Testimony of

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Small Business Technology Council

BEFORE THE COMMITTEE ON SMALL BUSINESS AND ENTREPRENEURSHIP, UNITED STATES SENATE

Washington, D.C.

Regarding

Reauthorization of the SBIR/STTR Programs – The Importance of Small Business Innovation to National and Economic Security

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SBTC, the nation's largest association of small, technology-based companies in diverse fields, is proud to serve as the technology council of the National Small Business Association, the nation's oldest nonprofit advocacy organization for small business, serving more than 150,000 small companies throughout the United States.

Chairman Vitter, Ranking Member Shaheen, members of the Committee, thank you for the opportunity to appear here today to discuss the importance of technological innovation to the United States, and the reauthorization of the SBIR and STTR Programs.

I am Jere W. Glover, Executive Director of the Small Business Technology Council (SBTC) of the National Small Business Association (NSBA), in Washington, DC. I have been involved in federal science and technology innovation programs since 1978, when I staffed joint Senate/House hearings and the resulting report that showed severe under-utilization of small business high-tech companies in the Federal R&D programs. [1] The 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.

When Arthur Obermayer was inducted into SBIR Hall of Fame at the White House as one of the key founders of the SBIR Program, he stated that next to the GI Bill after WWII, SBIR was one of the most significant pieces of legislation ever passed by Congress. After considering his comments, I'm inclined to agree with him.

The SBIR/STTR Program has been copied by seventeen countries around the world. While **t**he SBIR/STTR program accounts for only 2.6-3. 0%[2] of the Federal extramural R&D budget over the last 4 years, it has created 22% of key innovations. According to a recent Air Force Economic Impact Study, every dollar spent on the SBIR program returns 3.6 dollars in sales, 50 cents of additional outside investment or venture capital, and resulted in over 400 mergers and licenses. Thirteen percent of the Phase II firms had commercial sales of over $10 million. According to 17 National Academy of Science studies conducted over 17 years, totaling 5,251 pages, the SBIR/STTR programs have met (all but the minority participation which the NRC said was not the fault of the SBIR/STTR) their stated Congressional objectives (See Appendix A. Appendix A also includes references for 25 Government Accountability Office reports.).

In Washington it is extremely difficult to reach a consensus. However, there is consensus that SBIR is a wonderful example of people working together to create new technologies, jobs, and improve the economy in a most cost effective manner. This program was started with the strong support of President Reagan and with the leadership of Senators Kennedy and Rudman.

Despite its strong support and wonderful record of success, reauthorization has, on occasion, been difficult. After 17 National Academies studies and 25 GAO reports and 33 years of positive experience **it is time to recognize that 1) increasing the programs is a cost effective investment of Federal R&D dollars, and 2) making SBIR and STTR permanent is long overdue. This Committee voted ten years ago to make these programs permanent, and at the same time Senator Vitter joined with then Senator Bayh to call for a doubling of the SBIR program to five percent. The bill passed 18-0. With Senator Shaheen calling for permanency, and Senator Vitter's legacy on increasing the program, I can't think of two better Senators to lead the committee during this reauthorization.**

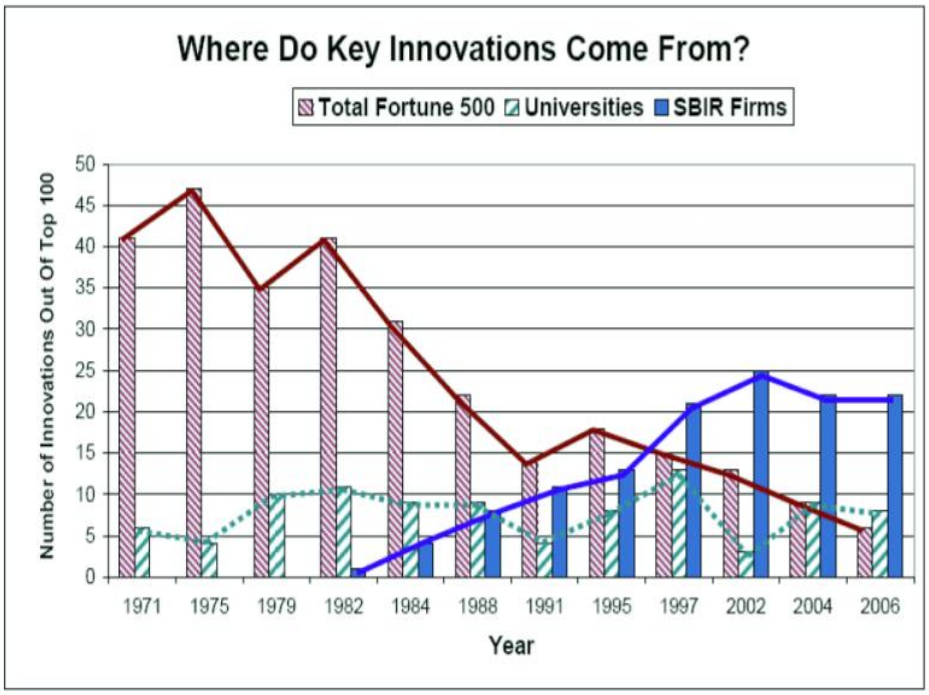
SBIR/STTR Overview

The SBIR/STTR Programs together account for $2.0-2.5 billion dollars, or about 3.0% of the Federal **extramural** R&D budget. SBIR/STTR represents less than 2% of the **total** Federal R&D budget of 144.4 billion dollars. Each year the 11 Federal agencies[3] make almost 5,000 awards with almost one half coming from the Department of Defense. For a description of how the program works see www.SBIR.Gov .

It bears repeating that **t**he National Academy of Sciences and its National Research Council's (NRC) 17 reports have shown that the SBIR/STTR Programs have met the Congressional objectives for the Program: (1) to stimulate technological innovation, (2) use small businesses to meet federal R&D needs, (3) foster and encourage the participation of socially and economically disadvantaged small businesses, and (4) increase the private sector commercialization of innovations derived from federal R&D. While the NRC indicates that (3) has not been meet, NRC says it is not SBIR/STTR problem but a STEM problem.

While commercialization is only one of the Congressional Objectives of the Program, I nevertheless want to focus on SBIR commercialization and job creation. In addition to the NRC Reports, studies by the Air Force and the Information Technology & Information Foundation have documented the commercial success of the program. These Reports show that almost 60% of Phase II awards end up with commercial sales exceeding $1 million, making this the most successful innovation commercialization program in America. Successful alumni of the SBIR program are firms like: Qualcomm (cell phone communications), Symantec (computer security), Genzyme (biotech therapies), Affymatix (GeneChip), Amgen (biopharmaceuticals), Jarvick Heart (artificial heart), Titan (now Intersection, interactive computer graphics), Chiron (pediatric vaccines), AMTI (advanced materials, radars), Amorworks (military armor), Biogen (Idec, neurological, autoimmune therapies), American Biophysics (mosquito control), Millennium Pharma (gene databases), Geron (telomerase inhibitors for cancer treatment), Neocrine Bioscience (neurological and endocrine pharmaceuticals), ABIOMED (world's smallest heart pump), Aerovironment (unmanned aircraft), A123 Systems (lithium-ion batteries), iRobot (unmanned robotic vehicles, vacuum cleaning, Roomba), JDS Uniphase (fiber optics, lasers, software), Stem Cells Inc. (cell based therapies for CNS and liver disorders), and Nanosys (quantum dot displays), as well as thousands of others.

An analysis of R&D 100 awards show SBIR/STTR Programs have resulted in 22-25% of all key innovations in the United States.[4]



Another analysis of the SBIR program was performed by the Air Force. They found the following in their study.[5]

Well over half of the Air Force Phase II contracts— 58 percent—resulted in sales of new products and services based on the innovations developed with these contracts. Companies reported the following direct commercialization-related outcomes from their Phase II contracts:

HUGE R.O.I.

58%

Of Phase II contracts resulted in sales of new products and services based on the innovations developed with these contracts.

$14.7B

In total sales of new products and services, including **$4.4 billion** in military product sales.

