issue and update a policy directive for the Federal government-wide conduct of the SBIR and R/R&D Goaling Programs.

- Develop and administer an information and outreach program for the SBIR program.

- Develop and maintain a source and information file of interested small businesses.
- Develop, coordinate, publish and disseminate SBIR Pre-Solicitation Announcements.

- Survey, monitor and report on each agency's SBIR program.

- Report at least annually to Congress on each agency's SBIR program and on SBA's monitoring activities.

- Coordinate private-sector commercialization of SBIR innovations.

- Obtain information on the current National Critical Technologies.

## Authorities and Responsibilities for Participating Agencies

Each participating agency has the authority and responsibility to:

- Determine the categories of projects to include in its SBIR program.

- Issue SBIR solicitations in accordance with a schedule determined cooperatively with the SBA.

- Unilaterally determine research topics within each SBIR solicitation, giving special consideration to broad research topics and to topics that further one or more National Critical Technologies.

- Receive and evaluate proposals resulting from SBIR solicitations.

- Select awardees for SBIR funding agreements.

- Ensure that funding agreements under the SBIR program include provisions setting forth the respective rights of the United States and small businesses with regard to intellectual property rights and follow-on research.

- Administer SBIR funding agreements (or delegate such administration to another agency).

- Make payments to SBIR award recipients based on progress toward or completion of the funding agreement requirements.

# PROGRAM SERVICES

In setting SBIR program policy and in monitoring and evaluating the program, the SBA seeks to simplify and standardize grant and contract award procedures, minimize paperwork, and encourage small companies owned by women, minorities and disadvantaged individuals to participate in the program. The SBA also conducts an ongoing national information and outreach campaign, and ensures that participating agencies conform to SBIR policy directives.

The SBIR solicitation process minimizes administrative burden. It standardizes timely receipt and review of proposals, peer review, and adherence to cost principles. Also, it establishes guidelines for proprietary information, selection of awardees, data rights retention, title to Government property, and cost sharing.

## Pre-Solicitation Announcements

The SBA's SBIR Pre-Solicitation Announcement to small businesses presents basic program solicitation information in a succinct and understandable manner. Each quarterly announcement provides complete information on all SBIR activity for that quarter, eliminating the need for small businesses to track the activities of each participating agency individually. The announcements are available from the SBA's Internet website which is www.sba.gov/sbir. The announcements provide small businesses with--

- A brief statement of each research topic, listed by participating agency;
- The opening and closing dates of each solicitation;
- An estimate of the number of awards to be made under each solicitation;
- The party to contact for a copy of the agency's solicitation; and
- A master schedule of solicitation opening and closing dates for all participating agencies.

Other SBIR information available from SBA includes award winners from the latest available fiscal year and the SBIR Proposal Preparation Handbook.

## Outreach

SBA field representatives and public and private organizations play significant roles in dissemination of SBIR program information.

The SBA continued its aggressive outreach efforts for the SBIR program. The SBA participated in numerous conferences, seminars and workshops to promote the SBIR program to the small business community. In FY 2003, the SBA participated in three National SBIR conferences: Albuquerque, New Mexico, Burlington, Vermont, and Washington, DC.

The SBA will continue to participate in local, regional and national events that promote the SBIR program and will provide technical assistance, with an emphasis on outreach efforts to increase the participation of socially and economically disadvantaged small business concerns and women-owned small business concerns in the SBIR Program.

Another form of outreach involves briefing officials of foreign governments. During FY 2003, foreign interest in the SBIR program continued to grow. SBIR-type programs are in place in the United Kingdom and other European countries.

# PROGRAM DATA

## FY 2003 Summary

There have been long-term upward trends in the number of Phase I, Phase II and total SBIR awards.

- In FY 2003, the 10 agencies participating in the SBIR program released a total of 15 Phase I solicitations. The Department of Defense, the Department of Commerce and the Department of Education each released two solicitations; the Environmental Protection Agency released three solicitations; and the other six agencies released one each.

- Participating agencies received 27,992 Phase I proposals from small high-tech enterprises. Agencies subsequently made 4,465 Phase I awards, representing 16.0 percent of proposals received.

- A total of 3,267 Phase II proposals were received by participating agencies, resulting in 1,759 awards. These awards represented 54 percent of Phase II proposals received.

- In total, 31,259 Phase I and Phase II proposals were received in FY 2003. Phase I and Phase II awards totaled 6,224, representing 20 percent of the total number of proposals received.

  The participating agencies made 24 Phase I awards and 11 Phase II awards to HUBZone small business concerns, for a total of 35 awards. Phase I awards totaled $2.1 million, and awards for Phase II totaled $7.4 million for a total of $9.5 million to HUBZone small business concerns.

As defined in Section 9 of the Small Business Act, the SBA has designed and implemented the Technology Resources Network (Tech-Net) to streamline and standardize the reporting of SBIR awards and applicant information by the Federal agencies required to participate in the SBIR program. This process involved the SBA establishing several working sessions with the agencies to define the input data fields and a core set of output reports to help facilitate the agencies administration of the program. The SBA incorporated the unique needs of each agency into the design of the database system to insure that the system would provide much needed award and applicant information. Information such as name, size, location, abstracts and identifying number of each small business concern that has received a Phase I or Phase II award is available in this database. Agencies now have the ability to review awards and applicant information, and edit previously reported data interactively through Tech-Net. The public version of this database can be accessed by visiting the website www.tech-net.sba.gov.

