

SMALL BUSINESS INNOVATION DEVELOPMENT ACT *Eighth Year Results*

Office of Innovation,
Research and
Technology

8th Annual Report

July 1991



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U.S. SMALL BUSINESS ADMINISTRATION
WASHINGTON, D.C. 20416



July 1991

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

This report, prepared pursuant to Public Laws 97-219 and 99-443, depicts the eighth year results of the Small Business Innovation Development Act of 1982.

Presented in this report are the progress and accomplishments of the participating federal agencies under the Small Business Innovation Research (SBIR) Program and their achievement of small business goals in Research and Research and Development acquisition. The report also presents Small Business Commercialization information.

During fiscal year 1990 small business concerns received nearly \$460.7 million in obligated funding and successfully competed for 3,183 SBIR awards from the eleven participating agencies. These figures are both significantly greater than fiscal 1989 totals.

We continue to depart from traditional fiscal year reporting for awards. The report includes awards of procurements initiated in FY 1990, but which were made after the close of the fiscal year. This more accurately reflects the program's FY 1990 activity.

Copies of this report have been provided to the Office of Science and Technology Policy, the Office of Federal Procurement Policy and the General Accounting Office. The review and analysis were made by the Office of Innovation, Research and Technology of this Agency.

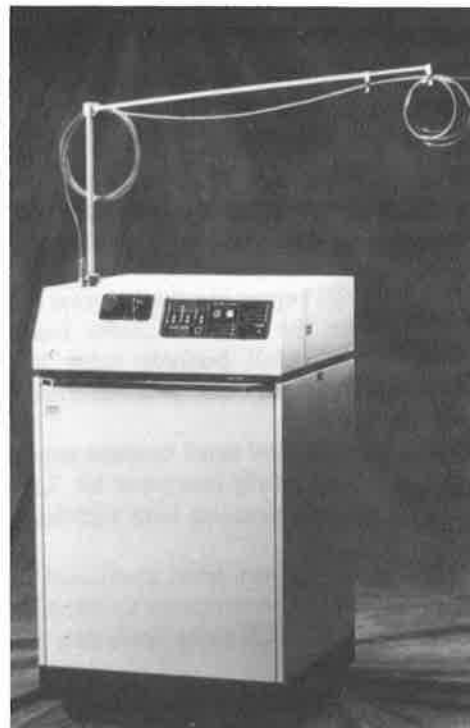
Sincerely,

Richard J. Shane
Assistant Administrator
Office of Innovation, Research
and Technology

◆ New surgical instruments based on laser technology are becoming more numerous and are being used for an ever-widening list of medical procedures. It's forecast that within the next five years, 25 percent of all surgery will utilize laser-based technology and instruments, compared with 5 percent today. Doctors, hospitals, patients and health care enterprises all applaud this trend, which means less time spent in hospital operating rooms and beds, more rapid patient recovery, reduced patient pain and scarring, and lower health care costs.

In a rising number of procedures, the laser-based devices — basically using concentrated streams of light — replace the need for traditional surgery.

The Small Business Innovation Research (SBIR) Program is linked to laser instrument advances largely because of Program awards directed to Candela Laser Corp. of Wayland, MA. The company, a leader in the field of



The Candela MDL 2000 LaserTripter is used to break up kidney stones and to treat gallstones. Candela says this product, developed with the help of an SBIR award, is ideal for mobile services among health care institutions.

laser technology, has won 21 SBIR awards since the Program started — and reports a list of impressive successes. Six of its instruments are being sold today (or will be in the next few months) and several others are in clinical trials (a prelude to commercialization). At the same time, Candela forecasts that 12 products will go to market over the next three years. It's significant to note that all these instruments were developed after the company received an SBIR award to work on specific proposals.

Candela's commercial sales first involved flashlamp excited dye lasers used in the treatment of birthmarks, to break up kidney stones and to treat gallstones. Just released is a laser to treat benign pigmented lesions such as liver or age spots, freckles and cafe au lait birthmarks. Next in line for commercialization is a laser to treat muscular degeneration of eyes and instruments for the treatment of glaucoma. Farther down the

road, Candela envisions its instruments being used, among other things, for treatment of membranes in the eye, for better imaging of the retina, confocal imaging of clouding eyes, precision cutting of bone materials in the head and neck, selective removal of pulp from a tooth's root canal, cure of dental deposit resins, and accurate measurement of cholesterol.

Significantly, the company reports that of the 21 SBIR awards granted for as many proposals, only two had to be abandoned.

Success under the SBIR awards is evident in Candela's financial results: Revenues in the last fiscal year rose 80.2 percent over the previous year, to a record \$32.8 million. Net income was \$5.1 million, compared with a loss in Fiscal 1989. Candela's fastest growth has been overseas, and it expects that trend to continue. Subsidiaries have been set up in Japan, France, Spain and Germany.



The Candela Vascular Lesion Laser offers system simplicity with convenient touch sensitive controls and two standard handpieces.

Candela, of course, is an outstanding example of multiple SBIR award recipients. As other examples in this report illustrate, in the area of research and development success often breeds further success. And in a growing number of cases, award winners use successive proposals to build on original product ideas and technologies.

John T. Pavlic, chief executive officer and president of Candela, says, "The SBIR Program is of immense value to companies like ours. The Program allows us to pursue innovative, yet high-risk projects that we could not financially support otherwise. The true value of this program, ultimately, is that we have been able to develop minimally invasive therapies that improve the quality of life for thousands of patients. Without the SBIR support, these products may never have been developed."



John T. Pavlic, chief executive officer and president of Candela Laser Corp.



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OVERVIEW OF THE SBIR PROGRAM

*SBIR multiple
award winners
recognize
the advisory,
"innovate or stagnate."*



The Small Business Innovation Research (SBIR) Program, which began eight years ago, reflects solid and ever-increasing proof of the innovative abilities and talents of the nation's small hi-tech enterprises and the abilities of such enterprises to move their new products, processes and services out of the laboratory and testing grounds into the private marketplace. The SBIR Program also illustrates the fact that, in many cases, small hi-tech companies could not have turned their ideas into profitable products without the assistance received from the Program.

As this annual report for Fiscal 1990 shows, through Program statistics and stories of awardee successes, an ever-increasing number of SBIR Program participants are succeeding in commercializing their new products, processes and services - and in so doing are helping to boost our nation's competitiveness in world markets and improve our environment and physical well-being. It also is encouraging that an increasing number of small firms headed by minorities are winning SBIR awards and proving their own technical and innovative talents.

In administering and supervising the SBIR Program, the Small Business Administration and its Office of Innovation, Research and Technology continues efforts to encourage more and more small hi-tech enterprises to respond to agency award solicitations. At the same time, it

should be noted that a number of Program participants have won multiple awards - an understandable development in view of their abilities and past successes. Such multiple award winners, along with their fellow small hi-tech managers, recognize the value of the time-old advisory, "innovate or stagnate."

The SBIR Program began in Fiscal 1983. In its eight years, SBIR can list these highlights and accomplishments:

- In response to 104 solicitations, the 11 federal agencies involved in the Program have received 118,776 proposals from small hi-tech firms, resulting in 18,086 awards worth more than \$2.2 billion.
- In Fiscal 1990, 3,183 awards were made, worth \$460.7 million.
- More than 30,000 names and addresses of small firms are now recorded on SBIR's fully automated outreach system mailing list, and thus receive current information on SBIR programs and policies and useful information on agency solicitations for proposals.

The increasing number of commercial sales successes have come in a wide area of technologies and industries - everything from military weapon testing, lubricants, fiber optics and water purification to space, computers and lasers. As noted in previous annual reports, at least one in four small hi-tech firms receiving SBIR awards has



achieved commercial sales success or has good reason to expect that commercialization will be realized.

Thus, the SBIR Program is turning research and development results into new products and processes which help keep America competitive and benefit virtually all of our citizens—and even people abroad.



INTRODUCTION



Congress enacted the Small Business Innovation Development Act (Public Law 97-219) in 1982 to strengthen the role of small, innovative companies in federally-funded research and development and give the nation a stronger base for technical innovation and wider commercialization of the ideas generated in the laboratories, research facilities and factory floors of small hi-tech enterprises.

*In many cases
all that
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The statute, which created the SBIR Program, also was enacted at a time when studies show that small businesses - especially small hi-tech businesses - have been responsible for most of our new products, processes and technologies and are particularly capable of turning research and development into new and helpful products and processes. In many cases, all these small innovators needed was an infusion of SBIR assistance.

This report is the eighth in a series of annual reports pursuant to the Act and reflects, among other things, SBIR Program results and activities during Fiscal 1990 (the year ended Sept. 30, 1990). The report is presented by the Small Business Administration (SBA), which is directed by the Act to set program policy and to monitor, evaluate and report the progress of the SBIR Program.

FINDINGS & PURPOSE OF THE ACT

The President signed the Small Business Innovation Development Act on July 22, 1982. The Act originally was to expire on October 1, 1988, but during Fiscal 1986 Congress enacted legislation extending the law through September 30, 1993. The President signed the extension legislation on October 6, 1986.

In passing the 1982 Act, Congress said it found that technological innovation creates jobs, increases productivity, competition and economic growth, and is a valuable counterforce to inflation and the United States balance of payments deficit.

Congress also said that while small business is the nation's principal source of significant innovations, the vast majority of federally funded research and development had been conducted by large businesses, universities and government laboratories.

Based upon these findings, Congress described four purposes of the Act:

1. To stimulate technological innovation.
2. To use small businesses to meet federal research and development needs.

3. To foster and encourage participation by minority and disadvantaged persons in technological innovation.

4. To increase private sector commercialization innovations derived from federal research and development.

TWO DISTINCT PROGRAMS

The law created two distinct programs and directed that the programs be implemented by SBA. The primary program is the Small Business Innovation Research (SBIR) Program. The secondary program is the Research and Research and Development (R&R&D) Goaling Program.

Under the SBIR Program, each federal agency with an extramural budget for research or research and development in excess of \$100 million for Fiscal 1982, or any fiscal year thereafter, must establish an SBIR Program. The program is funded by setting aside a set percentage of the participating agency's extramural research or research and development contracting dollars during each fiscal year. The maximum set aside is 1.25 percent. Civilian agencies were given four years to reach the 1.25 percent maximum; the Department of Defense was allowed five years.

There were 11 participating federal SBIR agencies during Fiscal 1990:

Department of Agriculture
Department of Commerce
Department of Defense
Department of Education
Department of Energy
Department of Health and Human Services
Department of Transportation
Environmental Protection Agency
National Aeronautics & Space
Administration
National Science Foundation
Nuclear Regulatory Commission

SBIR IS A THREE PHASE PROGRAM

Phase I: Phase I awards average \$50,000 and are made for research projects to evaluate the scientific and technical merit and feasibility of an idea.

Phase II: Phase I projects with the most potential are funded to further develop the proposed idea for one or two years. Most Phase II awards are funded for \$500,000 or less.

Phase III: An innovation is brought to market by private sector investment and support. No SBIR funds may be used in Phase III. When appropriate, Phase III may involve follow-on production contracts with a federal agency for future use by the Federal Government.



In line with a General Accounting Office (GAO) recommendation, SBA now requires participating SBIR federal agencies to submit their annual reports to SBA six months after the close of the fiscal year. Previously, submissions were required three months after the close of the year. This additional reporting time allows participating agencies to report actual obligations rather than estimated obligations.

THE GOALING PROGRAM

The law requires federal agencies with a budget for research or research and development in excess of \$20 million for any fiscal year to establish small business goals for awarding research and research and development (R&R&D) funding agreements to small companies. The annual goal to be set cannot be less than an agency's achievement during the previous fiscal year.

In addition to the 11 SBIR agencies, seven other agencies participate in the goaling program:

Department of the Interior
Department of Justice
Department of the Treasury
Department of Veteran Affairs
Agency for International
Development

Smithsonian Institution
Tennessee Valley Authority

SBA AUTHORITIES AND RESPONSIBILITIES

The law designated SBA as the agency for program implementation, governing policy and monitoring and analysis.

The SBA's authorities and responsibilities are:

1. Developing, coordinating, issuing and updating a Policy Directive for the Federal Government-wide conduct of the SBIR and Goaling Programs.
2. Developing and administering an SBIR Program information and outreach program.
3. Developing and maintaining a mailing list file of interested small business concerns.
4. Developing, coordinating, publishing and disseminating SBIR Pre-Solicitation Announcements.
5. Surveying, monitoring and reporting on agency SBIR Programs.
6. Reporting at least annually to Congress on the two programs and on SBA monitoring activities.



7. Private sector coordination on the commercialization aspects of SBIR innovations.

AGENCY SBIR PROGRAM AUTHORITIES AND RESPONSIBILITIES

The authorities and responsibilities of the participating agencies are to:

1. Determine categories of projects to be in the agency's SBIR Program.
2. Issue SBIR solicitations in accordance with a schedule determined cooperatively with SBA.
3. Receive and evaluate proposals resulting from SBIR solicitations.

4. Select awardees for SBIR funding agreements.

5. Administer an agency's SBIR funding agreements (or delegate such administration to another agency).

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

7. Submit an annual report on the SBIR and Goaling Programs to SBA and the Office of Science and Technology Policy.



SBIR PROGRAM SERVICES



Five basic objectives guide SBA in its provision of the SBIR Program services:

1. Keeping contract award procedures simple and standardized.
2. Keeping paperwork to a minimum.
3. Making special efforts to encourage minority/disadvantaged companies to take part in the SBIR Program.
4. Conducting an on-going national information and outreach campaign.
5. Conformance with the SBIR Policy Directive.

*More
than 2 million
Pre-Solicitation
Announcements
have been
distributed.*

AUTOMATED OUTREACH SYSTEM

SBA, in carrying out a major responsibility, wants to make sure that all interested small businesses are provided with current program and solicitation information and opportunities available in the SBIR Program. Toward this end, SBA has developed a mailing list of those individuals and small firms that have requested to be included. This list was converted to a fully computerized process six years ago.

