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Testimony of

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Chairman, Board of Directors
Small Business Technology Council
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COMMITTEE ON SMALL BUSINESS
UNITED STATES HOUSE OF REPRESENTATIVES

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Room 2360 of the Rayburn House Office Building.

Spurring Innovation and Job Creation: The SBIR Program

On behalf of

The Small Business Technology Council *(202) 785-4300* www.sbtc.org **of** **The National Small Business Association** *(202) 293-8830* www.nsba.biz

SBTC is the nation's largest association of small, technology-based companies in diverse fields, and represents more companies that are active in the federal Small Business Innovation Research (SBIR) Program than any other organization. SBTC is proud to serve as the technology council of the National Small Business Association.

Founded in 1937, the National Small Business Association (NSBA) is the nation's oldest nonprofit advocacy organization for small business, serving more than 150,000 small companies throughout the United States.

Chairman Graves, Ranking Member Velázquez, members of the Committee, thank you for the opportunity to appear here today to discuss the views of the small, high-tech companies on Spurring Innovation and Job Creation: The SBIR Program. I am Michael R. Squillante, Vice President of Research for Radiation Monitoring Devices, Inc. (RMD) of Watertown, MA. I am appearing here today as the Chairman of the Board of Directors of the Small Business Technology Council (SBTC) of the National Small Business Association (NSBA) in Washington, DC. SBTC is an outgrowth of the White House Conference on Small Business in 1995, and is the nation's largest association of small, high-tech SBIR and STTR companies in diverse fields. NSBA serves more than 150,000 small companies throughout the United States.

SBTC welcomes your Committee taking an early lead in this new Congressional term in considering the SBIR program reauthorization. We are pleased to work with you and your capable staff to answer any questions you may have today or in the future. In this spirit, we have provided considerable factual information in this testimony regarding the SBIR and STTR program and the contribution of small, high-tech companies on innovation and job creation.

Chairman Graves, we want to state at the outset that we are heartened to see your strong support for and understanding of the importance of small businesses in job creation and innovation as stated in your official House biography as quoted below:

> "Small businesses create 7 out of every 10 jobs in this country. It is important that our policies encourage innovators and entrepreneurs to follow their dreams and create jobs." – Congressman Sam Graves, Chairman, House Committee on Small Business.[1]

With the support on this issue from the White House, as quoted by President Obama on February 18, 2011 at a high-tech meeting, we are hopeful for early reauthorization:

> "Basically, if we want to win the future, America has to out-build, and out-innovate, and out-educate and out-hustle the rest of the world." – President Barack Obama.[2]

We could not have said either statement better. I am pleased to provide the Committee with an overview and brief history of the SBIR and STTR programs and the issues surrounding the reauthorization. I have been involved with the SBIR program since its inception in 1982, and successfully led projects through the research and development stage to successful commercialization. I was Principal Investigator and Program Manager on numerous programs funded by various government agencies, including NASA, NIH, NSF, DOE, EPA and DOD, for the development of materials, sensors and instruments for cancer diagnosis, scientific research and industrial testing. I joined RMD in 1980 after receiving my Ph.D. in Chemistry from Tufts University in Medford, MA. I am also an Adjunct Professor of Physics at the University of Massachusetts in Lowell. This provides me with a deep personal understanding of the value of the industry/university collaborations possible with the SBIR and STTR program. (See Appendix A for the New England Innovation Alliance survey of SBIR/STTR and university participation.)

I. The SBIR Program History: The original SBIR legislation was started almost exactly 30 years ago by Representative Jerry Lewis (R-CA) when he sponsored H.R. 3091 on April 7, 1981 with 56 cosponsors (28 Republican, 28 Democrat). It was subsequently reintroduced as H.R. 4326 on July 29, 1981 with 189 bipartisan cosponsors. On June 27, 1982 H.R. 4326 was laid on the table in the House, and S.881 (amended) was passed in lieu. S.881 was sponsored by Senator Warren Rudman (R-NH) and cosponsored by Barry Goldwater (R-AZ) also on April 7, 1981, with 83 other bipartisan cosponsors. It was strongly supported by the Administration of, and signed into law as PL 97-219 by, the Republican iconic champion of Free Markets, President Ronald Reagan on July 22, 1982, in the midst of the recession lasting from July 1981 to November 1982.[3]

II. Congressional Findings and Purpose of the SBIR Program: The House and Senate records clearly show that the SBIR program **was not an allocation to help needy small companies**. Rather it was a strong signal to Federal Agencies to make more effective use of the innovative scientists and engineers employed by aggressive small companies that had the potential to convert R&D funds into new products and create new jobs – to optimize return on taxpayers' dollars.

From the PL-97-219 House and Senate Findings and Purpose it was clear that the SBIR program was intended to maximize the return on taxpayers' innovation dollars by forcing the Federal Agencies overseeing this R&D funding to utilize more small businesses because: (see Appendix B)

> "(3) small businesses are among the most cost-effective performers of research and development and are particularly capable of developing research and development results into new products."

III. Reauthorization and Increase of SBIR and STTR in 1992: The 1992 SBIR reauthorization legislation was introduced in the House as H.R. 4400 on March 5, 1992 (with 47 bi-partisan co-sponsors) which doubled the SBIR allocation rate to 2.5 percent and increased the STTR allocation rate to 0.3 percent. Senator Rudman also sponsored the Senate 1992 SBIR reauthorization legislation (with 21 bi-partisan co-sponsors) The Hearings were held shortly after the recession which dated from July 1990 to March 1991. PL-102-564 was signed into law by President George H. W. Bush on October 28, 1992.

The House Findings for H.R. 4400 below show further House support for the SBIR program and frustration that the Federal Agencies had not increased small business R&D contracting [Appendix C]:

> **"(3) small businesses participating in the Small Business Innovation Research Program have demonstrated that they are among the most competent and cost-effective providers of high quality research and development; [Emphasis added.]**
>
> (4) small businesses participating in the Small Business Innovation Research Program have provided innovative products and services which are vital to the national defense, the exploration of space, the advancement of science, the promotion of the health, safety, and welfare of United States citizens, and many other fields important to the functions of the Federal Government;
>
> (5) the Small Business Innovation Research Program has been successful in converting Federal research and development into innovative products benefiting both the United States Government and the commercial marketplace;
>
> **(6) by moving technology from the laboratory to the marketplace, the Small Business Innovation Research Program has expanded business opportunities, increased productivity, created jobs, stimulated the introduction of new products by high technology-related firms, and made United States industry more competitive; [Emphasis added.]**
>
> (7) the Small Business Innovation Research Program has also resulted in a positive benefit to the Nation's balance of trade by increasing exports from small businesses;
>
> (8) Federal employees have exhibited skill and innovation in implementing the Small Business Innovation Research Program;

(9) the Small Business Innovation Research Program can provide productive employment to the Nation's scientists and engineers who have been displaced due to cuts in the budget of the Department of Defense and due to economic recession; and

(10) despite the fact the Small Business Innovation Research Program has achieved its participation goals, the proportion of Federal funds for industrial research and development received by small businesses remains at 3 percent (the same level as 10 years ago), although private sector use of small businesses for research and development doubled in the 1980's." [Emphasis added.]

The original impetus for the SBIR program came from joint House and Senate Small Business Committee hearings on August 9 and 10, 1978, where it was found that there was a severe under-utilization of small businesses in Federally funded research and development (R&D).[4] The conclusions of these hearings were that Federal R&D funds could be more efficiently utilized by small businesses.

IV. How The SBIR and STTR Programs Work: First, it is important to state that the SBIR and STTR programs **are not separate appropriations for small businesses**. Rather, they are an allocation of already appropriated Federal R&D funds (currently 2.5% for SBIR and 0.6% for STTR) for each Federal Agency with more than $100 million in R&D funds (SBIR) and more than $1 billion (STTR). This allocation ensures that the major R&D agencies make use of small businesses to maximize the return on taxpayers' dollars.

The primary difference between the SBIR and STTR programs is that for the STTR program at least 30%, but no more than 60%, of the project must be conducted by a university or non-profit.

The SBIR and STTR programs are effective Federally funded R&D programs because they are multi-phase programs as follows (Table 1 below from the DoD web site):[5]

The genius of the SBIR/STTR programs is that there is a "down-select" going from Phase I to Phase II. The SBIR/STTR contractors must provide the funding agency with a progress report on the completion of the Phase I project and a proposal for the Phase II funds. Only about 40% of the Phase I projects move to Phase II – thus only the best of the projects advance to the Phase II development stage.

Three Phased Program

	SBIR	STTR
✓ **Phase I**: Project feasibility	6 months up to $150,000	12 months up to $100,000
✓ **Phase II**: Project development to Prototype	2 years up to $1,000,000	2 years up to $750,000
✓ **Phase III**: Commercialization	Commercialize, with non-SBIR/non-STTR funds, the technology in military and/or private sector markets	

Table 1. Overview of SBIR & STTR Programs

In Phase III, Congress included special contractual protections for the small businesses that developed the technology which has helped improve the commercialization rate.

The other Federal Agencies involved in the SBIR and STTR programs have some variations on the DoD chart shown. Congress legislated that the U.S. Small Business Administration is to issue a "Policy Directive" providing consistent regulations and guidelines for the programs across all agencies.

The competition for the program is quite strong and while it varies across agencies and time it is typically 10-12 Phase I proposals for each award, and approximately 40-50% of the Phase I

awards go to Phase II. This means the competition for the larger Phase II awards is about 20 Phase I proposals for each successful progression to a Phase II, $750,000 - $1 million award. The programs are working well as discussed below and in Appendix D.

V. Impact of SBIR/STTR on Selected States:

We recognize the critically important role that venture capital plays in our society. However, by its very nature, VC funding inherently tends to concentrate in a small number of specific geographic regions. The SBIR and STTR programs have been particularly beneficial to the states that are traditionally ignored by the venture capital industry. The VC community concentrates approximately 70% of its investments in California, New England and Metro New York,[6] with only token amounts in the Midwest, south, and rural states. SBIR and STTR on the other hand encourage proposals from all states. Since the proposals are simplified to a 25-page limit, good submittals are obtained from every state.

The information on SBIR-STTR data versus VC funding for the states represented by the members of the House Committee on Small Business is shown below in Figure 2, from information provided by Innovation Development Institute (IDI), Ann Eskesen, President, Swampscott, MA:[7]

SBIR-STTR Data: House Small Business Committee. Organized by State of Members
Total SBIR Awardees; Phases I-II; Dollars and VC funded firms (March 2011)

State	Life of Program: 1983-present (to include FY 11 announcements so far made- March 2011)					Current SBIR-Activity: relevant data for period 2007-present			
	Total # Awardees	Total SBIR-STTR Awards		Total SBIR-STTR Dollars	VC funded Firms	Total # Awardees	Total SBIR-STTR Awards		Total SBIR-STTR Dollars*
		Phase I	Phase II				Phase I	Phase II*	
CA	3,948	19,073	7,449	$6,837,889,814	571	984	2,974	1,367	$1,136,757,335
CO	650	3,984	1,597	$1,401,498,610	38	189	703	342	$278,678,898
FL	621	2,177	815	$714,187,830	33	153	391	175	$140,375,878
IA	107	216	79	$63,494,922	5	28	41	22	$13,071,976
IL	493	1,499	550	$500,009,367	39	120	305	154	$118,421,856
LA	68	225	78	$64,520,263	4	15	28	15	$10,852,390
MA	1,582	12,641	4,892	$4,473,132,061	275	429	1,911	905	$747,560,728
MD	951	4,453	1,652	$1,536,523,131	100	240	726	353	$282,310,815
MI	485	1,737	701	$651,968,291	28	137	349	170	$142,313,535
MO	177	500	156	$140,495,716	22	57	112	37	$27,284,512
NC	428	1,325	500	$517,982,885	66	127	279	122	$111,134,870
NY	975	3,914	1,571	$1,483,129,211	83	275	758	375	$313,398,206
OH	676	3,244	1,287	$1,223,089,379	27	195	605	283	$240,205,931
OR	267	1,070	473	$415,829,680	20	75	183	88	$78,082,115
PA	834	3,302	1,354	$1,231,504,476	108	217	617	276	$223,870,389
RI	88	279	121	$121,397,580	12	28	51	31	$30,578,959
SC	85	261	94	$84,441,077	5	28	63	28	$19,134,588
TN	207	747	300	$239,733,320	9	44	107	53	$42,536,391
WA	541	2,032	865	$776,173,986	71	146	344	161	$140,269,975
Totals for the 19 states	13,183	62,679	24,534	$22,477,001,599	1,516	3,487	10,547	4,957	$4,096,839,347
Whole program data: 1983-present	*19,508*	*90,045*	*35,138*	*$31,953,273,665*	*1,984*	*5,227*	*15,384*	*7,268*	*$7,025,967,375*

* There is a considerable time-lag between Phase I and onset of Phase II. It is not unusual to see Phase II begin 2,3,4 or even 5 years after the Phase I aw
Similarly, especially in NIH, Phase II award segments are awarded and reported incrementally (usually annually). Consequently, one can properly assume t
totals and Phase II dollars on current projects will continue to increase, sometimes substantially.

Source: Innovation Development Institute, Swampscott, MA. Copyright 2000-2011. All Rights Reserved

Table 2. SBIR and VC Impacts by Committee Members' States

Additional information from IDI on the SBIR-STTR awards by Committee members' states and districts is included in Appendix E. Further information from IDI on the contribution of SBIR-STTR to the technology employment in Committee members' states is included in Appendix F.

Clearly the SBIR and STTR programs are having a major positive impact on states that are not well served by the venture capital firms, and generally on all states. Additional information can be provided if required. The SBA Office of Technology maintains a public Internet database of all SBIR and STTR awards at http://web.sba.gov/tech-net/public/dsp_search.cfm and information on state awards by a number of search parameters may be obtained online.

VI. High Quality of SBIR/STTR Research: The SBIR program is addressing exactly the very same demanding advanced scientific and technology challenges as those addressed by universities and large businesses doing research for the Federal Government. All proposals receive stringent "peer reviews" and selection is made on the best scientific and technical approach to the agencies' needs as determined by the reviewers. Please note that review panels for SBIR/STTR proposals typically include university professors, scientists from our major research hospitals, and scientists and engineers from the national laboratories.

The high quality of the SBIR and STTR programs has been evaluated many times by GAO, and by the National Research Council as a result of their 6-year study of the SBIR/STTR program which was mandated by the House in the 2000 reauthorization. This NRC study[8] is an excellent and extremely thorough analysis of the two programs and we recommended it highly to obtain an in-depth review of these programs. [This subject is covered in more detail in **Section IX.5** below and in Appendices D (SBIR – It Is Working!, by SBTC), G (GAO Report excerpts) and H (NRC Report excerpts).]

Of particular interest is the high commercialization rate for the SBIR program. The GAO and NRC studies both found that SBIR and STTR projects have between a 30% and 50% commercialization success – amazingly high compared to university funded projects as discussed later. It is even remarkably high compared to many studies of commercial or consumer companies that report a 10% to 15% commercialization rate.[9] During the previous reauthorizations for the programs, Congress required a that "commercialization plan" be included in Phase II proposals and this appears to have increased the commercialization rates.

VII. Issues on Reauthorization: SBTC would like to state at the beginning of this discussion that we support the proposed current legislation by the Senate, S.493. Late last year, the Small Business Technology Council (SBTC), the Biotechnology Industry Organization (BIO), SBANE, Bay area Innovation Alliance, US Chamber of Commerce, NDIA, NABA, Calif. SB, NEIA and NVCA finally reached a compromise, which paved the way for last year's proposed legislation, S.4053, reintroduced this year as S.493. Among other things, the compromise allowed U.S. majority-VC-owned businesses into the program, but limited their participation to ensure that small businesses not backed by large firms are not edged out of the program. SBTC members and Board of Directors supported the compromise legislation last Congress, and we continue to support the compromise legislation as long as it holds together.

The current process to reauthorize the SBIR program has been going on for almost 5 years. Since the last reauthorization expired in 2008, there have been 10 continuing resolutions keeping this program going a few months at a time. The Federal Agencies and the small businesses that depend on this program need to know with certainty that this program is going to be around for the long term to plan their budgeting and staffing. By only extending the program a few months at a time, Federal Agencies and small businesses are forced to guess whether or not they will have funding for future projects. This is inefficient.

1. **First, The VC Question:** For most of this period, the issue holding up reauthorization has been whether or not to allow majority venture capital (VC) owned firms into the program. The compromise discussed above answers that question to the satisfaction of

SBTC. This compromise included a prohibition against majority-VC ownership by non-U.S. VC firms. The Federal Extra-mural R&D funds are U.S. taxpayer dollars and the benefits should accrue to U.S. firms and investors.

2. Second, Eliminating Phase I: During discussions over the past two years, the House version of the reauthorization included a provision to permit the agencies to eliminate Phase I and go directly to Phase II. We have opposed this plan because it strips out the heart of the success of the SBIR/STTR programs – the "down-select" at the end of the first 6-months of the projects.

Almost all paper proposals addressing very tough scientific challenges have interesting ideas from qualified principal investigators. However, when trying to solve very difficult scientific break-throughs, not all research projects succeed. That is the nature of advanced research.

As stated earlier, the genius of the SBIR/STTR programs is to **force** a down-select at the completion of the "feasibility phase" before proceeding to the "prototype phase." By selecting only the best 40% to 50% of the Phase I projects, the maximum Federal R&D dollars are focused on the projects with the highest likelihood of success.

Instead of proposing to eliminate Phase I on the SBIR/STTR programs, we respectfully recommend that Congress apply this same "down-select" concept to the university programs. As shown later, the SBIR/STTR programs are orders of magnitude more effective in patents, innovations and commercial success compared to Federally funded university research.

3. Increase of the SBIR/STTR Award Amount: While every researcher would always like to have more funding to apply to their project, the dramatic increase in award size contemplated in the previous House proposals (H.R. 2965) would dramatically reduce the number of projects, without a commensurate increase in research value. The strict limitation on Phase I and Phase II award sizes over the 28-plus years of the programs have resulted in the production of extremely high numbers of quality research projects. Again, while individual companies and researchers would like to see these numbers increase, SBTC Board and members believe that this would be detrimental to taxpayers' returns and the long-term interests of the successes of the SBIR/STTR programs.

Table 3. Impact of Dramatic Increases in SBIR Award Amounts (Assumes a $2 Billion/year program and 50% down-select to Phase II)

	Maximum Award Phase I & Phase II	Number of Awards per Year
Current SBIR Law	**$100,000 & $750,000**	**4,210 Phase I & 2,105 Phase II**
Proposed Increased Award Size (HR 2965)	**$250,000 & $2,000,000**	**1,600 Phase I & 800 Phase II**
Proposed Increased Award Size (S.493)	**$150,000 & $1,000,000**	**3,076 Phase I & 1,538 Phase II**

The agencies have the other 96% of their R&D budget that they can apply to increases to SBIR/STTR projects that they find particularly attractive. SBTC believes that the levels proposed in the Senate bill (S. 4053 last year and S.493 this year) are appropriate and we support such an increase. The NRC study concluded that these amounts were proper.[10]

Our members also oppose permitting agencies to dramatically increase the upper limits of Phase I and Phase II awards. Again, the agencies have the other 96% of their budget to add to SBIR and STTR programs. Such increases from the SBIR and STTR budgets would dramatically reduce the number of awards as follows:

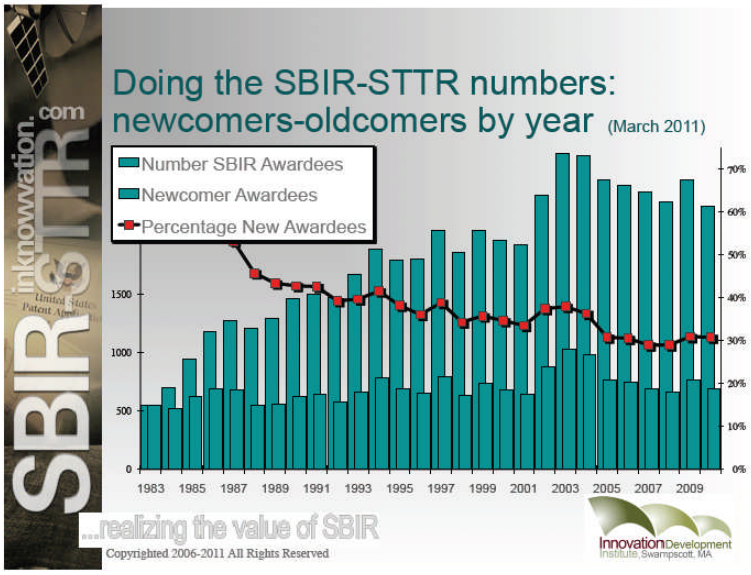
a. One $5.2 million award eliminates 8 Phase I and 4 Phase II awards.

b. One $10.2 million award eliminates 16 Phase I and 8 Phase II awards.