The SBA is currently developing a Government database, an on-line commercialization reporting system, which will maintain information on all Phase II awards funded under the SBIR program. This database will not be accessible by the public; therefore, any confidential information that is provided by the SBIR Phase II awardees will not be disclosed to the public. A username and password will be required to access the database. The SBA will control the issuance of the username and passwords. The database is being designed to collect information that will allow the SBA, each participating agency, GAO, the National Academy of Science and the Congress to effectively measure the impact and success of the program. The SBA intends to have the Government database implemented and functional on or before October 1, 2005.

## Federal and State Technology Partnership

During FY 2003, the FAST program was not funded; therefore, SBA did make any FAST awards.

## Reporting of Follow-on Non-SBIR Awards

SBIR firms should be encouraged to develop and expand business applications of their SBIR research with the desired outcome of generating new employment and income. One purpose of follow-on funding agreements or Phase III is to commercialize the innovation and help the SBC grow. Section 4(c)(7) and 10(b)(13) of the Policy Directive requires agencies to report only those instances where a follow-on award with non-SBIR funds was issued to a concern other than the SBIR awardee that developed the technology to be pursued under the follow-on award.

In addition, the "notice" requirement in section 4(c)(7), as well as the "reporting" requirements in section 10(b)(13), require agency coordination of SBIR Program Managers/Coordinators and contracting activities. The intent of the program is to help small businesses grow through commercialization in Phase III. Therefore, when agencies make follow-on awards to a concern other than the one that received the Phase I and II award, this should be reported to Congress.

# Table 1: SBIR Program Data

*Fiscal Year 2003 SBIR Agency Obligations Summary (dollars in thousands)*

| | DOA | DOC | DOD | DOE | DOT | ED | EPA | HHS | NASA | NSF | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Agency Extramural Budget | 709,756 | 333,716 | 35,928,064 | 3,768,058 | 120,000 | 296,917 | 268,482 | 21,383,389 | 4,179,000 | 3,430,000 | 70,417,382 |
| Agency SBIR Budget | 17,744 | 8,343 | 894,950 | 94,201 | 3,000 | 7,423 | 6,712 | 534,585 | 107,300 | 87,780 | 1,762,038 |
| Dollars Obligated | 17,098 | 8,314 | 917,587 | 95,141 | 3,214 | 7,788 | 6,310 | 535,525 | 109,429 | 91,400 | 1,791,806 |
| Percent of SBIR to Extramural Budget | 2.41% | 2.49% | 2.55% | 2.52% | 2.68% | 2.62% | 2.35% | 2.50% | 2.62% | 2.66% | 2.54% |
| Deficit/Surplus | -646 | -29 | 22,637 | 940 | 214 | 365 | -402 | 940 | 2,129 | 3,620 | 29,768 |

*Fiscal Year 2003 Award Profile (dollars in thousands)*

| | DOA | DOC | DOD | DOE | DOT | ED | EPA | HHS | NASA | NSF | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Phase I Awards | 86 | 45 | 2,113 | 219 | 11 | 16 | 51 | 1,210 | 267 | 447 | 4,465 |
| Minority/Disadvantaged Phase I Awards | 8 | 3 | 408 | 26 | 2 | 1 | 8 | 7 | 34 | 56 | 553 |
| Total Phase II Awards | 38 | 19 | 1,080 | 105 | 4 | 16 | 9 | 404 | 7 | 77 | 1,759 |
| Minority/Disadvantaged Phase II Awards | 4 | 1 | 187 | 6 | 1 | 2 | 0 | 4 | 1 | 8 | 214 |
| Total Phase I Dollars Awarded ($) | 6,384 | 3,220 | 178,885 | 21,750 | 1,098 | 1,185 | 4,216 | 175,544 | 18,604 | 44,500 | 455,386 |
| Minority/Disadvantaged Phase I Dollars ($) | 585 | 225 | 35,172 | 2,583 | 200 | 60 | 680 | 905 | 2,368 | 5,600 | 48,378 |
| Total Phase II Dollars Awarded (Obligations) | 10,714 | 5,094 | 624,960 | 71,866 | 2,116 | 6,603 | 2,024 | 355,512 | 90,825 | 45,000 | 1,214,714 |
| Minority/Disadvantaged Phase II Dollars ($) | 1,181 | 300 | 136,850 | 3,785 | 1,488 | 1,000 | 0 | 2,761 | 600 | 4,000 | 151,965 |
| Average Amount for Phase I Awards ($) | 74 | 72 | 85 | 99 | 100 | 74 | 83 | 145 | 70 | 100 | 102 |