$1.9B

In outside investment from venture capital,angel, & other private-sector funding sources

225

COMPANIES

Acquired by larger corporations

180

TECHNOLOGIES

Licensed to other companies for commercialization

125

NEW SPIN-OUT COMPANIES

To commercialize Air Force-funded innovations

The research team used IMPLAN economic-impact assessment software to estimate the total economic impacts related to both the $4 billion in Air Force SBIR/STTR Phase II contracts and subsequent $14.7 billion in sales of new technologies. **Results included:**

$47.9B **Total economic output nationwide**

$24.7B In value added, representing new wealth creation in the economy

$15.5B In labor income

16,751 Average new full-time jobs per year, with an average wage of **$65,968**

The study was commissioned by the Air Force SBIR/STTR Program. It is the first-ever comprehensive study of the economic impacts of an entire federal SBIR/STTR program. The study was conducted by TechLink, a federally funded technology transfer center at Montana State University-Bozeman, in collaboration with the Business Research Division (BRD) of the Leeds School of Business at the University of Colorado Boulder.

The Air Force study found after surveying 96% of all Air Force Phase II winners between 2000 and 2013, that 58% of the contracts had sales in excess of $1 Million. Four contracts resulted in sales of over $500 million, 23 had sales of over $100 million, 221 companies had sales of over $10 million and 1,715 contracts has sales of over $1 million. I know of no other program with such a remarkable record of commercialization success.

Air Force SBIR/STTR Phase II Contracts	**Total Number of Contracts**	**Percent of Total**	**Total Sales** *$ Billions*
Total Contracts	**4,524**	**100**	**$14.7**
All contracts with sales	**2,631**	**58**	**$14.7**
Contracts with sales exceeding $500 million	4	0.1	$3.1
Contracts with sales exceeding $100 million	23	0.5	$6.6
Contracts with sales exceeding $10 million	221	5	$11.4
Contracts with sales exceeding $1 million	1,155	26	$14.3
Contracts without sales	**1,715**	**38**	--
Companies not responding	**178**	**4**	--

SBIR/STTR Success Stories:

The SBIR and STTR programs have experienced considerable success in meeting agency needs as reported by National Research Council (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. SBIR Success Stories: https://www.sbir.gov/news/success-stories

b. DOD: http://www.acq.osd.mil/osbp/sbir/about/success-stories.shtml

c. NIH: https://sbir.nih.gov/statistics/success-stories

d. DOE: http://science.energy.gov/sbir/highlights/

e. NIST/DOC: http://www.nist.gov/tpo/sbir/sbir-success-stories.cfm

f. USDA: http://nifa.usda.gov/impacts

g. EPA: http://www.epa.gov/sbir/sbir-success-stories-and-highlights

h. Tibbett's Award & SBIR Hall of Fame: https://www.sbir.gov/about-tibbetts-awards

i. Overall, if one performs a web search for "SBIR Success Stories" there are approximately 59,600 responses on Google and 146,000 on Yahoo (of course, some are redundant).

SBIR JOB CREATION

The 2014 Air Force Economic Impact Study shows that the Phase II award winners had $14.7 billion in sales and added 234,000 jobs in America between 2000 and 2013.
This is more than Google, Apple, Cisco, and Microsoft combined– **JUST FROM AIR FORCE SBIR PROGRAMS.**

	Worldwide	US	Outside US	% Outside US	References
Google	56,300	37,792	18,508	32.9%	http://reviews.greatplacetowork.com/google-inc
Cisco	70,911	35,549	35,362	50%	http://reviews.greatplacetowork.com/cisco
Microsoft	115,905	60,515	55,390	47.8%	http://news.microsoft.com/facts-about-microsoft/#EmploymentInfo
Apple	115,000	76,000	39,000	34%	http://www.apple.com/about/job-creation/
Total	358,116	209,856	148,260	41.4%	
Air Force Study Employment	234,000	234,000			Air Force Economic Impact Study Pg 27

When looking at the entire SBIR program, SBIR involved firm's employ 500,000 graduate-level engineers & scientists across every field of industrial/ technical endeavor is arguably largest single concentration of demonstrated technical talent. - See more at: http://www.inknowvation.com/sbir/about-us#sthash.YfqTc7qg.dpuf

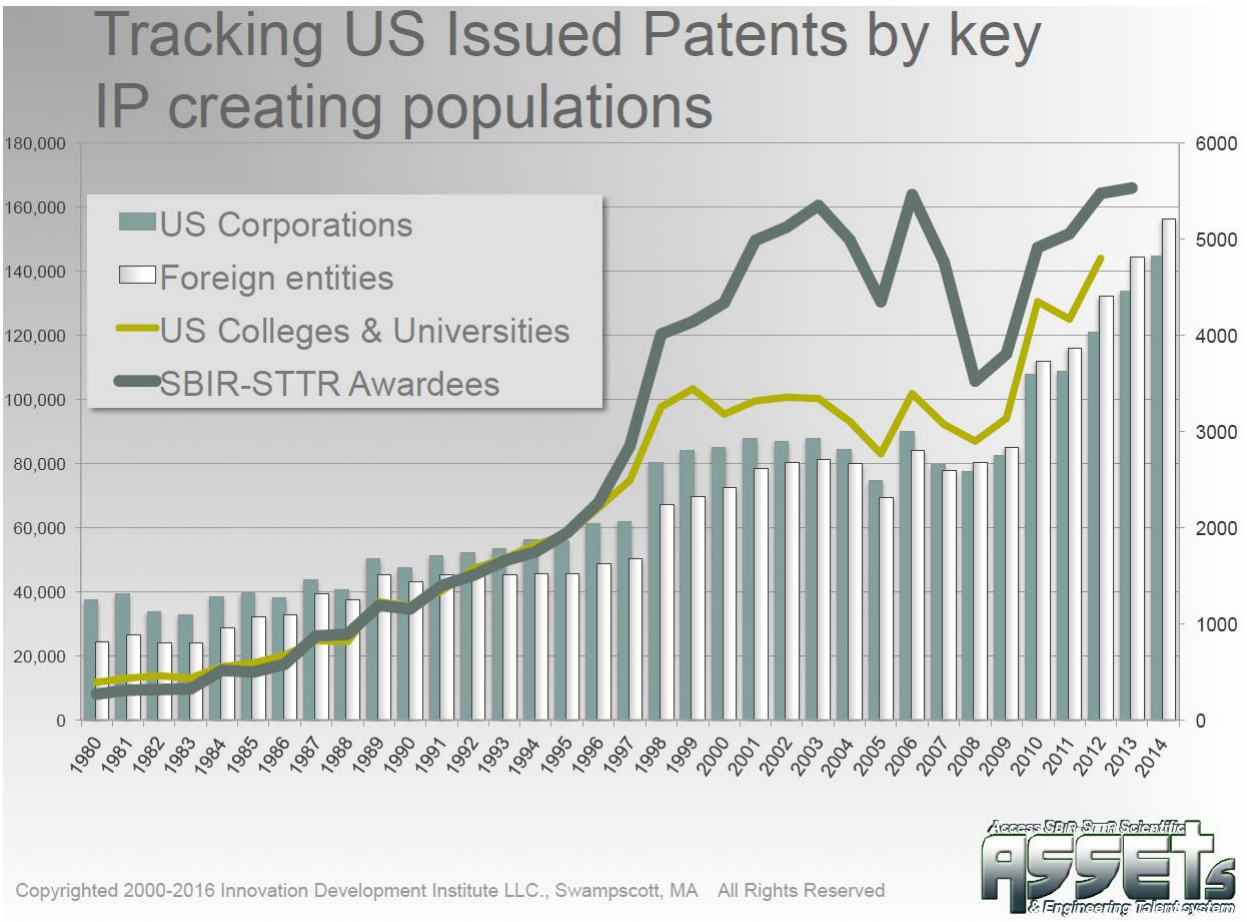
Mergers and Acquisitions

Another indication of success is the number of SBIR/STR firms that are acquired. The Air Force Economic Impact study found that 225 of the Phase II winners had been acquired. This is just the tip of the iceberg. According to Innovation Development Institute of Swampscott, MA (IDI) database 1,975 SBIR/STTR firms have been acquired. This shows that large firms value SBIR/STTR technology. Companies active in acquiring SBIR/STTR firms include L3 Communications with 40 acquisitions, SAIC with 13, General Electric with 12, Raytheon with 11 and BAE and Lockheed Martin with 10.