SBA in the last year worked to improve and update this informational mailing list, to insure the current interest of small firms represented - and thus the accuracy of the listing and also save taxpayer paperwork and mailing costs. The result was that at Fiscal 1990's end, the automated outreach list contained 30,000 names and addresses, a significant reduction from the previous year.

As required by law, the solicitation process minimizes regulatory burdens and mandates timely receipt and review of proposals, peer review, proprietary information guidelines, selection of awardees, data rights retention, title to government property, cost sharing and cost principles.

PRE-SOLICITATION ANNOUNCEMENTS

SBA's SBIR Pre-Solicitation Announcements to small businesses present basic program solicitation information in a succinct and understandable manner. Each publication provides complete information on all quarterly SBIR activity and eliminates the need for small businesses to track the activities of each participating agency.

The Pre-Solicitation Announcements are published and distributed prior to the time of agency solicitations. The announcements provide small businesses with a brief statement of each agency research topic, the opening and closing dates of each solicitation, an estimate of the number of awards to be made under each solicitation, who to contact for a copy of the agency solicitation and a master schedule of agency opening and closing dates.

The response from the public to these Pre-Solicitation Announcements has been excellent.

During Fiscal 1990, SBA published four Pre-Solicitation Announcements. For the eight years of the program, over 2,000,000 announcements have been distributed.



SBIR SEMINARS AND CONFERENCES

During Fiscal 1990, SBA cooperated with numerous organizations that conducted SBIR seminars and conferences. This cooperation included providing information, materials and speakers. SBA field representatives and public and private organizations have become a more significant part of the information dissemination process.

*Foreign
interest in
the SBIR
program grew
even stronger
in Fiscal 1990*

SBA continues to publish a special SBIR Program pamphlet which in addition to providing program information also serves as a mechanism for mailing list development. SBA field offices have been furnished a supply of the pamphlets and will continue to be a primary source of outreach. In order to meet the demand for speakers throughout the country, SBA utilized an audio/visual program which presents a

detailed explanation of the SBIR Program. The audio/visual program is available on video tape.

Another form of outreach used by SBA are briefings to officials of foreign governments. During Fiscal 1990, foreign interest in the SBIR Program grew even stronger and SBA's staff briefed a number of foreign government officials. SBIR-type programs are in place in Europe and the United Kingdom.

In late 1985, the Basic Research in Industrial Technologies for Europe (BRITE) Program was begun by the Directorate General for Science, Research & Development, Commission of the European Communities in Brussels.

In June 1986, the Research & Technology Policy Division, Department of Trade & Industry, London, issued its Innovation Support for Business Applications for Stage I of the Small Firms Merit Award for Research & Technology (SMART) Program. This is a competitive two-stage program which strives to encourage the formation of small firms to develop and market new ideas in selected areas of science and technology.

COMMERCIALIZATION MATCHING SYSTEM

A major goal of the SBIR Program is to bring research and development results to the marketplace.

The SBIR Program therefore not only encourages more research and development, but it also encourages commercialization by offering the possibility of economic reward for innovations successfully marketed by SBIR firms.

At each stage of a small firm's progress through this program, there are policies and incentives to promote research work with commercial potential and to encourage the availability of the completed research in the marketplace.



Recognizing that most small firms with innovative products have difficulty finding the financing required for the final development, manufacture, and marketing of their product, SBA has developed a Commercialization Matching System. The system maintains information on all SBIR awardees including the company name and address, principal investigator, and information about the innovation to be commercialized. The system also includes information on financing sources that have requested inclusion and will provide information on the type of investment opportunities they are seeking.

From this data base, the Commercialization Matching System provides technical abstracts of SBIR projects to possible investors, and provides SBIR firms with information on sources of capital that might consider investing in

their innovations. Matching selections from the data base are made on the basis of technology and industry preferences, geographic preferences, and dollar thresholds. Over 12,000 SBIR projects and nearly 500 capital sources are currently listed in the data base.

In order to provide accurate information to SBIR awardees, the data on sources of capital were updated in Fiscal 1990. Capital sources that no longer have an interest in investing in SBIR companies were deleted.

❖ There has been a steady year-to-year increase in the number of proposals received from small hi-tech enterprises - a trend which illustrates the past award successes and the ever-growing awareness and acceptance of the SBIR Program within the small business community. There also has been a year-to-year increase in the dollar value of awards made.

*Proposal,
award totals
show steady
year-to-year
increases.*

In Fiscal 1990, 22,976 Phase I and Phase II proposals were received and a record 3,183 awards worth a record \$460.7 million were distributed. Since the Program was first implemented, there have been 18,086 awards distributed. The awards were worth more than \$2 billion.

SBIR REPORTING REQUIREMENTS

Beginning with Fiscal 1983, each agency establishing an SBIR Program set aside a set percentage of its extramural R&R&D budget for award to small businesses. Through a phased-in process over a four-year period, civilian agencies were required to increase the percentage of their set asides, from 0.2% in Fiscal 1983 to 1.25% in Fiscal 1986. The Department of Defense was allowed five years to phase in the program and was required to set aside .01% in Fiscal 1983 and reach 1.25% in Fiscal 1987.

Each agency required by Sections 4(f) and 4(h) of Public

Law 97-219 to establish an SBIR Program for Research and Research and Development (R&R&D) was required to report annually to SBA on the number of grant, contract and cooperative agreement awards over \$10,000 and to report the dollar value of all such awards, identifying SBIR awards and comparing the number and amount of such awards with awards to other than small business.

To properly monitor and report on the participating agencies' SBIR Programs, SBA established a reporting base to compare against each agency's budget data. In determining extramural R&R&D obligations as a base for the size of the SBIR Programs, the Act provided a definition of research and development identical to that in the Office of Management and Budget (OMB) Circular A-11 on the "Preparation and Submission of Budget Estimates."

Agencies submit to the National Science Foundation (NSF) breakdowns of their total R&R&D obligations into intramural and extramural R&R&D obligations, which are published in "Federal Funds for Research and Development."

For agencies with SBIR Programs, SBA reviews the NSF data and uses as an extramural base for SBIR that amount determined by the agency to be its extramural budget. A distinction between intramural and extramural is not made for agencies participating in the R&R&D Goaling Program.



SBIR

Program Data

Fiscal Year 1990 SBIR Agency Obligations Summary (Dollars in Thousands)

	DOA	DOC	DOD	DOE	DOT	ED	EPA	HHS	NASA	NRC	NSF	TOTAL
Agency Extramural Budget	\$331,698	73,850	19,241,000	3,124,697	171,473	161,500	277,508	6,689,106	5,227,700	87,674	1,601,500	36,987,706
Agency SBIR Budget	\$4,146	923	240,513	39,059	2,143	2,019	3,469	83,614	65,346	1,096	20,018	462,346
Dollars Obligated	\$4,106	710	240,631	39,397	4,468	2,284	3,235	83,969 ^(a)	61,680	579 ^(b)	19,669 ^(c)	460,728
Percent of SBIR To Extramural Budget	1.24%	.96%	1.25%	1.26%	2.61%	1.41%	1.17%	1.26%	1.18%	.66%	1.23%	1.25%
Deficit/Surplus	-40	-213	+118	+338	+2325	+265	-234	+355	-3,666	-517	-349	-1,618

Fiscal Year 1990 Award Profile (Dollars in Thousands)

	DOA	DOC	DOD	DOE	DOT	ED	EPA	HHS	NASA	NRC	NSF	TOTAL
Total Phase I Awards	32	9	1,140	170	27	30	32	482	249	6	169	2,346
Minority/Disadvantaged Phase I Awards	2	0	141	19	2	2	4	28	29	1	16	244
Total Phase II Awards	13	2	415	66	10	8	11	146	115	2	49	837
Minority/Disadvantaged Phase II Awards	0	1	47	5	2	0	0	8	12	1	5	81
Total Phase I Dollars Awarded (\$)	\$1,576	312	59,558	8,420	1,341	874	1,586	23,507	12,263	299	8,362	118,098
Minority/Disadvantaged Phase I Dollars Awarded (\$)	100	0	7,354	940	100	60	195	1,383	1,436	50	796	12,464
Total Phase II Dollars Awarded	\$2,530	398	181,073	30,977	3,127	1,410	1,649	60,462	49,417	250	11,238	341,836
Minority/Disadvantaged Phase II Dollars Awarded (\$)	\$0	200	17,094	2,467	592	0	0	3,815	5,645	125	1,108	31,046
Average Amount for Phase I Awards (\$)	\$49	35	52	50	50	29	50	49	49	50	49	50

Fiscal Year 1990 SBIR Agency Solicitation Profile

	DOA	DOC	DOD	DOE	DOT	ED	EPA	HHS	NASA	NRC	NSF	TOTAL
Number of Solicitations Released	1	1	2	1	1	1	1	3	1	1	1	14
Number of Research Topics in Solicitations	7	7	1,228	30	32	7	10	674	15	5	26	2,041
Number of Copies Distributed	10,000	5,000	175,000	25,000	17,000	1,600	5,175	26,850	25,000	969	48,000	339,594
Number of Phase I Proposals Received	314	190	12,413	1,172	453	208	434	2,283	2,148	76	1,266	20,957
Number of Phase II Proposals Received	17	9	940	137	24	24	24	401	203	6	193	2,019
Number of Phase I Awards	32	9	1,140	170	27	30	32	482	249	6	169	2,346
Number of Phase II Awards	13	2	415	66	10	8	11	146	115	2	49	837

(a) 970K modifications to non FY 90 Awards

(b) 30K modifications to non FY 90 Awards

(c) 69K in modifications to non FY 90 Awards

Because of the three-year budget cycle in estimating extramural R&R&D obligations, and consequent changes in the SBIR bases, some differences between SBIR required expenditures and actual obligations are to be expected. Because of these obligations and base reporting arrangement, SBA uses a system of deficits and credits for adjusting future years. Thus SBIR agencies proceed on the best

available estimates and ultimately, through adjustments, achieve the percentages specified by law.

SBIR Awards

<i>Fiscal Year</i>	<i>Phase I</i>	<i>Phase II</i>	<i>Totals</i>
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
Total	13,712	4,374	18,086

In awarding Phase II two-year funding agreements, agencies utilize various acquisition methods of obligation and funding. For purposes of consistency in our reporting, the acquisition data in this report reflect only actual obligations during Fiscal 1990.

SBIR AGENCY TOTAL OBLIGATION SUMMARY

During Fiscal 1990, the 11 participating SBIR agencies awarded \$460.7 million through the SBIR Program; the total represented a 6.7% increase over the approximately \$431.7 million obligated in Fiscal 1989. Phase I awards were worth \$118 million in Fiscal 1990; Phase II awards totaled \$342 million. The overall award dollar total includes \$1.1 million in modifications to non-1990 awards.

As in prior years, SBA continues to use a system of deficits and credits to evaluate agency SBIR budgets to actual amounts obligated. At the beginning of each fiscal year, SBA provides each agency with estimates (based upon NSF data) of the agency's extramural and SBIR budget. These estimates change during the year to reflect congressional action on a participating agency's R&R&D budget. Thus to ensure proper implementation, each agency establishes a budget and proceeds during the year on that budget. Adjustments may then be made in the following year.

SOLICITATION PROFILE

Fourteen Phase I SBIR solicitations were released by the 11 participating agencies in Fiscal 1990; HHS released three, DOD two solicitations; the other 9 agencies released one each.

As a result of the solicitations, 20,957 Phase I proposals were received from small businesses. A total of 2,346 Phase I awards were made in Fiscal 1990. Phase I awards represented 11% of proposals received.

During Fiscal 1990, a total of 2,019 Phase II proposals were received and resulted in 837 new awards. The Fiscal 1990 awards represented 41% of all Phase II proposals received.

Minority/disadvantaged-owned firms received 244 Phase I and 81 Phase II awards in Fiscal 1990, which represented



9.4% of all SBIR dollars. Since the program's inception, minority/disadvantaged-owned firms have received 1,981 awards, representing 11.0% of all SBIR awards; the value of these awards totaled \$222 million, representing 9.7% of all dollars awarded.

R&R&D GOALING AGENCIES

During Fiscal 1983 and 1984, agencies required to submit annual R&R&D Goaling reports often submitted inaccurate data or incomplete reports. As a result, the General Accounting Office recommended that SBA change reporting requirements to obtain additional data from reporting agencies; that all agencies be required to submit accurate or revised reports for Fiscal 1983 and 1984, and that SBA change the due dates for R&R&D Goaling reports to ensure that budget data were consistent with data reported to OMB. Consistent with these recommendations, SBA required all R&R&D Goaling agency annual reports to include the following information:

1. Previous fiscal year's total R&R&D obligations.
2. Previous fiscal year's total R&R&D-obligated dollars to small businesses, minority and disadvantaged small businesses and women-owned small businesses under funding agreements, and the percentage to the agency's total R&R&D obligations. (Women-owned small business data are not required by law to be collected by the agencies therefore the data are incomplete.)
3. Current fiscal year's total R&R&D budget.

4. Current fiscal year's total R&R&D small business goal based on the percentage of obligations to small businesses made the previous fiscal year.
5. Current fiscal year achievement of the singular small business R&R&D goal and the dollars obligated through prime funding agreements by categories of small business, minority and disadvantaged small business and women-owned small business.

6. The total number and dollar value of R&R&D awards to small business for contracts, grants, and cooperative agreements over \$10,000 and a comparison of such awards to awards made to non-small businesses for the same categories.

To evaluate the agencies' R&R&D Goaling Program, SBA uses a final budget report from OMB entitled "Conduct of R&D by Agency." This report details the agencies' total R&R&D obligations for the reported fiscal year and provides R&D budget estimates for future years. SBA then computes the agencies' total R&R&D obligations to small business, as reported to SBA, to determine the actual percentage of the R&R&D obligations awarded to small business.