*Fiscal Year 2003 Agency Solicitation Profile*

| | DOA | DOC | DOD | DOE | DOT | ED | EPA | HHS | NASA | NSF | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of Solicitations Released | 1 | 2 | 2 | 1 | 1 | 2 | 3 | 1 | 1 | 1 | 15 |
| Number of Research Topics in Solicitations | 10 | 19 | 920 | 47 | 9 | 7 | 13 | 170 | 30 | 4 | 1,229 |
| Number of Copies Distributed | 1,000 | 0 | 0 | 2,000 | 250 | 200 | 0 | 0 | 0 | 0 | 3,450 |
| Number of Phase I Proposals Received | 656 | 272 | 15,038 | 1,185 | 136 | 172 | 530 | 5,061 | 2,238 | 2,704 | 27,992 |
| Number of Phase II Proposals Received | 67 | 43 | 1,482 | 207 | 6 | 68 | 42 | 876 | 251 | 225 | 3,267 |
| Number of Phase I Awards | 86 | 45 | 2,113 | 219 | 11 | 16 | 51 | 1,210 | 267 | 447 | 4,465 |
| Number of Phase II Awards | 38 | 19 | 1,080 | 105 | 4 | 16 | 9 | 404 | 7 | 77 | 1,759 |

*Dollars obligated can include modifications to previous year's awards: DOD $113,742K HHS $4,469K, NSF $1,900K and EPA $70K*

The number of awards for Phase I and Phase II have increased during the life of the program. (See Table 2 immediately following)

## Table 2: Number of SBIR Awards -- FY 1983 through FY 2003

| Fiscal Year | Phase I | Phase II | Totals |
|---|---|---|---|
| 83 | 686 | - | 686 |
| 84 | 999 | 338 | 1,337 |
| 85 | 1,397 | 407 | 1,804 |
| 86 | 1,945 | 564 | 2,509 |
| 87 | 2,189 | 768 | 2,957 |
| 88 | 2,013 | 711 | 2,724 |
| 89 | 2,137 | 749 | 2,886 |
| 90 | 2,346 | 837 | 3,183 |
| 91 | 2,553 | 788 | 3,341 |
| 92 | 2,559 | 916 | 3,475 |
| 93 | 2,898 | 1,141 | 4,039 |
| 94 | 3,102 | 928 | 4,030 |
| 95 | 3,085 | 1,263 | 4,348 |
| 96 | 2,841 | 1,191 | 4,032 |
| 97 | 3,371 | 1,404 | 4,775 |
| 98 | 3,022 | 1,320 | 4,342 |
| 99 | 3,334 | 1,256 | 4,590 |
| 00 | 3,166 | 1,330 | 4,496 |
| 01 | 3,215 | 1,533 | 4,748 |
| 02 | 4,243 | 1,577 | 5,820 |
| 03 | 4,465 | 1,759 | 6,224 |
| Total | 55,566 | 20,780 | 76,346 |

There have been parallel long-term upward trends in the dollar amount of Phase I and Phase II totals.

- During FY 2003, participating agencies awarded $1.7 billion through the SBIR program.
- FY 2003 Phase I awards totaled over $455 million.
- Phase II awards aggregating over $1.2 billion were made in FY 2003.
- In FY 2003, minority/disadvantaged-owned firms received 767 awards totaling over $200 million.

Please see Table 3, immediately following.

## Table 3: Value of SBIR Awards-- FY 1983 through FY 2003 (in millions of dollars)

| Fiscal Year | Phase I | Phase II | Totals |
|---|---|---|---|
| 83 | $ 44.5 | $ | $ 44.5 |
| 84 | 48.0 | 60.4 | 108.4 |
| 85 | 69.1 | 130.0 | 199.1 |
| 86 | 98.5 | 199.4 | 297.9 |
| 87 | 109.6 | 240.9 | 350.5 |
| 88 | 101.9 | 248.9 | 389.1 |
| 89 | 107.7 | 321.7 | 431.9 |
| 90 | 118.1 | 341.8 | 460.7 |
| 91 | 127.9 | 335.9 | 483.1 |
| 92 | 127.9 | 371.2 | 508.4 |
| 93 | 154.0 | 490.7 | 698.0 |
| 94 | 220.4 | 473.6 | 717.6 |
| 95 | 232.2 | 601.9 | 834.5 |
| 96 | 228.9 | 645.8 | 916.3 |
| 97 | 277.6 | 789.1 | 1,106.9 |
| 98 | 262.3 | 804.4 | 1,066.7 |
| 99 | 299.5 | 797.0 | 1,096.5 |
| 00 | 302.0 | 888.2 | 1,190.2 |
| 01 | 317.0 | 977.3 | 1,294.3 |
| 02 | 411.4 | 1,023.3 | 1,434.7 |
| 03 | 455.3 | 1,215.0 | 1,670.3 |
| Total | 4,108.8 | 10,956.5 | 15,065.3 |

FY 2004 EST: - $1.9 billion
Total does not include $121 million in award modifications

As in prior years, in FY 2003 SBA continued to use a system of deficits and credits to evaluate agency SBIR budgets against actual amounts obligated.

Through its SBIR Policy Directive, SBA requires each participating agency to list the number of Phase I awards made both within 6 months and after 6 months of the closing date of its solicitation announcement. Table 4 (immediately following) provides this information for FY 2003.