Unfortunately all small business, the recognized leader in innovation, still receives less than 5% of the total Federal R&D funding, the majority of which comes from the SBIR/STTR programs. Large firms, universities and government laboratories receive the remaining 95% of Federal funding.

Small business gets a tiny amount despite the that fact that small businesses make up: 99.7 percent of U.S. employer firms, 63 percent of net new private-sector jobs, 48.5 percent of private-sector employment, 42 percent of private-sector payroll, 46 percent of private-sector output, 37 percent of high-tech employment, 98 percent of firms exporting goods, and 33 percent of exporting value.[6] Again, despite their small size and limited resources, small and micro entities accounted for almost 30% of all U.S. origin issued U.S. patents in 2015.[7] And, according to the Federal Reserve, patents are the number one indicator of regional wealth.[8]

The IDI has been tracking SBIR commercialization, mergers and patents by SBIR/STTR involved firms for decades. Their comparison of SBIR firms and patents filed show that SBIR/STTR involved firms receive 12-14 patents each day. SBIR/STTR firms have received 125,631 patents.[9] As shown on the below chart, each year SBIR/STTR firms receive over 5,000 patents. That is more than all universities combined, on less than 2% of the Federal funding. As noted above patents are very important to commercialization of innovations. IDI analysis of patents show that over one third of all SBIR/STTR firms receive patents.



With this remarkable success of Small Business and the SBIR/STTR programs, it is our view that America has been stifling job creation and economic growth by limiting its support to these small business companies to less than2% of the total R&D budget, even when they have clearly been the companies that drive new innovation and new jobs.

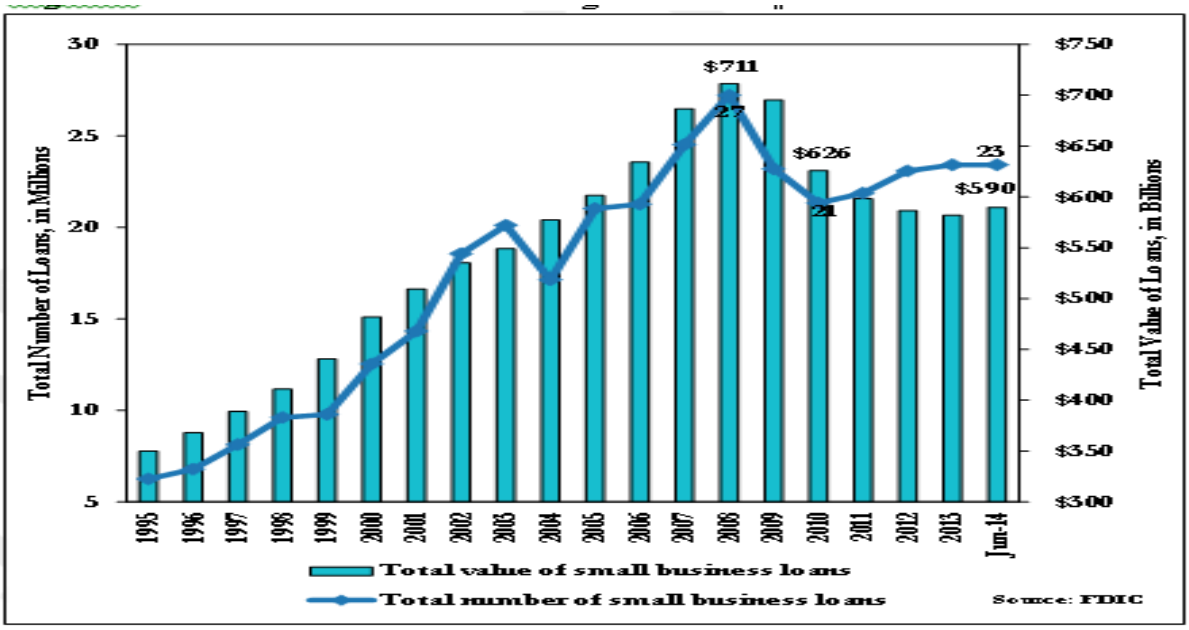
We believe it is time for America to focus on Small Business Innovation, and unleash the creativity, passion, enthusiasm, and zeal of America's greatest job creators by expanding the SBIR/STTR programs, and making them permanent.

Small business has a remarkable history of innovation. Today I will focus on the success of the SBIR/STTR Program.

Financing Innovation is difficult

SBIR/STTR are the only Federal programs designed specifically to help small high technology firms grow and succeed. Unfortunately, bank lending to small business is down, and venture capital is difficult, if not impossible to obtain in most areas of the country. For thousands of inventors and small businesses, SBIR is their only hope of funding their inventions, and America's best opportunity to create American jobs.

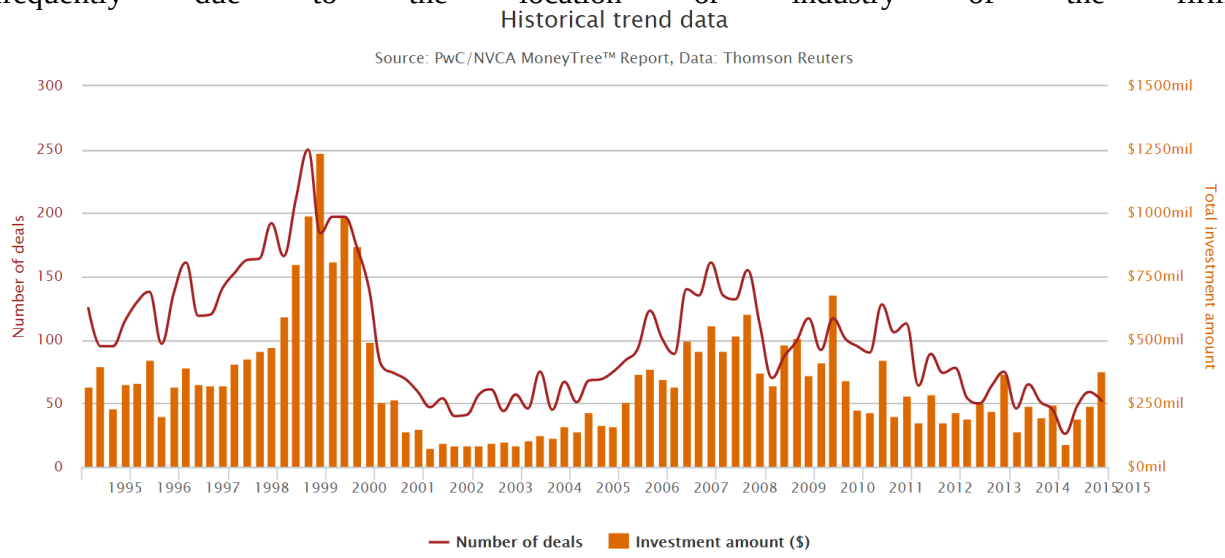
BANKING: Small business options for financing growth and commercialization of their innovations are very limited. Bank lending has declined dramatically since 2007. Bank lending is not available for most innovative small businesses. The amount of lending to small businesses by banks is down over $120 Billion over the last 7 years. According to Professor Cole at DePaul University, lending to small business is 50% lower than it should be.