4. Increases in Award Size Without a Commensurate Increase In Allocation: The SBTC members and Board asked me to bring to your attention that the increases in award size contemplated in S.4053/S.493 would reduce the number of awards as shown in Table 2 unless the allocation is also increased. While we support S.4053/S.493 as is, we respectfully ask for consideration of this issue. A 36% increase in allocation would bring this back to parity in number of awards in both Phases I and II.

5. Retaining SBA Control of Policy Directives: SBTC recommends retaining SBA Office of Technology as the Federal Agency that interprets the legislation and issues the SBIR/STTR Policy Directives. This agency has performed this task well over the 28 years of the program. We would respectfully encourage the Committee to direct the SBA Administrator to staff this department adequately to perform the tasks outlined by this Committee for the administration of the programs. We further respectfully urge the Committee to require strict interpretation of the Congressional language and SBA Policy Directives in the implementation of the program in the various agencies. We would finally respectfully urge the Committee to require that SBA review and approve the SBIR regulations and guidelines of all implementing agencies and make certain that the SBIR processes and regulations are as simple and consistent as possible and that compliance does not place an undue burden on small business. We are concerned that allowing individual agencies to modify their programs with no oversight will make the application process confusing, difficult and overly burdensome for small businesses. One of the great successes of the SBIR program is that about 30% of all winners are new to the program each year, see IDI slide, Figure 1, below.[11] A key consideration for new regulations and guidelines should be on making it easier for new firms to participate, not harder. The SBA is the appropriate agency to guide this process.

Figure 1. SBIR Newcomers by Year



VIII. Next, Let's Counter the University Arguments Against Increasing the SBIR/STTR Allocations:

SBTC believes strongly that SBIR companies and the universities should not be fighting over their pieces of the Federal Extra-mural R&D pie (SBIR receives 2.5% of Federal R&D funding, and universities have averaged about 28%).[12] In the introduction to Congressional testimony in 1999, Jere W. Glover, now the Executive Director of SBTC, stated, "A proposal to create bridges, rather than walls, between these organizations is advanced to help ensure that the importance of the federal R&D funding of the entire continuum of the U.S. innovation process is communicated well to Congress and the public."[13]

As the NRC found in their study and as the New England Innovation Alliance survey found, there is already significant utilization of universities and university staffs by SBIR companies. (Appendix A)

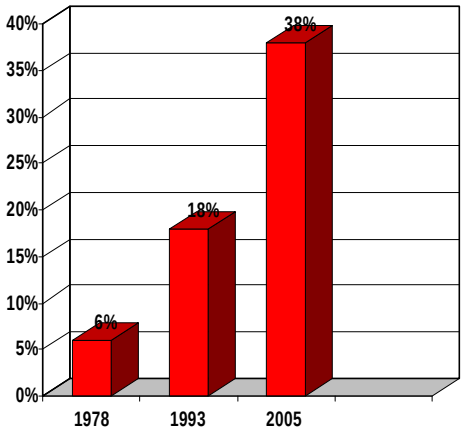
We know that the university lobbies and some universities will argue against increasing the allocation on the basis that this increase will come out of "their pot" of Federal R&D funding. We know this because:

1. During the initial SBIR Congressional deliberations and hearings for the legislation in 1982, the universities and their lobbyists testified against the program.[14]
2. During every SBIR and STTR Congressional hearing where universities and their lobbyists have had an opportunity to testify regarding increases in the program allocations, they have always opposed such increases.

So, let's look at the facts surrounding SBIR/STTR and University utilization of the Federal R&D funds:

1. **Both SBIR and STTR programs, and the universities are in competition for the same "Extra-mural" R&D funds from the Federal Government.** The SBIR/STTR legislation has very carefully defined what "Extra-mural R&D funds" mean and they essentially are the funds that Federal Agencies spend outside their own labs for Research and Development projects. The SBIR and STTR programs and universities must perform high quality research projects that meet Federal Agencies' needs.
2. **Universities' primary outputs are publication of the research and graduates seeking jobs; Small businesses' primary output is products – and jobs.** The historical "publish or perish" mandate for academics means that the primary output of their research is to publish their findings in peer-reviewed journals and on the Internet – which can be utilized by any other researcher, anywhere in the world. For small businesses, the primary goal is production of products and services – and they employ staff mostly in the United States – they are too small for globalization. Note that STTR and SBIR programs are very important ways university professors and their students can start companies to commercialize the research carried out in their labs.
3. **A significant transformation in our innovation sector has occurred over the almost 30 years of the SBIR/STTR programs.** Strikingly, there are now more scientists and engineers working in smaller companies (38%) than in any other sector. Some 27% of U.S. scientists and engineers currently work for large companies, 16% for universities, 13% for government, and 6% for nonprofits, see Figure 2 below.[15]

Figure 2. Percent of U.S. Scientists and Engineers Employed by Companies with Fewer than 500 Employees[16]



As found in the 1978 House and Senate Hearings referenced above, and in the Findings of the 102nd Congress hearings leading up to PL-102-564 of 1992:

> "**despite the general success of the small business innovation research program . . . funds received by small business concerns . . . has remained at 3 percent."**

In short, although the proportion of quality scientists and engineers has grown more than **six-fold** during the life of the SBIR program, the small company portion of the Federal R&D funds has remained almost the same over these past 30-plus years. And, as shown in Table 3, small businesses are the most productive of our technology sectors in converting dollars to patents. The commercial technology market has recognized the efficiency and cost saving of using small business. Outside of the highly qualified SBIR and STTR staffs, the Government Agencies have not.

IX. Why can't small business obtain a larger share of the Federal R&D funds without an "allocation" program? This is a great question that was answered in the 1978 Senate-House joint hearings referenced above and the House hearings of 1982 and 1992.

1. **What Congress found were the following market structural problems that prohibited a "free-market" competition for Federal R&D funds:**
    a. Small businesses were always at a disadvantage when competing with large companies or universities for research projects – because Federal Program Managers and Contracting Officers would always take the safe bet for their careers – the large companies or universities. Who could criticize a career civil servant for choosing MIT or IBM over "Jane and Joe Smith's 5-person R&D shop?"
    b. Universities had an "inside track" for almost all Federal R&D contracts because many of the decision makers and peer-review panels were staffed with university employees on loan to the agencies conducting the research. These individuals have a bias toward their fellow academics.

c. Universities and large businesses have dedicated marketing organizations that are often larger than the entire technical staffs of the competing small companies and therefore are able to obtain "inside tracks" on procurements.

For these reasons, Congress in 1982 and 1992, with a strong history of full and open hearings going back to 1978, and with great bipartisan support passed and enlarged the SBIR program to correct this distortion in the Federal R&D funding market.

2. What agency management says about the SBIR/STTR program: The NRC study found that many agency management personnel supported the SBIR program, particularly in DoD where they were found to permit much faster deployment of the latest technology to the fighting forces (see Box 1, page 50 of the NRC report).[17] From page 5 of the NRC study:

> **"Meeting Agency Procurement Needs.** The SBIR program helps to meet the procurement needs of diverse federal agencies. At the Department of Defense, the Navy has achieved significant success in improving the insertion of SBIR-funded technologies into the acquisition process. The commitment of upper management to the effective operation of the program appears to be a key element of this success. Teaming among the SBIR program managers, agency procurement managers, the SBIR awardees, and, increasingly, the prime contractors is important in the transition of technologies from projects to products to integration in systems. At DoD, the growing importance of the SBIR program within the defense acquisition system is reflected in the growing interest of prime contractors, who are seeking opportunities to be in support of SBIR projects—a key step toward acquisition."

DoD has capitalized on the SBIR/STTR programs to move advanced technology to the war front quickly by linking warfighters and Program Offices to the development of solicitation topics, and utilization of the Phase III process for quick-reaction contracting. In December 8, 2008, then Deputy Under Secretary of Defense, Acquisition and Technology, the Honorable James I. Finley wrote to the Secretaries of the Military Departments, and to the Directors of Defense Agencies (See Appendix I).

> "…As a vehicle to tap thousands of high-technology small businesses for solutions, the SBIR Program is an exceptional source of innovation and industrial base vitality. As such, it is imperative that SBIR Phase III efforts be executed in a manner consistent with the tenets listed above. DoD SBIR policy discussed in this memorandum will be reflected, as appropriate, in DoD regulations. I appreciate your support and assistance."

The Department of Energy has been especially forward thinking in the utilization of the SBIR/STTR programs as shown in September 15, 2010, Dr. Kristina M. Johnson, then the Under Secretary of Energy, wrote:[18]

> "Today is a first for the Department of Energy, as $57 million, including nearly $11 million under the American Recovery and Reinvestment Act, is being awarded as part of our new Phase III *Xlerator* awards. This grant program builds off the Small Business Innovation Research Program (SBIR) and the Small Business Technology Transfer Program (STTR), and gives qualified small businesses around the country the staying power they need to bring their clean energy technology projects to commercialization.
>
> With these Phase III *Xlerator* awards, 33 small businesses in 16 states will lead projects that received SBIR or STTR funding, teaming up with universities, national labs and industry to bring their work to the commercial marketplace. By drawing upon the

resources of universities, labs and industry, innovative small businesses will be able to develop the manufacturing processes needed to scale up production of their new and proven technologies.

The 33 small businesses receiving SBIR Phase III *Xlerator* awards are tackling big issues. These small businesses have demonstrated energy-efficient methods for harvesting algae to make a product that's competitive with petroleum. They are introducing lighting products that can go toe-to-toe with linear fluorescent technology. They are improving fuel cell technologies, reducing size, changing fuel membranes, and even adding wood saw dust to bio oil for a new integrated power system."

The statement to me by a retired senior Federal manager provides another perspective of the value of the programs to agency goals in areas not normally publicized:

"The SBIR program was, and is, a rich source of successful innovation for the Domestic Nuclear Detection Office. Small businesses have proven to be resourceful and creative, so it is particularly important for the federal government to provide a competitive mechanism for small companies to apply their expertise to important national needs."

Dr. William Hagen, Former Deputy Director, DHS Domestic Nuclear Detection Office (DNDO)[19]

3. SBIR/STTR Success Stories: The SBIR and STTR programs have experienced considerable success in meeting agency needs as reported by NRC. The agencies first provided reports of these successes and later developed web sites listing their successes. In some cases they improve agency research, in others they resulted in new products that could be commercialized, and for DoD, there were new products that provided advanced technology to the warfighters on a quick-reaction basis. Almost all of the SBIR/STTR agencies post their SBIR/STTR success stories on their web sites as follows:

a. DOD: http://www.dodsbir.com/SuccessStories/default.asp
b. NIH: http://grants.nih.gov/grants/funding/sbir_successes/sbir_successes.htm
c. NASA: http://sbir.nasa.gov/SBIR/success.htm
d. DOE: http://www.science.doe.gov/sbir/Success.html
e. NIST/DOC: http://tsapps.nist.gov/success/sbir_successes/sbir_successes.cfm
f. EPA: http://www.epa.gov/ncer/sbir/success/
g. USDA: http://www.csrees.usda.gov/newsroom/impact/sbir_impacts.html
h. Overall, if one Googles "SBIR Success Stories" there are approximately 35,000 responses (of course, some are redundant).

SBA began the "Tibbetts Awards" to recognize excellence in the program in companies, products and government program staff. The 2011 Tibbetts Awards, and a new award, the SBIR Hall of Fame Awards are listed on the SBA website at:
http://www.sba.gov/content/sba-announces-winners-2011-tibbetts-awards

4. What about the productivity of the SBIR/STTR program versus universities in the effective use of taxpayer Federal R&D funds?

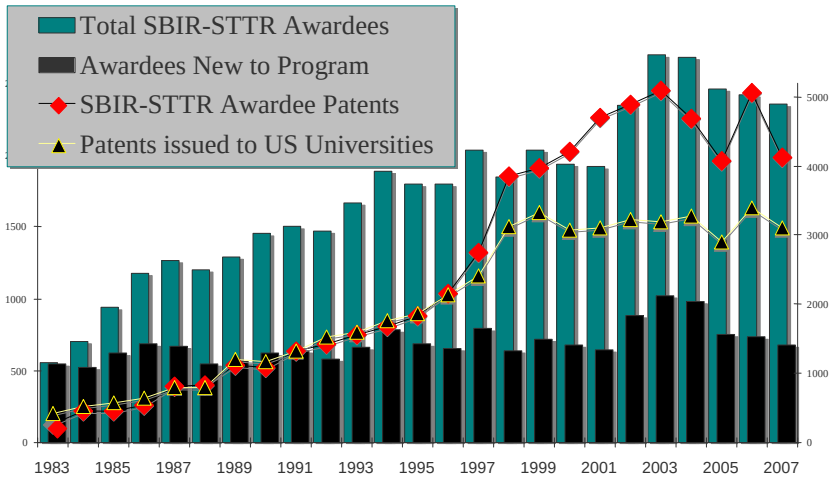
SBTC believes it is helpful to compare the productivity of the SBIR companies versus universities in two key critical factors shown below in Table 4.

Table 4. SBIR vs Universities in Dollars per Patent, and Commercialization Returns	
Dollars of Federal Funding per Patents Issued:	
Universities (Average 2007 to 2009)[20]	**$14, 940,401**
SBIR Companies (Average 1982 to 2010)[21]	**$ 421,975**
Commercialization Returns:	
Universities 2009 Licensing = $2.3 B (vs $53.0 B funding)[22]	**4.3 %**
SBIR Companies (Average cash return per award)[23]	**~ 50 %**

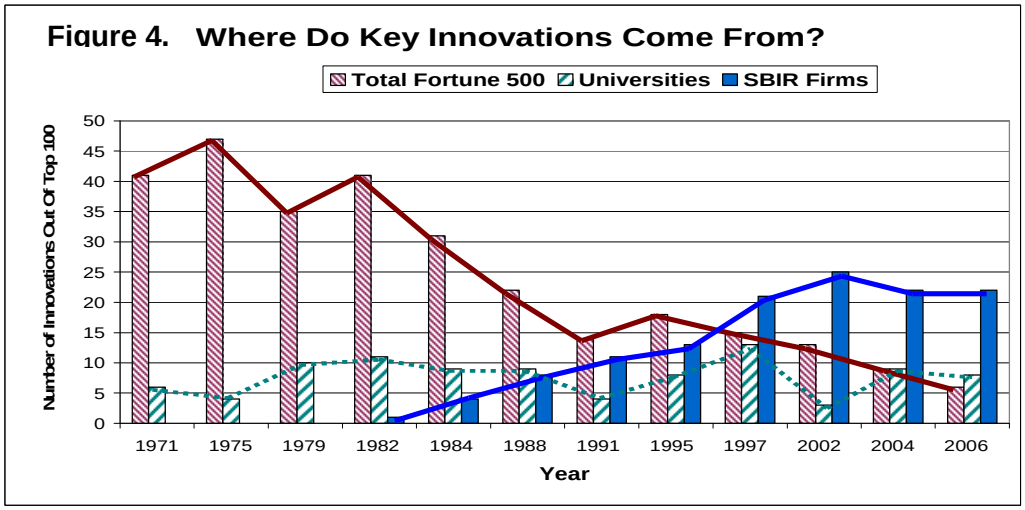
On these two measures, the SBIR program is 35 times more effective in generating patents per dollar of Federal R&D funding, and at least 10 times more effective in creating cash returns on the Federal R&D investment. However, this is not surprising. The primary purposes of the small businesses are to bring new products to market and to create jobs – and they do this quite well, creating more than two-thirds of the net new jobs in the past 15 years.[24] The primary purpose of universities is to provide highly qualified graduates to enter the U.S. economy[25] – and they do this quite well as all SBIR companies will attest (See Appendix J).

A further analysis of patents and where innovations come from is shown in Figure 3 from Innovation Development Institute.

Figure 3. Effectiveness of SBIR Companies vs Universities in Patents Issued[26]



From a different perspective, the Information Technology and Innovation Foundation recently analyzed the annual lists of the 100 most technologically-important innovations, as selected each year by a panel of judges for *R&D Magazine*.[27] In Figure 4 below, the authors compared the performance of innovations from SBIR companies on these annual assessments, with those from Fortune 500 companies and universities.[28] [Note: The "missing" approximately 50-55% innovations of the chart are from other businesses large and small, collaborations between organizations, federal labs and spin-offs, and foreign innovations.]



As the chart indicates, for the past decade, about one-fourth of the most important technological innovations in the nation have been coming from the SBIR Program – with only 2.5 percent of the Federal Extramural R&D funding, vs approximately 28+ percent for the universities. Or, as the authors themselves put it:

> "The results show that these SBIR-nurtured firms consistently account for a quarter of all R&D 100 award winners – a powerful indication that the SBIR Program has become a key force in the innovation economy of the United States."[29]

A rough calculation of dollars per innovation can be made by comparing the number of "Key Innovations" per Figure 3, the ITIF chart, with total funding provided over an average of two years to universities and the SBIR funding to SBIR companies (2005 to 2006). We have rounded up the university Key Innovations to 10 for the years 2004 to 2006, and have rounded down the SBIR Key Innovations to 20 for the same years. Based on the AUTM report for 2005 to 2006 the average university funding was $43.5 billion,[30] and according to the NSF SBIR web site, the 2006 SBIR funding was approximately $1.73 billion.[31] The approximate results are shown in Table 5 below and show a ~ 50:1 multiplier of SBIR firms vs universities:

Table 5. Key Innovations Per Dollar of R&D Funding – Approximate Average 2005 to 2006

Organization	Avg. Funding – Billions	Key Innovations-Average	$/Key Innovation
Universities	~ $43.5	~ 10	~ $4.35 Billion
SBIR Companies	~ $1.73	~ 20	~ $86.5 Million

5. What about the quality of SBIR/STTR projects versus university-conducted research? This has been studied by both GAO and the National Research Council and they both found that the quality of the SBIR/STTR research is comparable to university research.

a. **GAO Observations**: From: *Observations on the Small Business Innovation Research Program*, Statement for the Record of Anu K. Mittal, Director Natural Resources and Environment Team, GAO-05-861T, June 2005. See Appendix G.

   i. "Between July 1985 and June 1999, GAO. . . . found that SBIR is achieving its goals . . . to stimulate commercialization of research results . . . Participating agencies and companies . . . generally rated the program highly."

   ii. *"High-quality research*. . . **more than three-quarters of the research conducted with SBIR funding was as good as or better than other agency-funded research.** Agency officials also rated the research as more likely than other research they oversaw to result in the invention and commercialization of new products. . ." [Emphasis added.]

   iii. *"Widespread competition*. . . . had a high level of competition, and consistently has had a high number of first-time participants. . . .We also found that the agencies deemed many more proposals worthy of awards than they were able to fund. For example, the Air Force deemed 1,174 proposals worthy of awards in fiscal year 1993 but funded only 470.

   iv. *"Successful commercialization*. SBIR successfully fosters commercialization of research results.

   v. *"Helping to serve mission needs*. SBIR has helped serve agencies' missions and R&D needs.

b. **National Research Council Study**. This 2008 study was mandated by the House and involved a 6-year assessment of the entire SBIR program at all agencies.[32] The report has been presented to Congress and some of the findings are presented here. See Appendix H for details.

NATIONAL RESEARCH COUNCIL (NRC) STUDY FINDINGS:

   i. "The Small Business Innovation Research (SBIR) Program Is Making Significant Progress in Achieving the Congressional Goals for the Program.

   ii. Overall, the Program Has Made Significant Progress in Achieving its Congressional Objectives by: Stimulating Technical Innovation

   iii. Using Small Businesses to Meet Federal Research and Development Needs.

   iv. Increasing Private Sector Commercialization of Innovation Derived from Federal Research and Development.

   vi. SBIR Is Meeting Federal R&D. The NRC survey revealed that 56 percent of surveyed projects were successful in attracting additional funding from a variety of sources.

   vii. Linking Universities to the Public and Private Markets. . . .a third of all NRC Phase II and Firm Survey respondents indicated that there had been involvement by university faculty, graduate students, and/or a university itself …"

X. Proposed Dramatic Increase in the STTR Allocation: We appreciate the great contribution that universities make to advancing knowledge. As stated in Jere Glover's 1999 testimony,[33] SBTC believes in a cooperative relationship between universities and small businesses such as envisioned by Congress in establishing the STTR program. In this economic time with the need to allocate the federal funds to the most efficient use, we think it is better for the knowledge sector and the jobs/money sector to work together. For this reason, we have proposed a dramatic increase in the STTR program. This program provides an excellent opportunity for universities and small businesses to work together to the mutual benefit of all – especially the taxpayers. A detailed discussion by SBTC of expanding the STTR program is included in this testimony as Appendix K.