Value of SBIR Awards
(in millions of dollars)

<i>Fiscal Year</i>	<i>Phase I</i>	<i>Phase II</i>	<i>Total</i>
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	284.9	389.1*
89	107.7	321.7	431.9*
90	118.1	341.8	460.7*
Total	\$697.5	\$1,579.1	\$2,282.4**

EST: Fiscal 91 \$450+
 *includes awards modifications
 **includes all previous modifications



As in prior years, there was some difference between each agency's total R&R&D obligations reported to SBA as compared to data reported to OMB. Since SBA uses the

OMB data as an actual base, the agency percent awards to small business may be higher or lower in this report compared to that percentage as reported by the agency to SBA.

In Fiscal 1990, \$2.2 billion was awarded to small business under the R&R&D Goaling Program, representing 3.6% of the total R&D obligations for 18 reporting agencies.

R&R&D awards to minority/disadvantaged-owned firms totaled \$596 million in Fiscal 1990, representing 27% of all agency R&R&D obligations to small businesses.

CUMULATIVE DATA

Since the SBIR Program's start, over \$2.2 billion has been awarded to small businesses; \$222 million was awarded to minority/disadvantaged-owned small businesses.

Each participating agency will continue to award at least the maximum of 1.25% as required by law. Therefore, unless agency R&D budgets significantly increase or decrease, total SBIR dollars obligated in the future are estimated to remain at about the present level.

A total of 13,712 Phase I and 4,374 Phase II awards have been made since the program's beginning. The agencies received 108,256 Phase I proposals and 9,520 Phase II proposals responding to 104 SBIR solicitations. Several participating agencies have allocated more for this program than required by law. Awards have been made to firms in 50 states, Puerto Rico and the District of Columbia. The SBIR Program continues to receive national acceptance and international recognition for quality performance.

SBA requires, through its SBIR Policy Directive, that each participating agency list the number of Phase I awards made within six months, and beyond six months, of the closing date of the agency's solicitation announcement.

Fiscal Year 1990 Phase I Time Frame

Agency	Total FY 90 Phase I Awards	Number Within Six Months of Solicitation Close	Number Over Six Months of Solicitation Close
DOA	32	0	32
DOC	9	0	9
DOD	1,140	892	248
DOE	170	170	0
DOT	27	26	1
ED	30	30	0
EPA	32	0	32
HHS	482	68	414
NASA	249	127	122
NRC	6	6	0
NSF	169	57	112
TOTAL	2,346	1,376	970

*Agency
Research and
Research &
Development
Data*

*(Dollars in
thousands)*

<i>Agency</i>	<i>Agency % Goal FY 90</i>	<i>Total R&D Budget</i>	<i>\$ Goal</i>	<i>Agency Reported \$ To Small Business</i>	<i>% Awarded To Small Business</i>	<i>\$ Awarded To Minority/ Disadvantaged</i>	<i>% Awarded To Minority/ Disadvantaged</i>
DOA	0.0	\$1,086,920	NR	NR	NR	NR	NR
DOC	5.0	424,000	21,200	5,600	1.3	2,000	0.5
DOD	3.5	36,632,000	1,282,000	1,447,000	3.9	323,000	0.9
DOE	1.3	6,464,500	84,039	82,039	1.3	8,990	0.1
DOI	0.0	510,700	1,532	953	0.0	19	0.0
DOT	21.0	242,856	51,000	67,180	28.0	42,659	18.0
ED	1.9	159,800	3,036	1,700	1.1	397	0.0
EPA	7.7	344,800	26,600	29,300	8.5	7,400	2.1
HHS	1.6	7,690,069	123,810	142,762	1.9	25,499	0.3
NASA	8.5	5,568,300	473,300	409,900	7.4	175,600	3.2
NSF	0.9	1,689,500	15,380	19,070	1.1	7,890	0.5
NRC	1.6	87,674	1,403	2,860	3.2	1,082	1.2
AID	5.1	120,400	602	3,500	2.9	0	0.0
DOJ	19.8	37,392	7,404	5,762	15.4	1,301	3.5
DVA	1.4	237,694	345	968	0.4	99	0.0
SI	0.4	84,000	336	375	0.4	0	0.0
TR	19.8	27,922	5,533	4,390	15.7	0	0.0
TVA	NR	NR	NR	NR	NR	NR	NR
Total		61,408,527	2,097,520	2,223,359	3.6	595,936	0.9

NR - Not Reported

Research and
Research &
Development
Goaling
Program Data

Agency	SMALL BUSINESS						NON-SMALL BUSINESS					
	Number of Contracts Awarded	Dollar Amount of Contracts	Number of Grants Awarded	Dollar Amount of Grants	Number of Co-op Agreements	Dollar Amount of Co-op	Number of Contracts Awarded	Dollar Amount of Contracts	Number of Grants Awarded	Dollar Amount of Grants	Number of Co-op Agreements	Dollar Amount of Co-op
DOA	11	265	45	4,106	18	491	27	13,322	1,129	317,780	492	31,241
DOC	120	5,593	3	180	1	235	60	6,041	600	142,000	31,241	4
DOD	8,191	1,687,000	NU	NU	235	NU	21,265	19,241,000	NU	NU	4,800	NU
DOE	153	95,067	NR	NR	NU	NR	621	6,464,500	84	NR	NR	NU
DOI	35	953	NR	NR	NR	NR	84	3,879	NR	NR	NR	NR
DOT	556	50,309	NR	NR	0	0	466	26,595	19	12,563	7	686
ED	71	7,905	NR	NR	NR	NR	223	38,073	752	138,805	NR	NR
EPA	247	29,300	NR	NR	NR	NR	395	83,100	NR	NR	NR	NR
HHS	717	145,082	150	22,100	14	4,486	1,932	420,577	29,168	6,995,830	NR	2,023
NASA	1,800	471,500	NR	NR	NR	NR	2,360	4,729,100	3,483	299,700	561	68,100
NSF	171	13,920	318	24,820	NU	NU	102	112,020	15,823	1,421,000	NU	NU
NRC	24	3,387	NR	NR	NR	NR	27	9,067	11	593	NR	NR
AID	NR	NR	NR	NR	NR	NR	140	81,300	NR	NR	NR	NR
DOJ	44	3,351	15	2,161	1	250	64	11,217	103	10,850	15	7,007
DVA	8	968	NR	NR	NR	NR	9	959	NR	NR	NR	NR
SI	9	375	0	0	0	0	0	0	0	0	0	0
TR	20	4,390	NU	NU	NU	NU	28	1,389	NU	NU	NU	NU
TVA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

NR = Not reported

NU = Not used by reporting agency



*A
healthy
level of
commercialization
is taking place.*



Almost one in four SBIR Program participants report successful commercialization of projects six years after receiving Phase II funding, an SBA survey shows. In summary, the ongoing survey, which

began three years ago, shows a healthy level of commercialization — the basic aim of the Program. But the survey also shows that commercialization often takes some time.

The SBA study, which at the end of Fiscal 1990 involved 1,315 surveys, showed that 12 percent of the small hi-tech companies reported

commercial successes four years after receiving their Phase II funding. That percentage rose to 18 percent five years after Phase II funding and to 23 percent six years after Phase II funding.

The survey also turned up another encouraging statistic: The companies surveyed experienced a 50 percent growth from the time of their Phase I award to four years after their Phase II award.

Company growth and commercialization success are illustrated in the profiles of successful SBIR Program participants in this section of the report.

During the initial SBA survey, 834 Phase II projects were studied from awards made in Fiscal 1984, 1985 and 1986. Follow-up surveys taken during the last two fiscal years brought the total to 1,315. The survey, done by telephone, was targeted at determining the commercialization progress for each project and at identifying factors related to successful commercialization. The telephone format allowed the interviewers to ask challenging follow-up questions designed to maximize response accuracy. The amount of commercialization, the SBA study again found, varies with federal agency. As in past years, the Department of Health and Human Services shows the greatest commercialization success reported by companies five years after their Phase II award — 35 percent. The success rates for other agencies:

- Department of Energy — 20 percent
- National Science Foundation — 17 percent
- National Aeronautics & Space Administration — 15 percent
- Department of Defense — 14 percent

The survey also showed that companies achieving commercial success are more likely to:

- Be oriented towards product development rather than research and development.
- Be oriented towards private markets rather than government markets.
- Produce products rather than services.



- Be knowledgeable about the need for legal protection (usually patents).
- Target their products towards smaller, more realistic markets.
- Target their SBIR products towards private markets rather than government markets.
- Seek and obtain outside capital when needed.
- Implement partnership agreements when needed.
- Obtain technical support from subcontractors on SBIR efforts.
- Prepare a solid marketing/business plan.

When all data have been assembled, SBA plans to officially publish its SBIR survey results. In the meantime,

the results discussed here are subject to review.

The profiles of unusually successful SBIR Program participants on the following pages and on the opening pages of this report (the profile of Candela Laser Corp.) represent companies in an unusually wide variety of industries. These profiles also illustrate the fact that a number of participants have won numerous awards; this is to be expected because the Program is now eight years old and because of the accepted business adage that success breeds success. The profiles also suggest that the commercialization of SBIR-funded technology is a priority for multiple award recipients.



Electro-Optek Corp. Torrance, CA.



Electro-Optek today is commercializing a number of sophisticated new products developed under 25 SBIR awards from the Defense Department, NASA and the National Science Foundation.

Its most dramatic project, called the Dynamic Infrared Scene Projector, is involved with the proven accuracy of high-tech weaponry that successfully and dramatically sought out targets in the Persian Gulf war. Electro-Optek's Dynamic Infrared Scene Projector simulates a variety of mission conditions which missile seekers face while homing toward their targets. The projector generates a wide variety of complex environments, including severe weather, decoy and night-time conditions. Electro-Optek's use of microchip and computer technologies allow these tests to be conducted at a small fraction of the costs involved in actual field tests.

The company now is developing projector systems for a number of customers, including federal test and evaluation facilities, missile manufacturers, aerospace and defense companies involved in surveillance satellites and weapons systems, and NASA, where Electro-Optek sees a use for its projector systems in development of space-based telescopes and interplanetary sensors. The company also is talking with industrial companies that could use the projector systems to develop imaging systems for pollution, medical diagnostics and production control.

The SBIR programs have allowed Electro-Optek to expand from 5 to 35 employees and have generated 60 percent of revenues.

William S. Chan, president of Electro-Optek, says that "we view our SBIR programs as lifelines of our high-tech business, for they afforded us the only chance to innovate and create business at the same time. I view the SBIR program as one of the most important pieces of legislation that Congress enacted in the 1980s. It has deliberately invested in this country for the long haul, by harnessing the energy as well as the innovative and entrepreneurial spirit of small businesses and individuals."

Cell Analysis Systems, Inc. Elmhurst, IL.



Cell Analysis Systems (CAS), thanks to SBIR awards from the Department of Health and Human Services, developed and now successfully markets an image analysis workstation designed for use in cancer prognosis.

The techniques employed in the CAS product are based on high resolution digital imaging technology. The image analysis system employs a conventional light microscope, a multi-colored solid state camera and the efficiency of a digital computer to provide high speed, high resolution digital image processing of cells and tissues. To



supplement the system, CAS offers easy-to-use computer software designed for specific biological applications, including quantitative ploidy analysis to analyze different types of cancers (prostate, breast, colon and cervical), estrogen and progesterone receptor assay, quantification of oncogene products, and a quantitative proliferation index.

CAS has sold more than 200 of its image analysis systems, almost half of them overseas. (The system's hardware costs about \$50,000 and each software package costs about \$6,000.) So far, most sales have been to pathologists; the company is targeting future sales to oncologists, surgeons and urologists.

CAS has established its own laboratory to do image analysis testing for smaller hospitals which might not be able to afford to buy the equipment. The company also sells reagent kits used for staining examination slides and provides training and technical assistance on the systems. CAS, in bringing its SBIR-assisted products to market and thus fulfilling a basic Program goal, has obtained funding from venture capitalists and from Becton-Dickinson, a large drug and medical corporation.

When CAS received its first SBIR award eight years ago, Dr. James Bacus, now CAS president, was working as a lone researcher. Today, the company has 36 employees. As the company's reports say, "CAS has made successful use of the SBIR Program in the development of its business."

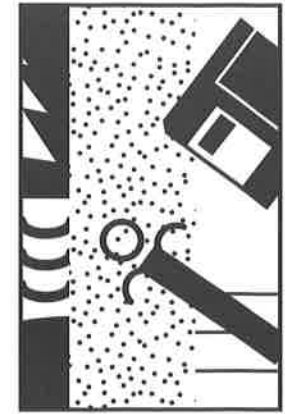
GEO-Centers, Inc.

Newton Centre, MA.

★ GEO-Centers, Inc. has won more than 40 SBIR awards from the Defense Department and NASA. About half of the awards have gone to the company's Sensor Systems Group (SSG), which as a result of SBIR assistance has developed four different optical sensing systems now being successfully sold to both the government and private industry.

In its pursuit of SBIR awards, the company has applied a unique central strategy: Focus on specific technical areas and build upon work already accomplished. As GEO-Centers describes this strategy, "if SSG performs on an SBIR program for the Army, the Army benefits from previous work underway on a program for the Navy... Work is never duplicated, yet the state-of-the-art is constantly pushed and spinoff applications are pursued. In fact, because of the leveraging of work performed on several programs, ongoing programs run more efficiently and more cost-effectively. Results are shared among government clients, and common programs among the military services are enhanced."

One of the company's commercially successful sensor systems, the fiber optic voltage sensing system, measures voltage over a broad range, while protecting personnel and equipment from dangerous voltages and currents. The fiber optic air blast (pressure) sensing system, which has been sold to the Air Force, is electrically passive, allowing direct contact with explosives. The firm's fiber optic



electric field sensors measure electric field strength in harsh environments. And a distributed sensor system uses time domain reflectometry techniques to interrogate an array of fiber optic sensors distributed along a single optical fiber bundle.