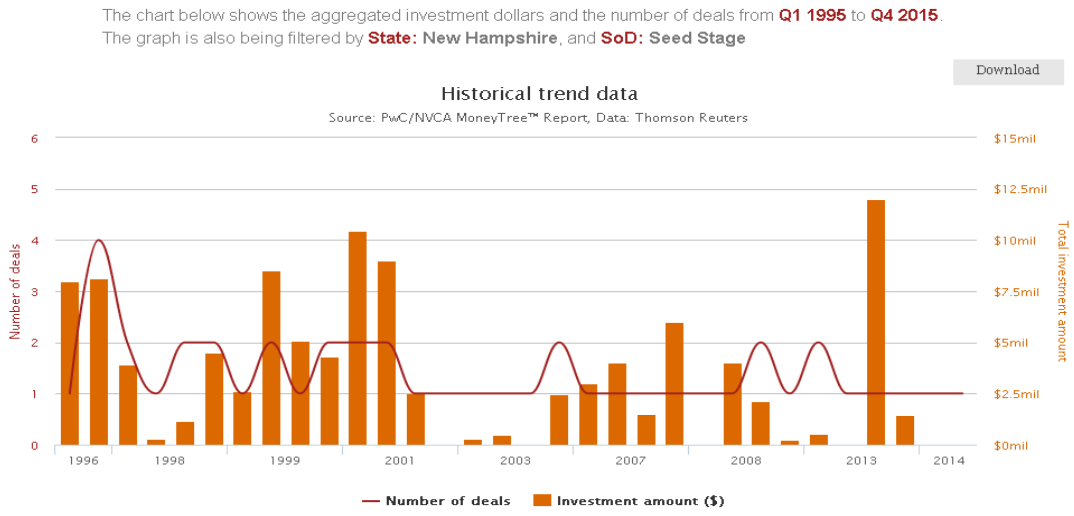
VENTURE CAPITAL: Since 2008 venture capital has declined significantly, especially for first round financing and for early stage investment. **T**his decline in venture capital is especially troubling since about 14% of all SBIR firms eventually received venture capital and one of every eight dollars invested by venture capital is to an SBIR/STTR involved firm.[10]

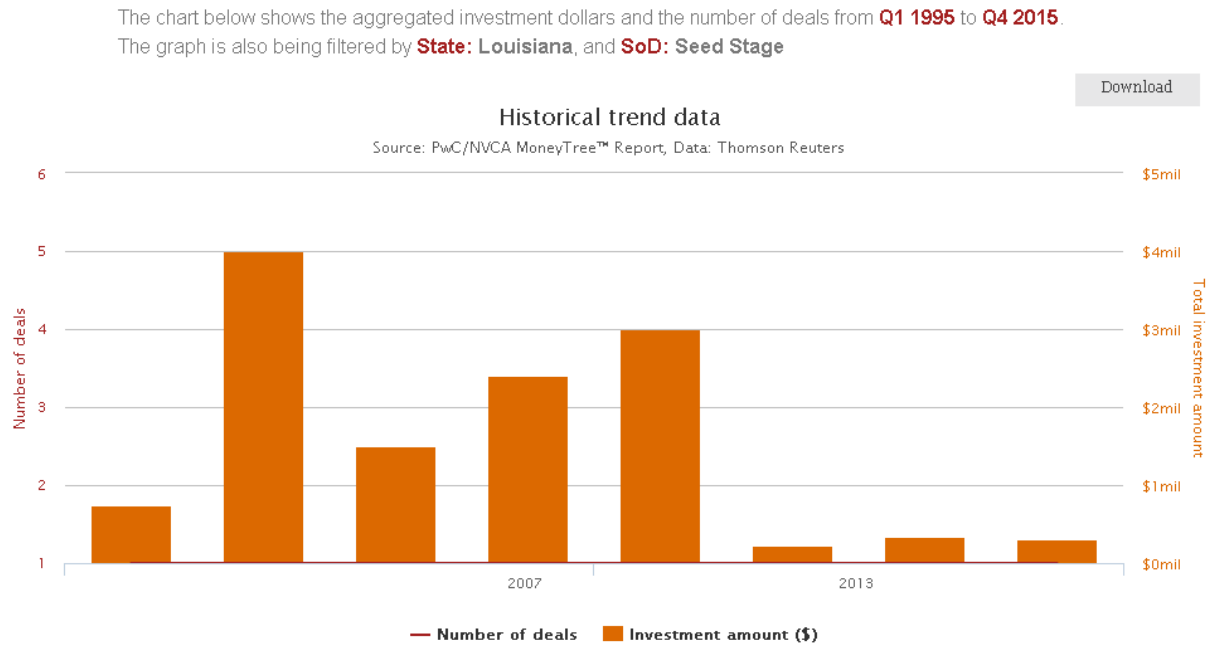
Unfortunately small business cannot rely on venture capital to fund their new innovations. Venture capital only made 185 seed round deals in 2015.[11] Compare this with the SBIR/STTR program that makes almost 5,000 awards each year (**about 27 times as many funding opportunities as VCs provide**). Venture capital investments tend to be located in just a couple of states, California and Massachusetts, and in very few industries. (85% of the VC funding is provided to just five states, and 60% of the total funding goes to California.)[12] This means that for most small business in most of the country, venture capital it not a realistic option to grow and commercialize their invention.

Most tech firms (82%) do not raise VC or any other type of institutional capital (VC, Private Equity, Growth Equity, etc.) prior to exit.[13] This is because VC funding is not an option for them, frequently due to the location or industry of the firm.



For example if you pick a couple of states selected at random, Louisiana and New Hampshire, the data shows that venture capital had only one or two seed stage financings from per year in New Hampshire, and none or one per year in Louisiana.[14]





Given the circumstances, small businesses seeking to fund their inventions have only one real way. **The SBIR/STTR Program is the only option for most innovative firms. In addition to providing needed funds to innovative small business the SBIR/STR Programs meet the Congressional Objectives of** (1) to stimulate technological innovation, (2) use small businesses to meet federal R&D needs, and (4) increase the private sector commercialization of innovations derived from federal R&D.

U.S. innovation leadership in the World is Challenged

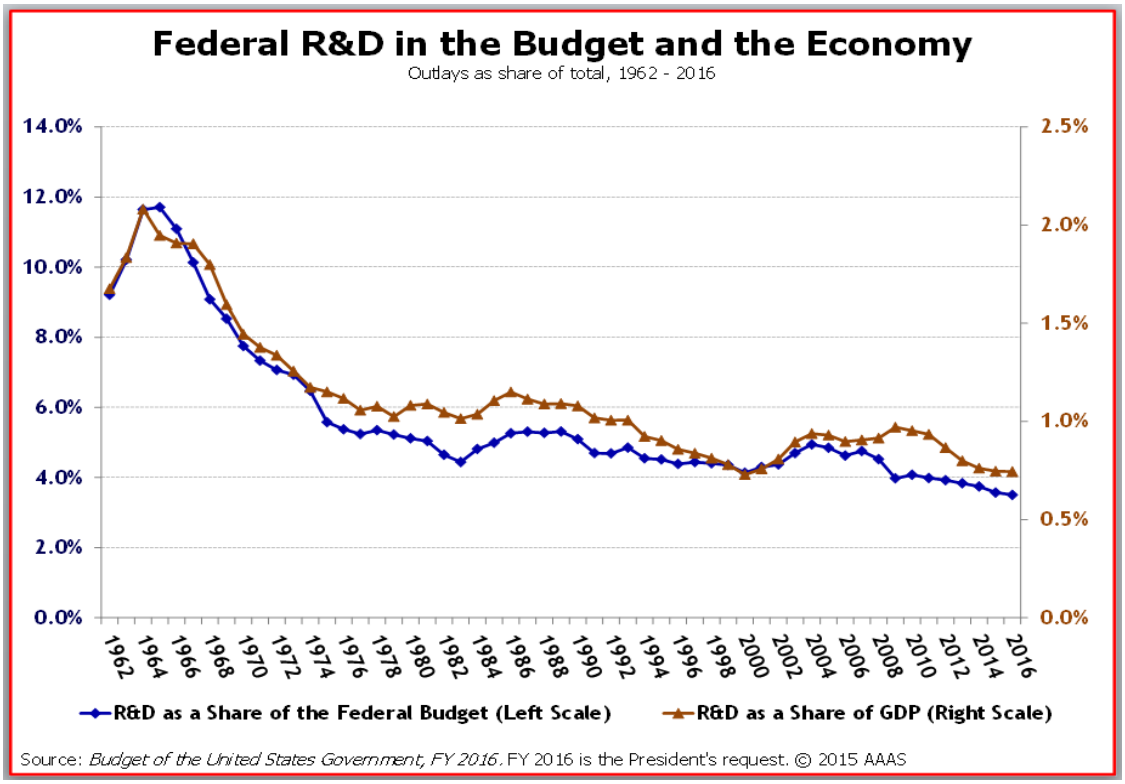
America's leadership in innovation and technology is being challenged. While America leads in the number of scientific articles and journals, we no longer lead in high tech exports and patents filed. The rest of the world is far exceeding America in filing patents and in exporting high technology.