**Table 4: FY 2003-- Phase I Time Frame**

| Agency | Total FY 03 Phase I Awards | No. within 6 Months of Solicitation Close | No. More Than 6 Months After Solicitation Close |
|---|---|---|---|
| DOA | 86 | 0 | 86 |
| DOC | 45 | 45 | 0 |
| DOD | 2,113 | 1,950 | 163 |
| DOE | 219 | 219 | 0 |
| DOT | 11 | 11 | 0 |
| ED | 16 | 16 | 0 |
| EPA | 51 | 51 | 0 |
| HHS | 1,210 | 1,210 | 0 |
| NASA | 267 | 267 | 0 |
| NSF | 447 | 447 | 0 |
| TOTAL | 4,465 | 4,216 | 249 |

## Extramural Budget Calculation

Public Law 106-554 directs each Federal agency with an SBIR program to provide to the Small Business Administration an annual report that includes a description of the methodology used for calculating the amount of the extramural budget of the Federal agency. Please see Table 5.

To monitor and report on the participating agencies' SBIR programs, SBA has established a reporting base to compare against each agency's budget data. To determine extramural obligations as a base for the size of each agency's SBIR program, the Small Business Act provides a definition of R&D.

It should be noted that a 3-year budget cycle is used for establishing extramural R/R&D obligations. Within any given year, a participating agency's initial estimate can change due to congressional action on that agency's R/R&D budget. To ensure proper implementation of the program, each agency establishes an estimated budget as a basis for operations during the year.

The SBA's Chief Financial Officer's office has reviewed the methodology used in calculating each participating agency's extramural budget. The results of that review are in the following chart (Table 5).

## Table 5: CALCULATION OF EXTRAMURAL BUDGET
## ($ In Thousands)

| Agency Name | FY 2003 R&D Budget | Intramural Budget & Other | Extramural Budget | $SBIR | Overall Compliance | Other Comments |
|---|---|---|---|---|---|---|
| Dept. of Air Force | $12,484,824 | $1,764,897 | $10,719,927 | $267,998 | Yes | |
| Dept. of Army | 7,578,000 | 818,000 | 6,760,000 | 169,000 | Yes | |
| Defense Adv. Research Project Agency | 2,712,700 | 271,300 | 2,441,400 | 61,035 | Yes | |
| DOD Defense Missile Defense Agency (MDA) | 6,685,258 | 1,520,360 | 5,164,898 | 129,122 | Yes | |
| DOD Washington HQs Services | 2,331,448 | 822,448 | 1,509,000 | 37,725 | Yes | |
| US Special Operations Command | 537,495 | 75,667 | 461,828 | 11,546 | Yes | |
| Defense Threat Reduction Agy | 408,836 | 212,267 | 196,569 | 4,914 | Yes | |
| Dept. of Navy (Office of Naval Research) | 9,623,587 | 1,758,611 | 7,864,976 | 196,624 | Yes | |
| Dept. of Energy | 3,882,763 | 114,705 | 3,768,058 | 94,201 | Yes | |
| Department of HHS | 23,085,000 | 1,702,000 | 21,383,000 | 534,575 | Yes | |
| Nat'l Institute of Standards & Technology | 470,874 | 291,622 | 179,252 | 4,481 | Yes | |
| Nat'l Oceanic Atmospheric Administration | 683,400 | 530,600 | 152,800 | 3,820 | Yes | |
| Nat'l Science Foundation | 3,609,000 | 167,000 | 3,442,000 | 86,050 | Yes | |
| Dept. of Transportation (Combined) | 680,843 | 490,229 | 190,614 | 4,765 | Yes | |
| Dept. of Education | 302,852 | 12,780 | 290,072 | 7,252 | Yes | |
| EPA | 631,000 | 362,500 | 268,500 | 6,713 | Yes | |
| NASA | * 15,000,000 | * 2,125,000 | *12,875,000 | * 321,875 | Yes | *All #s were 2003 projections. Actual #s not available due to the migration to a new accounting system. |
| Dept. of Agriculture | | | | | | Non-Submission as of Sept. 8, 2004 |

## Highlights of Cumulative Data

The SBIR program continues to receive recognition for quality performance. The following highlights accomplishments of the SBIR program since it began in FY 1983:

- More than $15.1 billion has been awarded.
- Participating agencies received a total of 422,092 Phase I and Phase II proposals in response to 285 SBIR solicitations. A total of 76,346 Phase I (55,566) and Phase II (20,780) awards have been made.
- Minority/ disadvantaged firms have received 9,601 awards, representing 12.5 percent of all SBIR awards. The value of these awards is $3.5 billion, representing 23 percent of all dollars awarded under the program.
- Awards have been made to firms in all 50 states, Puerto Rico and the District of Columbia.
- Several participating agencies have allocated more for this program than required by law. In accordance with the law, each participating agency will continue to award at least 2.5 percent of its R/R&D extramural budget each fiscal year.

# SUCCESS STORIES

The following stories represent the most recent successes from FY 2003 SBIR awards issued by the participating Federal agencies.