Also under development, says Mary Beth Tabacco, GEO-Centers' senior scientist, "are several other very promising and complementary sensor types, many of which had their inception through the SBIR Program."

Zetek, Inc.

Aurora, CO

With SBIR funding from the Department of Health and Human Services, Zetek, Inc. has developed a unique product used in the treatment of infertility. Zetek's CUE Ovulation Predictor, which has been approved by the Food and Drug Administration (FDA), predicts a woman's ovulation a week in advance and confirms ovulation that day that it takes place. Used in the home, CUE can be obtained directly from Zetek or from a woman's physician.

CUE's ability to predict ovulation a week in advance is the product's most unique feature. CUE monitors the electrical characteristics of a woman's saliva and vaginal mucus by tracking changes in their concentrations of electrolytes. The electrolyte constituents of these fluids change cyclically in relation to concentrations of reproductive hormones in a woman's body. CUE provides

a more convenient ovulation test than others now in use and replaces serum and urine testing, follicular ultrasound scanning, basal body temperature testing, symptomatic methods and the calendar method of identifying the fertile phase of the menstrual cycle.

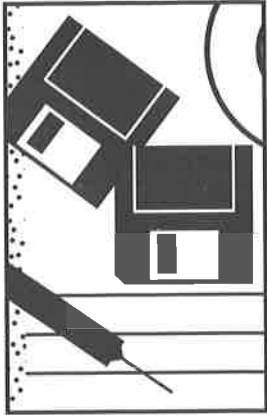
About 1,000 CUE units, with a sales value of about \$500,000, have been sold by Zetek in the U. S. and abroad. Zetek reports considerable investments in production equipment and marketing for its product. A distribution agreement was signed recently with a Japanese firm to market CUE in the Far East.

Zetek President Paul Regas says that "the SBIR Program has benefitted our company by providing funds for the basic research that proved our theory about this new testing method. No other researchers had ever looked for a predictive event so early in a woman's cycle. Therefore, much fundamental research was required to gain even limited acceptance by the medical community. Without the SBIR funding, I seriously doubt that the CUE Ovulation Predictor would be as advanced as it is today."

Electrosynthesis Company, Inc.

East Amherst, NY.

The Federal Clean Air Act requires that factories and other installations reduce emissions from a number of polluting sources. Conventional emission control technologies to achieve legally low toxic levels can be expensive. Enter the



Electrosynthesis Company, which has received 10 SBIR awards from the Defense Department and the National Science Foundation.

Electrosynthesis, using SBIR awards from the Defense Department, has introduced a technology that converts major pollutants to harmless gases, rather than merely concentrating them for disposal. The Electrocinerator System™ is a novel, low-cost air purification device that destroys airborne pollutants, including toxic chemicals, odors and biological substances, at ambient temperatures.

The system incorporates an efficient scrubber, an electrochemical cell and an aqueous solution which circulates between the scrubber and the cell. Most of the pollutant destruction occurs in the aqueous solution; the cell serves to regenerate the active oxidizing components in the solution and to complete the pollution degradation. Organic pollutants like phenol and formaldehyde are converted to carbon dioxide and water.

Thus in many respects, the Electrocinerator System behaves like an incinerator but without flames and with greater control.

The potential U. S. sales market for air purification devices is estimated in the \$25 billion to \$50 billion range. Electrosynthesis' system is aimed at a \$1 billion segment of the overall market, including use as an air purifier in paint spray booths, sewage treatment and plant compost odor control, ethanol emission control from bakeries, destruction of VOCs from polluted ground water and

indoor applications in hospitals, office buildings and even in homes.

To market the system, Electrosynthesis last year formed a new company, Electrocinerator Technologies. Financing came from Electrosynthesis and a group of private investors.

Hannah R. Weinberg, Electrosynthesis vice president, says, "The SBIR Program helped get our Electrocinerator System off the ground by providing the initial high-risk funding (as a four-person company at the time of the award we could not have funded this work). New York State provided matching funds to our Phase I SBIR award for hospital applications and we came to the attention of many companies through publication of the SBIR abstract filed with our award proposal."

Paravant Computer Systems West Melbourne, FL.

★ Hand-held and laptop computers used by military troops are increasingly important elements in today's technical battlefields. This was proved during Operation Desert Shield and the Persian Gulf War, where computers were successfully used in a number of tactical military applications.

And it was in the Persian Gulf that small computers produced by Paravant Computer Systems — computers developed through SBIR funding from the Department of Defense — were employed by the Marine Expeditionary

Force to provide 24-hour targeting assistance for the Stinger missile. Paravant's computers, each about the size of a hard cover book, worked even after being buried for weeks under Saudi Arabia's unforgiving sands.

Paravant's computers were developed originally as ruggedized machines for administering performance assessment batteries during military training exercises. In the Persian Gulf, the small computers were utilized to provide radar information to remotely located troops for tracking, acquiring and launching surface-to-air missiles. In addition to the Marines, other branches of the military forces employ Paravant's computers for online equipment maintenance and downloading data from aircraft avionics.

Paravant's computers are not only small; they are tough and designed to meet strict temperature, humidity, shock resistance and sand resistance standards. One Paravant computer was tossed into a pond; it kept on working. The company's computers operate on the MS-DOS system and provide long service without a battery charge.

Paravant's sales totaled about \$5 million in the firm's last fiscal year, and are expected to double this year. About 60 percent of sales are to the military, and 40 percent to commercial customers. The State of Florida uses Paravant machines in land surveys. Other customers include Teledyne, Martin Marietta, Raytheon and Weyerhaeuser, the large timber and paper corporation which is interested in supplying its field staff with hand-held computers to better manage tree harvesting.

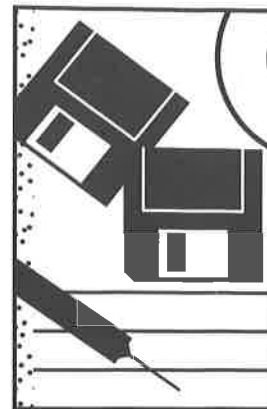
Paravant, which recently was acquired by Universal Energy Systems of Dayton, OH (another SBIR participant), credits the SBIR Program for all its success. "We would not be here today without this shot in the arm from SBIR," says Paravant Vice President Ronald Simmons. "The SBIR Program changed Paravant from an R&D company to a product company."

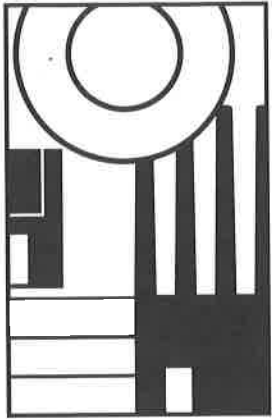
Martek Corp. *Columbia, MD.*



While homeowners scrub hard to eliminate the algae in their bird baths and backyard ponds, Martek Corp. grows algae and then seeks to identify commercial uses for some of the 70,000 algae species. With 20 SBIR awards from the Departments of Energy and Health and Human Services and the National Science Foundation, Martek is an example of a program participant whose original projects fell short of expectations but later resulted in related technology with commercial potential and success.

One Martek project, on biodeuterated lubricants, involved growing oil-producing microalgae in tanks of heavy water, so that all hydrogen atoms in the oil produced would be replaced by deuterium. This oil had 10 times the life expectancy of regular oils and could be used at higher temperatures, but Martek's oils were 10 times as costly as conventional lubricants. Potential customers balked at these costs. But the upshot of the basic technologies involved in this work led Martek into a new area — stable isotopically labeled biochemicals (not limited to lubricants)





and commercially successful new products. Martek's sales in this area now exceed \$100,000 a month.

Martek faced a parallel situation when it used algae to produce poly-unsaturated fatty acids which could be used as an alternative to fish oils. The bioactive components in fish oils are known to be responsible for the reduced incidence of coronary vascular disease in fish-eating populations (for example, Eskimos and the Japanese).

Martek's oil was highly enriched in the bioactive ingredient, but again higher costs worked against successful marketing. Martek, not discouraged, used alternative algae-growing methods and isolated a cell line that produced a different fatty acid — docosahexaenoic acid (DHA) — that is the primary structural component in brain tissue and retinas of the eye. Human breast milk, for example, is rich in DHA. No present infant formulas contain supplemental DHA, and so Martek has started talks with several infant formula manufacturers on proposals to market the firm's DHA additive (called Formulaid).

David Kyle, Martek's research director, says that "not all SBIR projects result in immediate success or commercialization of the initial proposal or idea. After all, the program is intended to fund research that is too risky for the private sector to underwrite." Then he adds, "It is highly unlikely that Martek would exist today if it were not for the SBIR Program."

OPTRA, Inc. Beverly, MA.



OPTRA, Inc. specializes in the use of laser technology for optical metrology, the non-contact measurement of things like strain, rotation, temperatures and currents. OPTRA, which has won more than 40 awards from five federal agencies (the Departments of Defense, Energy and Health and Human Services; NASA and the National Science Foundation), is successfully marketing several products developed as a result of SBIR assistance.

The firm's Laser Extensometer, which already has been cited as winner of the Photonics Circle of Excellence Award and as one of the 100 most significant technical products introduced last year, is an electro-optical instrument used by material scientists to measure the strength properties of materials. The Extensometer, unlike other measurement devices used for similar tasks, is not attached on the sample being tested, making it particularly useful when ceramics and other types of new and unusual materials are involved. Use of this OPTRA product gives researchers the information needed to properly design mechanical parts of sufficient strength for an intended task. OPTRA President James R. Engel says sales of the Laser Extensometer have been "brisk during the first year."

Another OPTRA product developed as a result of SBIR awards is the Nanoscale Position Sensor, an electro-optical

sensor which has applications in areas where motion and position must be determined to very high precision and accuracy. This sensor has broad applications in semiconductor manufacturing and in high-precision machining. OPTRA's Nanoscale Position Sensor's small size and relatively low cost make it unique compared to laser-based systems costing considerably more. The company has placed a Nanoscale device at a beta site and says that initial reactions to the sensor have been very encouraging.

Mr. Engel says that "the SBIR Program has been particularly beneficial to OPTRA by providing an outlet of the technology to a wide variety of commercial and government users. What this has allowed at OPTRA is the realization of a commercial revenue stream."

Photo-Catalytics, Inc. *Boulder, CO.*



Thanks to Photo-Catalytics, America's astronauts can be assured of enough clean drinking water while on their space missions. Supported by an SBIR award from the National Aeronautics and Space Administration (NASA), the company successfully developed a system that demonstrates the feasibility for turning space shuttle wastewater into potable drinking supplies. Now with new SBIR awards from the Environmental Protection Agency (EPA), Photo-

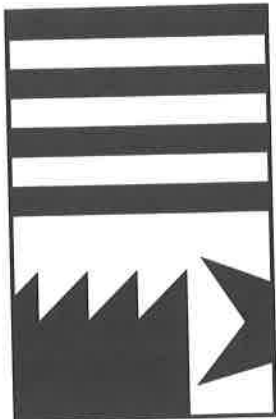
Catalytics is well on its way to applying its technology to practical applications on earth, where environmental regulations are making disposal and purification of industrial waste water ever more costly.

Photo-Catalytics' key to purifying space shuttle wastewater is a metal oxide powder that reacts with ultra-violet light, creating electrical charges that cause the breakdown of organic pollutants into carbon dioxide. The basic process is called photocatalysis, in which inexpensive, recyclable, non-toxic and chemically stable semiconductor powders are dispersed into waters polluted with organic compounds.

An important feature of the firm's technology is that it can be driven by solar or artificial ultra-violet light. Photo-Catalytics has developed a system that allows using only solar energy and air to economically purify water contaminated by the worst carcinogens and mutagens (such as pesticides, chlorinated solvents, benzene and toluene). Because the contaminants are destroyed instead of being transferred to a different medium, Photo-Catalytics' techniques are ideal for large-scale cleanup of contaminated water.

Photo-Catalytics, thanks in large part to its SBIR awards from EPA, already has economically purified some of industry's most-difficult-to-treat wastewaters. The firm's system has been demonstrated in Mexico and is being considered as a wastewater treatment in that country. A related system is being tested at a biotechnology company for the provision of ultra pure process water.





Gerald Cooper, president of Photo-Catalytics, recalls that after much research and even after receipt of a patent for his water purification system, "the SBIR Program was the only avenue left to demonstrate the practicality of this new technology . . . I am completely supportive of the continuation of the SBIR Program. There are few alternatives that provide the R&D money to fuel this country's entrepreneurial spirit."

Knowledge Access International Mountain View, CA.

★ Knowledge Access International, which manufactures indexing and retrieval computer software for compact disc-read only memory (CD-ROM) and magnetic disk information systems, already has commercialized two of its innovations as a result of three SBIR awards from the Department of Health and Human Services.

The firm's KAware Disk Publisher and KAware2 Retrieval System enable users in government offices, corporations and publishing houses to save information distribution costs. Printed reports, technical documents, repair manuals and journals are costly to print and costly to mail. KAware Disk Publisher allows the information to be organized on optical or magnetic discs, which can hold

millions of words and pieces of information, and which, compared with traditional printed materials, are inexpensive to produce and mail. KAware2 Retrieval System allows users to easily, quickly and inexpensively access information contained on the optical or magnetic discs.

Both of Knowledge Access International's products have been chosen by the Government Printing Office for use in helping federal agencies create CD-ROM files. The World Bank awarded a large contract to Knowledge Access International to transfer more than 5,000 agricultural research documents onto CD-ROM discs, so the stored information can be distributed world-wide. In addition, hundreds of other government agencies, corporations and publishers are using the firm's two products.