As mentioned earlier, I have found that the SBIR and STTR programs foster collaborations between small businesses and universities. In New England we studied this phenomenon and reported the results as shown in Appendix A mentioned earlier. This included 243 professors and students involved in 175 different contracts with 17 NEIA companies over a 5-year period, for a total contract value of over $31 million.

The NRC study also independently verified this as quoted below:

> "**1.3.4 SBIR and the University Connection**
>
> SBIR is increasingly recognized as providing a bridge between universities and the marketplace. In the NRC Firm Survey, conducted as a part of this study, over half of respondents reported some university involvement in SBIR projects. Of those companies, more than 80 percent reported that at least one founder was previously an academic.
>
> SBIR encourages university researchers to found companies based on their research. Importantly, the availability of the awards and the fact that a professor can apply for an SBIR award without founding a company, encourages applications from academics who might not otherwise undertake the commercialization of their own discoveries. In this regard, previous research by the NRC has shown that SBIR awards directly cause the creation of new firms, with positive benefits in employment and growth for the local economy."[34]

XI. Spurring Innovation and Job Creation

The SBIR/STTR Programs are a "Perfect Solution" to the "Perfect Storm" of Financial Challenges Facing SBIR and STTR Companies – and The U.S. Economy:

SBTC believes that the Committee's title for this hearing is especially germane in today's financial and budgetary climate.

The financial challenges facing the small SBIR/STTR companies have peaked into a "Perfect Storm" of financial problems affecting our economy. The SBIR/STTR programs have become the "financing of last resort" as described in the next sections.

And, with the budgetary challenges facing this Congress and the Administration, the demonstrated high efficiency of SBIR/STTR companies in producing extraordinarily high numbers of patents, innovations and jobs, make these programs especially valuable to our country and taxpayers at this time in our Nation's history.

As Congress and the Administration address the budgetary and deficit challenges of our nation, it is clear that the most efficient use of taxpayers' dollars is paramount. From the data we presented

earlier, it is clear that small businesses and the SBIR/STTR programs are the most efficient way to convert Federal R&D dollars into patents, innovations, products and jobs – here in America.

We urge the Committee to consider this financial factor in reauthorization deliberations.

In a November 18, 2010 WSJ article, authors Justin Lahart and Mark Whitehouse provide a very good overview of the challenges facing all small businesses, including SBIR companies (Appendix L). They state:

> "Fewer new businesses are getting off the ground in the U.S., available data suggest, a development that could cloud the prospects for job growth and innovation. Research shows that new businesses are the most important source of jobs and a key driver of the innovation and productivity gains that raise long-term living standards. Without them there would be no net job growth at all, say economists John Haltiwanger of the University of Maryland and Ron Jarmin and Javier Miranda of the Census Bureau. "Historically, it's the young, small businesses that take off that add lots of jobs," says Mr. Haltiwanger. "That process isn't working very well now.""

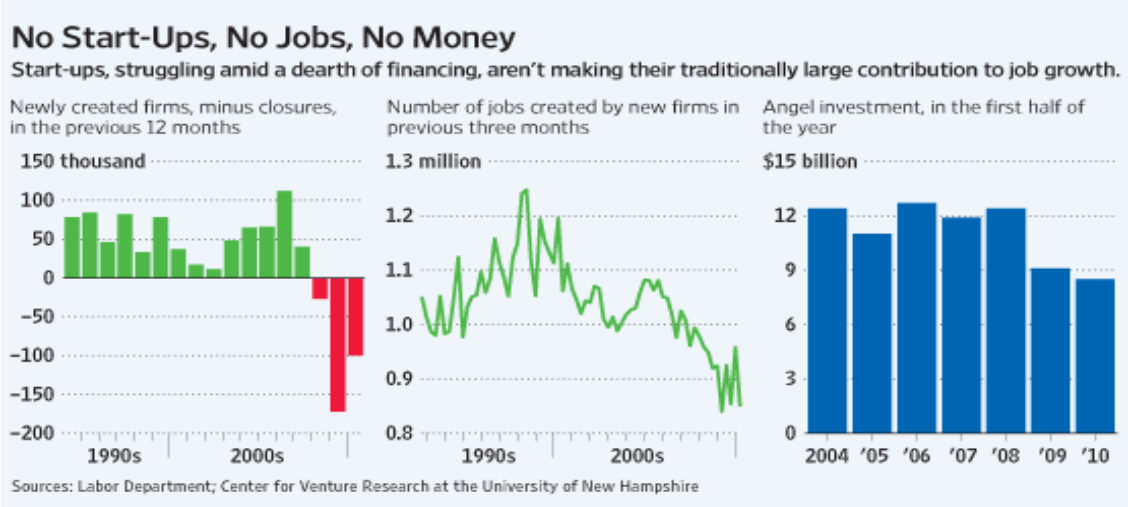


Figure 5. Charts from Appendix N

XII. The Important Financing Challenges All Small Businesses, Including SBIR/STTR Companies, Face in Today's Recession. In a recession, small businesses are hit the hardest during the ensuing credit crunch. In the 1991 recession, banks had a net negative lending to businesses – meaning they pulled more loans than they made.[35] This is also true in the current recession as shown in Figure 6 of the Federal Reserve Bulletin below.

Figure 6. Federal Reserve Bank Report on All Commercial and Industrial Loans

This credit crunch is also hitting small businesses as shown in Figure 7 and Figure 8 below.[36] These charts are from the Office of Advocacy, US Small Business Administration research: *The Economy During the 1990s*, and were presented at the *Innovations in Economic Development Forum* in Atlanta on February 2, 2010.

Figure 7. Small Business Bank Lending 1991 to 2010.

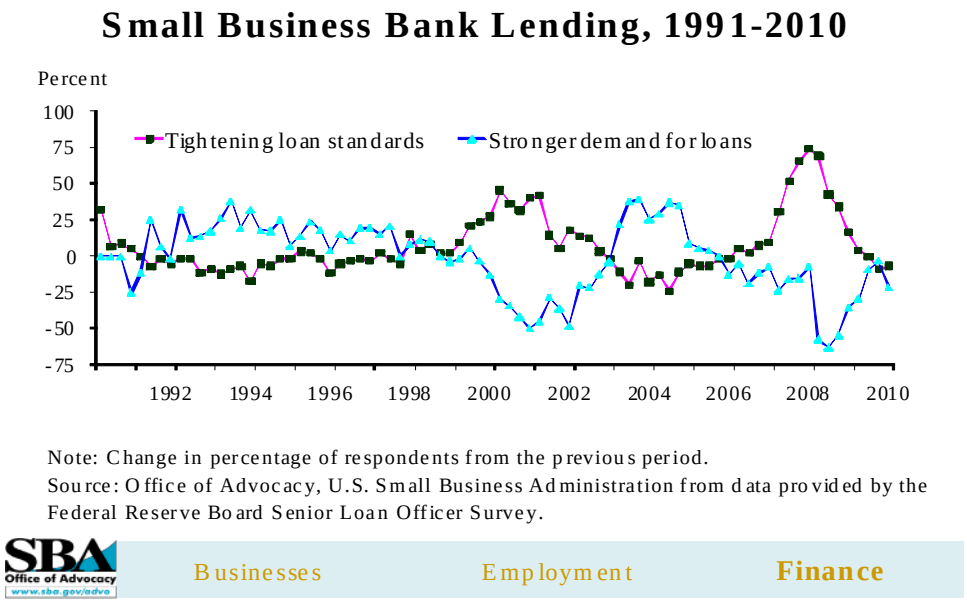
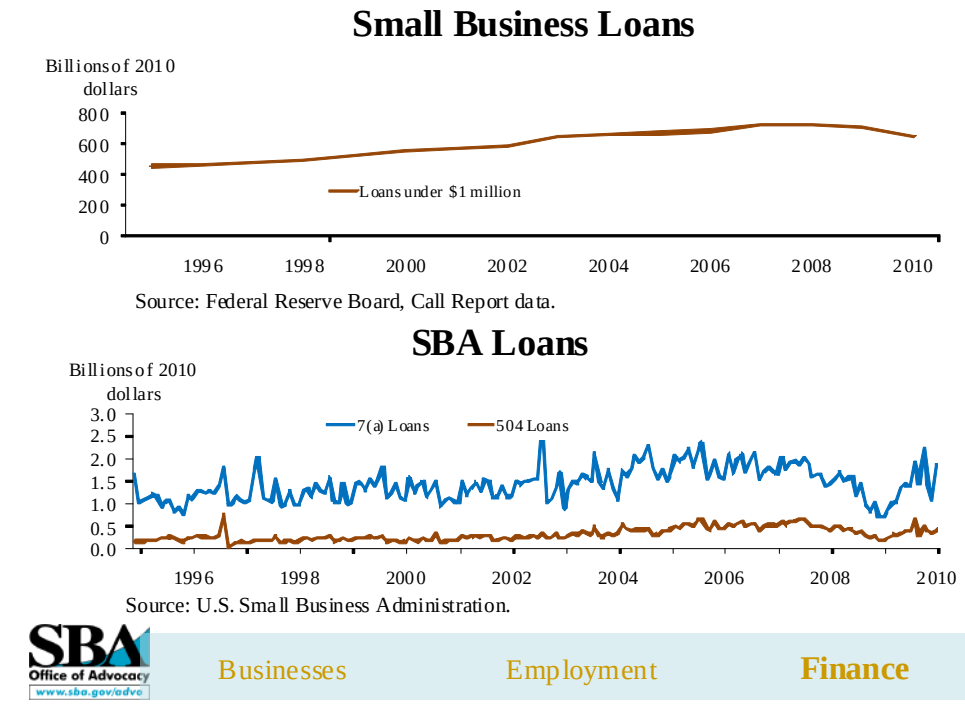


Figure 8. Small Business Loans (under $ 1 million) and SBA Loans



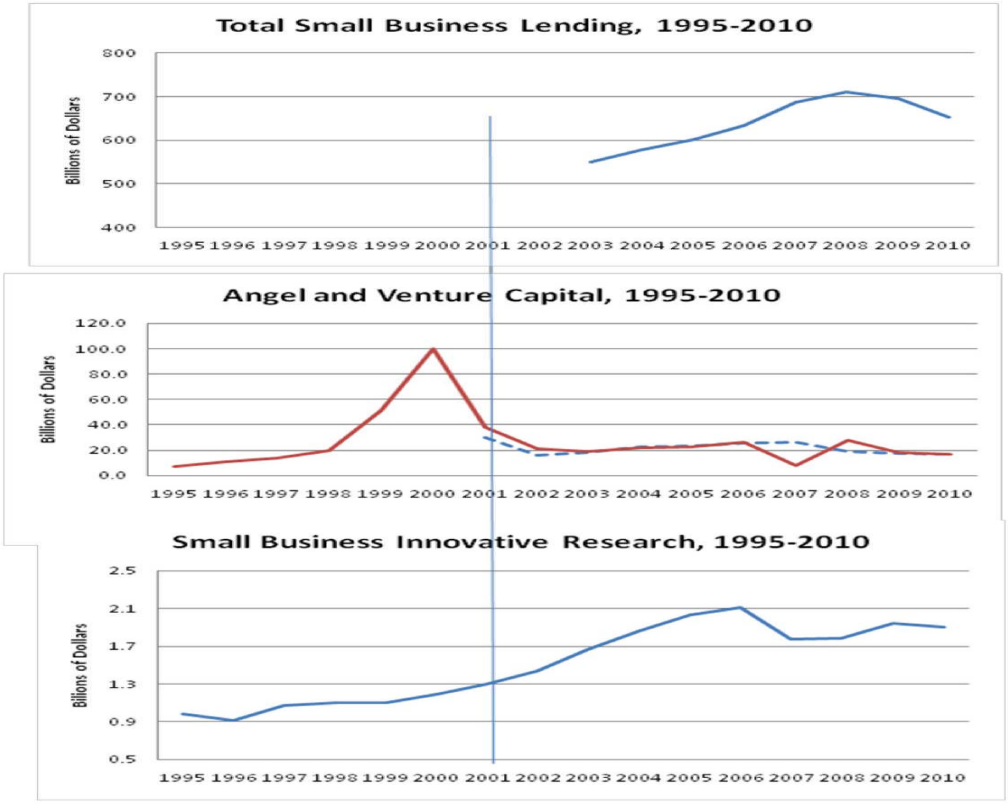
The Office of Advocacy, US Small Business Administration, just released on February 11, 2011, their annual banking study, *Small Business Lending in the United States, 2009-2010.*[37] The report summary states:

> "U.S. gross domestic product has increased since second quarter 2009; however, small business lending by depository institutions continues to decline. This decline reflects the challenges posed by an uncertain economy in which small business owners are reluctant to acquire more debt, lenders are cautious about extending more debt, and regulators are carefully watching the performance of all out-standing debt. The aggregate value of small business loans held by depository institutions declined by 6.2 percent from $695.2 billion in 2009 to $652.2 billion in 2010."

A further Office of Advocacy release on February 13, 2011 by the Chief Counsel are the Small Business Financing[38] charts below in Figure 9 which show the reduction of the most important financing affecting the SBIR/STTR programs: (all in $ Billions)

1. Total Small Business Lending (1995) 2003 to 2010 showing the steep drop in banking and related lending after 2008.
2. Angel (Blue-dashed line) and Venture Capital Financing (Red line) 1995 to 2010 showing the declines after the dot-com bust of 2000.
3. SBIR funding showing the drop after 2006.

Figure 9. Small Business Financing 1995 to 2010



What these charts show is that SBIR companies are facing the same very discouraging credit market that all small businesses have. This Committee is well familiar with this problem and we applaud your efforts to draft policies that can help turn this problem around.

XIII. Finally, Let's Look at the Importance of the SBIR Program in Financing Small High-Tech Companies – And, How They Leverage Federal R&D Funds to Bring Products to Market. What I'd like to discuss in closing today is that SBIR and STTR companies can and do provide financial leverage to the Federal R&D dollars they receive – something that is not possible on most university projects. The SBIR and STTR programs can provide a very important stimulus to jump start the commercialization of the technologies of the companies awarded contracts. The SBIR and STTR grants/awards are non-dilutive to the shareholders' equity, and are not loans that detract from a company's balance sheet. In fact they are looked on with considerable favor by:

1. Equity investors because the SBIR/STTR program has "vetted" the company's technology through the peer review competitive selection, and because the company has shown an ability to meet the contract/financial/management reporting systems imposed by the programs regulations. In addition, the commercialization plans legislated by Congress and required by all of the SBIR/STTR agencies provide the potential investors with the company's strategies for creating a market for the product.
2. Banks and other financial institutions for lending because of the "solid customer" caliber of the contract with the Federal government, and because of the vetting and reporting requirements and commercialization plans favored by equity investors. In addition, lenders see these contracts as "operations loans" with very low risk since the delivery requirements are research reports and items.
3. Lenders and equity investors when the SBIR/STTR program reaches the Phase III stage because the company is now in commercial production of a product that the lenders and investors have known through the approximate two plus years of Phases I and II. At this stage the commercialization plans are particularly useful because the companies have real customers and market opportunities.

This leverage permits the SBIR/STTR companies to employ more staff than the universities can for the same Federal R&D dollar because universities produce only research reports/items. By their very nature, they do not have marketing and production organizations; therefore, there is no Phase III for their research. The high rate of commercialization reported by GAO and NRC referenced above provides for a direct multiplier on the Federal R&D funds expended on the SBIR and STTR program.

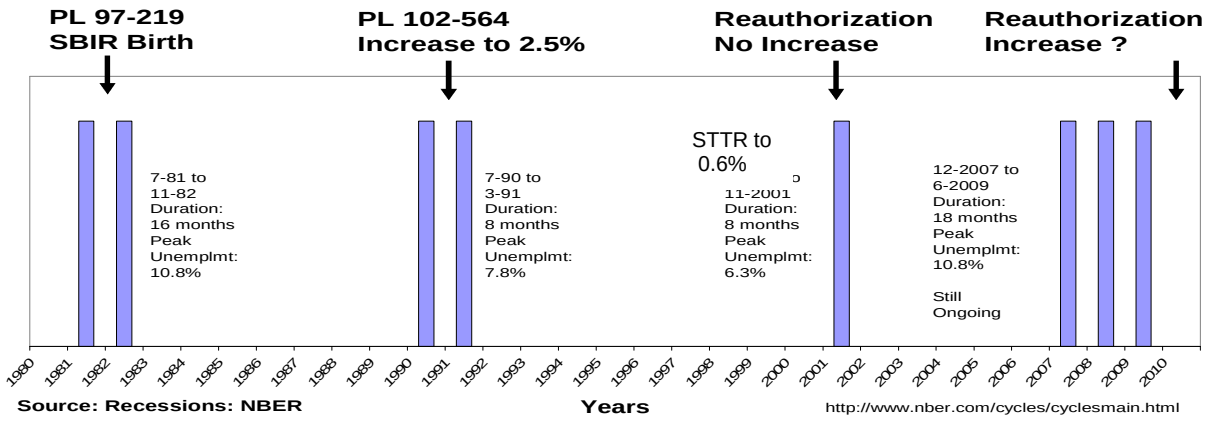
Lastly, this Committee well knows that the small businesses are the most important sector of our economy in creating net new jobs – sorely needed today.

XIV. The SBIR and STTR programs deserve to be reauthorized quickly – perhaps permanently — and their allocation significantly increased. On behalf of the members and Board of SBTC we thank you for holding this very timely hearing. Figure 10 on the page 22 provides a one-page picture of the major factors in why we believe that the SBIR/STTR programs are the "Perfect Solution" to the 2011 "Perfect Storm."

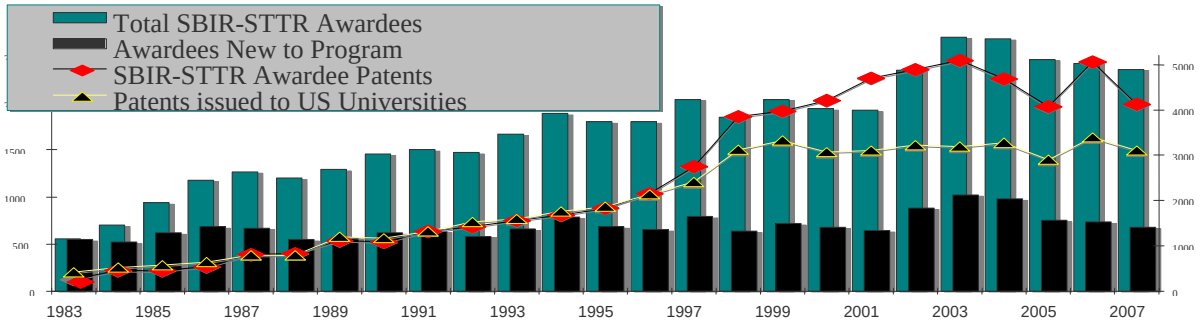
Note 1: We have provided for your information a paper that the "Father of the SBIR Program," Roland Tibbetts prepared at the beginning of the reauthorization deliberations in 2008 as Appendix M. Roland provides the historical perspective and details of why and how the program was designed and some of the lessons learned from inside the operations of the agencies. This dedicated civil servant was a decorated WWII navigator (Distinguished Flying Cross), venture capitalist, and creator of the SBIR program at NSF. He is an honorary Board member of SBTC. He stands ready to answer any questions the Committee may have.

Note 2: A copy of my CV is provided as Appendix N for your information. I, too, stand ready to answer any questions the Committee may have as does SBTC. Normally, we would not provide such a voluminous document in our testimony; however, there are a number of new Congressmembers who may not have any knowledge of the SBIR and STTR programs. The 28+ year history of these programs has a wealth of information that we believed needed to be provided to you and your competent staffs in order for you to make informed decisions in the current economic conditions.