## Quantum Simulations, Inc. Murrysville, Pennsylvania

Quantum Simulations, Inc., a developer of artificial intelligence (AI) tutoring software for science, has participated in the SBIR program for over six years. During this period, Quantum has received 12 SBIR awards from the U.S. Department of Education and the National Science Foundation totaling over $2.5 million. The SBIR program has provided Quantum with critical funding to create a new generation of cognitive modeling technology. Successful projects have resulted in the research and development of 13 artificial intelligence tutoring modules for science and mathematics education, which have been commercialized. Ongoing projects include continued development of assessment tools to support No Child Left Behind (NCLB) science requirements, as well as new content.

Quantum's goal is to provide ***every*** student with unlimited access to affordable, high-quality personal tutoring help anytime, anywhere. To achieve this mission, Quantum has used SBIR funding to develop the first – and only – AI Tutors for science including;

- Quantum Chemistry: Nine modules covering core introductory chemistry topics for high school- and college-level students
- Quantum Mathematics: Five applied mathematics for science modules for middle school to ninth grade students.

Similar to a human tutor, Quantum's tutoring software gives personalized hints, guidance and feedback based on the student's own work and subject knowledge. As a result, classroom trials have proven that Quantum Tutors can **improve test scores by as much as 50 percent**, specifically benefiting those students who are having the most difficulty. Accessed over the Internet, Quantum Tutors are designed for classroom learning, at-home study and teacher training/professional development.

Dr. Benny Johnson, president and CEO of Quantum, was invited to present the Quantum software at the 2004 Education Secretary's NCLB Technology Leadership Summit as a benchmark example of cutting-edge educational technology. Furthermore, Quantum has successfully commercialized and launched the resulting technology using an award-winning business plan, as follows:

**Patents**: A patent has been issued on Quantum's consistency rules and conceptual-based feedback, claiming methodology that is applicable to any subject area. In addition, Quantum has a patent-pending and a third is in preparation.

**Commercialization Partners**: Long-term contracts have been executed with two distributors to deliver Quantum Tutors to schools, teachers, distance learning providers and homeschoolers via the Internet. These partners view the Quantum technology as flagship products in their initiatives to enter new markets and expand offerings:

- Holt, Rinehart and Winston, a leading publisher of textbooks and educational materials for grades six through 12
- Science Kit & Boreal Laboratories, a leading supplier of K-12 science

education materials and equipment throughout the United States and Canada.

**Collaboration Partners**: Key collaborations, which have proven very successful for application, evaluation and testing of the Quantum technology, include:

- Event-Based Science, funded by NSF and NASA, is a new inquiry-based approach to teaching science at the middle-school level, using newsworthy events to establish relevance of and interest in science topics.

- Wexford, Inc., an evaluation partner, is a non-profit educational agency recognized nationally for its work in collaboration, strategic planning, evaluation, educational technology, distance learning and equity.

Quantum Simulations is grateful to the SBA and SBIR programs for their essential and continued contributions and support. Quantum remains dedicated to further research and development of innovative technologies to improve education, delivering learning tools to market that are proven effective, accessible and affordable for *all* students.

## The Eagle® Cargo Inspection System Sunnyvale, California

The U.S. Customs Service (USCS) designated ARACOR's Eagle® system as a primary cargo inspection instrument in U.S. seaports, and it has initiated procurement for what may become a significant homeland defense system. This is the culmination of a 21-year technology development that began with an NSF SBIR Phase I grant in computed tomography (CT) systems. Under President and Founder Robert Armistead, ARACOR in Sunnyvale, CA entered an NSF SBIR Phase II in 1982 as well as a related Air Force SBIR contract. Drawing from the SBIR contracts, ARACOR developed the first industrial CT system. This CT system used a 420-kV X-ray source and was designed for the inspection of tactical rocket motors. In 1985, a CT system with a 15-MV linear accelerator X-ray source was developed for detailed inspections of large rocket motors of the Minuteman and Peacekeeper strategic missile systems. ARACOR has sold CT systems worth about $60 million up to the present. Besides rocket motors, these systems are used for inspections of nuclear weapons, for quality assurance in the castings and automotive industries and for research.

This system and a similar CT system delivered in the mid-1990s to Hill Air Force Base are the largest 3-D X-ray imaging systems in the world. They can form X-ray image slices and full 3-D digital models of objects that are 8 feet in diameter, 28 feet in height and that weigh over 100 lbs.

ARACOR built the Eagle® prototype in 1997 using a 6-MV X-ray source and a linear detector array mounted on a custom straddle carrier. The imaging components used in the Eagle were evolved from the high-performance imaging technology developed for its CT systems and thus trace their origin to work done under several SBIR awards. The prototype Eagle® was tested at the Port of Miami by the USCS and employed there for two years, where it supported the discovery of considerable quantities of drugs hidden in sea cargo containers. The system was recently relocated to El Paso, Texas to be part of the Free and Secure Trade program.

The Bureau of Customs and Border Protection has awarded ARACOR a five-year contract for Eagles. So far, $20 million in Eagle®-related orders have been logged. In addition to units ordered by CBP, an order was received from the Port Authority of Jamaica. They will use the Eagle to support their application for U.S. certification under the Container Security Initiative and help reduce manifest fraud at the Port of Kingston.