Matilda Butler, president of Knowledge Access International, says that "the SBIR Program enabled us to enhance our products, to better address different types of information and different types of users. The SBIR Program benefited our company by providing financial strength and by giving us the ability to recruit excellent employees." She also has said that "the SBIR Program can lead to major cost savings in the government, can lead to new technologies and to increased employment. Innovation is needed now more than ever before."

Technical Solutions, Inc.
Mesilla Park, NM.

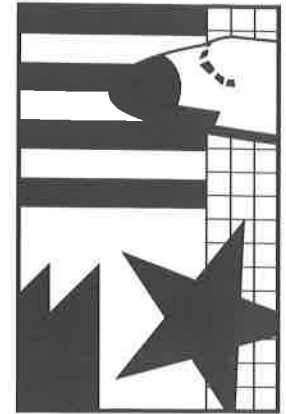
★ Technical Solutions, Inc. (TSI), which has received 11 SBIR awards from the Defense Department, is convinced that multiple awards enable an enterprise (such as TSI) to develop an internal technology base necessary to develop solutions and then commercialize its products. The firm says that often an individual SBIR award can be used to address only a part of a complex problem. Multiple SBIR awards, coupled with internal R&D, the firm feels, are then necessary to achieve a level of technology resulting in a product.

TSI says that one Army SBIR award project, titled "Contour Description for Machine Vision," provided a method to compress fingerprint imagery beyond previous methods and then resulted in development and delivery of a system to a major vendor of automatic fingerprint identification systems. The research involved in the fingerprint imagery project led to another SBIR award, whose objective involved providing intelligent tracking systems to DoD. TSI research on this project led to delivery of a measurement tool for micron-level non-

contact measurement of weld seams in military jet engine fabrication. These efforts provided the technology base that allowed TSI to build a custom product, VisionMate, which has already generated \$2 million in sales.

Another Army SBIR award to TSI involved the integration of segmented, complex functions into a cooperating system, independent of the means used in networking the functions together. Work on this basic system has resulted in an application involving the integration of disparate functions provided by multiple contractors into a cooperating weapons platform; further work on this project is being funded under an SBIR Phase III (commercialization) operation by the Army's Armament R&D and Engineering Center. Another Phase II-funded effort, which has received strong interest for a Phase III program by the Army Human Engineering Laboratory, involves TSI's work on simulating the control and deployment of multiple robotics platforms.

According to TSI's Dr. Alton Gilbert, "the SBIR Program has probably been the single most important factor in the growth of TSI. The program has directly contributed to a growth from approximately 6 to 35 employees in a period of six years."





MicroGeneSys, Inc.
Meriden, CT.



One of the more promising experimental vaccines being tested for AIDS has been successful in triggering the creation of cells that attack HIV-1, the immunodeficiency virus that causes AIDS in humans. The fundamental technology behind the genetically-engineered vaccine was developed by MicroGeneSys, which was greatly assisted by SBIR awards from the Departments of Defense and Agriculture.

MicroGeneSys first used SBIR funding to demonstrate the feasibility of producing vaccines utilizing the company's novel gene expression system based on insect viruses (baculoviruses). The company then applied its technology to produce candidate vaccines for Japanese encephalitis and Dengue fever; such vaccines have been effective in animal models.

MicroGeneSys' vaccine technology contributed to development of the firm's VaxSyn HIV-1 AIDS vaccine. VaxSyn HIV-1 was the first AIDS vaccine approved by the Food and Drug Administration (FDA) for testing on

humans and the first pharmaceutical product to be produced for clinical trials using a baculovirus expression system. Trials began with HIV-negative (non-infected) volunteers; additional studies now are using this vaccine as immunotherapy for HIV-positive individuals.

MicroGeneSys has broadened its vaccine portfolio to include a second AIDS vaccine and a malarial vaccine; both are currently in clinical trials. Preliminary results from those clinical trials indicate that the MicroGeneSys vaccine is safe in humans. The results also support the use of baculoviruses for vaccine production. MicroGeneSys has entered into an agreement with American Home Products Corp., a major drug company, to assist in winning regulatory approval and to co-market the VaxSyn HIV-1 AIDS vaccine.

MicroGeneSys is an excellent example of how the SBIR Program is being used to fund basic technology during a company's early growth and then having that technology serve as a basis for future developments and product commercialization.



DISTRIBUTION OF SBIR AWARDS



The maps on the following pages show the distributions of Fiscal 1990 SBIR awards (Phase I plus Phase II) by state.

For a more detailed look at the geographical distribution of SBIR awards, the amount of funding by metropolitan area (as defined by the Census Bureau) is shown in Exhibit 1. The metropolitan areas are listed in order of their population in millions (column 1). The next two columns show the SBIR funding (Phase I plus Phase II) for Fiscal 1990 and for the program to date. A per capita funding rate is calculated by dividing the cumulative SBIR dollars by the population in millions. The last two columns show the running cumulative total and the cumulative percentage.

*\$130 million
in awards went to towns
with under 125,000
populations.*

The metropolitan areas with the largest growth rates in SBIR awards are shown above (to avoid distortions, only those areas awarded at least \$1 million in Fiscal 1990 are shown):

Funding

<i>Metro Areas</i>	<i>FY 90 as a % of FY 83-90</i>
Chattanooga, TN-GA	62%
Binghamton, NY	59%
Waterbury, CT	53%
New London - Norwich, CT	44%
Middlesex - Somerset - Huntington, NJ	43%
Salem, OR	43%
Norfolk - Virginia Beach, VA	40%
Allentown-Bethlehem, PA-NJ	40%
Burlington, VT	38%
Tampa - St. Petersburg Clearwater, FL	36%

As reported last year, most SBIR awards in past years and also in Fiscal 1990 go to large metropolitan areas. However, small towns and rural settings are by no means excluded from the SBIR program. Nearly \$130



million has been awarded to communities with populations under 125,000. In Fiscal 1990 the following areas received their first SBIR awards: Iron Mountain, MI; Carrizozo, NM; Worland, WY; and Carbondale, IL.

The metropolitan areas were also ranked by total SBIR funding, Fiscal 1983-90. The top 50 areas are shown in Exhibit 2. Large metropolitan areas dominate the ranking: 18 of the first 25 have over one million population. The ranking is not very different from last year. The biggest gains were rendered by Waterbury, CT (from 47th place to 36th place), Middlesex - Somerset - Huntington, NJ (41 to 34); Norfolk - Virginia Beach (51 to 45); Orlando, FL (32 to 28) and San Antonio, TX (50 to 46).

Lastly, the metropolitan areas were ranked by total dollars per capita. Now the ranking is dominated by smaller areas; 15 of the first 25 have populations under 500,000. Many of the newcomers to this list are communities with major universities: Bryan-College Station, TX; Charlottesville, VA; State College, PA; Athens, GA; and Fayetteville-Springdale, AR.

Technology investment policies followed by SBIR participating agencies are reflected in the amount of

funding for awards made in various technology areas. Those areas are described and listed in Exhibit 4.

Exhibit 5 summarizes, by participating agency, the dollar amount of Fiscal 1990 funding made in each technology area. The accompanying graph in Exhibit 6 illustrates the Fiscal 1990 technology distribution for all agencies combined. Exhibits 7 and 8 show corresponding distributions for the entire program to date—that is, Fiscal 1983-1990.

In Fiscal 1990, four technology areas continued receiving the most SBIR funding: Optical Devices/Lasers, Information Processing, Biotechnology/Microbiology, and Advanced Materials. With nearly \$60 million in Fiscal 1990 funding the Optical Devices/Lasers area has become the leading technology area for the first time. While funding in laser technology remains strong, there has been increased attention to optoelectronics, infrared sensors, and fiber optic sensors.

With regard to the cumulative funding in Exhibit 7, Information Processing remains the leading technology area, but the gap between it and Optical Devices/Lasers has been cut in half.

GEOGRAPHIC DISTRIBUTION

*Fiscal 1990 Phase I
and Phase II Awards (Number and Dollar Value)*



GEOGRAPHIC DISTRIBUTION

Fiscal 1990 Phase I and Phase II Awards to Minority Companies (Number and Dollar Value)



*Distribution of
SBIR Funding
by Metropolitan
Areas*

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*	Cum \$	Cum %
NEW YORK AREA	15.529	13051	66722	4297	66722	3.0%
LOS ANGELES AREA	13.075	43663	213068	16296	279790	12.6%
CHICAGO-LAKE COUNTY	7.381	6470	29404	3984	309194	14.0%
PHILADELPHIA AREA	5.697	15518	80417	14115	389611	17.6%
BAY AREA (SF)	5.534	41760	206012	37225	595623	26.9%
DETROIT-ANN ARBOR,MI	4.601	4404	28663	6230	624286	28.2%
BOSTON AREA	4.056	68607	322375	79487	946661	42.8%
DALLAS-FT. WORTH AREA	3.655	2701	19093	5223	965754	43.7%
HOUSTON,GALVESTON,TX	3.634	4353	17032	4686	982786	44.4%
WASHINGTON,DC-MD-VA	3.565	28505	186833	52408	1169619	52.9%
MIAMI-FT.LAUDERDALE,FL	2.912	961	2933	1007	1172552	53.0%
CLEVELAND-AKRON AREA	2.766	2085	8044	2909	1180596	53.4%
ATLANTA,GA	2.561	1616	12494	4880	1193090	53.9%
ST LOUIS,MO-IL	2.438	724	4400	1805	1197490	54.1%
PITTSBURGH-BEAVER VALLEY,PA	2.316	2460	16963	7324	1214453	54.9%
MINNEAPOLIS-ST PAUL,MN-WI	2.295	7469	27371	11925	1241824	56.1%
SEATTLE-TACOMA AREA	2.284	8735	51430	22514	1293254	58.5%
BALTIMORE,MD	2.280	5729	29616	12989	1322870	59.8%
SAN DIEGO,CA	2.201	19826	102808	46703	1425678	64.4%
TAMPA-ST PETE-CLEARWATER,FL	1.914	1045	2890	1510	1428568	64.6%
PHOENIX,AZ	1.900	2511	10651	5605	1439219	65.1%
DENVER-BOULDER-LONGMONT,CO	1.847	9529	56246	30446	1495465	67.6%
CINCINNATI AREA, OH,KY,IN	1.690	792	3094	1831	1498559	67.7%
MILWAUKEE-RACINE,WI	1.552	326	2774	1787	1501333	67.9%
KANSAS CITY,MO-KS	1.518	0	1821	1200	1503154	67.9%
NEW ORLEANS ,LA	1.334	1110	4399	3297	1507553	68.1%
NORFOLK-VA BEACH AREA,VA	1.310	2969	7356	5617	1514909	68.5%
COLUMBUS,OH	1.299	2013	13029	10027	1527938	69.1%
SACRAMENTO,CA	1.291	1247	6523	5051	1534461	69.4%

*Per capita rate is obtained by dividing by the population in millions

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*	Cum \$	Cum %
SAN ANTONIO,TX	1.276	2192	6704	5252	1541165	69.7%
INDIANAPOLIS,IN	1.213	149	2329	1921	1543494	69.8%
BUFFALO-NIAGARA AREA	1.182	5441	18469	15631	1561963	70.6%
JACKSONVILLE-DAYTONA,FL	1.174	0	915	780	1562878	70.6%
PORTLAND ,OR	1.153	892	4358	3780	1567236	70.8%
PROVIDENCE AREA,RI,MA	1.108	2939	9670	8724	1576906	71.3%
CHARLOTTE AREA,NC,SC	1.065	49	189	177	1577095	71.3%
SALT LAKE CITY-OGDEN,UT	1.041	5394	32767	31464	1609862	72.8%
OKLAHOMA CITY,OK	0.983	150	994	1011	1610856	72.8%
ROCHESTER,NY	0.980	1894	8461	8631	1619317	73.2%
HARTFORD AREA,CT	0.967	5264	25943	26826	1645260	74.4%
LOUISVILLE,KY-IN	0.963	0	1148	1192	1646408	74.4%
MEMPHIS,TN-AR-MS	0.959	147	953	993	1647361	74.5%
MIDDLESEX-SOMERSET AREA,NJ	0.950	4967	11521	12126	1658882	75.0%
MONMOUTH-OCEAN,NJ	0.935	961	3353	3585	1662235	75.1%
DAYTON-SPRINGFIELD,OH	0.933	4415	30552	32728	1692787	76.5%
NASHVILLE,TN	0.931	203	2163	2324	1694950	76.6%
BIRMINGHAM,AL	0.911	149	1855	2036	1696805	76.7%
GREENSBORO-WINSTON SALEM,NC	0.899	50	1230	1367	1698035	76.7%
ORLANDO,FL	0.898	4632	14892	16576	1712927	77.4%
ALBANY-SCHENECTADY,NY	0.844	1102	6116	7250	1719043	77.7%
HONOLULU,HI	0.817	464	4528	5544	1723571	77.9%
RICHMOND-PETERSBURG,VA	0.810	499	1582	1953	1725153	78.0%
WEST PALM BEACH AREA,FL	0.756	646	4262	5641	1729415	78.2%
STOCKTON+MODESTO,CA	0.749	44	710	948	1730125	78.2%
TULSA,OK	0.733	447	4165	5678	1734290	78.4%
AUSTIN,TX	0.726	3467	16243	22361	1750533	79.1%
SCRANTON-WILKES-BARRE,PA	0.726	65	609	839	1751142	79.1%
ALLENTOWN-BETHLEHEM,PA-NJ	0.657	1174	2932	4464	1754074	79.3%