Figure 10. SBIR, "The Perfect Solution" to The 2011 "Perfect Storm"



Recessions and the SBIR Program



Percent of U.S. Scientists and Engineers Employed in Small Businesses (< 500 employees)		
Year 1978	Year 1993	Year 2005
6%	18%	38%
Percent of Federal R&D $ = 3.5%	Percent of Federal R&D $ = 3.8%*	Percent of Federal R&D $ = 4.3%*
* Includes SBIR and STTR in 1993 and 2005 report of Percent of Federal R&D $		

Comparison of Federal R&D Dollars Received and Patents Granted

Organizations	Federal R&D Dollars	Patents Granted
Small Business	4 percent	38 percent
Universities	28 percent	3 percent
Large Business	36 percent	55 percent

[1] From Congressman Sam Graves web site: http://www.house.gov/graves/biography.shtml
[2] February 18, 2011, http://www.whitehouse.gov/the-press-office/2011/02/18/remarks-president-winning-future-hillsboro-oregon
[3] Recession source: NBER Recessions of the Twentieth Century.
[4] These 1978 hearings showed that, despite their demonstrated superior efficiencies at innovating, small companies received only 3.5% of federal R&D contract dollars. Today, with far more science and engineering talent at their disposal, and a far more widely acknowledged record of innovations, small companies still receive only 4.3% of those R&D contract dollars. And SBIR/STTR accounts for more than half of that. The SBTC Executive Director, Jere W. Glover was Counsel to the House Small Business Committee in 1978 and helped convene this first joint House-Senate Small Business Committee hearing on the subject. SBTC, its Board of Directors, and members have had a very long association with both the SBIR and STTR programs and believe that we provide an experienced and balanced perspective on the program.
[5] From DoD web site: http://www.acq.osd.mil/osbp/sbir/overview/index.htm
[6] PricewaterhouseCoopers/NVCA MoneyTree;
https://www.pwcmoneytree.com/MTPublic/ns/nav.jsp?page=region
[7] Data provided for this testimony by Ann Eskesen, President of Innovation Development Institute (IDI), Swampscott, MA, 2011, the best and most comprehensive source of SBIR data.
[8] *An Assessment of the Small Business Innovation Research Program*, National Research Council, National Academies Press; Charles W. Wessner, *Editor*, Committee on Capitalizing on Science, Technology, and Innovation; 2008; see: http://www.nap.edu/catalog.php?record_id=11989
[9] See: http://www.wilkinguge.com/roi-approach/pdfs/harvard-business-review-dont-blame-the-metrics.pdf ; and for a popular, non-scientific review, see: http://www.theproduct.com/marketing/product_failure.htm, and http://www.corpmagazine.com/executives-entrepreneurs/entrepreneurs/itemid/274/winning-the-new-product-innovation-game
[10] *An Assessment of the SBIR Program,* Op Cit, page 9
[11] Ann Eskesen, IDI, op cit.
[12] http://www.nsf.gov/statistics/seind10/append/c4/at04-07.pdf
[13] *A New View of Government, University, and Industry Partnerships,* Jere Glover, then Chief Counsel of the Office of Advocacy, at the Senate Committee on Small Business Roundtable Discussion on the SBIR program on August 4, 1999.
[14] One of the first examples was the March 10, 1982 hearing by the R&D Subcommittee of the House Armed Services Committee on HR-4326, where Stanford University and the American Electronics Association (AEA) both testified against the program, and the Electronic Association of California (a small-business trade association spin-off from AEA) testified in favor of the SBIR program.
[15] Testimony by Jere W. Glover before the Subcommittee on Technology and Innovation, Committee on Science and Technology, United States House of Representatives, 23 April 2009.
[16] National Science Foundation, *Science and Engineering Indicators*, 2007.
[17] *An Assessment of the SBIR Program,* Op Cit, page 50.
[18] See: http://blog.energy.gov/blog/2010/09/15/boost-small-business
[19] Personal discussions with the author on March 10, 2011. DNDO is the office of the Department of Homeland Security that is the primary entity in the U.S. government for implementing domestic nuclear detection efforts for a managed and coordinated response to radiological and nuclear threats, as well as integration of federal nuclear forensics programs.
[20] Press releases for the Association of University Technology Managers (AUTM) U.S. Licensing Activity Survey Summary: FY-2007 to 2009, average annual funding is $51.4 billion; average number of patents issued is 3440. See:
http://www.autm.net/AM/Template.cfm?Section=Licensing_Surveys_AUTM&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=6&ContentID=2409
[21] Data from www.inknowvation.com the web site for Ann Eskesen, President of Innovation Development Institute, Swampscott, MA, 2011, the best and most comprehensive source of SBIR data. From the program inception in 1982 to date total funding is $31.8 billion; total number of patents issued is 75,265.
[22] AUTM, Op Cit, 2009; R&D funding to universities was $53.9 billion, and licensing income was $2.3 billion for 2009.
[23] NRC-Wessner, Op Cit, Page 122, which states: "On average, SBIR projects received almost $800,000 from non-SBIR sources, with over half of respondents (51.6 percent) reporting some additional funds for

the project from a non-SBIR source." [Since only one-half of the respondents reported receiving additional funds, we have discounted the $800,000 number in the NRC report to $400,000. Per the NRC report, the average Phase I plus Phase II funding was approximately $100,000 plus $675,000 or $775,000 during the period of the study.]

[24] Office of Advocacy, U.S. Small Business Administration, See: http://www.sba.gov/advocacy/7495/8420

[25] *Managing University Intellectual Property in the Public Interest***,** 2010, Committee on Management of University Intellectual Property: Lessons from a Generation of Experience, Research, and Dialogue; Stephen A. Merrill and Anne-Marie Mazza, Editors; National Research Council, http://www.nap.edu/catalog/13001.html Page 68, "Finding 2**:** The transition of knowledge into practice takes place through a variety of mechanisms, including but not limited to: 1. movement of highly skilled students (with technical and business skills) from training to private and public employment; 2. publication of research results in the open academic literature that is read by scientists, engineers, and researchers in all sectors; . . . 8. licensing of IP to established firms or to new start-up companies."

[26] Innovation Development Institute, 2009, from U.S. Patent and Trademark Office data.

[27] Fred Block and Matthew Keller, *Where Do Innovations Come From? Transformations in the U.S. National Innovation System 1970-2006*, Information Technology and Innovation Foundation, July 2008.

[28] *A New View of Government, University, and Industry Partnerships,* Jere Glover, 2009, Op Cit

[29] Ibid., p. 15

[30] AUTM, Op Cit, In 2005 and 2006, the reported R&D funding to universities was $42 billion and $45 billion respectively.

[31] http://www.nsf.gov/statistics/seind10/c8/c8s6o49.htm For 2005 and 2006 NSF reports that the SBIR funding was approximately $1.73 billion average per year. It is clear that a "Key Innovation" may take years from the time of research to market impact, but it is proposed that by treating both organizations the same, and since the funding levels were relatively comparably stable over the previous 2 years, the information shown is a reasonable approximation.

[32] *An Assessment of the SBIR Program,* Op Cit.

[33] *A New View of Government, University, and Industry Partnerships,* Jere Glover, 2009, Op Cit

[34] *An Assessment of the SBIR Program,* Op Cit, page 42.

[35] Federal Reserve Bulletin: Profits and Balance Sheet Developments at U.S. Commercial Banks in 2009, Last update: September 2, 2010.
See: http://www.federalreserve.gov/Pubs/Bulletin/2010/articles/profit/default.htm#fig3

[36] Innovations in Economic Development Forum, Co-sponsored by the Georgia Tech School of Public Policy and the Georgia Tech Enterprise Innovation Institute, Atlanta, GA. Wednesday February 2, 2010. Speaker: Brian Headd, Economist, Office of Advocacy, U.S. Small Business Administration *The Economy During the 1990s.*

[37] *Small Business Lending in the United States, 2009-2010,* Office of Advocacy, US Small Business Administration, released on Feb 11, 2011, by Chief Counsel for Advocacy, Dr. Winslow Sargeant. See: http://www.sba.gov/sites/default/files/files/sbl_10study.pdf

[38] *Small Business Financing, 1995 to 2010*, Office of Advocacy, US Small Business Administration, released on February 14, 2011, by Chief Counsel, Dr. Winslow Sargeant.

APPENDIX A

New England Innovation Alliance

http://www.neinnovation.org/NEIA/neia.html

Five Years of University Participation in SBIR/STTR

A Survey of 17 NEIA members

1 June, 2007

Participating NEIA Companies

- AER
- Aerodyne
- AFR
- AnthroTronix
- Delsys
- Dynamet
- EIC
- FarSounder
- Inflexxion
- MSI
- ProChange
- PSI
- RMD
- SSI
- SSCI
- Triton
- Visidyne

Total of 101Universities Cited

- MIT (8)
- U of Connecticut (7)
- Harvard University (5)
- Boston University (5)
- UMass/Lowell (4)
- SUNY (4)
- Brown University (3)
- Northeastern U (3)
- Georgia Tech (3)
- UC/Berkley (3)
- Rice University (3)
- U of Arizona (3)
- Princeton (3)
- Purdue (3)
- Johns Hopkins (3)
- 20 others (2)
- 66 others (1)

Total Dollars Subcontracted

- 175 separate subcontracts to universities
- $28,124,005 subcontracted to universities
- 243 professors and grad students involved
- $3,108,700 additional to professors

Faculty Involvement in NEIA Companies

- Founders included 9 faculty members
- 49 members of tech staff formerly held academic positions
- 45 professors are part-time employees or consultants
- 33 grad students on SBIRs were hired
- 25 employees are adjunct professors at universities

APPENDIX B

Findings and Purposes of PL 97-219
http://www.history.nih.gov/research/downloads/PL97-219.pdf

PUBLIC LAW 97-219 Signed JULY 22, 1982

Public Law 97-219, 97th Congress
An Act
To amend the Small Business Act to strengthen the role of the small, innovative firms in federally funded research and development, and to utilize Federal research and development as a base for technological innovation to meet agency needs and to contribute to the growth and strength of the Nation's economy.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. This Act may be cited as the "Small Business Innovation Development Act of 1982".

SEC. 2. **(a)** The Congress **finds** that-
(1) 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;
(2) while small business is the principal source of significant innovations in the Nation, the vast majority of federally funded research and development is conducted by large businesses, universities, and Government laboratories; and
(3) small businesses are among the most cost-effective performers of research and development and are particularly capable of developing research and development results into new products.

(b) Therefore, the **purposes** of the Act are-
(1) to stimulate technological innovation;
(2) to use small business to meet Federal research and development needs;
(3) to foster and encourage participation by minority and disadvantaged persons in technological innovation; and
(4) to increase private sector commercialization innovations derived from Federal research and development.

APPENDIX C

http://thomas.loc.gov/cgi-bin/query/F?c102:4:./temp/~c1020B9ao8:e44878:

H.R.4400

Small Business Innovation Development Amendment Act of 1992
(Reported in House - RH)

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS- Congress finds that--

(1) the Small Business Innovation Research Program established by the Small Business Innovation Development Act of 1982 has been effective in encouraging the participation of small businesses in Federal research and development;

(2) the Small Business Innovation Research Program has stimulated technological innovation by small businesses participating in the program;

(3) small businesses participating in the Small Business Innovation Research Program have demonstrated that they are among the most competent and cost-effective providers of high quality research and development;

(4) small businesses participating in the Small Business Innovation Research Program have provided innovative products and services which are vital to the national defense, the exploration of space, the advancement of science, the promotion of the health, safety, and welfare of United States citizens, and many other fields important to the functions of the Federal Government;

(5) the Small Business Innovation Research Program has been successful in converting Federal research and development into innovative products benefiting both the United States Government and the commercial marketplace;

(6) by moving technology from the laboratory to the marketplace, the Small Business Innovation Research Program has expanded business opportunities, increased productivity, created jobs, stimulated the introduction of new products by high technology-related firms, and made United States industry more competitive;

(7) the Small Business Innovation Research Program has also resulted in a positive benefit to the Nation's balance of trade by increasing exports from small businesses;

(8) Federal employees have exhibited skill and innovation in implementing the Small Business Innovation Research Program;

(9) the Small Business Innovation Research Program can provide productive employment to the Nation's scientists and engineers who have been displaced due to cuts in the budget of the Department of Defense and due to economic recession; and

(10) despite the fact the Small Business Innovation Research Program has achieved its participation goals, the proportion of Federal funds for industrial research and development received by small businesses remains at 3 percent (the same level as 10 years ago), although private sector use of small businesses for research and development doubled in the 1980's.

(b) PURPOSES- The purposes of this Act are--

(1) to expand and improve the Small Business Innovation Research Program;

(2) to modify the Small Business Innovation Research Program to emphasize private sector commercialization of technology derived from Federal research and development; and

(3) to increase the opportunity for participation in Federal research and development by small businesses.

APPENDIX D

Small Business Technology Council of the National Small Business Association
1156 15th Street NW, Suite 1100, Washington, DC 20005

The SBIR Program – It Is Working!

The SBIR program is now 28 years old, with tens of thousands of awards and many studies. What are the conclusions? How is it being used by the SBIR agencies? Is it successful in the commercialization of advanced technology? Is it being copied anywhere else in the world? Is it relevant in today's economy?

- The most recent and most intensive study was a six-year analysis by the prestigious National Research Council of the National Academies published in 2008 by National Academies Press,[1] which concluded:

  "By strengthening the SBIR program, the Committee believes that the capacity of the United States to develop innovative solutions to government needs and promising products for the commercial market will be enhanced." (Paragraph 1.6, page 53)

- SBIR companies have produced approximately 25% of key innovations in the past 10 years– with only 2.5% of the Federal R&D extra-mural budget.[2] The 11 agencies participating in the SBIR program have adapted the SBIR program to their particular missions with considerable success. (A Google search of "SBIR Success Stories" provides over 30,000 returns.) See SBIR Success Stories at www.sbtc.org.

- The commercialization success of the SBIR program is unparalleled in Federal R&D programs with its focus on the Phase III production outcome. According to the NAP study, ". . . approximately 30-40 percent of projects generate products that do reach the marketplace." (Page 129) This is further exemplified by the very high rate of patents generated by SBIR firms compared to universities and large businesses – 38% of U.S. patents for small business (with < 4% of the Federal R&D budget); 3% for universities (with 28% of the budget); and 55% for large businesses (with 36% of the budget).[3] For universities, it is "publish or perish." For small businesses, it is "patent and produce products or perish." These commercialization efforts produce products, jobs and tax revenue to help pay for our universities.

- The NAP study also found that the following countries have adopted an SBIR-type program – Sweden, Russia, The United Kingdom, The Netherlands, Japan, Korea, Taiwan and other Asia countries (Page 54). A European Union policy paper has a goal of 15% of EU R&D funding to SMEs.[4]

- Further, the NAP study found that the SBIR program builds meaningful bridges to universities:

  ". . . about a third of all NRC Phase II and Firm Survey respondents indicated that there had been involvement by university faculty, graduate students, and/or a university itself

---

[1] *An Assessment of the Small Business Innovation Research Program*, National Research Council, National Academies Press; Charles W. Wessner, *Editor*, Committee on Capitalizing on Science, Technology, and Innovation; 2008; http://www.nap.edu/catalog.php?record_id=11989

[2] *Where Do Innovations Come From? Transformations in the U.S. National Innovation System*, 1970-2006, published by THE INFORMATION TECHNOLOGY & INNOVATION FOUNDATION, Washington, DC July 2008.

[3] *A New View of Government, University, and Industry Partnerships*, This paper was submitted by Jere Glover, Chief Counsel of the Office of Advocacy, at the Senate Committee on Small Business Roundtable Discussion on the SBIR program on August 4, 1999.

[4] http://cordis.europa.eu/fp7/home_en.html

in developed technologies. (Page 64) . . . These data underscore the significant level of involvement by universities in the program and highlight the program's contribution to the transition of university research to the marketplace." (Page 65)

- SBTC believes that this partnership between universities and small business is an important economic multiplier that is unique to the U.S. innovation strategy. We have always strongly supported this partnership throughout the entire 28-year history of the program.[5] We see the important successes that these strong university/small business partnerships have created in Silicon Valley, Route 128, San Diego, Research Triangle Park, Ann Arbor, and others across the country. The U.S. needs more such programs.
- The importance of these partnerships is reinforced by the NAP study of 2002, wherein they state:

  "Public-private partnerships, involving cooperative research and development activities among industry, government laboratories, and universities, can play an instrumental role in accelerating the development of new technologies from idea to market."[6]
- U.S. universities have produced 119 Nobel Laureates in the past 25 years, and they graduate the brilliant scientists and engineers that our innovative companies need. Small companies introduce the innovative products to the marketplace that keeps the U.S. in the forefront of technology. We need this partnership.

[5] *A New View of Government, University, and Industry Partnerships*, op. cit.
[6] *Government-Industry Partnerships for the Development of New Technologies*, National Research Council, National Academies Press: Charles W. Wessner, Editor; 2002, page 23; http://www.nap.edu/catalog/10584.html

APPENDIX E

SBIR-STTR VERSUS VENTURE CAPITAL INVESTMENTS IN HOUSE COMMITTEE ON SMALL BUSINESS MEMBER STATES

112th Congress. House Small Business Committee: Republicans

Extent and Form of SBIR-STTR activity and participation.

Organized By Congressional District of Small Business Committee Members:

Committee Members	State	District	SBIR-STTR Data over life of program 1983-present					Currently Active*			
			Total Awardees	Total SBIR-STTR Awards		Total SBIR-STTR Dollars***	VC funded Firms	Total Awardees	Total SBIR-STTR Awards		Total SBIR-STTR Dollars***
				Phase I	Phase II**				Phase I	Phase II**	
Sam Graves	MO	6th	4	12	2	$1,764,473	0	2	2	0	$169,763
Roscoe Bartlett	MD	6th	42	176	55	$54,728,675	4	4	7	10	$15,392,954
Steve Chabot	OH	1st	34	145	40	$50,057,172	1	10	33	13	$13,692,262
Steve King	IA	5th	6	6	2	$2,398,114	0	1	1	1	$723,154
Mike Coffman	CO	6th	69	471	198	$173,305,118	3	17	64	34	$30,988,826
Mick Mulvaney	SC	5th	6	16	8	$5,029,639	0	1	2	1	$799,742
Scott Tipton	CO	3rd	16	43	15	$13,788,414	0	4	6	3	$3,699,542
Chuck Fleischmann	TN	3rd	46	261	113	$86,289,043	0	9	29	12	$11,022,642
Jeff Landry	LA	3rd	4	49	7	$5,955,515	0	2	2	1	$766,162
Jaime Herrera Beutle	WA	3rd	22	83	42	$35,103,796	1	10	28	14	$13,087,237
Allen West	FL	22nd	31	65	22	$21,278,507	2	5	8	4	$4,128,410
Renee Ellmers	NC	2nd	18	39	9	$17,381,220	0	5	9	1	$4,257,385
Joe Walsh	IL	8th	34	72	29	$26,076,866	2	7	12	6	$4,542,775
		Totals	*332*	*1,438*	*542*	*$436,663,404*	*13*	*77*	*203*	*100*	*$103,270,854*

* In compilation of these type of aggregate data analyses, "Currently Active" refers to any firm in receipt of an SBIR-STTR Phase I award in the passed three years. It is common that may convert to Phase II up to three-four years following the Phase I award. In practical terms, there may be any number of reasons why a particular company may not in fact be consid currently SBIR-involved. They applied for - but were not selected - for Phase II; they have outgrown SBIR employment limitations; been acquired etc. Nontheless, as an indicator of tr and Form of SBIR participation in a particular region, this aggregate approach is useful

** Typically, we take previous FIVE year period as 'current' Phase IIs. Work on those funded projects is likely still to be ongoing. Later year projects (post 2009) should always properly considered as still part of SBIR-STTR active pool. It can be assumed that in the next year or two, several more Phase I projects will continue into the more sophisticated work that is Pl

*** Always in NIH, but to a lesser extent also in DOD, Phase II dollar are allocated incrementally over two-three years. It can be assumed that, even with no more Phase I or Phase II a made - not allkely prospect, total award dollars will increase, probably quite substantially.

112th Congress. House Small Business Committee: Democrats

Extent and Form of SBIR-STTR activity and participation.