The Eagle has been selected for a "2004 R&D 100" award. Each year, *R&D Magazine* uses an independent judging panel to select the 100 most "technologically significant" products introduced into the marketplace over the past year. ARACOR was acquired in January 2004 by OSI Systems, a security products company in Hawthorne, California and thus has "graduated" from SBIR.

## IA Tech
## Los Angeles, California

IA Tech is a woman-owned small disadvantaged business. The company was founded in 1997 to carry out research and development work on computer software that provides a human interface with robotic and manufacturing systems and dependable computing techniques for a variety of industrial/commercial applications.

With SBIR program support, IA Tech has been able to make significant contributions to the new technology requirements of NASA, the Air Force and the Army. Software for mission planners on the Mars Polar Lander mission was developed by IA Tech. Planning the daily operations of a NASA exploratory mission is a complex process involving inputs and communications with large number of scientists and engineers at several different locations. IA Tech has also played a valuable role in the 2003 Mars Exploration Rover mission and is currently developing software for the 2009 Mars Science Laboratory mission. Technologies and software have also been contributed to the U.S. Air Force human factors experiments for UAV control and the Army Autonomous Collaborative Operations Program.

IA Tech has received several awards in recognition of their contributions, which consist of NASA Software of the Year Sole Runner-Up Award in 1998, two NASA Space Act awards, eight NASA Certificate of Recognition awards and a NASA Group Achievement Award for the Web Interface for Telescience Team in 2002.

IA Tech is still a small company, but its inventory of software tools and experience has placed them in a position to develop products and provide services for applications in dependable systems and networks. In the words of the company's President, Ana Tai, "Since founding IA Tech, we have been increasingly convinced that America is a land of opportunities and of boundless freedom for people who desire to work hard to accomplish. Among other things, we particularly appreciate the SBIR program. Our achievements would not have been there without the program."

# GENERAL INFORMATION

## Publications Update

All publicly distributed SBIR documents have been updated and are available on the SBA's website, which is www.sba.gov/sbir.

## National Conferences

The Department of Defense and the National Science Foundation sponsored SBIR conferences in FY 2003 in Washington, DC; Anaheim, California; and Rapid City, South Dakota.

## General Information

The SBA has offices located throughout the United States. For the one nearest you, look under "U.S. Government" in your telephone directory, or call the SBA Answer Desk at (800) 8-ASK-SBA. To send a fax to the SBA, dial (202) 205-7064. For the hearing impaired, the TTD number is (704) 344-6640.

To access the Agency's electronic public information services, you may access the following:

- Internet: using uniform resource locators URLs
- SBA Home Page: http://www.sba.gov/sbir
- U.S. Business Advisor: http://www.business.gov

You also may request a free copy of The Resource Directory for Small Business Management, a listing of for-sale publications and videotapes, from your local SBA office or the SBA Answer Desk.

U. S. Small Business Administration
Office of Technology
Total SBIR Awards for FY 2003

| State | Number of Phase 1 Awards | Phase 1 Dollars | Number of Phase 2 Awards | Phase 2 Dollars | Total Awards | Total Dollars |
|---|---|---|---|---|---|---|
| Alabama | 81 | $7,212,544 | 35 | $25,648,505 | 116 | $32,861,049 |
| Alaska | 6 | $584,793 | 1 | $750,000 | 7 | $1,334,793 |
| Arizona | 80 | $7,339,777 | 25 | $17,188,809 | 105 | $24,528,586 |
| Arkansas | 15 | $1,662,429 | 2 | $998,433 | 17 | $2,660,862 |
| California | 865 | $96,301,391 | 360 | $289,371,231 | 1225 | $385,672,622 |
| Colorado | 209 | $20,079,264 | 82 | $60,856,537 | 291 | $80,935,801 |
| Connecticut | 72 | $9,008,792 | 31 | $20,592,040 | 103 | $29,600,832 |
| Delaware | 22 | $1,962,757 | 4 | $2,271,846 | 26 | $4,234,603 |
| District of Columbia | 11 | $1,279,385 | 6 | $3,905,722 | 17 | $5,185,107 |
| Florida | 101 | $9,163,942 | 49 | $32,324,831 | 150 | $41,488,773 |
| Georgia | 49 | $4,753,866 | 17 | $11,572,025 | 66 | $16,325,891 |
| Hawaii | 13 | $1,160,769 | 5 | $3,195,984 | 18 | $4,356,753 |
| Idaho | 10 | $769,154 | 4 | $2,252,693 | 14 | $3,021,847 |
| Illinois | 60 | $6,127,833 | 30 | $19,905,559 | 90 | $26,033,392 |
| Indiana | 31 | $3,243,480 | 10 | $7,685,135 | 41 | $10,928,615 |
| Iowa | 15 | $2,627,481 | 4 | $2,579,418 | 19 | $5,206,899 |
| Kansas | 16 | $1,537,239 | 5 | $2,752,726 | 21 | $4,289,965 |
| Kentucky | 9 | $1,188,737 | 1 | $500,000 | 10 | $1,688,737 |
| Louisiana | 12 | $962,045 | 2 | $1,411,017 | 14 | $2,373,062 |
| Maine | 20 | $1,801,744 | 5 | $2,643,183 | 25 | $4,444,927 |
| Maryland | 237 | $29,948,115 | 88 | $66,635,348 | 325 | $96,583,463 |
| Massachusetts | 594 | $66,581,036 | 236 | $175,768,743 | 830 | $242,349,779 |
| Michigan | 82 | $10,277,460 | 46 | $31,781,909 | 128 | $42,059,369 |
| Minnesota | 63 | $6,489,633 | 31 | $20,912,566 | 94 | $27,402,199 |
| Mississippi | 9 | $865,510 | 3 | $1,477,530 | 12 | $2,343,040 |
| Missouri | 25 | $2,379,990 | 4 | $1,934,927 | 29 | $4,314,917 |
| Montana | 19 | $1,750,012 | 9 | $4,867,164 | 28 | $6,617,176 |
| Nebraska | 10 | $950,217 | 1 | $296,000 | 11 | $1,246,217 |
| Nevada | 17 | $1,549,441 | 6 | $4,134,104 | 23 | $5,683,545 |
| New Hampshire | 50 | $4,494,233 | 23 | $15,935,773 | 73 | $20,430,006 |
| New Jersey | 141 | $13,132,571 | 40 | $28,007,176 | 181 | $41,139,747 |
| New Mexico | 67 | $6,081,436 | 21 | $14,101,618 | 88 | $20,183,054 |
| New York | 163 | $17,441,077 | 76 | $61,286,167 | 239 | $78,727,244 |
| North Carolina | 62 | $6,740,558 | 19 | $15,417,029 | 81 | $22,157,587 |
| North Dakota | 5 | $451,437 | 3 | $1,500,000 | 8 | $1,951,437 |
| Ohio | 159 | $16,863,975 | 78 | $57,592,547 | 237 | $74,456,522 |