High Tech Exports 2013

Country name	High Tech Exports (millions $)	Resident patents	Scientific articles
United States	147,833	287,831	208,601
China	560,058	704,936	89,894
Germany	193,088	47,353	46,259
Japan	105,078	271,731	47,106
Korea	130.468	159,978	25,593
Singapore	135,602	1,143	4,543

Source: http://wdi.worldbank.org/table/5.13

In addition, the US Federal R&D spending as a percentage of Gross Domestic Product is declining while it is increasing in other countries.



History of SBIR

The SBIR Program History: The original SBIR legislation was started almost 35 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) 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.

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:

> "(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."

The House was concerned that small business share of the Federal R&D budget remained at less than 5%. Ironically 33 years of proof that small business innovate better than large companies and universities and thousands of success stories, the **small business share of Federal R&D remains at 5%.** Most of which comes from the SBIR/STTR program.

Despite the SBIR's enduring popularity from both industry and government, reauthorizing the program has proven a challenge in the past. In 2000, the program was reauthorized for eight years, expiring on September 30, 2008. After its expiration, it wasn't reauthorized again for over 3 years, until SBIR reauthorization language was included in the NDAA 2012 bill passed on December 15, 2011. In between those reauthorizations, there were 14 continuing resolutions that kept the program temporarily alive for months at a time, sometimes passed only days before the SBIR program would have been terminated. This process was incredibly stressful for small businesses, as there was a constant atmosphere of uncertainty for over three years over whether or not the program would be around. Small businesses had to gamble with their budgets, employees, and long term plans that the program would eventually be reauthorized. This caused some small businesses to lose key employees who sought a more stable work environment, which subsequently cost the Federal Government more in trying to recreate technology and retrain new employees.

SBTC Concerns

Funding Commercialization

As pointed out above, funding for commercialization of innovation is difficult for all small business. This is true for SBIR/STTR firms. While SBIR/STTR firms have a conversion rate of 58%, there remains significant problem. For decades companies of all sizes have had difficulty getting their technology inserted into DoD. Contractors at DoD prefer to reinvent technology instead of acquiring technology from others. Congress and DoD have tied for years to address this problem. (See Appendix D page 5) SBTC believes that it is time to require DoD and its contractors to create a Program Objective Memorandum (POM) for SBIR technology and to require its contractors to subcontract with SBIR/STTR firms for part of their RDT&E budgets.

Implemented key provisions of the 2011 Reauthorization in 4 years.

SBTC is concerned that after four years SBA, DOD and the Armed Services have not implemented key provisions of the SBIR/STTR Reauthorization Act of 2011. (See SBTC DOD White Paper APPENDIX D). Specifically, there are no goals, or incentives as required by Section 5108, nor any reporting as required by Section 5123. We are also concerned that the civilian agencies have not taken steps to make sure that Section 5123 has been implemented.

Section 5108 provides: **To the greatest extent practicable, Federal agencies and Federal prime contractor shall issue Phase III awards relating to technology, including sole source awards, to the SBIR and STTR award recipients that developed the technology**….

With the exception of the Department of the Navy Phase III Guidebook, no other agency has issued guidance or directives implement this provision. In the four years since Reauthorization became law, DoD has not issued goals and incentives for Program Executive Officers (PEOs) or prime contractors required in Section 5123. In addition Section 5123 requires that the agencies and prime contractors and SBA report on the number and dollar amount of Phase III awards. None of these required reports have been released.

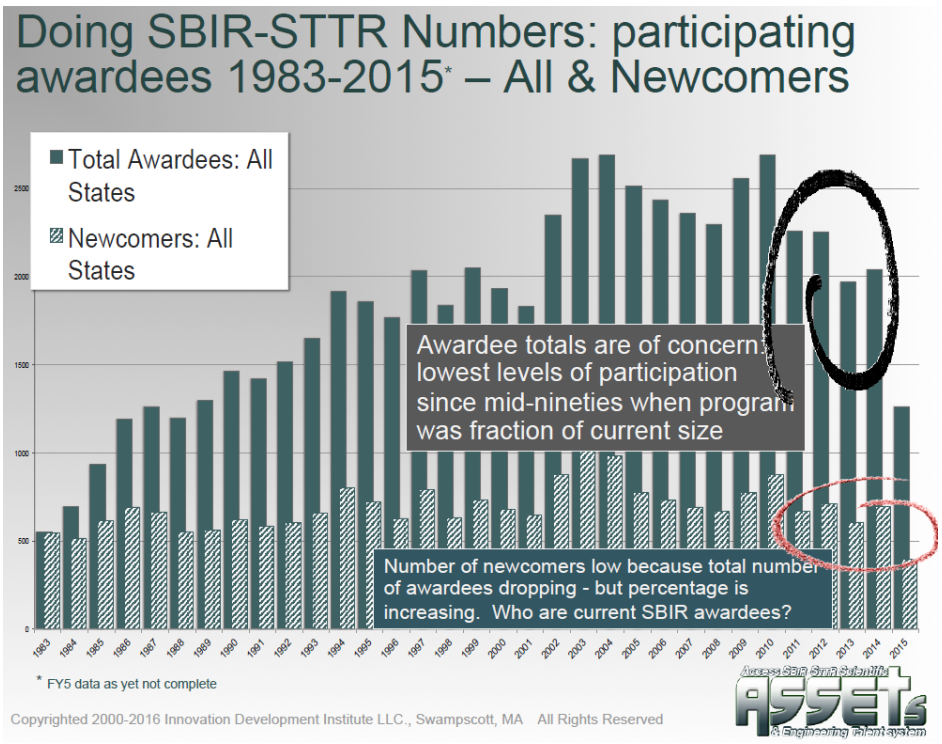
Had DOD and SBA implemented these provisions of the law, DoD would not have been criticized by the National Academy of Science. (See Appendix B for discussion of the key recommendations of the NRC recent report on the DoD. Most of these recommendations are already in the law, but have not been implemented by the DoD or by the other civilian agencies).

SBA Staffing and Budget

SBTC is concerned that the SBIR/STTR staff and budget at SBA are too small. According to the SBA's ''Historical Summary, Office of Technology,'' in 1991, the Office of Technology had a budget of $907,000 and 10 positions. While I do not have current information, I believe that is in need of more funding and personnel. Running a $2 billion dollar program with just 4 or 5 people and a very limited budget makes no sense. SBA is years behind in submitting its Annual Reports to Congress and hasn't issued guidance directing the Agencies to comply with the provisions of the last Reauthorization bill. SBA was lucky to convince John Williams to move over from the Navy SBIR program to run its Office of Technology, but it has not given him enough staff to fully leverage all of his talent and follow-through. Lack of personnel and funds are a serious problem at SBA's Office of Innovation.

Declining Number of Awards and Newcomers

One other SBTC concern is the decline in the number of SBIR/STTR awards and especially the number of Phase I awards. The below chart shows the decline in award over the past 5 years.[15] These numbers show a decline of as much as a third of the number of awards since 2009. This decline together with a decline in the age of newcomer as winner of SBIR/STTR and the decline in the number of first time winners of awards is a real concern and another justification for increasing the SBIR/STTR allocation.



Breakout SBIR-STTR Awardees By Type & Percentage; By-Agency & Year 1983-2015 October 2015

Agenc	2014						
	Total Awardees	First Time Awardees[1]	% New/ oldcomers	# Agency Returners[2]	% Agency Returners	First time in agency[3]	% agency first time[4]
DOD	715	145	20.28%	550	76.92%	20	2.80%
NIH	706	249	35.27%	426	60.34%	31	4.39%
NASA	20	1	5.00%	16	80.00%	3	15.00%
DOE	178	40	22.47%	104	58.43%	34	19.10%
NSF	301	205	68.11%	57	18.94%	39	12.96%
DHS	32	5	15.63%	15	46.88%	12	37.50%
USDA	3	0	0.00%	1	33.33%	2	66.67%
DOT	18	6	33.33%	6	33.33%	6	33.33%
EPA	21	10	47.62%	5	23.81%	6	28.57%
DoEd	4	0	0.00%	4	100.00%	0	0.00%
DOC	21	4	19.05%	8	38.10%	9	42.86%

Dept of Defense: all Agency Data and by Service Breakout							
DOD	715	145	20.28%	550	76.92%	20	2.80%
AF	339	55	16.22%	242	71.39%	42	12.39%
Army	84	12	14.29%	52	61.90%	20	23.81%
Navy	321	53	16.51%	227	70.72%	41	12.77%
MDA	22	1	4.55%	14	63.64%	7	31.82%
DARPA	23	11	47.83%	4	17.39%	8	34.78%
DMEA	2	0	0.00%	0	0.00%	2	#####
DTRA	6	0	0.00%	2	33.33%	4	66.67%
CBD	19	6	31.58%	5	26.32%	8	42.11%
OSD	61	13	21.31%	33	54.10%	15	24.59%
SOCOM	9	0	0.00%	3	33.33%	6	66.67%
NGA							
DHP	25	6	24.00%	10	40.00%	9	36.00%
Source: Innovation Development Institute, LLC., Swampscott, MA							2014

The charts in **Appendix E** show that for DoD components newcomers decline by 20% since 2004 and 30% since 1994.