Organized By Congressional District of Small Business Committee Members:

Committee Members	State	District	SBIR-STTR Data over life of program 1983-present					Currently Active*			
			Total Awardees	Total SBIR-STTR Awards		Total SBIR-STTR Dollars***	VC funded Firms	Total Awardees	Total SBIR-STTR Awards		Total SBIR-STTR Dollars***
				Phase I	Phase II**				Phase I	Phase II**	
Nydia M Valazquez	NY	12th	5	11	5	$4,118,298	0	3	3	1	$544,773
Kurt Schrader	OR	5th	47	118	42	$32,877,259	1	8	14	4	$3,927,152
Mark Critz	PA	12th	17	54	19	$18,412,594	2	4	10	6	$6,701,843
Jason Altmire	PA	4th	78	213	74	$71,354,322	13	15	30	13	$11,857,297
Yvette Clarke	NY	11th	12	76	22	$28,001,418	2	8	15	6	$12,562,710
Judy Chu	CA	32nd	24	110	32	$29,402,750	2	11	21	4	$5,205,728
David Cicilline	RI	1st	51	163	65	$65,186,843	5	15	20	14	$15,007,303
Cedric Richmond	LA	2nd	13	34	12	$11,155,479	1	3	4	3	$3,740,355
Gary Peters	MI	9th	52	114	52	$43,430,237	1	11	12	7	$5,981,205
Bill Owens	NY	23rd	9	28	12	$8,745,850	0	2	4	2	$1,872,142
William Keating	MA	10th	46	294	95	$73,642,750	2	12	26	10	$7,422,301
Totals			354	1215	430	$386,327,800	29	92	159	70	$74,822,809

* In compilation of these type of aggregate data analyses, "Currently Active" refers to any firm in receipt of an SBIR-STTR Phase I award in the passed three years. It is common that may convert to Phase II up to three-four years following the Phase I award. In practical terms, there may be any number of reasons why a particular company may not in fact be consid currently SBIR-involved. They applied for - but were not selected - for Phase II; they have outgrown SBIR employment limitations; been acquired etc. Nontheless, as an indicator of tr and Form of SBIR participation in a particular region, this aggregate approach is useful

** Typically, we take previous FIVE year period as 'current' Phase IIs. Work on those funded projects is likely still to be ongoing. Later year projects (post 2009) should always properly considered as still part of SBIR-STTR active pool. It can be assumed that in the next year or two, several more Phase I projects will continue into the more sophisticated work that is Pl

*** Always in NIH, but to a lesser extent also in DOD, Phase II dollar are allocated incrementally over two-three years. It can be assumed that, even with no more Phase I or Phase II a made - not allkely prospect, total award dollars will increase, probably quite substantially.

APPENDIX F

Useful data synopsizing

Extent and Form of SBIR-STTR participation in the relevant States and Specific Districts of Members of the 112th Congress House Small Business Committee

Innovation Development Institute
45 Beach Bluff Avenue Suite 300
Swampscott, MA 01907-1542
Voice: (781) 595-2920
web: inknowvation.com

Realizing SBIR-STTR value

Access SBIR-STTR Scientific & Engineering Talent system

Useful data synopsizing

Extent and Form of SBIR-STTR participation in the relevant States and Specific Districts of Members of the 112th Congress House Small Business Committee

Ann Eskesen, President
Innovation Development Institute
March 8, 2011

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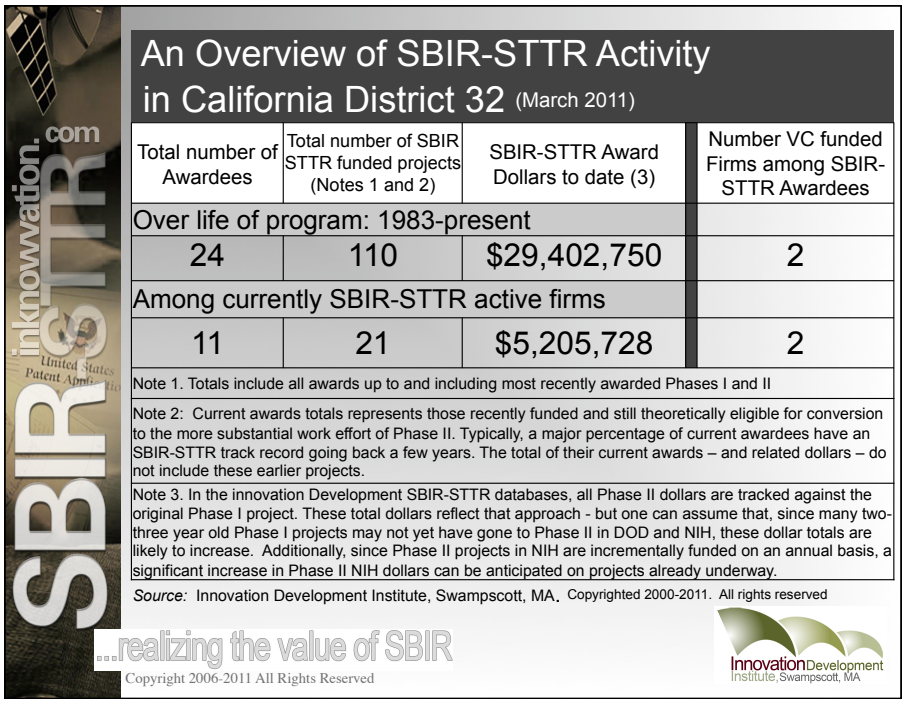
SBIR inknowvation.com STTR
United States Patent Application
An Overview of SBIR-STTR Activity in California District 32 (March 2011)
Total number of Awardees
Total number of SBIR STTR funded projects (Notes 1 and 2)
SBIR-STTR Award Dollars to date (3)
Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present
24
110
$29,402,750
2
Among currently SBIR-STTR active firms
11
21
$5,205,728
2
Note 1. Totals include all awards up to and including most recently awarded Phases I and II
Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.
Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.
Source: Innovation Development Institute, Swampscott, MA. Copyrighted 2000-2011. All rights reserved
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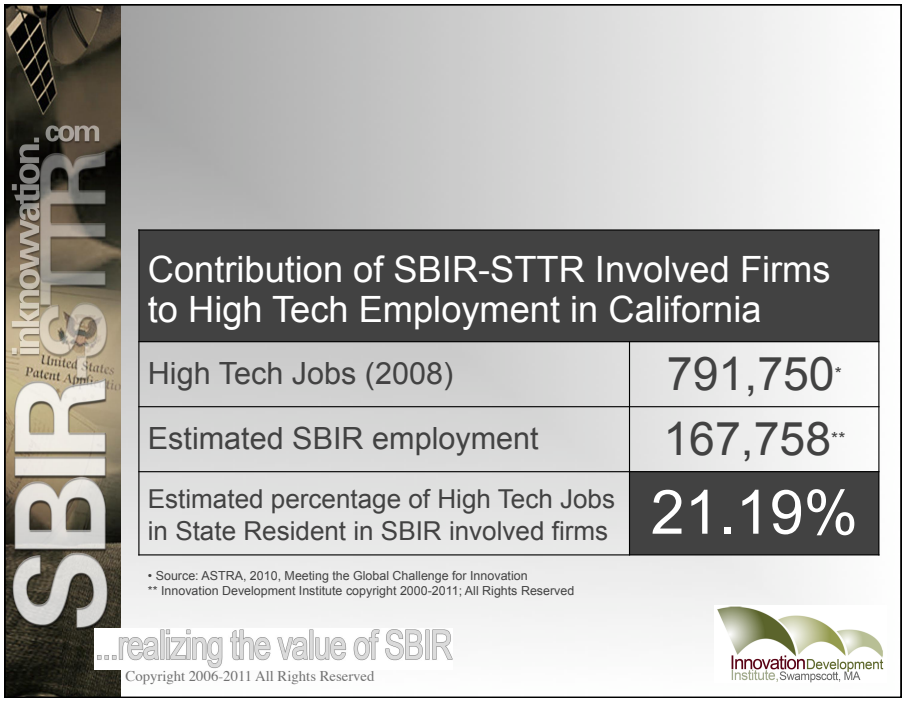
SBIR inknowvation.com STTR
United States Patent Application
Contribution of SBIR-STTR Involved Firms to High Tech Employment in California
High Tech Jobs (2008)
791,750*
Estimated SBIR employment
167,758**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms
21.19%
• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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InnovationDevelopment Institute, Swampscott, MA

An Overview of SBIR-STTR Activity in Colorado District 3 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
16	43	$13,788,414	0
Among currently SBIR-STTR active firms			
4	6	$3,699,542	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Colorado

High Tech Jobs (2008)	147,000*
Estimated SBIR employment	12,421**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	8.45%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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Innovation Development Institute, Swampscott, MA

An Overview of SBIR-STTR Activity in Colorado District 6 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
69	471	$173,305,118	3
Among currently SBIR-STTR active firms			
17	64	$30,988,826	1

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

...realizing the value of SBIR

Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Colorado

High Tech Jobs (2008)	147,000*
Estimated SBIR employment	12,421**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	8.45%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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Innovation Development Institute, Swampscott, MA

An Overview of SBIR-STTR Activity in Florida District 22 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
31	65	$21,278,507	2
Among currently SBIR-STTR active firms			
5	8	$4,128,410	1

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Florida

High Tech Jobs (2008)	248,200*
Estimated SBIR employment	14,299**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	5.73%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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An Overview of SBIR-STTR Activity in Iowa District 5 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
6	6	$2,398,114	0
Among currently SBIR-STTR active firms			
1	1	$723,154	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Iowa

High Tech Jobs (2008)	46,180*
Estimated SBIR employment	1,573**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	3.41%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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Innovation Development Institute, Swampscott, MA

An Overview of SBIR-STTR Activity in Illinois District 8 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
34	72	$26,076,866	2
Among currently SBIR-STTR active firms			
7	12	$4,542,775	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Illinois

High Tech Jobs (2008)	224,370*
Estimated SBIR employment	5,771**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	2.57%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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Innovation Development Institute, Swampscott, MA

An Overview of SBIR-STTR Activity in Louisiana District 2 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
13	34	$11,155,479	1
Among currently SBIR-STTR active firms			
3	4	$3,740,355	1

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Louisiana

High Tech Jobs (2008)	41,790*
Estimated SBIR employment	2,068**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	4.95%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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An Overview of SBIR-STTR Activity in Louisiana District 3 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
4	49	$5,955,515	0
Among currently SBIR-STTR active firms			
2	2	$766,162	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Louisiana

High Tech Jobs (2008)	41,790*
Estimated SBIR employment	2,068**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	4.95%

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An Overview of SBIR-STTR Activity in Massachusetts District 10 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
46	294	$73,642,750	2
Among currently SBIR-STTR active firms			
12	26	$7,422,301	1

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Massachusetts

High Tech Jobs (2008)	217,310*
Estimated SBIR employment	76,263**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	35.09%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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Innovation Development Institute, Swampscott, MA

An Overview of SBIR-STTR Activity in Maryland District 6 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
42	176	$54,728,675	4
Among currently SBIR-STTR active firms			
4	7	$15,392,954	1

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Maryland

High Tech Jobs (2008)	167,070*
Estimated SBIR employment	28,172**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	16.86%

* Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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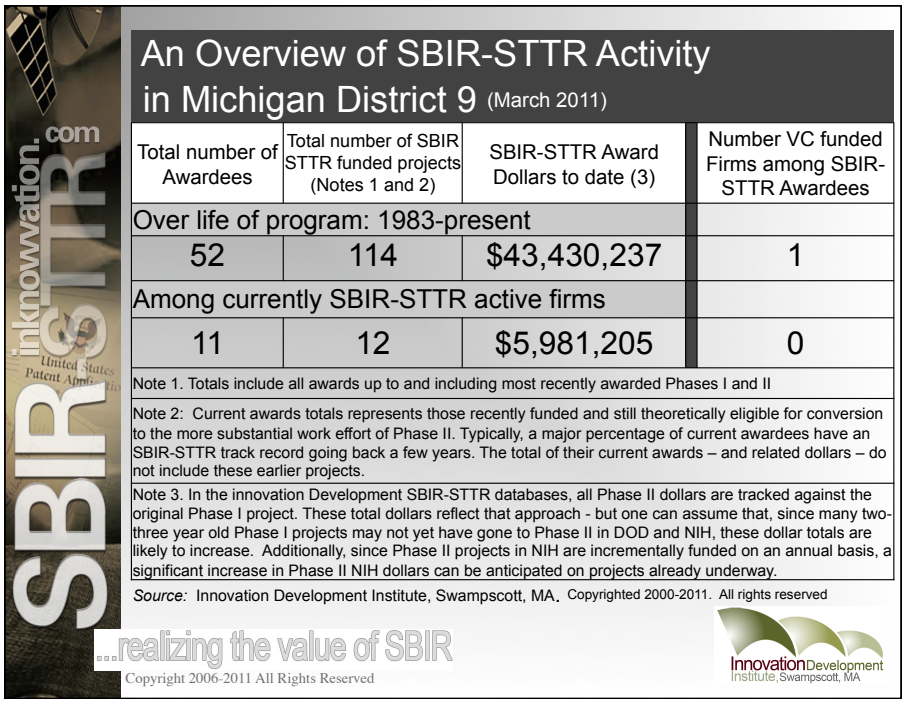
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United States Patent Appli
An Overview of SBIR-STTR Activity in Michigan District 9 (March 2011)
Total number of Awardees
Total number of SBIR STTR funded projects (Notes 1 and 2)
SBIR-STTR Award Dollars to date (3)
Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present
52
114
$43,430,237
1
Among currently SBIR-STTR active firms
11
12
$5,981,205
0
Note 1. Totals include all awards up to and including most recently awarded Phases I and II
Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.
Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.
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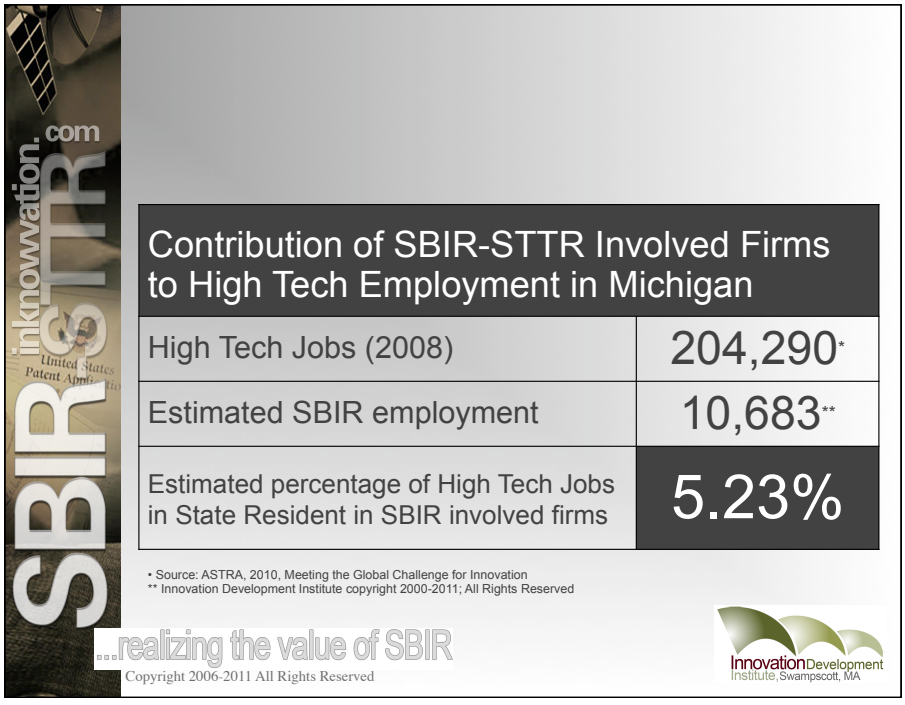
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Contribution of SBIR-STTR Involved Firms to High Tech Employment in Michigan
High Tech Jobs (2008)
204,290*
Estimated SBIR employment
10,683**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms
5.23%
• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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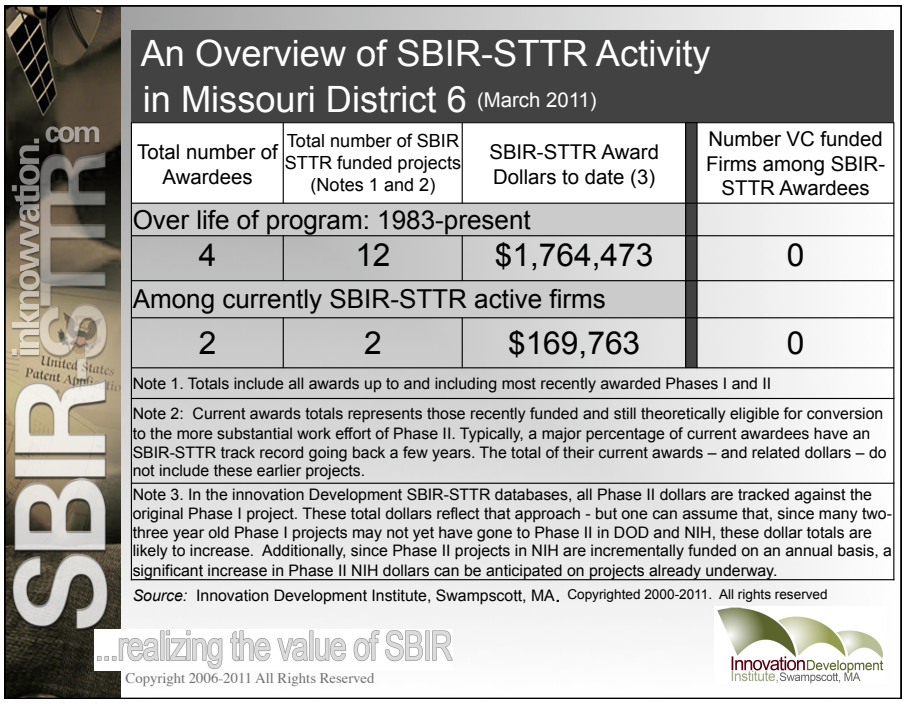
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United States Patent Application
An Overview of SBIR-STTR Activity in Missouri District 6 (March 2011)
Total number of Awardees
Total number of SBIR STTR funded projects (Notes 1 and 2)
SBIR-STTR Award Dollars to date (3)
Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present
4
12
$1,764,473
0
Among currently SBIR-STTR active firms
2
2
$169,763
0
Note 1. Totals include all awards up to and including most recently awarded Phases I and II
Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.
Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.
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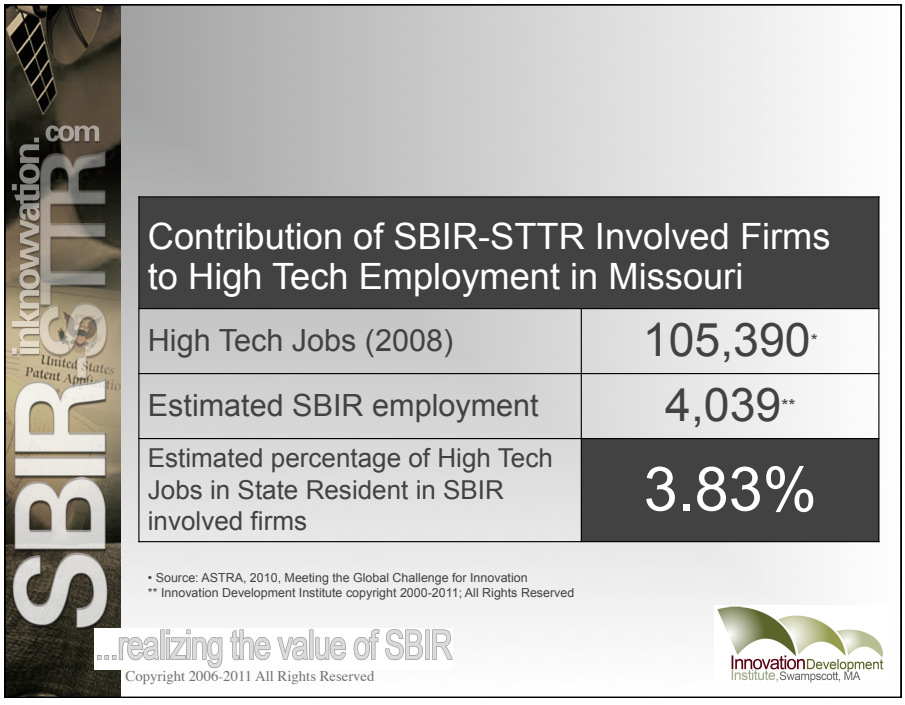
SBIRSTTR.com
inknowvation.com
United States Patent Application
Contribution of SBIR-STTR Involved Firms to High Tech Employment in Missouri
High Tech Jobs (2008)
105,390*
Estimated SBIR employment
4,039**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms
3.83%
• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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An Overview of SBIR-STTR Activity in North Carolina District 2 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
18	39	$17,381,220	0
Among currently SBIR-STTR active firms			
5	9	$4,257,385	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Contribution of SBIR-STTR Involved Firms to High Tech Employment in North Carolina

High Tech Jobs (2008)	153,680*
Estimated SBIR employment	8,989**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	5.85%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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An Overview of SBIR-STTR Activity in New York District 11 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
12	76	$28,001,418	2
Among currently SBIR-STTR active firms			
8	15	$12,562,710	2

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Contribution of SBIR-STTR Involved Firms to High Tech Employment in New York