Dollar amounts reflect actual dollars

State Order

U. S. Small Business Administration
Office of Technology
Total SBIR Awards for FY 2003

| State | Number of Phase 1 Awards | Phase 1 Dollars | Number of Phase 2 Awards | Phase 2 Dollars | Total Awards | Total Dollars |
|---|---|---|---|---|---|---|
| Oklahoma | 18 | $2,709,165 | 4 | $1,829,994 | 22 | $4,539,159 |
| Oregon | 47 | $4,931,169 | 18 | $12,096,440 | 65 | $17,027,609 |
| Pennsylvania | 147 | $17,202,677 | 78 | $55,829,948 | 225 | $73,032,625 |
| Puerto Rico | 2 | $150,000 | 0 | $0 | 2 | $150,000 |
| Rhode Island | 16 | $1,452,318 | 9 | $6,159,843 | 25 | $7,612,161 |
| South Carolina | 24 | $2,236,141 | 8 | $6,271,957 | 32 | $8,508,098 |
| South Dakota | 4 | $369,934 | 4 | $1,728,761 | 8 | $2,098,695 |
| Tennessee | 27 | $2,533,289 | 8 | $5,850,015 | 35 | $8,383,304 |
| Texas | 208 | $21,764,892 | 68 | $47,942,828 | 276 | $69,707,720 |
| Utah | 31 | $3,295,096 | 21 | $13,891,213 | 52 | $17,186,309 |
| Vermont | 14 | $1,785,847 | 6 | $5,048,096 | 20 | $6,833,943 |
| Virginia | 259 | $24,191,280 | 105 | $72,342,311 | 364 | $96,533,591 |
| Washington | 89 | $9,545,475 | 43 | $31,263,553 | 132 | $40,809,028 |
| West Virginia | 20 | $1,669,967 | 5 | $6,182,069 | 25 | $7,852,036 |
| Wisconsin | 37 | $5,640,852 | 24 | $16,309,199 | 61 | $21,950,051 |
| Wyoming | 9 | $1,172,380 | 1 | $729,960 | 10 | $1,902,340 |