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*	Cum \$	Cum %
RALEIGH-DURHAM,NC	0.651	5637	22947	35271	1777021	80.3%
SYRACUSE,NY	0.649	1190	5559	8562	1782580	80.6%
GRAND RAPIDS,MI	0.649	0	283	436	1782863	80.6%
OMAHA,NE-IA	0.614	99	342	557	1783205	80.6%
TOLEDO,OH	0.611	402	2635	4311	1785840	80.7%
GREENVILLE-SPARTANBURG,SC	0.606	0	656	1082	1786496	80.7%
TUCSON,AZ	0.602	1325	11538	19153	1798034	81.3%
NEW HAVEN,CT	0.597	4647	19774	33139	1817808	82.2%
KNOXVILLE,TN	0.591	6348	26395	44654	1844203	83.4%
HARRISBURG AREA,PA	0.577	0	306	530	1844509	83.4%
LAS VEGAS,NV	0.569	698	1433	2516	1845942	83.4%
EL PASO,TX	0.561	0	50	89	1845992	83.4%
BATON ROUGE,LA	0.546	50	784	1437	1846776	83.5%
SPRINGFIELD,MA	0.518	629	3792	7323	1850568	83.6%
YOUNGSTOWN,OH	0.510	49	99	194	1850667	83.6%
LITTLE ROCK AREA,AR	0.506	292	1339	2648	1852006	83.7%
CHARLESTON,SC	0.486	71	524	1079	1852530	83.7%
ALBUQUERQUE,NM	0.474	6450	33239	70065	1885769	85.2%
WICHITA,KS	0.470	247	297	632	1886066	85.2%
COLUMBIA,SC	0.445	49	508	1142	1886574	85.3%
FLINT,MI	0.435	0	48	110	1886622	85.3%
CHATTANOOGA,TN-GA	0.425	1383	2246	5278	1888868	85.4%
LANSING-E LANSING,MI	0.425	324	2282	5372	1891150	85.5%
WORCESTER,MA	0.408	584	9743	23892	1900893	85.9%
SAGINAW,MI	0.404	41	989	2450	1901882	86.0%
CANTON,OH	0.400	0	482	1204	1902364	86.0%
YORK,PA	0.398	0	225	566	1902589	86.0%
LANCASTER,PA	0.394	1785	9798	24900	1912387	86.4%
JACKSON,MS	0.392	0	227	579	1912614	86.4%

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*	Cum \$	Cum %
AUGUSTA,GA-SC	0.390	0	50	128	1912664	86.5%
DES MOINES,IA	0.381	198	733	1922	1913397	86.5%
COLORADO SPRINGS,CO	0.380	2317	9766	25673	1923163	86.9%
SHREVEPORT,LA	0.365	0	37	101	1923200	86.9%
CORPUS CHRISTI,TX	0.363	0	49	135	1923249	86.9%
MELBOURNE AREA,FL	0.361	3904	16045	44421	1939294	87.7%
SPOKANE,WA	0.357	380	2951	8268	1942245	87.8%
FORT WAYNE,IN	0.356	45	345	969	1942590	87.8%
MADISON,WI	0.345	1370	4851	14065	1947441	88.0%
SALINAS-SEASIDE-MONTEREY,CA	0.340	964	2130	6270	1949571	88.1%
SANTA BARBARA,CA	0.339	2990	14880	43842	1964451	88.8%
PENSACOLA,FL	0.337	69	2493	7395	1966944	88.9%
LEXINGTON,KY	0.332	262	1064	3205	1968008	89.0%
READING,PA	0.321	0	538	1676	1968546	89.0%
UTICA-ROME,NY	0.315	248	702	2226	1969248	89.0%
APPLETON-OSHKOSH-NEENAH,WI	0.307	265	355	1154	1969603	89.0%
MONTGOMERY,AL	0.299	0	50	167	1969653	89.0%
ATLANTIC CITY,NJ	0.297	0	1303	4381	1970956	89.1%
ROCKFORD,IL	0.280	0	50	178	1971006	89.1%
EUGENE-SPRINGFIELD,OR	0.263	1783	5332	20258	1976338	89.3%
SALEM,OR	0.262	1108	2597	9908	1978935	89.4%
BINGHAMTON,NY	0.262	1559	2663	10172	1981598	89.6%
NEW LONDON-NORWICH,CT-RI	0.260	1083	2466	9503	1984064	89.7%
POUGHKEEPSIE,NY	0.257	0	50	195	1984114	89.7%
JOHNSTOWN,PA	0.254	0	30	118	1984144	89.7%
DULUTH,MN-WI	0.243	0	100	411	1984244	89.7%
SOUTH BEND-MISHAWAKA,IN	0.241	773	1070	4432	1985314	89.7%
PROVO-OREM,UT	0.240	549	1919	7979	1987233	89.8%

*Per capita rate is obtained by dividing by the population in millions



Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*	Cum \$	Cum %
SAVANNAH,GA	0.240	0	50	209	1987283	89.8%
ANCHORAGE,AK	0.235	49	140	596	1987423	89.8%
HUNTSVILLE,AL	0.234	5513	30462	130347	2017885	91.2%
ROANOKE,VA	0.225	1950	13648	60685	2031533	91.8%
LUBBOCK,TX	0.225	0	0	0	2031533	91.8%
RENO,NV	0.225	738	4520	20125	2036053	92.0%
TALLAHASSEE,FL	0.218	0	295	1353	2036348	92.0%
KALAMAZOO,MI	0.218	0	753	3459	2037101	92.1%
PORTSMOUTH AREA,NH-ME	0.215	122	2104	9786	2039205	92.2%
WATERBURY,CT	0.212	5546	10494	49523	2049699	92.6%
LINCOLN,NE	0.206	200	2037	9884	2051736	92.7%
PORTLAND,ME	0.206	1018	5555	27005	2057291	93.0%
GAINESVILLE,FL	0.200	1509	6488	32472	2063779	93.3%
WACO,TX	0.188	0	98	522	2063877	93.3%
CHAMPAIGN-URBANA-RANTOUL,IL	0.171	1663	6595	38545	2070472	93.6%
ASHEVILLE,NC	0.170	49	449	2641	2070921	93.6%
CEDAR RAPIDS,IA	0.169	231	1292	7654	2072213	93.7%
NASHUA,NH	0.163	105	1241	7600	2073454	93.7%
TOPEKA,KS	0.161	0	1316	8184	2074770	93.8%
WATERLOO-CEDAR FALLS,IA	0.151	456	555	3663	2075325	93.8%
OLYMPIA, WA	0.147	472	1338	9127	2076663	93.9%
MANCHESTER,NH	0.145	500	1105	7615	2077768	93.9%
JACKSON,MI	0.144	150	150	1039	2077918	93.9%
ATHENS,GA	0.141	790	1739	12290	2079657	94.0%
MEDFORD,OR	0.140	0	50	357	2079707	94.0%
PASCAGOULA,MS	0.128	0	347	2707	2080054	94.0%
WICHITA FALLS,TX	0.127	0	49	386	2080103	94.0%
ABILENE,TX	0.126	0	100	794	2080203	94.0%

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*	Cum \$	Cum %
BURLINGTON,VT	0.125	1378	3656	29342	2083859	94.2%
LAFAYETTE-W LAFAYETTE,IN	0.124	562	4600	36977	2088459	94.4%
LAS CRUCES,NM	0.123	49	5550	45122	2094009	94.6%
CHARLOTTESVILLE,VA	0.121	682	2538	20906	2096547	94.8%
MUNCIE,IN	0.121	0	96	794	2096643	94.8%
BRYAN-COLLEGE STATION,TX	0.121	598	3401	28154	2100044	94.9%
LAWTON,OK	0.121	509	2873	23803	2102917	95.0%
STATE COLLEGE,PA	0.115	819	2185	19066	2105102	95.1%
BELLINGHAM,WA	0.114	50	640	5629	2105742	95.2%
GLENS FALLS,NY	0.112	0	52	463	2105794	95.2%
MIDLAND,TX	0.111	498	498	4474	2106292	95.2%
FAYETTEVILLE-SPRINGDALE,AR	0.107	500	1294	12048	2107586	95.3%
SANTA FE,NM	0.106	1712	9039	85113	2116625	95.7%
BLOOMINGTON,IN	0.102	398	3315	32596	2119940	95.8%
KOKOMO,IN	0.101	0	50	493	2119990	95.8%
ROCHESTER,MN	0.098	0	50	510	2120040	95.8%
FITCHBURG-LEOMINSTER,MA	0.096	120	1784	18525	2121824	95.9%
LA CROSSE,WI	0.094	0	39	414	2121863	95.9%
ELMIRA,NY	0.090	2698	8290	91602	2130153	96.3%
BISMARK,ND	0.086	50	100	1163	2130253	96.3%
BANGOR,ME	0.083	88	228	2734	2130481	96.3%
PITTSFIELD,MA	0.081	57	287	3548	2130768	96.3%
RAPID CITY,SD	0.077	0	206	2679	2130974	96.3%
VICTORIA,TX	0.076	0	407	5355	2131381	96.3%
CASPER,WY	0.071	0	50	704	2131431	96.3%
GRAND FORKS,ND	0.069	233	1092	15735	2132523	96.4%
NOT IN METROPOLITAN AREA		10227	79923		2212446	100.0%

*Per capita rate is obtained by dividing by the population in millions

EXHIBIT TWO

SBIR Awards by Metropolitan Areas

Ordered by
total dollars,
fiscal 83-90

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*
BOSTON AREA	4.056	68607	322375	79487
LOS ANGELES AREA	13.075	43663	213068	16296
BAY AREA (SF)	5.534	41760	206012	37225
WASHINGTON,DC-MD-VA	3.565	28505	186833	52408
SAN DIEGO,CA	2.201	19826	102808	46703
PHILADELPHIA AREA	5.697	15518	80417	14115
NEW YORK AREA	15.529	13051	66722	4297
DENVER-BOULDER-LONGMONT,CO	1.847	9529	56246	30446
SEATTLE-TACOMA AREA	2.284	8735	51430	22514
ALBUQUERQUE,NM	0.474	6450	33239	70065
SALT LAKE CITY-OGDEN,UT	1.041	5394	32767	31464
DAYTON-SPRINGFIELD,OH	0.933	4415	30552	32728
HUNTSVILLE,AL	0.234	5513	30462	130347
BALTIMORE,MD	2.280	5729	29616	12989
CHICAGO-LAKE COUNTY	7.381	6470	29404	3984
DETROIT-ANN ARBOR,MI	4.601	4404	28663	6230
MINNEAPOLIS-ST PAUL,MN-WI	2.295	7469	27371	11925
KNOXVILLE,TN	0.591	6348	26395	44654
HARTFORD AREA,CT	0.967	5264	25943	26826
RALEIGH-DURHAM,NC	0.651	5637	22947	35271
NEW HAVEN,CT	0.597	4647	19774	33139
DALLAS-FT. WORTH AREA	3.655	2701	19093	5223
BUFFALO-NIAGARA AREA	1.182	5441	18469	15631
HOUSTON,GALVESTON,TX	3.634	4353	17032	4686
PITTSBURGH-BEAVAR VALLEY,PA	2.316	2460	16963	7324

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*
AUSTIN,TX	0.726	3467	16243	22361
MELBOURNE AREA,FL	0.361	3904	16045	44421
ORLANDO,FL	0.898	4632	14892	16576
SANTA BARBARA,CA	0.339	2990	14880	43842
ROANOKE,VA	0.225	1950	13648	60685
COLUMBUS,OH	1.299	2013	13029	10027
ATLANTA,GA	2.561	1616	12494	4880
TUCSON,AZ	0.602	1325	11538	19153
MIDDLESEX-SOMERSET AREA,NJ	0.950	4967	11521	12126
PHOENIX,AZ	1.900	2511	10651	5605
WATERBURY,CT	0.212	5546	10494	49523
LANCASTER,PA	0.394	1785	9798	24900
COLORADO SPRINGS,CO	0.380	2317	9766	25673
WORCESTER,MA	0.408	584	9743	23892
PROVIDENCE AREA,RI,MA	1.108	2939	9670	8724
SANTA FE,NM	0.106	1712	9039	85113
ROCHESTER,NY	0.980	1894	8461	8631
ELMIRA,NY	0.090	2698	8290	91602
CLEVELAND-AKRON AREA	2.766	2085	8044	2909
NORFOLK-VA BEACH AREA,VA	1.310	2969	7356	5617
SAN ANTONIO,TX	1.276	2192	6704	5252
CHAMPAIGN-URBANA-RANTOUL,IL	0.171	1663	6595	38545
SACRAMENTO,CA	1.291	1247	6523	5051
GAINESVILLE,FL	0.200	1509	6488	32472
ALBANY-SCHENECTADY,NY	0.844	1102	6116	7250

*Per capita rate is obtained by dividing by the population in millions

EXHIBIT THREE

SBIR Awards by Metropolitan Areas

Ordered by
total dollars
per capita

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*
HUNTSVILLE,AL	0.234	5513	30462	130347
ELMIRA,NY	0.090	2698	8290	91602
SANTA FE,NM	0.106	1712	9039	85113
BOSTON AREA	4.056	68607	322375	79487
ALBUQUERQUE,NM	0.474	6450	33239	70065
ROANOKE,VA	0.225	1950	13648	60685
WASHINGTON,DC-MD-VA	3.565	28505	186833	52408
WATERBURY,CT	0.212	5546	10494	49523
SAN DIEGO,CA	2.201	19826	102808	46703
LAS CRUCES,NM	0.123	49	5550	45122
KNOXVILLE,TN	0.591	6348	26395	44654
MELBOURNE AREA,FL	0.361	3904	16045	44421
SANTA BARBARA,CA	0.339	2990	14880	43842
CHAMPAIGN-URBANA-RANTOUL,IL	0.171	1663	6595	38545
BAY AREA (SF)	5.534	41760	206012	37225
LAFAYETTE-W LAFAYETTE,IN	0.124	562	4600	36977
RALEIGH-DURHAM,NC	0.651	5637	22947	35271
NEW HAVEN,CT	0.597	4647	19774	33139
DAYTON-SPRINGFIELD,OH	0.933	4415	30552	32728
BLOOMINGTON,IN	0.102	398	3315	32596
GAINESVILLE,FL	0.200	1509	6488	32472
SALT LAKE CITY-OGDEN,UT	1.041	5394	32767	31464
DENVER-BOULDER-LONGMONT,CO	1.847	9529	56246	30446
BURLINGTON,VT	0.125	1378	3656	29342
BRYAN-COLLEGE STATION,TX	0.121	598	3401	28154