SBTC RECOMMENDATIONS

SBTC has the following recommendations for the SBIR/STTR Program.

1. Complete reauthorization this Congress, preferably before members leave in mid-July.
2. Make the SBIR/STTR program permanent.
3. Increase the allocation significantly.
4. Require the Services to Program Objective Memorandum (POM) for insertion of technology from SBIR/STTR, from Non Traditional Vendors (NTV), or from small businesses using university technology.
5. Require all companies with contracts with a value of $100 million or more to report on the number and dollar amount of SBIR/STTR, small business NTV and small business using university technology.
6. Each contract or modification to a contract with a value of $100 million or more shall include a goal of 23% of technology funding to be awarded to SBIR/SBIR, small business NTV or small business using university technology.
7. 2% of 6.4 and above funding at DOD shall be allocated to fund SBIR/STTR Phase III contracts, or technology from small business NTV or small business using university technology.
8. If the 3% administrative fee is to be continued, it should only be for agencies that have reported what they have spent the funds for in the previous year, and what they will spend the funds for in the coming year. They must also report on what they have done to implement fully the provisions in this and prior reauthorization bills. Any reports submitted to SBA by an agency or component there of shall be submitted directly to Congress within 90 days unless SBA has submitted the report to Congress. Agencies shall respond to recommendations in their respective National Academy of Sciences study within 90 days in a report to Congress. Any agency that has not complied with all SBIR reporting requirements shall not be able to use the administrative fees in the following year.
9. The Rapid Innovation Fund (RIF Program) should be expanded at DoD and implemented at DoE and NASA for Phase III SBIR/STTRs at an amount that is at least equal to the amount of the SBIR/STTR programs at the respective agencies.
10. All SBIR/STTR contractors and grantees that have no original contract or grant, or any single modification to a contract or grant that is more than $7,500,000 shall have the choice to use a Certified Public Accountant to examine financial records and indirect cost rates, in lieu of a review by an Agency's financial services department or the Agencies audit agency. The Agency shall accept the CPA's review and rates without additional audit or review unless directed otherwise by the Agency Director for a specific company.
11. Require that patent costs be allowable as an indirect cost.
12. Require that the provisions in this and all prior reauthorizations bills be implemented immediately and the FAR and DFAR be updated and implemented immediately to include the language in the reauthorization bills.
13. Increase the number of personnel and budget of the SBA Office of Technology

Conclusion

The SBIR/STTR Program has been extremely successful. It has helped create and grow over 22,000 firms. These firms have received over 125,000 patents. Fourteen percent of the firms have received venture capital. One thousand, nine hundred and seventy-five SBIR/STTR firms have been acquired. It has provided high quality for military and other national needs. Twenty-five percent of key innovations come from this program. All of this with less only 2% of the total Federal R&D budget. After 17 NRC favorable reports and 33 years of success, the Small Business Technology Council agrees with the Chairman and Ranking Member of this Committee. It is time to increase the size of the program and make it permanent.

We thank the Senate SBE Committee for the opportunity to make these remarks.

Appendix A

National Academies of Science Studies

(5,251 pages)

1. National Academies of Sciences, Engineering, and Medicine. *STTR: An Assessment of the Small Business Technology Transfer Program.* Washington, DC: The National Academies Press, 2016. (339 pages)

   "STTR is meeting its congressional objective of fostering cooperation between small business concerns and research institutions, and does so in some respects to an extent that SBIR does not."

2. National Academies of Sciences, Engineering, and Medicine. *SBIR/STTR at the National Institutes of Health.* Washington, DC: The National Academies Press, 2015. (376 pages)

   "The NIH SBIR program is having a positive overall impact. It is meeting three of its four legislative objectives, namely, stimulating technological innovation, using small businesses to meet federal R&D needs, and increasing private sector commercialization of innovations derived from federal R&D."

3. National Academies of Sciences, Engineering, and Medicine. *SBIR at the National Science Foundation.* Washington, DC: The National Academies Press, 2015. (366 pages)

   "the Committee finds that with one exception the NSF SBIR program is meeting its overall legislative and mission-related goals."

4. National Research Council. *SBIR at the Department of Defense.* Washington, DC: The National Academies Press, 2014. (444 pages)

   "SBIR projects at DoD commercialize at a substantial rate."

5. National Research Council. *Venture Funding and the NIH SBIR Program.* Washington, DC: The National Academies Press, 2009. (140 pages)

   "In its recent assessment of SBIR, the Committee found that the concept of the program is sound and recommended that the basic program structure of SBIR be preserved. Accordingly, the Committee recommends that SBA and the agencies should maintain an open competition that is based on scientific quality and commercial potential."

6. National Research Council. *Revisiting the Department of Defense SBIR Fast Track Initiative.* Washington, DC: The National Academies Press, 2009. (212 pages)

   "The Fast Track Program should be continued, given its success in encouraging firms with little or no prior SBIR experience to innovate and commercialize their product."

7. National Research Council. *An Assessment of the Small Business Innovation Research Program at the National Aeronautics and Space Administration*. Washington, DC: The National Academies Press, 2009. (344 pages)

   "The NASA SBIR program stimulates collaboration, technological innovation, and generates new knowledge"

8. National Research Council. *An Assessment of the Small Business Innovation Research Program at the National Institutes of Health.* Washington, DC: The National Academies Press, 2009. (456 pages)

   "The NIH SBIR program is making significant progress in achieving the congressional goals for the program."

9. National Research Council. *An Assessment of the Small Business Innovation Research Program at the Department of Defense*. Washington, DC: The National Academies Press, 2009. (468 pages)

   "SBIR is in broad alignment with the needs of the DoD agencies and components."

10. National Research Council. *An Assessment of Small Business Innovation Research Program at the Department of Energy*. Washington, DC: The National Academies Press, 2008. (256 pages)

    "SBIR awards from the Department of Energy fund the development of technologies that, otherwise, might have developed more slowly, if at all."

11. National Research Council. *An Assessment of the SBIR Program.* Washington, DC: The National Academies Press, 2008. (402 pages)

    "The SBIR program is sound in concept and effective in practice."

12. National Research Council. *An Assessment of the SBIR Program at the National Science Foundation*. Washington, DC: The National Academies Press, 2007. (366 pages)

    "The National Science Foundation's (NSF) Small Business Innovation Research (SBIR) program is adding to the storehouse of public scientific and technological knowledge."

13. National Research Council. *SBIR and the Phase III Challenge of Commercialization: Report of a Symposium*. Washington, DC: The National Academies Press, 2007. (200 pages)

    "the Small Business Innovation Research (SBIR) program is the nation's premier innovation partnership program."

14. National Research Council. *SBIR Program Diversity and Assessment Challenges: Report of a Symposium*. Washington, DC: The National Academies Press, 2004. (200 pages)

    "SBIR facilitates the development and utilization of human capital and technological knowledge."

15. National Research Council. *An Assessment of the Small Business Innovation Research Program: Project Methodology.* Washington, DC: The National Academies Press, 2004. (124 pages)

16. National Research Council. *The Small Business Innovation Research Program: An Assessment of the Department of Defense Fast Track Initiative*. Washington, DC: The National Academies Press, 2000. (372 pages)

    "The SBIR Program is contributing to the achievement of Department of Defense mission goals. Valuable innovative projects are being funded by the SBIR."