Dollar amounts reflect actual dollars

State Order

U. S. Small Business Administration
Office of Technology
Total SBIR Awards for FY 2003

| State | Number of Phase 1 Awards | Phase 1 Dollars | Number of Phase 2 Awards | Phase 2 Dollars | Total Awards | Total Dollars |
|---|---|---|---|---|---|---|
| California | 865 | $96,301,391 | 360 | $289,371,231 | 1225 | $385,672,622 |
| Massachusetts | 594 | $66,581,036 | 236 | $175,768,743 | 830 | $242,349,779 |
| Maryland | 237 | $29,948,115 | 88 | $66,635,348 | 325 | $96,583,463 |
| Virginia | 259 | $24,191,280 | 105 | $72,342,311 | 364 | $96,533,591 |
| Colorado | 209 | $20,079,264 | 82 | $60,856,537 | 291 | $80,935,801 |
| New York | 163 | $17,441,077 | 76 | $61,286,167 | 239 | $78,727,244 |
| Ohio | 159 | $16,863,975 | 78 | $57,592,547 | 237 | $74,456,522 |
| Pennsylvania | 147 | $17,202,677 | 78 | $55,829,948 | 225 | $73,032,625 |
| Texas | 208 | $21,764,892 | 68 | $47,942,828 | 276 | $69,707,720 |
| Michigan | 82 | $10,277,460 | 46 | $31,781,909 | 128 | $42,059,369 |
| Florida | 101 | $9,163,942 | 49 | $32,324,831 | 150 | $41,488,773 |
| New Jersey | 141 | $13,132,571 | 40 | $28,007,176 | 181 | $41,139,747 |
| Washington | 89 | $9,545,475 | 43 | $31,263,553 | 132 | $40,809,028 |
| Alabama | 81 | $7,212,544 | 35 | $25,648,505 | 116 | $32,861,049 |
| Connecticut | 72 | $9,008,792 | 31 | $20,592,040 | 103 | $29,600,832 |
| Minnesota | 63 | $6,489,633 | 31 | $20,912,566 | 94 | $27,402,199 |
| Illinois | 60 | $6,127,833 | 30 | $19,905,559 | 90 | $26,033,392 |
| Arizona | 80 | $7,339,777 | 25 | $17,188,809 | 105 | $24,528,586 |
| North Carolina | 62 | $6,740,558 | 19 | $15,417,029 | 81 | $22,157,587 |
| Wisconsin | 37 | $5,640,852 | 24 | $16,309,199 | 61 | $21,950,051 |
| New Hampshire | 50 | $4,494,233 | 23 | $15,935,773 | 73 | $20,430,006 |
| New Mexico | 67 | $6,081,436 | 21 | $14,101,618 | 88 | $20,183,054 |
| Utah | 31 | $3,295,096 | 21 | $13,891,213 | 52 | $17,186,309 |
| Oregon | 47 | $4,931,169 | 18 | $12,096,440 | 65 | $17,027,609 |
| Georgia | 49 | $4,753,866 | 17 | $11,572,025 | 66 | $16,325,891 |
| Indiana | 31 | $3,243,480 | 10 | $7,685,135 | 41 | $10,928,615 |
| South Carolina | 24 | $2,236,141 | 8 | $6,271,957 | 32 | $8,508,098 |
| Tennessee | 27 | $2,533,289 | 8 | $5,850,015 | 35 | $8,383,304 |
| West Virginia | 20 | $1,669,967 | 5 | $6,182,069 | 25 | $7,852,036 |
| Rhode Island | 16 | $1,452,318 | 9 | $6,159,843 | 25 | $7,612,161 |
| Vermont | 14 | $1,785,847 | 6 | $5,048,096 | 20 | $6,833,943 |
| Montana | 19 | $1,750,012 | 9 | $4,867,164 | 28 | $6,617,176 |
| Nevada | 17 | $1,549,441 | 6 | $4,134,104 | 23 | $5,683,545 |
| Iowa | 15 | $2,627,481 | 4 | $2,579,418 | 19 | $5,206,899 |
| District of Columbia | 11 | $1,279,385 | 6 | $3,905,722 | 17 | $5,185,107 |
| Oklahoma | 18 | $2,709,165 | 4 | $1,829,994 | 22 | $4,539,159 |

Dollar amounts reflect actual dollars

Ranking by Total Dollars

U. S. Small Business Administration
Office of Technology
Total SBIR Awards for FY 2003

| State | Number of Phase 1 Awards | Phase 1 Dollars | Number of Phase 2 Awards | Phase 2 Dollars | Total Awards | Total Dollars |
|---|---|---|---|---|---|---|
| Maine | 20 | $1,801,744 | 5 | $2,643,183 | 25 | $4,444,927 |
| Hawaii | 13 | $1,160,769 | 5 | $3,195,984 | 18 | $4,356,753 |
| Missouri | 25 | $2,379,990 | 4 | $1,934,927 | 29 | $4,314,917 |
| Kansas | 16 | $1,537,239 | 5 | $2,752,726 | 21 | $4,289,965 |
| Delaware | 22 | $1,962,757 | 4 | $2,271,846 | 26 | $4,234,603 |
| Idaho | 10 | $769,154 | 4 | $2,252,693 | 14 | $3,021,847 |
| Arkansas | 15 | $1,662,429 | 2 | $998,433 | 17 | $2,660,862 |
| Louisiana | 12 | $962,045 | 2 | $1,411,017 | 14 | $2,373,062 |
| Mississippi | 9 | $865,510 | 3 | $1,477,530 | 12 | $2,343,040 |
| South Dakota | 4 | $369,934 | 4 | $1,728,761 | 8 | $2,098,695 |
| North Dakota | 5 | $451,437 | 3 | $1,500,000 | 8 | $1,951,437 |
| Wyoming | 9 | $1,172,380 | 1 | $729,960 | 10 | $1,902,340 |
| Kentucky | 9 | $1,188,737 | 1 | $500,000 | 10 | $1,688,737 |
| Alaska | 6 | $584,793 | 1 | $750,000 | 7 | $1,334,793 |
| Nebraska | 10 | $950,217 | 1 | $296,000 | 11 | $1,246,217 |
| Puerto Rico | 2 | $150,000 | 0 | $0 | 2 | $150,000 |

Dollar amounts reflect actual dollars

Ranking by Total Dollars