Metropolitan Area	Pop (M)	FY90 (\$K)	FY83-90 (\$K)	Total \$ per cap*
PORTLAND,ME	0.206	1018	5555	27005
HARTFORD AREA,CT	0.967	5264	25943	26826
COLORADO SPRINGS,CO	0.380	2317	9766	25673
LANCASTER,PA	0.394	1785	9798	24900
WORCESTER,MA	0.408	584	9743	23892
LAWTON,OK	0.121	509	2873	23803
SEATTLE-TACOMA AREA	2.284	8735	51430	22514
AUSTIN,TX	0.726	3467	16243	22361
CHARLOTTESVILLE,VA	0.121	682	2538	20906
EUGENE-SPRINGFIELD,OR	0.263	1783	5332	20258
RENO,NV	0.225	738	4520	20125
TUCSON,AZ	0.602	1325	11538	19153
STATE COLLEGE,PA	0.115	819	2185	19066
FITCHBURG-LEOMINSTER,MA	0.096	120	1784	18525
ORLANDO,FL	0.898	4632	14892	16576
LOS ANGELES AREA	13.075	43663	213068	16296
GRAND FORKS,ND	0.069	233	1092	15735
BUFFALO-NIAGARA AREA	1.182	5441	18469	15631
PHILADELPHIA AREA	5.697	15518	80417	14115
MADISON,WI	0.345	1370	4851	14065
BALTIMORE,MD	2.280	5729	29616	12989
ATHENS,GA	0.141	790	1739	12290
MIDDLESEX-SOMERSET AREA,NJ	0.950	4967	11521	12126
FAYETTEVILLE-SPRINGDALE,AR	0.107	500	1294	12048
MINNEAPOLIS-ST PAUL,MN-WI	2.295	7469	27371	11925

*Per capita rate is obtained by dividing by the population in millions

*Technology
Areas***1 0 0 0***Computer, Information
Processing, Analysis***1100 Computer and communication systems**

- 1110 Computer systems technology
- 1120 Communication and control systems
- 1130 Networks and architectures
- 1140 Computer security

1200 Information processing and management

- 1210 Data and information processing
- 1220 Artificial intelligence
- 1230 Computer software
- 1240 Robotics and automation
- 1250 Man machine interface

1300 Signal and image processing

- 1310 Signal processing
- 1320 Image processing
- 1330 Navigation, guidance, positioning

1400 Systems studies

- 1410 General studies
- 1420 Operations and systems analysis
- 1430 Safety systems, health and risk analysis

1500 Mathematical sciences

- 1510 Math fundamentals
- 1520 Numerical modeling
- 1530 Math modeling

2 0 0 0*Electronics***2100 Microelectronics**

- 2110 Microelectronics:materials, concepts, processing
- 2120 Compound semiconductors
- 2130 Photovoltaics
- 2140 Optoelectronics

2200 Electronics device performance

- 2210 Electronic device performance, packaging, reliability
- 2220 Radiation damage and hardening
- 2230 Testability

2300 Electronic equipment and instrumentation

- 2310 Electronic equipment and systems
- 2320 Data and information processing equipment
- 2330 Sensors, transducers, instrumentation

2400 Electromagnetic radiation/propagation

- 2410 RF technology
- 2420 Electronic warfare
- 2430 Target detection
- 2440 Metal and mine detection

2500 Microwave and millimeter wave electronics

- 2510 Microwave electronics
- 2520 Millimeter wave electronics

2600 Optical devices and lasers

- 2610 Optical and IR sensors, components
- 2620 Optical fiber technology
- 2630 Laser technology
- 2640 Higher frequency EM radiation


3 0 0 0***Materials*****3100 *Advanced materials***

- 3110 Metallic, magnetic, highT, conducting & superconducting materials
- 3120 Polymers
- 3130 Ceramics
- 3140 Composites and lightweight materials
- 3150 Construction materials
- 3160 Fire, fabric, and insulation materials
- 3170 EM transparent materials
- 3180 Biomaterials

3200 *Materials processing and manufacturing*

- 3210 Materials processing
- 3220 Manufacturing methods
- 3230 Joining and welding technology
- 3240 Separation/characterization of multiphases

3300 *Coatings, corrosion and surface phenomena*

- 3310 Corrosion
- 3320 Coatings
- 3330 Thin films and surfaces

3400 *Materials performance*

- 3410 Failure, fracture, fatigue
- 3420 Lubrication, wear and seals
- 3430 Repair
- 3440 Non-destructive evaluation

3500 *Fundamentals and instrumentation*

- 3510 Materials fundamentals/general
- 3520 Instrumentation
- 3530 Chemistry

4 0 0 0***Mechanical Performance of Vehicles, Weapons, Facilities*****4100 *Hydrodynamics***

- 4110 Hydrodynamics
- 4120 Watercraft

4200 *Aerodynamics*

- 4210 Fundamental aerodynamics
- 4220 Aerodynamic performance
- 4230 Aerodynamic facilities, instrumentation

4300 *Acoustics*

- 4310 Underwater acoustic detection and communication
- 4320 Vibration related acoustics

4400 *Mechanical performance of structures and equipment*

- 4410 Shock vibration and structural performance of vehicles, facilities, equipment
- 4420 New structural concepts
- 4430 Performance of engine, equipment, mechanical components
- 4440 Weapons performance and effects

4500 *Control*

- 4510 Control concepts
- 4520 Vehicle/weapon motion control
- 4530 Structural controls

4600 *Mechanical measurements*

- 4610 Mechanical measurements (pressure, velocity, etc.)



5 0 0 0

Energy Conversion and Use

5100 Transport sciences

- 5110 Fluid mechanics
- 5120 Flow/fluid measurement and enhancement
- 5130 Heat transfer
- 5140 Refrigeration/cryogenics

5200 Propulsion/combustion technology

- 5210 Propulsion systems
- 5220 Propellants, fuels, explosives
- 5230 Combustion
- 5240 Fire detection
- 5250 Exhaust gases & gas analysis

5300 Large scale energy usage

- 5310 Industrial energy processes and utilization
- 5320 Physics, nuclear physics, fusion and plasma
- 5330 Energy use in buildings

5400 Energy conversion/electric power

- 5410 Batteries, fuel cells, electrochemistry, energy storage
- 5420 Alternative energy conversion
- 5430 Electric power technology

6 0 0 0

Environment & Natural Resources

6100 Ocean science

- 6110 Ocean science and instrumentation

6200 Atmospheric sciences

- 6210 Atmospheric science and monitoring
- 6220 Remote sensing
- 6230 Chemical and biological measurement
- 6240 Particulates and aerosols
- 6250 Pollution abatement and environment control

6300 Water management

- 6310 Water monitoring and characterization
- 6320 Water treatment
- 6330 Water management and utilization
- 6340 Ice, snow, frost detection

6400 Earth sciences

- 6410 Earth sciences
- 6420 Soil measurement and manipulation

6500 Environment protection

- 6510 Nuclear, chemical, biological waste management
- 6520 CBR defense



7 0 0 0

Life Sciences

7100 Medical instrumentation

- 7110 Medical measurements
- 7120 Measurements/techniques for radiation/imagery
- 7130 Medical devices
- 7140 Devices/systems for physically impaired

7200 Biotechnology and microbiology

- 7210 Biotechnology and genetic engineering
- 7220 Cellular biology
- 7230 Drugs, vaccines, toxicity, immunology, therapeutic agents
- 7240 Disease detection and screening

7300 Behavioral sciences

- 7310 Behavior, human factors, cognition
- 7320 Training, testing, simulation
- 7330 Social studies

7400 Physiology and miscellaneous

- 7410 Physiological mechanisms, injury, miscellaneous
- 7420 Dental
- 7430 Food, nutrition, agriculture
- 7440 Biotic resources
- 7450 Animal models and veterinary medicine
- 7460 Plant physiology

EXHIBIT FIVE

*Fiscal 1990
Phase I and II
Awards by
Technology
Area and
Agency*

*(Dollars in
thousands)*

		DOD	DOE	NASA	HHS	NSF	DOT	EPA	NRC	ED	DOA	DOC	TOTAL
1000	Computer, Information, Analysis*												
1100	Computer, Communication	15375	1634	4592	4789	1436	725	0	0	259	50	0	28860
1200	Information Processing	21189	1338	10320	8936	2379	530	50	0	690	198	34	45664
1300	Signal/Image Processing	25236	1830	4089	1079	1340	194	0	0	48	0	33	33849
1400	Systems Studies	5054	149	299	1981	0	443	0	50	30	0	0	8006
1500	Math Modelling	8315	49	9022	2400	1231	0	149	49	0	0	0	21215
2000	Electronics*												
2100	Microelectronics	23239	2239	4188	49	1445	0	0	0	0	0	0	31160
2200	Device Performance	6287	50	1465	879	49	50	0	49	0	0	0	8829
2300	Equipment/Instrumentation	16461	3614	5592	2338	1783	99	150	125	416	410	199	31187
2400	EM Radiation/Propagation	21907	641	910	50	99	296	0	49	0	0	0	23952
2500	Microwave/MM Wave	7286	149	2644	0	49	0	0	0	0	0	0	10128
2600	Optical/Laser	33246	5698	9312	6279	2772	286	0	174	0	170	35	57972
3000	Materials*												
3100	Advanced Materials	21056	7865	7243	2317	3059	1178	248	0	0	287	34	43287
3200	Processing/Manufacturing	4257	3387	4604	397	1916	50	346	124	0	215	0	15296
3300	Coatings/Corrosion	19746	3679	3896	1770	2431	0	399	0	0	0	34	31955
3400	Performance/Fatigue	9153	2756	2123	439	1295	1032	50	124	0	0	0	16972
3500	Fundamentals/Instruments	2381	398	2745	2896	1405	0	0	0	0	50	234	10109

* Multiple Technology Areas Assigned to Awards



	DOD	DOE	NASA	HHS	NSF	DOT	EPA	NRC	ED	DOA	DOC	TOTAL
4000	Mechanics of Vehicles, Facilities*											
4100	Hydrodynamics	906	0	49	0	0	0	0	0	0	0	955
4200	Aerodynamics	7498	0	7317	0	149	0	0	0	0	34	14998
4300	Acoustics	3797	0	293	0	0	0	0	30	0	0	4120
4400	Structural Performance	15974	50	2042	330	100	149	0	50	29	0	18724
4500	Control	3356	698	3437	50	831	99	0	0	0	0	8471
4600	Measurements	3329	99	743	98	99	148	0	0	0	0	4516
5000	Energy Conservation and Use*											
5100	Transport Sciences	8480	4375	8791	2161	597	50	149	0	0	97	24700
5200	Propulsion/Combustion	13737	4765	4436	0	773	99	547	0	0	100	24457
5300	Large Scale Uses	2771	9633	541	1009	323	0	0	49	0	0	14326
5400	Electric Power	7275	6459	2587	892	1473	0	0	0	0	224	18910
6000	Environmental and Natural Resources*											
6100	Ocean Science	1617	1267	0	0	328	0	0	0	0	302	3514
6200	Atmospheric Science	11065	2979	5050	3842	2068	648	1593	49	0	373	27970
6300	Water Management	726	268	2242	139	543	49	249	0	0	713	4929
6400	Earth Sciences	1186	1827	0	0	817	0	49	0	0	424	4303
6500	Environment Protection	2241	631	0	99	899	49	1594	0	0	91	5604
7000	Life Sciences*											
7100	Medical Instrumentation	2289	248	49	29350	716	98	0	0	1610	0	34360
7200	Biotechnology/Microbiology	2227	2792	647	34906	1353	299	0	0	0	751	42975
7300	Behavioral Sciences	3422	0	1119	8027	424	1119	0	0	1499	94	15704
7400	Physiology and Misc.	759	0	1611	3956	550	99	0	0	0	2897	9906