17. National Research Council. *The Small Business Innovation Research Program: Challenges and Opportunities*. Washington, DC: The National Academies Press, 1999. (186 pages)

    "SBIR [has a] history of supporting not only the growth of jobs and the overall economy, but also the missions of participating agencies."

GAO Reports

(1,097) pages

1. US Government Accountability Office. *SMALL BUSINESS RESEARCH PROGRAMS: Challenges Remain in Meeting Spending and Reporting Requirements*. Washington, DC: US GAO, 2015 (49 pages)

2. US Government Accountability Office. *SMALL BUSINESS INNOVATION RESEARCH: Change in Program Eligibility Has Had Little Impact.* Washington, DC: US GAO, 2014 (25 pages)

3. US Government Accountability Office. *SMALL BUSINESS RESEARCH PROGRAMS: More Guidance and Oversight Needed to Comply with Spending and Reporting Requirements*. Washington, DC: US GAO, 2014 (54 pages)

4. US Government Accountability Office. *SMALL BUSINESS INNOVATION RESEARCH: DOD's Program Has Developed Some Technologies that Support Military Users, but Lacks Comprehensive Data on Transition Outcomes*. Washington, DC: US GAO, 2014 (27 pages)

5. US Government Accountability Office. *SMALL BUSINESS INNOVATION RESEARCH: DOD's Program Supports Weapon Systems, but Lacks Comprehensive Data on Technology Transition Outcomes.* Washington, DC: US GAO, 2013 (5 pages)

6. US Government Accountability Office. *SMALL BUSINESS RESEARCH PROGRAMS: Agencies Are Implementing New Fraud, Waste, and Abuse Requirements*. Washington, DC: US GAO, 2012 (21 pages)

7. US Government Accountability Office. *SMALL BUSINESS INNOVATION RESEARCH: SBA Should Work with Agencies to Improve the Data Available for Program Evaluatio*n. Washington, DC: US GAO, 2011 (44 pages)

8. US Government Accountability Office. *SPACE ACQUISITIONS: Challenges in Commercializing Technologies Developed under the Small Business Innovation Research Program*. Washington, DC: US GAO, 2010 (41 pages)

9. US Government Accountability Office. *SMALL BUSINESS INNOVATION RESEARCH: Observations on Agencies' Data Collection and Eligibility Determination Efforts.* Washington, DC: US GAO, 2009 (15 pages)

10. US Government Accountability Office. *SMALL BUSINESS INNOVATION RESEARCH: Agencies Need to Strengthen Efforts to Improve the Completeness, Consistency, and Accuracy of Awards Data.* Washington, DC: US GAO, 2006 (36 pages)
11. US Government Accountability Office. *SMALL BUSINESS INNOVATION RESEARCH: Information on Awards Made by NIH and DoD in Fiscal Years 2001 through 2004*. Washington, DC: US GAO, 2006 (78 pages)

12. US Government Accountability Office. *FEDERAL RESEARCH: Observations on the Small Business Innovation Research Program.* Washington, DC: US GAO, 2005 (11 pages)

13. US Government Accountability Office. *DEFENSE ACQUISITIONS: Despite Restructuring, SBIR High Program Remains at Risk of Cost and Schedule Overruns*. Washington, DC: US GAO, 2003 (37 pages)

14. US Government Accountability Office. *FEDERAL RESEARCH AND DEVELOPMENT: Contributions to and Results of the Small Business Technology Transfer Program*. Washington, DC: US GAO, 2001 (20 pages)

15. US Government Accountability Office. *FEDERAL RESEARCH: Evaluation of Small Business Innovation Research Can Be Strengthened.* Washington, DC: US GAO, 1999 (94 pages)

16. US Government Accountability Office. *FEDERAL RESEARCH: Observations on the Small Business Innovation Research Program.* Washington, DC: US GAO, 1998 (28 pages)

17. US Government Accountability Office. *FEDERAL RESEARCH*: *The Small Business Technology Transfer Program*. Washington, DC: US GAO, 1997 (11 pages)

18. US Government Accountability Office. *FEDERAL RESEARCH: Observations on the Small Business Technology Transfer Program*. Washington, DC: US GAO, 1997 (9 pages)

19. US Government Accountability Office. *FEDERAL RESEARCH: DOD's Small Business Innovation Research Program.* Washington, DC: US GAO, 1997 (16 pages)

20. US Government Accountability Office. *FEDERAL RESEARCH: Preliminary Information on the Small Business Technology Transfer Program.* Washington, DC: US GAO, 1996 (38 pages)

21. US Government Accountability Office. *FEDERAL RESEARCH: Interim Report on the Small Business Innovation Research Program.* Washington, DC: US GAO, 1995 (40 pages)

22. US Government Accountability Office. *FEDERAL RESEARCH: Small Business Innovation Research Program Shows Success but Can Be Strengthened*. Washington, DC: US GAO, 1992 (98 pages)

23. US Government Accountability Office. *FEDERAL RESEARCH: Assessment of Small Business Innovation Research Programs*. Washington, DC: US GAO, 1989 (190 pages)

24. US Government Accountability Office. *FEDERAL RESEARCH: Effectiveness of Small Business Innovation Research Program Procedures*. Washington, DC: US GAO, 1987 (50 pages)

25. US Government Accountability Office. *FEDERAL RESEARCH: Small Business Innovation Research Participants Give Program High Marks*. Washington, DC: US GAO, 1987 (60 pages)

Appendix B

KEY NAS RECOMMENDATIONS for DOD on Phase III

The committee's key recommendations by thematic area are highlighted and cross-referenced below.

Encouraging Commercialization

- Encourage Prime Contractors: DoD should consider experimenting with different kinds of incentives to encourage primes to work more effectively—and more often—with SBIR firms to commercialize new technologies. (Recommendations I-A, I-B)
- Brief PEOs: DoD should use new administrative funding in part to develop better briefing materials for PEOs and PCOs. DoD should consider developing a briefing program for all PEOs and PCOs, and should in particular focus for new PEOs and PCOs. (Recommendation I-A)
- Financial Incentives: DoD should encourage its components to experiment with financial incentives for the adoption of SBIR technologies. Even where financial incentives are not available, DoD should consider encouraging components to add explicit targets to prime contracts, in the same way that targets for the participation of small businesses more generally have been added to some contracts. (Recommendation I-C)

Improving Tracking, Data Collection, and Adoption of Best Practices

- Alignment: DoD should address the need for better alignment of data collection, agreed metrics, and utilization of effective evaluation and assessment tools to guide program management. (Recommendation IIIA)
- Annual Report: DoD should provide a single, more comprehensive annual report that could —after appropriate consultations—be used to satisfy the reporting requirements of numerous Congressional sponsors. (Recommendation III-A)
- Data Accuracy: DoD should improve the accuracy of data recorded in the Federal Procurement Data System (FPDS). (Recommendation III-B)

Streamlining Program Management and Agency Mission Objectives

- Streamline Guidance: DoD should revise guidance at the Small Business Administration (SBA), DoD, or component levels that impose unnecessary rigidity on program operations. (Recommendation IV-A)
- Maintain TPOC Continuity: DoD should identify ways to ensure that the knowledge of and enthusiasm of sponsoring Technical Points of Contact (TPOC) is not lost to the project. DoD should consider ways to support ongoing engagement by TPOCs in projects after they have formally handed them on at the end of a rotation. (Recommendation IV-B)
- Protect Data Rights: DoD should work with SBA to explore mechanisms that more effectively protect SBIR data rights. (Recommendation IV-C)
- Disseminating Best Practices: DoD should develop a process for tracking experimentation within the SBIR program. Furthermore, DoD needs to focus attention on the development

of a comprehensive toolset of mechanisms for transferring both formal and informal knowledge about best practices. (Recommendation IV-D)

Improving Contracts and Audits

- Improve Audits: DoD should explore the development of less onerous and more effective auditing procedures for small businesses that can be completed in a timelier manner. (Recommendation V-A)
- Improve Contracting Practices: DoD should provide opportunities for small business concerns (SBC) to raise concerns about contracting practices at the component level. (Recommendation V-B)

APPENDIX C

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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 other 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.

<u>4. SBA is still the proper organization to manage SBIR, not the Department of Commerce</u>.
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.