High Tech Jobs (2008)	326,510*
Estimated SBIR employment	25,938**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	7.94%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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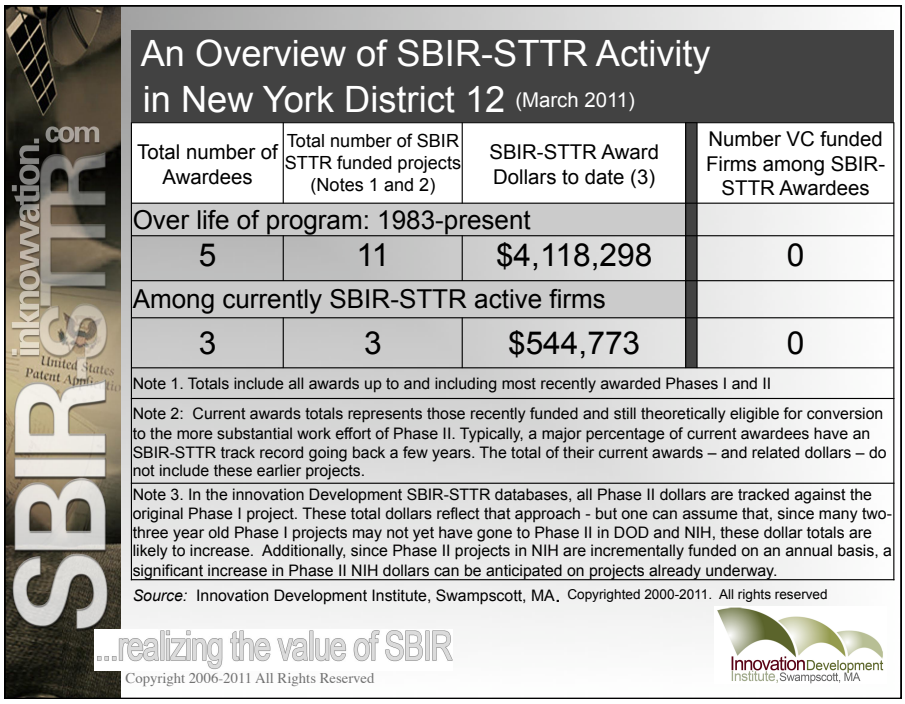

An Overview of SBIR-STTR Activity in New York District 12 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
5	11	$4,118,298	0
Among currently SBIR-STTR active firms			
3	3	$544,773	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

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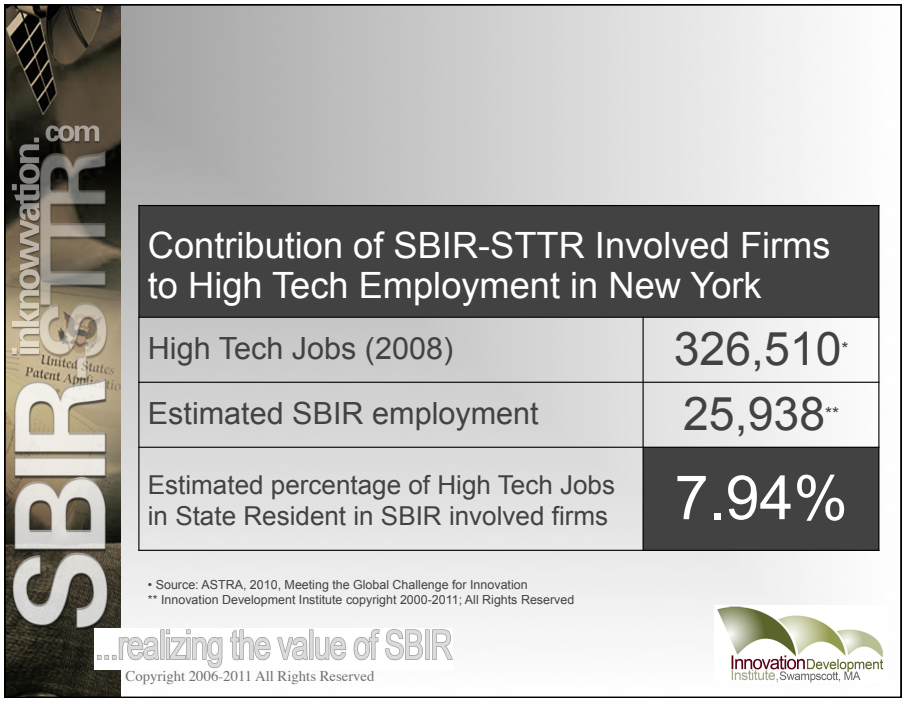

Contribution of SBIR-STTR Involved Firms to High Tech Employment in New York

High Tech Jobs (2008)	326,510*
Estimated SBIR employment	25,938**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	7.94%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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An Overview of SBIR-STTR Activity in New York District 23 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
9	28	$8,745,850	0
Among currently SBIR-STTR active firms			
2	4	$1,872,142	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in New York

High Tech Jobs (2008)	326,510*
Estimated SBIR employment	25,938**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	7.94%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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An Overview of SBIR-STTR Activity in Ohio District 1 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
34	145	$50,057,172	1
Among currently SBIR-STTR active firms			
10	33	$13,692,262	1

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Contribution of SBIR-STTR Involved Firms to High Tech Employment in Ohio

High Tech Jobs (2008)	40,202*
Estimated SBIR employment	2,068**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	5.14%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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An Overview of SBIR-STTR Activity in Oregon District 5 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
47	118	$32,877,259	1
Among currently SBIR-STTR active firms			
8	14	$3,927,152	1

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Innovation Development Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Oregon

High Tech Jobs (2008)	70,070*
Estimated SBIR employment	9,537**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	13.61%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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An Overview of SBIR-STTR Activity in Pennsylvania District 4 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
78	213	$71,354,322	13
Among currently SBIR-STTR active firms			
15	30	$11,857,297	5

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Pennsylvania

High Tech Jobs (2008)	227,170*
Estimated SBIR employment	24,765**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	10.90%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation
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An Overview of SBIR-STTR Activity in Pennsylvania District 12 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
17	54	$18,412,594	2
Among currently SBIR-STTR active firms			
4	10	$6,701,843	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Contribution of SBIR-STTR Involved Firms to High Tech Employment in Pennsylvania

High Tech Jobs (2008)	227,170*
Estimated SBIR employment	24,765**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	10.90%

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An Overview of SBIR-STTR Activity in Rhode Island District 1 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
51	163	$65,186,843	5
Among currently SBIR-STTR active firms			
15	20	$15,007,303	4

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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Contribution of SBIR-STTR Involved Firms to High Tech Employment in Rhode Island

High Tech Jobs (2008)	18,090*
Estimated SBIR employment	2,996**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	16.56%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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An Overview of SBIR-STTR Activity in South Carolina District 5 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
6	16	$5,029,639	0
Among currently SBIR-STTR active firms			
1	2	$799,742	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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InnovationDevelopment Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in South Carolina

High Tech Jobs (2008)	57,770*
Estimated SBIR employment	1,246**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	2.16%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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...realizing the value of SBIR

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InnovationDevelopment Institute, Swampscott, MA

An Overview of SBIR-STTR Activity in Tennessee District 3 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
46	261	$86,289,043	0
Among currently SBIR-STTR active firms			
9	29	$11,022,642	0

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

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InnovationDevelopment Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Tennessee

High Tech Jobs (2008)	72,760*
Estimated SBIR employment	5,680**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	7.81%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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InnovationDevelopment Institute, Swampscott, MA

An Overview of SBIR-STTR Activity in Washington District 3 (March 2011)

Total number of Awardees	Total number of SBIR STTR funded projects (Notes 1 and 2)	SBIR-STTR Award Dollars to date (3)	Number VC funded Firms among SBIR-STTR Awardees
Over life of program: 1983-present			
22	83	$35,103,796	1
Among currently SBIR-STTR active firms			
10	28	$13,087,237	1

Note 1. Totals include all awards up to and including most recently awarded Phases I and II

Note 2: Current awards totals represents those recently funded and still theoretically eligible for conversion to the more substantial work effort of Phase II. Typically, a major percentage of current awardees have an SBIR-STTR track record going back a few years. The total of their current awards – and related dollars – do not include these earlier projects.

Note 3. In the innovation Development SBIR-STTR databases, all Phase II dollars are tracked against the original Phase I project. These total dollars reflect that approach - but one can assume that, since many two-three year old Phase I projects may not yet have gone to Phase II in DOD and NIH, these dollar totals are likely to increase. Additionally, since Phase II projects in NIH are incrementally funded on an annual basis, a significant increase in Phase II NIH dollars can be anticipated on projects already underway.

Source: Innovation Development Institute, Swampscott, MA.

...realizing the value of SBIR

InnovationDevelopment Institute, Swampscott, MA

Contribution of SBIR-STTR Involved Firms to High Tech Employment in Washington

High Tech Jobs (2008)	156,524*
Estimated SBIR employment	16,855**
Estimated percentage of High Tech Jobs in State Resident in SBIR involved firms	10.77%

• Source: ASTRA, 2010, Meeting the Global Challenge for Innovation

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InnovationDevelopment Institute, Swampscott, MA

APPENDIX G

Observations on the Small Business Innovation Research Program, Statement for the Record of Anu K. Mittal, Director Natural Resources and Environment Team, GAO-05-861T; June 28, 2005.

1. "Between July 1985 and June 1999, GAO reviewed, reported, and testified on the SBIR program many times at the request of the Congress. While GAO's work focused on many different aspects of the program, it generally found that SBIR is achieving its goals to enhance the role of small businesses in federal R&D, stimulate commercialization of research results, and support the participation of small businesses owned by women and/or disadvantaged persons. Participating agencies and companies that GAO surveyed during the course of its reviews generally rated the program highly." [Page 1]

2. *"High-quality research.* Throughout the life of the program, awards have been based on technical merit and are generally of good quality. For example, in 1989 we reported that according to agency officials, more than three-quarters of the research conducted with SBIR funding was as good as or better than other agency-funded research. Agency officials also rated the research as more likely than other research they oversaw to result in the invention and commercialization of new products. When we again looked at the quality of research proposals in 1995, we found that while it was too early to make a conclusive judgment about the long-term quality of the research, the quality of proposals remained good, according to agency officials." [Page 5]

3. *"Widespread competition*. The SBIR program successfully attracts many qualified companies, has had a high level of competition, and consistently has had a high number of first-time participants. Specifically, we reported that the number of proposals that agencies received each year had been increasing. In addition, as we reported in 1998, agencies rarely received only a single proposal in response to a solicitation, indicating a sustained level of competition for the awards. We also found that the agencies deemed many more proposals worthy of awards than they were able to fund. For example, the Air Force deemed 1,174 proposals worthy of awards in fiscal year 1993 but funded only 470. Moreover, from fiscal years 1993 through 1997, one third of the companies that received awards were first-time participants. This suggests that the program attracts hundreds of new companies annually." [Page 5]

4. *"Successful commercialization*. SBIR successfully fosters commercialization of research results. At various points in the life of the program we have reported that SBIR has been successful in increasing private sector commercialization of innovations. For example, past GAO and DOD surveys of companies that received SBIR Phase II funding have determined that approximately 35 percent of the projects resulted in the sales of products or services, and approximately 45 percent of the projects received additional developmental funding. We have also reported that agencies were using various techniques to foster commercialization. For example, in an attempt to get those companies with the greatest potential for commercial success to the marketplace sooner, DOD instituted a Fast Track Program, whereby companies that are able to attract outside commitments/capital for their research during phase I are given higher priority in receiving a phase II award." [Pages 5 & 6]

5. *"Helping to serve mission needs*. SBIR has helped serve agencies' missions and R&D needs. Agencies differ in the emphasis they place on funding research to support their mission and to support more generalized research. Specifically, we found that DOD links its projects more closely to its mission. In comparison, other agencies emphasize research that will be commercialized by the private sector. Many of the projects DOD funded have specialized military applications while NIH projects have access to the biomedical market in the private sector. Moreover, we found that SBIR promotes research on the critical technologies identified in lists developed by DOD and/or the National Critical Technologies Panel." [Page 6]

APPENDIX H

***An Assessment of the Small Business Innovation Research Program*, National Research Council, National Academies Press; Charles W. Wessner, *Editor*, Committee on Capitalizing on Science, Technology, and Innovation; 2008; see: http://www.nap.edu/catalog.php?record_id=11989**

NATIONAL RESEARCH COUNCIL (NRC) STUDY FINDINGS:

1. **"The Small Business Innovation Research (SBIR) Program Is Making Significant Progress in Achieving the Congressional Goals for the Program.** The SBIR program is sound in concept and effective in practice. With the programmatic changes recommended here, the SBIR program should be even more effective in achieving its legislative goals.
2. **Overall, the Program Has Made Significant Progress in Achieving its Congressional Objectives by: Stimulating Technical Innovation.** By a variety of metrics, the program is contributing to the nation's stock of new scientific and technical knowledge.
3. **Using Small Businesses to Meet Federal Research and Development Needs.** SBIR program objectives are aligned with, and contribute significantly to fulfilling the mission of each studied agency. In some cases, closer alignment and greater integration should be possible.
4. **Increasing Private Sector Commercialization of Innovation Derived from Federal Research and Development.** The program enables small businesses to contribute to the commercialization of the nation's R&D investments, both through private commercial sales, as well as through government acquisition, thereby enhancing American health, welfare, and security through the introduction of new products and processes.
5. **SBIR Is Meeting Federal R&D Needs.** SBIR plays an important role in introducing innovative, science-based solutions that address the diverse mission needs of the federal agencies.
6. **SBIR Projects Attract Significant Additional Funding.** SBIR funded research projects enable small businesses to develop the technical know-how needed to attract third-party interest from a variety of public and private sources, including other federal R&D funds, angel investors, and venture funds. The NRC survey revealed that 56 percent of surveyed projects were successful in attracting additional funding from a variety of sources.
7. **Linking Universities to the Public and Private Markets.** The SBIR program supports the transfer of research into the marketplace, as well as the general expansion of scientific and technical knowledge, through a wide variety of mechanisms. With regard to SBIR's role in linking universities to the market, about a third of all NRC Phase II and Firm Survey respondents indicated that there had been involvement by university faculty, graduate students, and/or a university itself in

developed technologies. This involvement took a number of forms.41 Among the responding companies—

a. More than two-thirds had at least one academic founder, and more than a quarter had more than one;

b. b. About one-third of founders were most recently employed in an academic environment before founding the new company;

c. c. In some 27 percent of projects, university faculty were involved as principal investigators or consultants on the project;

d. d. 17 percent of Phase II projects involved universities as subcontractors; and

e. e. 15 percent of Phase II projects employed graduate students.

These data underscore the significant level of involvement by universities in the program and highlight the program's contribution to the transition of university research to the marketplace."

APPENDIX I

DEPUTY UNDER SECRETARY OF DEFENSE
3015 DEFENSE PENTAGON
WASHINGTON, DC 20301-3015

ACQUISITION AND
TECHNOLOGY

DEC - 8 2008

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DIRECTORS OF DEFENSE AGENCIES

SUBJECT: Small Business Innovation Research (SBIR) Program Phase III Guidance

DEPUTY UNDER SECRETARY OF DEFENSE
3015 DEFENSE PENTAGON
WASHINGTON, DC 20301-3015

ACQUISITION AND
TECHNOLOGY

DEC - 8 2008

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DIRECTORS OF DEFENSE AGENCIES

SUBJECT: Small Business Innovation Research (SBIR) Program Phase III Guidance

A primary purpose of Small Business Innovation Research (SBIR) Program is to stimulate technological innovation by increasing small business participation in federally funded Research and Development (R&D). The Department of Defense (DoD) SBIR Program is executed by the DoD Components. The Program is funded via 2.5% set-aside of the extramural Research Development Test and Evaluation (RDT&E) budget in excess of $100 million and is implemented through a uniform, three-phase competitive process. Proposals are submitted in response to DoD solicitations and funding agreements (contracts) are awarded to qualifying small businesses for R&D to meet stated Department needs. The SBIR Program invests over $1.1 billion annually to develop needed technologies through selection and award of roughly 2,000 Phase I feasibility studies and over 1,000 Phase II development efforts per year across the Department.

SBIR Phase III is both a principal objective of the SBIR Program and a means through which the Department realizes value from SBIR. SBIR Phase III refers to work that derives from, extends, or logically concludes effort(s) performed under prior SBIR funding agreements. Phase III work is typically oriented towards commercialization of SBIR research or technology to bring it to the marketplace, and must be funded by non-SBIR sources. There are several characteristics and requirements associated with SBIR Phase III detailed in the Small Business Administration's Policy Directive that must be understood by all DoD component contracting and acquisition activities.

1. **SBIR technical data rights extend to Phase III.** A Phase III award is, by its nature, an SBIR award, has SBIR status, and must be accorded SBIR data rights. If an SBIR awardee wins a competition, or receives a sole-source award or a subcontract, for work that derives from, extends, or logically concludes effort(s) performed under prior SBIR funding agreements, then the funding agreement for the new award must have SBIR Phase III status.

2. **Phase III contracts or subcontracts may be awarded without further competition.** The competition for SBIR Phase I and Phase II awards satisfies statutory competition requirements. Therefore, an agency that wishes to fund an SBIR Phase III project is not required to conduct another competition, or process a Justification and Approval (J&A) pursuant to FAR 6.302-5, in order to satisfy those statutory provisions, and may do so directly from Phase I or Phase II. If an

agency requires processing of a J&A in conducting actions relative to a Phase III SBIR award, it is sufficient to state, for purposes of the justification, that the project is an SBIR Phase III award that is derived from, extends, or logically concludes efforts performed under prior SBIR funding agreements and is authorized under 10 U.S.C. 2304(b) (2). In addition, the small business size standard, once met at the time of Phase I or II award, does not apply to Phase III.

3. The Department must show preference for SBIR-funded technology in Phase III. For Phase III, Congress intends that agencies or Government prime contractors that pursue R&D or production for agencies utilizing technology developed under the SBIR Program, give preference, including sole-source awards, to the awardee that developed the technology. Further, the Small Business Act requires that agencies report to the SBA all instances in which R&D or production of a technology developed by an SBIR awardee is pursued with a concern other than the one that developed the SBIR technology.

To properly implement this responsibility, DoD R&D and acquisition offices should be aware (and major systems prime contractors should be made aware) of relevant technologies being developed through SBIR, and through all other DoD programs and activities. Consistent with DoD policy, program managers should include SBIR as part of ongoing program planning and give favorable consideration, in technology and acquisition planning processes, for funding successful SBIR technologies. ACAT 1 programs should address plans for funding and insertion of SBIR-funded technologies at milestone reviews.

4. SBIR Phase III contract actions must be reported. Work performed under a DoD prime contract that principally derives from, extends, or logically concludes work begun under a prior SBIR effort should be coded as SBIR Phase III in the Federal Procurement Data System-Next Generation (FPDS-NG). At the present time, FPDS-NG only allows identification of Phase III awards to Small Businesses. A change request was submitted on January 18, 2008 to allow it to identify Phase III awards to other than small businesses.

As a vehicle to tap thousands of high-technology small businesses for solutions, the SBIR Program is an exceptional source of innovation and industrial base vitality. As such, it is imperative that SBIR Phase III efforts be executed in a manner consistent with the tenets listed above. DoD SBIR policy discussed in this memorandum will be reflected, as appropriate, in DoD regulations. I appreciate your support and assistance.

James I. Finley

APPENDIX J

Managing University Intellectual Property in the Public Interest

Committee on Management of University Intellectual Property:
Lessons from a Generation of Experience, Research, and Dialogue

Board on Science, Technology, and Economic Policy

Committee on Science, Technology, and Law

Policy and Global Affairs

Stephen A. Merrill and Anne-Marie Mazza, *Editors*

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

PRINCIPAL FINDINGS AND RECOMMENDATIONS

The University and the Transfer of Technology

Finding 1: The first goal of university technology transfer involving IP is the expeditious and wide dissemination of university-generated technology for the public good. The public good might include inputs into further research, new products and processes addressing societal needs, and generation of employment opportunities for the production, distribution, and use of new products. Although the transfer methods will vary from institution to institution depending on the history, location, and composition of their research portfolio, the goal of expeditious and wide dissemination of discoveries and inventions places IP-based technology transfer squarely within the research university's core missions of discovery, learning, and the promotion of social wellbeing.

Finding 2: The transition of knowledge into practice takes place through a variety of mechanisms, including but not limited to:

1. movement of highly skilled students (with technical and business skills) from training to private and public employment;
2. publication of research results in the open academic literature that is read by scientists, engineers, and researchers in all sectors;
3. personal interaction between creators and users of new knowledge (e.g., through professional meetings, conferences, seminars, industrial liaison programs, and other venues);
4. firm-sponsored (contract) research projects involving firm-institution agreements;
5. multi-firm arrangements such as university-industry cooperative research centers;
6. personal individual faculty and student consulting arrangements with individual private firms;
7. entrepreneurial activity of faculty and students occurring outside of the university without involving university-owned IP; and
8. licensing of IP to established firms or to new start-up companies.