* Multiple Technology Areas Assigned to Awards



EXHIBIT SIX

Distribution of Fiscal 1990 Phase I and II Awards among Technology Areas

Multiple technology areas assigned to awards

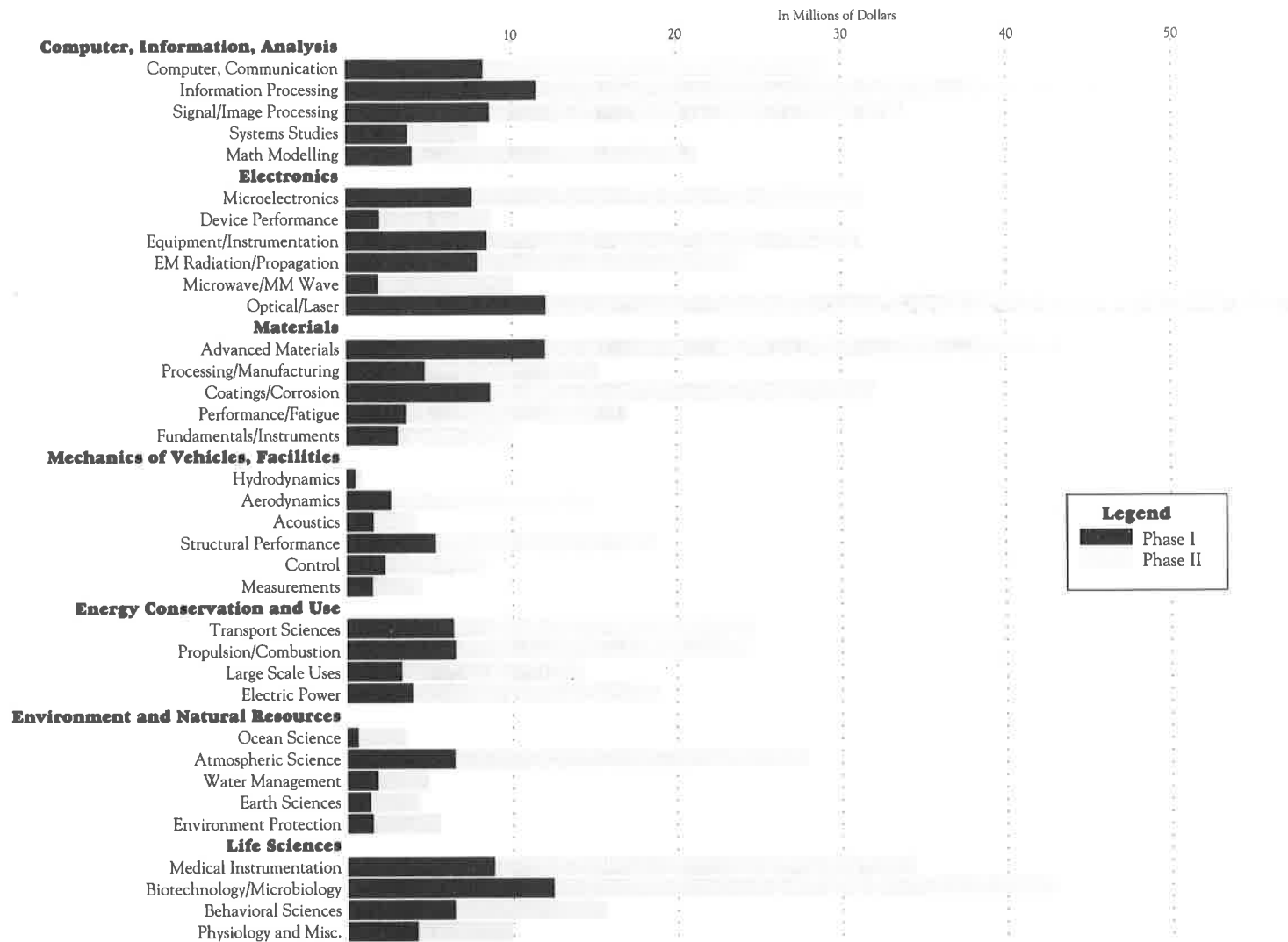



EXHIBIT SEVEN

*Fiscal 1983-90
Phase I and II
Awards by
Technology
Area and
Agency*

*(Dollars in
thousands)*

		DOD	DOE	NASA	HHS	NSF	DOT	EPA	NRC	ED	DOA	DOC	TOTAL
1000	Computer, Information, Analysis*												
1100	Computer, Communication	79584	9448	17302	17469	4797	2246	0	510	2683	300	300	134639
1200	Information Processing	150755	16505	46163	42699	11848	2791	50	1041	5630	944	541	278967
1300	Signal/Image Processing	102235	6658	26846	16765	5915	1659	0	480	277	250	947	162032
1400	Systems Studies	51420	3506	2130	9300	1673	1552	199	2275	515	1762	0	74332
1500	Math Modelling	55331	2480	32701	8951	6917	643	198	2088	230	0	60	109599
2000	Electronics*												
2100	Microelectronics	86647	10268	17301	588	8638	50	0	242	0	50	0	123784
2200	Device Performance	29706	1928	3425	3914	556	100	0	388	0	0	0	40017
2300	Equipment/Instrumentation	87635	26760	25266	15897	7001	3211	1770	908	1520	2255	768	172991
2400	EM Radiation/Propagation	114185	1352	3140	1913	810	1177	397	49	30	0	415	123468
2500	Microvave/MM Wave	32752	2975	8349	541	352	49	49	0	30	0	226	45323
2600	Optical/Laser	138955	31305	39925	25059	10570	2303	950	662	57	895	595	251276
3000	Materials*												
3100	Advanced Materials	130781	38538	31786	10366	11942	4748	1143	118	30	2156	264	231872
3200	Processing/ Manufacturing	36033	27078	15742	7499	10736	707	2825	348	30	1256	260	102514
3300	Coatings/Corrosion	71192	19288	14649	6898	8977	287	1389	50	0	520	34	123284
3400	Performance/Fatigue	52296	13331	9520	612	7692	4201	74	884	0	867	0	89477
3500	Fundamentals/Instruments	10491	3686	5889	11175	3984	0	1037	0	0	50	293	36605

* Multiple Technology Areas Assigned to Awards



		DOD	DOE	NASA	HHS	NSF	DOT	EPA	NRC	ED	DOA	DOC	TOTAL
4000	Mechanics of Vehicles, Facilities												
4100	Hydrodynamics	6583	0	49	0	35	0	0	0	0	0	259	6926
4200	Aerodynamics	31615	587	32308	0	640	1243	0	0	0	0	34	66427
4300	Acoustics	27918	2146	1605	612	167	399	0	0	281	0	530	33658
4400	Structural Performance	74785	1866	9712	2194	2808	1825	0	150	29	96	23	93488
4500	Control	16788	5532	9194	1530	1846	597	0	150	0	240	0	35877
600	Measurements	15729	2611	5096	681	1189	694	0	149	0	0	23	26172
5000	Energy Conservation and Use												
5100	Transport Sciences	57337	18845	41189	13467	4180	348	743	1107	0	700	0	137916
5200	Propulsion/Combustion	57806	22326	20077	1062	4180	1137	2233	50	0	450	30	109351
5300	Large Scale Uses	11639	63284	3398	3107	2739	396	360	474	0	557	21	85975
5400	Electric Power	45596	16772	9246	3948	5865	100	91	0	0	622	0	82240
6000	Environment and Natural Resources												
6100	Ocean Science	7483	1698	1166	0	1512	50	0	0	0	0	1675	13584
6200	Atmospheric Science	45442	20829	25122	22772	7688	2492	7766	98	0	1561	2108	135878
6300	Water Management	11028	2636	6086	877	3864	849	3805	288	0	1864	30	31327
6400	Earth Sciences	9795	8398	1295	0	5370	347	170	282	0	1446	225	27328
6500	Environment Protection	13271	7988	1067	269	3211	448	8161	330	0	166	0	34911
7000	Life Sciences												
7100	Medical Instrumentation	15185	3802	4504	162475	2369	953	0	100	6546	365	30	196329
7200	Biotechnology/Microbiology	11828	10978	2874	174042	11560	348	928	0	347	5456	119	218480
7300	Behavioral Sciences	27495	0	5389	40729	1614	2731	0	0	4889	1351	0	84198
7400	Physiology and Misc.	4493	3396	5980	26752	7389	399	274	0	60	16948	1075	66766

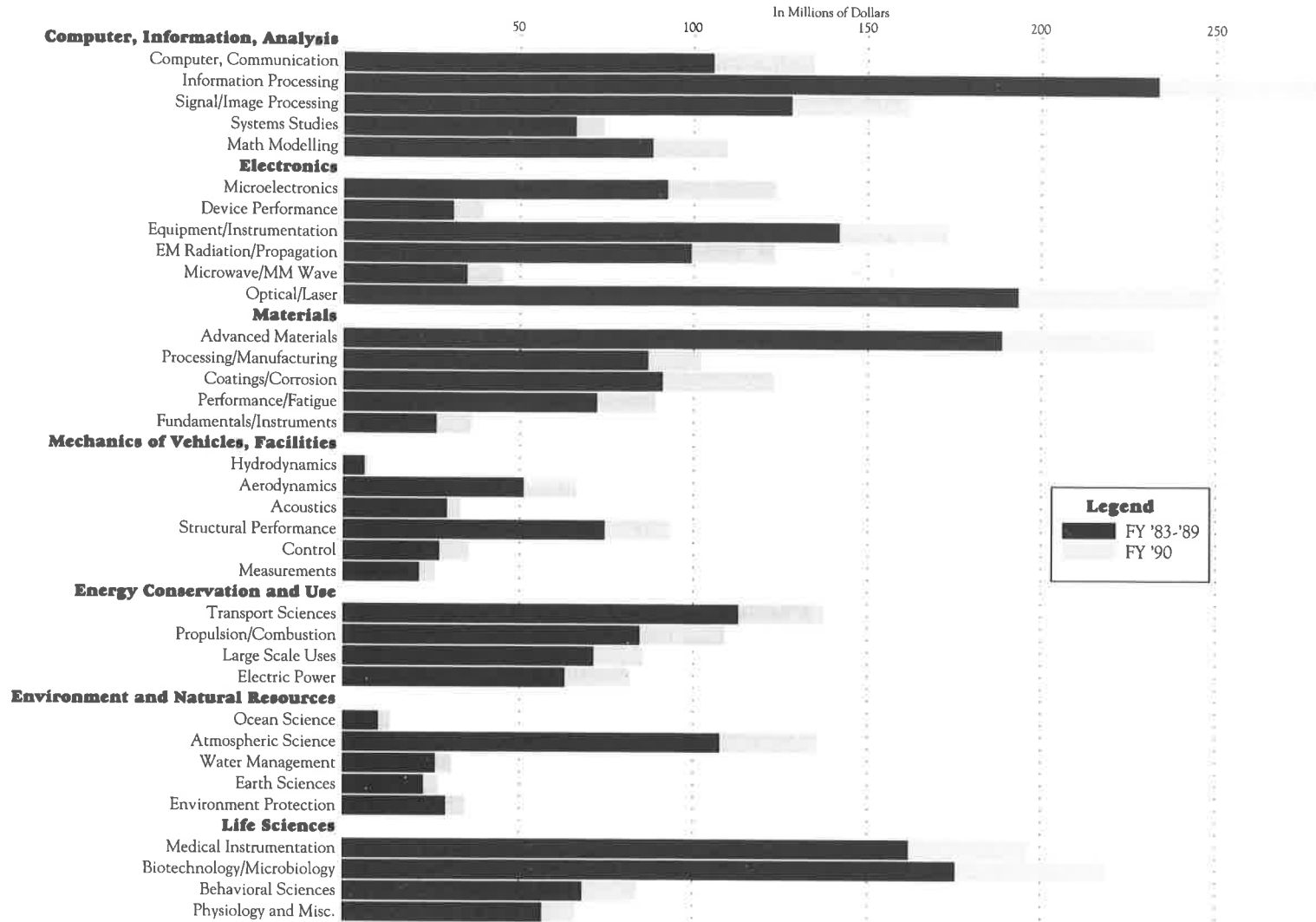
* Multiple Technology Areas Assigned to Awards



EXHIBIT EIGHT

Distribution of Fiscal 1983-90 Phase I and II Awards among Technology Areas

Multiple technology areas assigned to awards





PROGRAM SOLICITATION PAGE COUNT

During Fiscal 1990, the Office of Innovation, Research and Technology initiated a study aimed at determining reasons for the increasing number of pages of non-topical material in Agency SBIR solicitations. It is expected that the study will result in alteration or enforcement of the presently mandated 20-page limit.

AUTOMATED TELEPHONE ANSWERING SYSTEM

To further assist the public and extend Program outreach efforts, the Office of Innovation, Research and Technology in August 1990 installed a new automated telephone answering system that provides a "prompt-driven" method to enable small businesses to automatically enroll in the SBIR Mailing List System (MLS) and then receive Pre-Solicitation Announcements. The telephone system also permits callers wishing other information to be connected with Program experts in the Office of Innovation, Research and Technology.

STATE PROGRAMS BOOKLET

Enclosed with the June 1990 SBIR Pre-Solicitation Announcement was an SBA booklet listing research and development assistance available in each state, and names and telephone number of appropriate state officials. SBA's Office of Innovation, Research and Technology has established working relationships with state officials and will update the Agency booklet periodically. Arrangements also have been made to

furnish appropriate state officials with SBIR Program announcements and other program-related materials.

SBA'S NEW HEADQUARTERS

SBA's Central Office has moved into a new location. As a result, the Office of Innovation, Research and Technology can be reached as follows:

Small Business Administration
Office of Innovation, Research and Technology
409 Third Street, SW
Washington, D.C. 20416
Phone (202) 205-6450

MAILING LIST SYSTEM (MLS)

The Mailing List System (MLS) was improved and updated during Fiscal 1990, to ensure greater accuracy and minimize printing and mailing expenses. Any small company can write to the above address or call (202) 205-7777 to be placed on the system and receive the quarterly SBIR pre-solicitation announcements.

TECHNOLOGY CITATIONS

The Office of Innovation, Research and Technology presented two Awards of Distinction during Fiscal 1990:

Emerson and Stern Associates, Inc. of San Diego, a women-owned small company, was honored for having achieved all the objectives involved in the SBIR Program. Emerson and Stern Associates proved to be very successful



in its innovation efforts and in commercializing its projects. This award was presented during Small Business Week.

Mandex, Inc. of Springfield, VA, was honored for fulfilling the SBIR Program goals and for bringing the firm's innovations to the commercial market, while meeting federal agencies high technology research and research and development needs. This award was presented during Minority Enterprise Development Week.

GENERAL INFORMATION

The Office of Innovation, Research and Technology, as part of its continuing efforts to best serve the nation's small business community, upgraded its computing capabilities during the year. New hardware and software were added, and desktop publishing capability was realized. This equipment resulted in creation of a more readable and more comprehensive Pre-Solicitation Announcement format.

COMMERCIALIZATION ASSISTANCE

To increase awareness of the extent to which the SBIR Program serves small technology-based firms, the Office of Innovation, Research and Technology provided award data to Corptech, which publishes a directory of technology enterprises. Corptech will use the data to identify SBIR award-winning companies in the firm's directory listing. In turn, Corptech has provided SBA with a list of corporations having annual revenues of more than \$100 million. The Office of Innovation, Research and Technology uses this list to increase sources of potential capital in its Commercialization Matching System.

90-00.96

All of SBA's programs and services are extended to the public on a nondiscriminatory basis.

SBA

U.S Small Business Administration