All eight mechanisms, often operating in a complementary fashion, offer significant contributions to the economy. The licensing of IP, although not the most important of these mechanisms, is more often discussed, measured, quantified, and debated than all other mechanisms combined, and is the subject of our findings and recommendations.

APPENDIX K

Small Business Technology Council of the National Small Business Association
1156 15th Street NW, Suite 1100, Washington, DC 20005

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How Expanding the STTR Program Can Instantly Create Jobs and Technology Clusters

By memorandum or Executive Order, President Obama can dramatically create more jobs and encourage technology clusters by simply increasing the STTR (Small Business Technology Transfer program) program from the current 0.3 percent of the federal extramural R&D budget to 2.5 percent. This will not impact the budget deficit now or in the future.

This expansion will force the most innovative sector of the U.S. economy, small businesses, to cooperate more closely with the best basic research institutions in the world, American universities. The STTR is a very successful federal R&D procurement program specifically created by Congress in the *Small Business Research and Development Enhancement Act of 1992 (P.L. 102-564, S. 2941, Oct. 28, 1992)* to build bridges between universities who perform advanced research and small businesses who bring innovative products to market.

The commercialization success of the STTR program has been significant – with commercial sales dollars by the successful companies that are considerably greater than the initial federal funding. The 2001 GAO report,[1] which looked at the early results of the program, showed that for the 101 companies responding to their survey, 51 had successful Phase III projects, with sales totals of $132 million – compared to the cumulative federal investment in these STTR companies of approximately $44 million – a 3:1 return on taxpayer funds.

Technology clusters (with cooperating research universities and innovative businesses) have been demonstrated to create explosive centers of job growth, innovation and venture capital support – such as Silicon Valley, Boston's Route 128, San Diego's communications and biotech communities, Research Triangle Park in North Carolina, and Ann Arbor/WARF, MI. Numerous studies (from David Birch in 1980s through Office of Advocacy, 2008) have demonstrated the job creation and economic multiplier effect of these collaborations between research universities and technology companies with their development, commercialization and marketing skills.

The funds for the expansion of the STTR program will come from already budgeted federal extramural R&D funds – and at least 30% of the STTR funds *MUST* be spent with universities or similar research organizations. Since much of the extramural funds go to large companies, this will be a net increase for universities. Further, the STTR program has already developed model agreements for the management of the small company/

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[1] GAO-01-867T**,** FEDERAL RESEARCH AND DEVELOPMENT, *Contributions to and Results of the Small Business Technology Transfer Program*, Testimony before the Senate Small Business and Entrepreneurship Committee, June 21, 2001

university intellectual property rights so these programs are "shovel ready" and meet the important research needs of the federal agencies. (See: http://grants1.nih.gov/grants/funding/sbirsttr1/STTRModelAgreement.doc)

The most significant new innovations in the marketplace have been demonstrated to come from small businesses – especially from STTR and SBIR firms. An important new study, *Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006*[2] reports:

> "The results show that these SBIR-nurtured firms consistently account for a quarter of all U.S. R&D 100 Award winners—a powerful indication that the SBIR program has become a key force in the innovation economy of the United States."

[Note: the SBIR and STTR budgets combined are only 2.8 percent of the federal extramural budget – the rest goes mostly to large businesses and then to universities.]

[2] THE INFORMATION TECHNOLOGY & INNOVATION FOUNDATION, July 2008, Washington, DC. See: http://www.itif.org/publications/where-do-innovations-come-transformations-us-national-innovation-system-1970-2006

APPENDIX L

Few Businesses Sprout, With Even Fewer Jobs

Wall Street Journal
NOVEMBER 18, 2010

By JUSTIN LAHART And MARK WHITEHOUSE

Fewer new businesses are getting off the ground in the U.S., available data suggest, a development that could cloud the prospects for job growth and innovation.

View Full Image

Dan Krauss for The Wall Street Journal

A circuit board by Tesla Controls, one of many new companies with no workers beyond its founder.

In the early months of the economic recovery, start-ups of job-creating companies have failed to keep pace with closings, and even those concerns that do get launched are hiring less than in the past. The number of companies with at least one employee fell by 100,000, or 2%, in the year that ended March 31, the Labor Department reported Thursday.

That was the second worst performance in 18 years, the worst being the 3.4% drop in the previous year.

Newly opened companies created a seasonally adjusted total of 2.6 million jobs in the three quarters ended in March, 15% less than in the first three quarters of the last recovery, when investors and entrepreneurs were still digging their way out of the Internet bust.

Research shows that new businesses are the most important source of jobs and a key driver of the innovation and productivity gains that raise long-term living standards.

Without them there would be no net job growth at all, say economists John Haltiwanger of the University of Maryland and Ron Jarmin and Javier Miranda of the Census Bureau.

"Historically, it's the young, small businesses that take off that add lots of jobs," says Mr. Haltiwanger. "That process isn't working very well now."

Ensconced in a strip mall behind a Carpeteria outlet, Derek Smith has been tinkering for two years with a wireless electrical system that he says can help schools and office buildings slash lighting bills. With his financing limited to what he earns as a wireless-technology consultant, he has yet to hire his first employee.

This is a far cry from his last start-up, which he cofounded in 2002. At the two-year mark, that company, which makes radio-tracking gear for hospital equipment, had five employees, about $1 million in funding from angel investors and offices with views of downtown San Diego.

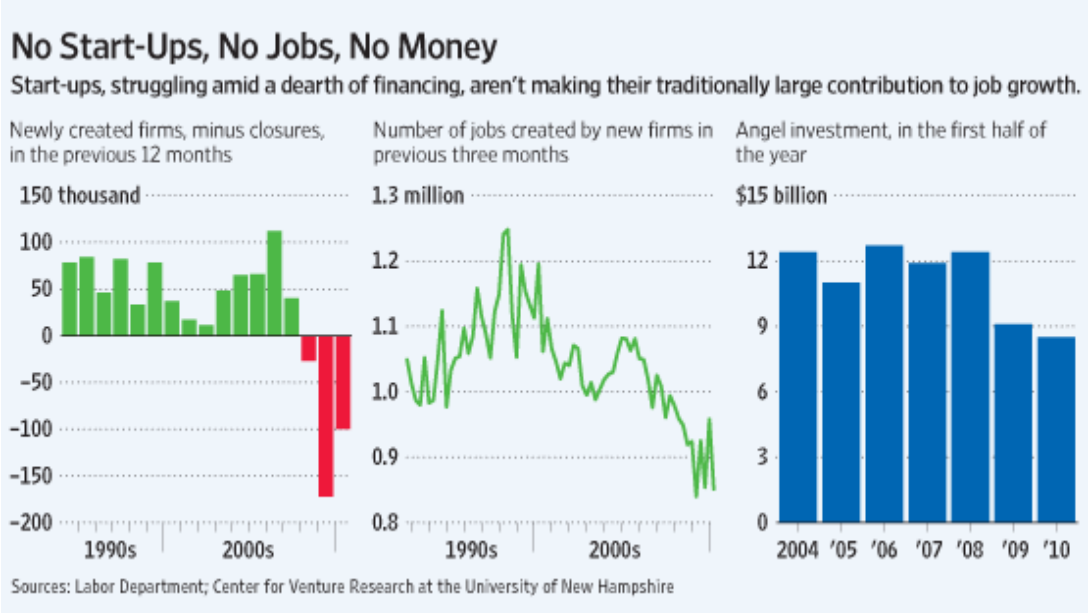
"When I started this the plan was to go out and raise a bunch of money," says Mr. Smith, who is 36 years old. That was in late 2008, just as financial markets around the world collapsed. "I quickly discovered I can't do what I did before."

Tough economic times have pushed more Americans into business for themselves, working as consultants or selling wares online. But many are not taking the additional step of forming a company and hiring employees.

For people like Mr. Smith, lack of funding seems to be the biggest problem. Two traditional sources of start-up cash—home-equity loans and credit cards—have largely dried up as banks wrangle with massive defaults and a moribund housing market. Venture-capital firms that typically invest in young companies, as well as angel investors that focus on early-stage start-ups, are pulling back as they struggle to sell the companies they already own.

Venture-capital firms invested $25.1 billion in the year that ended in September, up 10% from the same period a year earlier but still down 27% from two years earlier, according to Dow Jones VentureSource. Angel investment amounted to $8.5 billion in the 2010 first half—30% below the average level in the five years leading up to the financial crisis, estimates Jeffrey Sohl, director of the Center for Venture Research at the University of New Hampshire.

"I've never seen seed capital so low," says Mr. Sohl. "This is alarming."



Some entrepreneurs say it's not all about financing, though. They express concern about taxes, health-care costs and the impact that wrangling in Washington over the federal budget deficit will have on them. "I can't determine what the cost of providing health care for employees would be," says Kevin Berman, 47, who is starting a local-produce company in Orion Township, Mich., called Harvest Michigan. Starting a company "is harder than it was at any time I can remember."

San Diego has long been one of the nation's entrepreneurial hotbeds, a culture that dates back to the 1960s with the founding of Linkabit Corp., a communications company whose alumni have launched scores of technology companies. A 1970s biotechnology start-up, Hybritech Inc., gave rise to a thriving biotechnology industry.

Lately, though, the pace of start-ups securing funding in San Diego has been slowed at the University of California at San Diego center that helps researchers move their work into the commercial sphere. "Investors are moving away from early-stage companies," says Rosibel Ochoa, director of the William J. von Liebig Center. "Nobody wants to touch them."

Scarce funding is putting researchers like Deli Wang in a bind. The 42-year-old engineering professor is an expert on nanowires, thread-like structures with widths less than a thousandth the diameter of an average human hair. He has a plan to make light-emitting diodes using nanowires that, he says, would be far more efficient than existing alternatives. Investors, he says, are interested—if they can see a prototype. Building one would cost Mr. Wang $200,000 that he doesn't have. "We're kind of stuck," he says.

To be sure, some companies are still getting started, particularly in biotechnology, where cash-rich pharmaceutical concerns are eager buyers and investors. In the first half of 2010, health care and biotech accounted for 44% of all angel investments, Mr. Sohl says.

Derek Smith, owner of Tesla Controls, handles his own bookkeeping, emails and circuit-board fabrication.

And in many cases, entrepreneurs today don't need as much money, or as many people, to start new businesses. Software, communications technology and high-tech equipment are far cheaper and far more powerful than they were a decade ago.

At Mr. Smith's one-man San Diego start-up, Tesla Controls Corp., circuit boards, semiconductor chips and other components litter a plastic folding table he uses as a workbench. "The hardware stuff is all cheaper," he says. "Any of these chips are $5 or less."

Much of Mr. Smith's economizing is the result of necessity. With a family to support, he doesn't want to borrow against his house. Angel investors, if interested, would demand a larger stake at a lower price than he can stomach. And the small stake he still has in his earlier start-up, Awarepoint Corp., is only paper wealth.

The lack of funding is slowing him down. And the day a week he spends on consulting takes away from the time that he can devote to his new company. "I would love to be able to hire other people," he says. "But right now I can't."

Write to Justin Lahart at justin.lahart@wsj.com and Mark Whitehouse at mark.whitehouse@wsj.com

http://online.wsj.com/article/SB10001424052748704648604575621061892216250.html?mod=WSJ_hp_LEFTWhatsNewsCollection

APPENDIX M

Roland Tibbetts White Paper

May 28, 2008

REAUTHORIZING SBIR: THE CRITICAL IMPORTANCE OF SBIR AND SMALL HIGH TECH FIRMS IN STIMULATING AND STRENGTHENING THE U.S. ECONOMY

Roland Tibbetts
SBIR Program Manager, 1976 -1996
National Science Foundation

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REAUTHORIZING SBIR: THE CRITICAL IMPORTANCE OF SBIR AND SMALL HIGH TECH FIRMS IN STIMULATING AND STRENGTHENING THE U.S. ECONOMY

Roland Tibbetts
SBIR Program Manager, 1976 -1996
National Science Foundation

The proposed Small Business Innovation Research (SBIR) reauthorizing legislation (H.R. 5819) is of great concern to thousands of small technology-based firms and should be of similar concern to Congress.

The bill would significantly weaken the basic elements of the SBIR program by

(1) Cutting the number of awards, probably in half. Far larger SBIR awards would be allowed. Companies could receive multiple development awards. Agencies could waive even the higher award caps. Yet the overall size of the program would not be increased. Together, these steps would eliminate funding for a large number of innovative and breakthrough ideas.

(2) Allowing firms to avoid SBIR's competitive "proof of concept" step and move directly to much larger "development" awards. This is an irresponsible policy for a program that is funding very high-risk ideas. The "proof of concept" requirement, Phase I of SBIR, is necessary to weed out ideas that are not feasible, so that large sums of taxpayer dollars aren't wasted on them.

(3) Substituting SBIR's R&D funding for private investment capital in the commercialization phase of SBIR (Phase III). Phase III is a market-based reality check. A project that can't attract private-sector funding or mainstream government procurement contracts at that point should not be pushed forward with more R&D funding from SBIR.

(4) Threatening the integrity of SBIR as a small business program by weakening the safeguards against large business access to SBIR funds.

With each of these changes, the needs of the SBIR Program, and the history of its best practices, call for doing exactly the opposite of what the bill proposes.

What SBIR Is Designed to Do

SBIR was created to address a need that is still critical: to provide funding for some of the best early-stage innovation ideas – ideas that, however promising, are still too high risk for private investors, including venture capital firms. As happened with Microsoft, Apple and hundreds of other firms, technology innovations can mushroom into major products and businesses once private sector investors make a commitment. But they'll only make that commitment once the innovation is well along. In 2005 only 18 percent of all US *venture* capital invested went to seed and early stage firms while 82 percent went to later stages of development that are lower risk.

The positive role of innovative small technology firms in the economy is evident not only in the dozen or so geographic strongholds of tech entrepreneurship across the nation, but also in the increased productivity of the companies that buy and use the innovations. That is perhaps the most compelling reason to maintain a strong, effective SBIR Program.

SBIR addresses a paradox at the heart of innovation funding: capital is always short until the test results are in. At the idea stage, and even the early development stage, the risks are too great for all but a few investors. But innovations can't get beyond that stage without funding.

There is another paradox, too. The federal government has R&D needs that, for a variety of reasons, will never interest private sector investors. The business models of most investors focus on generating many sales to many customers. When the government is the only buyer, and buys on a one-time or very occasional basis, investors get skittish.

Large government contractors typically aren't interested in such R&D, either. The amounts involved are too small, and most large contractors don't have early-stage R&D capabilities anyway.

So needed innovations in fields like defense, space exploration and homeland security may not occur. The same can be true for innovations in science, especially the health sciences, when the projected patient populations are small or the innovation may only be needed once per person (such as with a vaccine).

SBIR was designed specifically to solve both of these paradoxes:

First, it provides a transparent, competitive and reliable source of early-stage funding for R&D, based entirely on scientific merit. Today, SBIR is the nation's largest source of such funding.

Second, it allows the government itself to obtain needed R&D that the private sector could not otherwise provide.

Why SBIR Has Been Successful

SBIR's success, as recently documented by the major National Research Council / National Academy of Sciences study, is rooted in a number of the program's characteristics.

Drawing on small business scientific talent. SBIR draws on the six million scientists and engineers that are now employed by small firms. That compares to the five million employed by medium-sized and large firms. In fact, small business employs more scientists and engineers than large business, universities, federal labs, or nonprofit organizations. A great many of these small business scientists and engineers are entrepreneurial. To see the entrepreneurial zeal of these technology-based small companies, one has only to look at the extent to which the SBIR Program and the nation's venture capital companies – the only important sources of risk capital for such companies -- are swamped with proposals. Or one can look at patents granted. The SBIR Program accounts for more than 50,000 of them. Currently, it accounts for an average of seven patents a day, which is more than all U.S. universities combined. SBIR has given us Qualcomm, Symantec and dozens of other highly successful technology companies.

Providing the primary source of government R&D funding for small business. Despite their huge numbers of scientists and engineers, and despite their well-documented science and technology successes, small businesses have virtually no access to federal R&D contracts outside of the SBIR Program. According to the National Science Foundation's annual *Science Indicators* report, large firms receive 50.3 percent of federal R&D, universities receive 35.3 percent, non-profits 10 percent, and small businesses just 4.3 percent. SBIR accounts for over half of that 4.3 percent. This is an astonishingly small figure for a nation that expects technological innovation to lead it to new economic heights, but there it is. For small companies, SBIR remains the only game in town, just as it was in 1983, when it began.

Adopting best practices.

In designing the SBIR program, I drew on my own experience as a founder, director and treasurer of Allied Capital here in Washington and as operational VP for two small tech firms, one of which grew to 600 employees before being sold to TRW. I read about 50 articles on innovation and R&D management. I talked with a few dozen economists and directors of research in large firms and universities. I met with ten or so venture capitalists. I asked them, and others like the DuPont R&D advisory committee, about best practices.

Best practices 1: managing portfolio risk. One thing everyone agreed on was the need to manage R&D portfolio risk through diversification. With the high risk involved in early-stage R&D, there is need to diversify the federal investment by betting on many, rather than fewer, technologies and ideas. (The R&D risk is high not only because of the technical challenges but also because cutting-edge R&D requires expensive equipment. Such R&D is the furthest away in time from the market, and the market may change during that period.)

The size of SBIR awards and thus the dollars at risk per innovation was therefore a major topic. Most of those I worked with in developing SBIR agreed that the technologies involved were such inherently high risks that smaller bets should be made on many projects before making a few larger bets.

Best practices 2: making the largest number of awards possible. Making many smaller awards was not only good risk management practice. Virtually everyone I spoke with argued, and my own 20-year experience as an SBIR Program Manager subsequently confirmed, that the economic payoffs would be higher this way. Many smaller awards mean that more ideas can be evaluated for their potential. More and better choices for further development become available.

Probably a few thousand CEO's of small tech firms have talked with me about SBIR over the years. In general, they liked almost everything about SBIR, except the terrible odds against winning an award. Many no longer submit proposals because of the large investment of time and cost required to prepare a competitive proposal when only one in 15 -20 receive the larger Phase II funding. Others still compete because there are almost no alternative sources of such funding.

If there are fewer SBIR awards in the future, not only will fewer technologies get evaluated and funded. Fewer companies will compete, because the odds against winning will get even higher. I believe we have been seeing some of this occur already at the National Institutes of Health, where larger award sizes and fewer awards have been accompanied by a fall off in applicants.

Best practices 3: creating scientific gates and milestones. Another best practice that we adopted for SBIR was the use of science-based gates and milestones before letting projects obtain more funding. Often an idea can be found to be infeasible through the Phase I "proof of concept" process. Other ideas show only a low probability of success. No further expenditures should be made on such technologies.

Unfortunately, some companies always came to us seeking to obtain as much SBIR funding as possible in both Phases I and II. Indeed, during my 20 years as an SBIR program manager, we frequently heard such requests from both the companies and the agency scientists and engineers. However, no proposer was ever allowed to go directly to Phase II. Even if they had done relevant work earlier, we expected Phase I to show further progress. Our strict policy on this point proved to be a good thing. The companies that argued that they had already done the early R&D, and therefore should be able to go directly into Phase II, almost always were unsuccessful when faced with competition. Their requests had been sales ploys. A company's success on earlier projects was no guarantee that its newest idea was competitive.

It is important to always remember that SBIR provides funding for *ideas*, not for *companies*. Competitive, science-based gateways are vital for identifying the best ideas.

Best practices 4: making SBIR a powerful economic development tool.

The past. The roots of SBIR actually go back to Congress' concern over the "Rust-Belt Recession" of the 1970's. Unemployment in Detroit was high, due to the growing sales of new smaller automobiles and machine tools from Japan and Germany. The question was asked whether National Science Foundation research was focused on economic needs. The result was a new NSF program in applied research called "Research Applied to National Needs" or RANN. For the first time in NSF history, ten percent of a program budget – the RANN program budget -- was set aside for small business. This was the basis for the design and initiation of the Small Business Innovation Program at NSF in 1977. That program grew each year. Its successes led to legislation in 1982 that required all agencies with an extramural R&D budget over $100 million (today 11 such agencies) to participate. There were some early successes, such as Symantec, that gave us confidence in the basic design of the program.

A little background here: Individuals and small firms are the primary source of category-creating inventions and technical breakthroughs. It is not the successful wagon company that invents the automobile. And it's not the large business that risks upending its business model and its product lines. Small company major economic breakthroughs include the digital computer, microchips, the personal computer, software, the successful cell phone, the internal combustion engine, diesel engine, steam turbines (steamships and railroads), the electric motor, typewriter, telephone, refrigerator, electric transmission, phonograph, incandescent lights, vulcanized rubber, pneumatic tire, photo plate, airplane, motion picture, anesthesia, x-ray MRI; and even earlier the cotton gin, power looms, the sewing machine, the mechanical reaper, and other agricultural machines.

Fast forward a few generations: The great technology-based economic successes of the late 1970's and 1980's – along the Route 128 corridor near Boston and in Silicon Valley – as well as the communications and information technology companies that have proliferated since the 1990's, were the result of tens of thousands of scientists and engineers annually opting to start or join small firms. Often this included many of the best and brightest, the most creative, the most entrepreneurial, and the shrewdest risk takers: exactly the qualities that private sector investors, particularly venture capital companies, were looking for.

Think about what happened as Internet-based businesses grew in the 90's. It wasn't all boom and bust. The core of the "dotcom" era was a series of rapid and related breakthroughs in new and emerging technologies. Most of the breakthroughs came from startup companies. Five "dotcom" era startups are now in the "20 Most Widely Held Stocks in the U.S": Intel (microchips), Microsoft (software), Apple (personal computers), Oracle (relational databases) and Cisco Systems (networks). In 2007 alone, their combined sales were $166 billion and they employed 221,000. Add to this the thousands of smaller new firms with directly related new products and services, both in the U.S. and worldwide. Overall, the "dotcom" era was probably the largest economic growth breakthrough in history.

The future. Just as we have seen small-business-driven technological breakthroughs throughout our history, we can see them again in the future. There are a whole series of new and emerging technology areas where innovations could have powerful economic impacts. They include:

- global warming and other environmental areas, such as water purity;
- alternative energy and energy conservation;
- all kinds of security -- national, military, commercial, and economic;
- ever-changing communications;
- health care improvements and cost reduction measure;
- disease prevention;

- more effective education;
- improved transportation;
- agricultural challenges addressed;
- nano- and miniaturization technology;
- automated manufacturing; and many more.

All of these needs represent potentially large markets. Today, the technological risks are still too great for most private investors. But the technologies still need funding. SBIR is perfectly situated to explore ideas in these areas.

SBIR funding is necessary because large firms, despite their public relations, do not in fact invest extensively in these areas. Big companies do not take major risks on unproven technologies, except with massive government funding, such as in defense, NASA, and nuclear power. Large firm R&D budgets focus on improving product competitiveness and the processes for fabricating their goods, solving specific problems, and overall growth in sales and profits. Universities and non-profits also cannot raise high risk money for private sector technological innovations.

The mechanism. Generally only small high-tech firms can raise sufficient amounts of high risk capital to pursue commercially and economically relevant innovations. The key reason for this is that only small companies can realistically offer the promise of their stocks multiplying dozens of times. It's the prospect of that exponential growth in stock value which makes the rewards worth the risks to investors.

When SBIR is guided well, it fosters breakthroughs by such small companies. These breakthroughs get the technologies to the point where they can deliver great economic benefits.

At that point, when the scientific evidence is starting to come in, innovations attract not only additional VC investments, but also investments by individual "angels," mutual funds, insurance companies, endowment funds, and others. Longer-term bank lending becomes possible. All of that financing lays the foundation for stock offerings. Then these stock offerings attract more capital. This business growth, plus the revenues from subsequent product sales and spin-offs, is the money that stimulates the economy.

Successful SBIR-funded technologies can thus generate many multiples of their federal investments, often in a much shorter time frame than traditional investments.

Again, the key steps are: casting the net as widely as possible, attracting entrepreneurial individuals and small companies, insisting on technical feasibility in a competitive and transparent environment, and then moving to a commercialization phase that requires private sector investment equaling or exceeding the federal investment.

What To Avoid in the Future

Avoid needless disruptions to the SBIR Program.

SBIR has proven itself over 25 years. It is known and understood by hundreds of thousands of scientists and engineers, most of them in small firms, but many of them also in the 11 participating federal R&D agencies, in universities, in venture capital companies, in larger firms, in Congress and in other parts of government, including the 50 state governments and a number of foreign countries. SBIR is successful. The National Research Council / National Academy of Sciences comprehensive assessment of the SBIR program last year confirmed the effectiveness of SBIR along the broad general lines that it exists today. Other studies, too, such as those by GAO and by Professor Josh Lerner of Harvard Business School have been highly favorable. No reputable independent study in the past 25 years has called for major changes in SBIR.

Rather than implementing the constructive recommendations offered by the NRC/NAS study, the House-passed bill (H.R. 5819) mandates a vast upheaval in SBIR. Such a re-write of the program would make the NRC/NAS changes far more difficult to execute. How, for example, can the agency Advisory Committees that the study recommends do their work when agencies in the program would be spending the next few years redrafting all their SBIR program rules and retraining all their personnel?

Worse, the extensive reworking of the program would confuse everyone who uses the program – all those people in the small firms, universities, VC firms, large companies, state programs, and Congress that tap into the program. It would lead to lengthy award delays as the program is re-tooled in one agency after another.

Small technology-based companies will suspect, probably correctly, that all these changes will self-destruct and that SBIR will have to be re-tooled again in a few more years. So they'll hold back and shift to other activities. This will intensify the upheaval.

And for what? H.R. 5819 is designed to sharply increase the amount of SBIR funding that goes to maybe half the current number of companies, and to explore perhaps half as many promising ideas. This bill is more like special interest legislation than national interest legislation.

All available evidence suggests the major changes proposed by H.R. 5819 would be highly detrimental to SBIR's mission and effectiveness. Congress has never examined the full implications of these changes and should not embark on them without doing so. Unraveling SBIR now, at a time when the nation urgently needs the economic boost that the program can provide, would be a national tragedy.

Avoid excessive increases in award sizes.

SBIR is not intended to pay for the entire R&D costs required for every project. Some ideas could require tens of millions and even hundreds of millions of dollars ultimately. The purpose of SBIR, as stated earlier, is to lower the R&D risk to the levels that can attract private investment.

H.R. 5819 triples the Phase II award cap, making it $2.2 million. The bill would also allow agencies to make multiple Phase II awards, and even to waive the $2.2 million cap. One effect of doing all this will be to divert tremendous amounts of energy to negotiations about how much of an award each project will get. It is difficult, unwise and unfair to most small firms and program officers to have to judge how much to request or award over such a vast range of dollars. Determining the award size will become a time consuming negotiation, complicated by questions of fairness to other participants. Those other applicants often will be equally qualified, and their projects will always be in need of more money. Ultimately, the size of many awards will end up being decided by salesmanship and personal connections, not by science. This will be a very corrosive influence on SBIR.

Just as important, larger awards reduce the number of ideas that can be funded. An $8 million Phase II award, if cut back to $1 million, could free up funding for seven other $1 million Phase II awards. Or, that $7 million difference could fund ***35*** "proofs of concept" ideas at $200,000 each. Similarly, a $1 million Phase I "proof of concept" award eliminates the possibility of four others at $200,000 each. We need to remember that research on innovative ideas at the idea stage is often primarily a one person job.

Avoid bypassing Phase I.

The foundation of the SBIR program is competition and openness. Take away the need to prove an innovation against other worthy innovations, in an above-board competition, and SBIR will degenerate into salesmanship and influence-peddling. Its genuine scientific accomplishments will diminish, year by year. If companies are allowed to apply directly for Phase II funding, SBIR will become little more than a traditional procurement program, not an innovation program. Phase I must not be by-passed; it is the seed bed of the entire SBIR Program.

Avoid using SBIR funds for commercialization.

If an SBIR firm cannot obtain a commercialization commitment from private sources, or from federal agencies (using non-SBIR funds), that at least equals the SBIR investment in an innovation, then SBIR's involvement in that innovation should end. The far more pressing public need is to fund additional recommended early-stage innovations, not to keep projects afloat that cannot attract financial support from the government or the private sector.

If SBIR award levels rise moderately to keep pace with inflation, an approach that the NAS/NAS study recommended, and that I agree with, then the SBIR investment in an early-stage technology idea should not exceed $1.2 million ($200,000 for Phase I and $1 million for Phase II). An innovation that cannot match or exceed that $1.2 million in the commercialization phase (Phase III) of SBIR, using non-SBIR funding, should not be rewarded with more SBIR funding.

In other words, no SBIR funds should be spent for Phase III. SBIR dollars are urgently needed to support additional promising ideas and to keep the high-risk SBIR portfolio diversified. If an agency feels that an innovation deserves financial support beyond a single Phase II award, then it can provide this further investment with non-SBIR funding. An agency that lacks that much faith in an innovation developed under its own guidance should not expect the taxpayers, via the SBIR program, to supply that faith.

Avoid steps that would diminish the small business character of the program.

Large companies view innovation much differently than small companies. A large company wants to protect its product lines and its customer bases. It looks for incremental innovations that make those existing products a little better and a little cheaper to produce. It looks for new products that are familiar and comfortable. For large companies, "re-defining" types of innovations are frightening. They upset settled ways of doing business. The nation needs both incremental innovations and quantum-leap innovations, but right now and for the foreseeable economic future, it needs those out-sized innovations the most. SBIR can deliver sweeping innovations, but to do so it must avoid taking on the coloration and biases of large companies.

Even if there were only a modest national need for "out-of-the-box" innovations, there would still be a powerful need for SBIR, because nothing else in the country, and certainly nothing else in the federal government, supports early-stage innovation by small companies. Despite having more scientists and engineers than large business, universities, nonprofit organizations, or the federal government itself, small business gets only 4.3 percent of federal R&D dollars. And SBIR accounts for over half of that. Those other institutions draw more than 90% of federal R&D dollars. And here's the rub: there aren't any <u>other</u> sources of that early-stage innovation funding for small business. Capital for small business innovation research is so short in the United States that SBIR rapidly became, and remains, the largest source of it.

I come from a long and deep background in venture capital and I am a great believer in it. SBIR won't be nearly as successful unless VC's can participate in it. But VC's that directly or indirectly report back to large companies shouldn't be in Phase I or Phase II of the SBIR program. Nor should VC's that are big companies themselves.

VC's that are large firms in fact or spirit will inevitably focus on companies more than innovations. That's fine in Phase III, but not earlier. If big VC's get into Phase I and Phase II, they will push for bigger bets on fewer companies. They will want to shift SBIR funding away from high-risk Phase I ideas and toward Phase II development, which is closer to market and therefore less risky for them. Sooner or later, they will back SBIR funding for Phase III, which will also offset some of their risk. And the kind of innovations they ultimately favor will be those that big companies favor – safer and more familiar ones, incremental rather than quantum leap. SBIR can do much more than this. SBIR's current restrictions on big VC's are therefore wise. By contrast, H.R 5819's approach to this issue is dangerously unwise.

What to Do in the Future

We must meet the competitive challenge.

We are currently the world leader in small high tech firms, in venture capital, and in basic research. These strengths are critical to our future economic growth. But others are catching up.

China, Japan, and Western Europe are rapidly increasing their investment in all three areas.

In a recent Harvard Business School Bulletin article, Jim Breyer, founder of Accel Partners and past chairman of NVCA, stated that there are now 6,000 venture-backed companies in Beijing alone! Accel has recently closed its second Chinese venture fund for $510 million. "Many of the very best [VC] firms in Europe and in Asia are affiliated with firms here in the United States," he notes.

The UK has just announced a new innovation program. Dozens of countries, notably including those that came here to study the SBIR program, are now increasing their investment in innovations by small technology firms, venture capital development, business schools, and basic research.

Seeking out technology breakthroughs should be a far more important objective of government R&D than ever before. The single most important initiative we could mount would be to increase the SBIR to 5 percent of extramural federal R&D in a series of steps.

Such an initiative would be opposed by the current recipients of over 90% of federal R&D, like large companies, universities, nonprofits, and the organizations representing them, but these were the same groups that opposed the creation of SBIR in the first place and have opposed every modest increase in the program ever since. The NAS/NAS report clearly shows that SBIR can successfully deploy additional funding.

Think what the Internet and the telecommunications revolution have done for our economy. This was accomplished primarily by small, high-tech firms with major VC support. Now the investment risk is even higher for initial funding. Seed-stage and early-stage VC support has plummeted. If there are only rare investments at the idea stage, there will be no storehouse of proven ideas ready for later development funding. As bad as our economic problems are today, with budget deficits, trade deficits, a shaky dollar, and so on, where would our tax revenues, our productivity, and our technology leadership be today if we had not had that technological revolution?

The SBIR program should be carefully strengthened.

The following are my recommendations to Congress about some specific issues in the SBIR reauthorization:

1. Small firms with 500 or fewer employees should remain eligible for SBIR awards as long as one or more large firms, including large venture capital firms, do not acquire a majority of ownership. Broad eligibility is necessary to identify and accelerate those innovations that can lead to technical and market success and superior economic growth. The nation needs these potentially fast-growing firms far more than those that do not grow. Outside investors can, and often must, obtain more than 50 percent of the stock to protect their investment. That should be acceptable in SBIR as long as these investors are individuals and as long as the companies that they represent are small, as is required today. However, these investors must not be controlled, directly or indirectly, by large businesses. SBIR was created to provide small companies with innovation funding. The program remains too small to allow funds to be siphoned off by large companies, which already receive over half of federal R&D.

2. There should be a set review period for Phase I results, as well as a set period for Phase II proposals, based upon Phase I results. Some firms are obtaining early reviews, before other firms. That is not fair to others and should not be allowed.

3. Agencies should not allow companies to extend the break between Phase I and II except for illness or similar reasons. On the other hand, agencies themselves sometimes need to extend the breaks between Phase I and Phase II due to budgetary issues. This should be allowed when truly necessary, despite justifiable company concerns about cash flow. In the end, SBIR's purpose is to fund ideas, not to support a company's financial picture.

4. SBA is still the proper organization to manage SBIR, not the Department of Commerce. Criticism of SBA over the years has been due in great part to significant understaffing by SBA management that should not have been allowed. SBA's SBIR staff is less than half the level any evaluator would recommend. When SBIR was a much smaller program, SBA had eleven staff members assigned to it. Today, there are only four. This headquarters staffing crisis is responsible for many complaints. But some agencies, such as DOE, also grossly under-staff SBIR. This leads to reductions in the number of award topics, in order to reduce agency workloads, and to the temptation to use jumbo awards, far in excess of the program's legal guidelines. I suggest some kind of a brake on agency proposal cutbacks and stricter enforcement of the caps.

5. Breakthroughs occur in new and emerging areas that cannot be predicted. I suggest that all agencies should allow innovation proposals in all areas that are relevant to their R&D programs. This openness to innovation proposals should be outlined in agency solicitations. Many agencies think in terms of relatively few topic areas. The original interagency innovation program essentially opened entire agency R&D programs for proposals. Solicitations now have become far more restrictive, which cuts against the national economic interest. Breakthrough ideas that are relevant to an aspect of an agency's R&D should be invited.

6. The commercial results of SBIR need to be strengthened. Awards should not be made by agencies solely on the basis of technical merit and without any consideration being given to downstream commercial potential. Unfortunately, some SBIR firms favor agency approaches that minimize commercial potential, because the firms are really only interested in having their R&D ideas funded, not in commercializing the results. I suggest that proposers and agencies require a commercialization plan in both phases with a more detailed and specific plan in Phase II. Reviewers should consider both technical and commercial merit in their recommendations. This would include the proposer's plan for obtaining non-SBIR funding for Phase III. I would also support an SBIR funding cutoff for firms that win many Phase I awards without advancing any of

them to Phase II, along the lines of what H.R. 5819 proposes. SBIR was specifically designed to force the small firm to focus on innovation, technology breakthroughs, and commercialization for their economic benefits to the nation. Defense and NASA should also seek SBIR projects that have potential Phase III follow-on funding from non-SBIR sources. SBIR funds should not be used for mainstream procurement.

7. Award sizes should be increased in size in this reauthorization, to keep pace with inflation since the last adjustment in 1992. I recommend increasing Phase I awards to a $200,000 cap and Phase II awards to a $1 million cap. These are both substantial amounts of risk capital to explore technical feasibility. SBIR is not intended to build up the capabilities of a company, based on considerations like its other projects, but to explore the promise of the specific idea proposed. And SBIR's budget must fund as many ideas as possible.

8. The SBIR set-aside should doubled as soon as possible. SBIR is a major national asset. It accelerates technological innovation and technology breakthroughs. It helps attract private sector investment to the most promising innovations. It increases economic growth. We need to reinvigorate the economy, and we need more technological innovation. Yet despite the history of small company innovations, notably relating to the Internet and to telecom, and despite the fact that there are six million scientists and engineers employed by small firms, over half of the government's external R&D, (50.3 percent) goes to large firms, 35.3 percent to universities, and 10 percent goes to non-profit institutions. Small business firms received only that 4.3 percent. (2005 figures from NSF.) Even a modest increase in the award caps, such as I recommend, will diminish the number of SBIR awards and companies unless Congress takes the sensible step that it took last time award steps were increased – increasing the program size by a large enough amount to offset the larger awards. Shrinking SBIR would be exactly the wrong thing for Congress to do at this point in our economic history.

Finally, I must say that as I review the SBIR recommendations made to Congress by the Biotechnology Industry Organization (BIO) and by my former VC colleagues in the National Venture Capital Association (NVCA), I am deeply troubled. It is mainly these two organizations that are calling for the far-reaching changes in the program. Many of the changes they are proposing would, in my judgment, significantly and perhaps irreparably harm the program. I can understand the desire of any organization to represent its members and prospective members, but this is a case when we must think of the broader national interest.

Without open and competitive early R&D efforts, spread as widely as possible, innovations will never reach the level of maturity that can draw in venture capital or other follow-on funding. BIO and especially NVCA should understand this. The need is to explore as many ideas as possible and lower the risk as much as possible to attract follow-on Phase III investment. There will be no shortage of great new innovations to invest in if we allow SBIR to do its work in supporting truly innovative small companies by objectively assessing which ideas are wheat and which ones chaff.

Congress supported the current SBIR objectives with the first SBIR legislation in 1982. The program is working well, but can be improved, as stated in the comprehensive NRC/NAS report. SBIR can stimulate thousands of high-risk, economically promising ideas like no other program. Given the opportunity to work as designed, and as proven, SBIR can make a major contribution to the national economic welfare.

May 28, 2008

APPENDIX N

MICHAEL SQUILLANTE CV

Curriculum Vitae

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Research and Professional Experience

Dr. Michael Squillante received his Ph.D. in Chemistry from Tufts University in Medford, MA in 1980. In 1980 he joined Radiation Monitoring Devices, Inc. in Watertown, MA (RMD) as a Staff Scientist. He became Director of Research in 1983 and Vice President of Research in 1992.

Dr. Squillante oversees RMD's research and development activities in the Advanced Imaging Technology, Advanced Instrumentation, Sensor Development, Instrument R&D and Biosensor Technology departments, including research programs to develop instrumentation for cancer diagnosis, scientific research and industrial testing. He has been Principal Investigator and Program Manager on numerous programs funded by various government agencies including NASA, NIH, NSF, DOE, EPA, HSARPA, DNDO, and DOD to develop materials, sensors and instruments. He has been involved with the SBIR program since its inception and has successfully led projects through the research and development stage to successful commercialization.

Dr. Squillante has published over 100 technical papers. He is an editor on a book published by Materials Research Society (1998). He is co-author on chapters about materials science and detector technology in books published by Marcel Dekker (1993), Academic Press (1995), in the CRC Measurement and Sensors Handbook (1999), and the John Wiley Encyclopedia of Electrical and Electronic Engineering (1999).

Dr. Squillante is an adjunct Professor of Physics at the University of Massachusetts in Lowell.

Other Relevant Experience

Dr. Squillante is the Chairman of the Small Business Technology Council (SBTC) in Washington D.C., and a founding member of the New England Innovation Alliance, a group of 40 small high technology firms that meet monthly to discuss issues of importance to small companies.

Dr. Squillante served as a reviewer for the National Research Council of the National Academies of Science studies “An Assessment of the SBIR Program”, 2008, "An Assessment of the SBIR Program at the National Institutes of Health", 2009, and "Venture Funding and the NIH SBIR Program" 2009.

Dr. Squillante testified at the Senate Small Business and Entrepreneurship Committee hearing on "Strengthening Participation of Small Business in Federal Contracting and Innovation Research Programs" in July 2006, and he participated in a Roundtable on "Reauthorization of the Small Business Innovation Research Program: National Academies' Findings and Recommendations" in August 2007.

In his home community of Waltham, MA, he served as an elected City Councillor from 1991 to 2003, and presently serves as an Associate Member of the Waltham Zoning Board of Appeals.