<u>6. The commercial results of SBIR need to be strengthened</u>. 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 D

SBTC White Paper

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Small Business Technology Council of the National Small Business Association
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20005

Recommendations for Implementing DOD SBIR Provisions from the National Defense Authorization Act of 2012

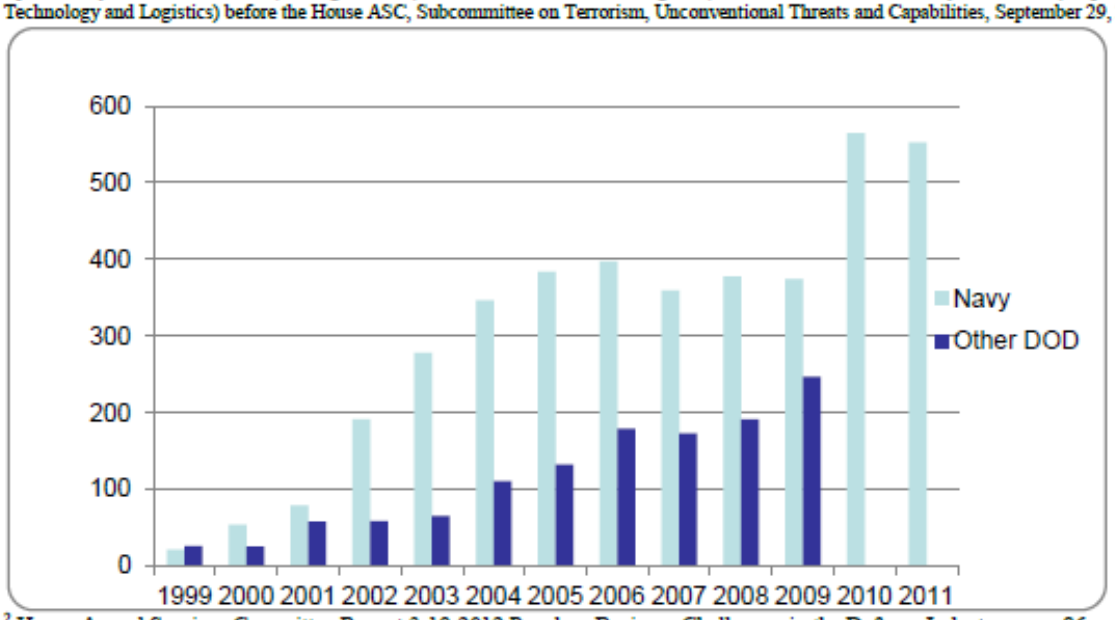
The National Defense Authorization Act of 2012 contains the SBIR/STTR reauthorization provisions [Appendix I] and includes major new language that indicates strong Congressional intent to improve the process of rapidly transitioning SBIR/STTR (hereafter SBIR) innovative technologies for insertion into DOD fielded systems and platforms. The law specifically states:

> "Sec. 5108: To the **greatest extent practicable**, Federal agencies and Federal prime contractors ***shall*** issue Phase III awards relating to technology, including sole source awards, to the SBIR and STTR award recipients that developed the technology." [Emphasis added.] [Phase III is further defined as, see Sec. 5125 – "for work that derives from, extends, or completes efforts made under prior funding agreements under the SBIR program."]

This provision is the strongest statement to date that Congress is serious that agencies and prime contractors issue Phase III awards to SBIR producers of technology - a mandate, - no longer merely an issue of discretion. Congress had good reason for its action since the DOD SBIR Program has over $21 billion in cumulative commercialization (i.e., investment in technology maturation) reported by over 7,500 projects since the inception of the Program. In recent years, OSD Office of Small Business Programs has offered various commercialization estimates ranging from 50% to 70%, but the more important insertion metric – which is unknown – may be much lower. This suggests that there is serious undercapitalization of the government's investment in the technology successes of Phase II and that the government needs to take greater advantage of its SBIR investments. As a rough comparative indicator the direct SBIR investment over the 2000-2009 periods was $9.6 billion."[1] Regardless of transparency, one participant in Congressional hearings noted that "SBIR transition is horrible" [2]

In fact, government-issued Phase III contract investments have increased annually since 1999 (2007-2009 excepted), with the Navy alone breaching the $500M ceiling for the past two years, and the DOD-wide figure climbing close to $1B in 2011 absent specific "other DOD" totals. Industry figures are unknown but

[1] [Testimony of Ms. Linda Oliver, Acting Director, Office of Small Business Programs, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics) before the House ASC, Subcommittee on Terrorism, Unconventional Threats and Capabilities, September 29, 2010.]



[2] House Armed Services Committee Report 3-19-2012 Panel on Business Challenges in the Defense Industry, page 86.

may approximate just 10% of government Phase III investments.

Congress ultimately recognized there is more potential and benefit to the government if more SBIR innovations make it into fielded systems or programs of record. Congress recognized that more needed to be done to transition SBIR technology into Federal projects and both the Armed Services Committees and the Small Business Committees dramatically strengthened the SBIR Reauthorization Act to require improved transition of SBIR innovations.

Congress adopted an interesting approach to stimulating Phase III awards by authorizing important incentives, goaling and reporting requirements for DOD departments, DOD Program Managers and PEO's, and for DOD Prime Contractors. The new law builds on and expands Section 252 of the FY 2007 National Defense Authorization Act. PL 109-163. This has been a major goal of the Small Business Technology Council, SBTC,[3] for years.[4]

These statutory provisions are provided in bold print and discussed here, followed by the recommendations of the Small Business Technology Council of the National Small Business Association (SBTC) to implement them. Concerning SBIR technology insertion goals, the law states:[5]

Sec. 5122: Commercialization Readiness Program at Department of Defense:

(5) INSERTION INCENTIVES.—For any contract with a value of not less than $100,000,000 the Secretary of Defense is authorized to—

(A) establish goals for the transition of Phase III technologies in subcontracting plans; and

The Secretary currently provides goals for subcontracting with small business, HubZones and minority owned business. DOD and the Navy have recently strengthened and increased their small business goals. (See recent DOD efforts subsequent) This new provision authorizes the Secretary to establish subcontracting goals for transitioning SBIR innovations for contracts of over $100 million. (Hereafter "major" primes or "major" contractors) This provision requires the DOD to establish specific subcontracting goals for SBIR transitions for each major contract. These provisions require that in all new contracts or significant modifications of existing contracts that the DOD provide a provision in all major solicitations require subcontracting plans that state clearly how the contractor would include SBIR technology in the project, what specific technology the company planned on using in the project and the dollar amount to be spent on SBIR innovations. The use of SBIR technology should be significant evaluation criteria for the proposals. The provision also provides for setting goals for program managers at DOD.

Recommendation: SBTC believes that the specific SBIR subcontracting goal should be 5% of major contract amounts.

(B) require a prime contractor on such a contract to report the number and dollar amount of contracts entered into by that prime contractor for Phase III SBIR or STTR projects.

Agencies are required in all future contracts or modification of existing contracts that each major prime contractor to report the number of contracts and dollar amounts that result from SBIR.

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[3] The Small Business Technology Council is the largest small business technology organization representing a diverse range of industries and is the technology council of the National Small Business Association, America's oldest small business organization.
[4] Prior recommendations for improving the SBIR and Phase III programs at DoD by the SBTC can be found here: http://www.nsba.biz/docs/sbir_dod_phase_iii_recommendations.pdf; http://www.nsba.biz/docs/dod_sbir_recommendations.pdf
[5] The provisions of the law are bolded. SBTC's comments are in italics.

Recommendation: DOD should develop a matrix for evaluating prime contractors transitioning SBIR technology. DOD should also require qualified major prime contractors to develop amended subcontracting plans to indicate how they will meet the goals for transitioning SBIR innovations.

(6) GOAL FOR SBIR AND STTR TECHNOLOGY INSERTION.—The Secretary of Defense shall—

(A) set a goal to increase the number of Phase II SBIR contracts and the number of Phase II STTR contracts awarded by the Secretary that lead to technology transition into programs of record or fielded systems;

This provision requires that the Secretary set goals for DOD and its Program Managers and senior acquisition personnel for transitioning SBIR technology.

Recommendation: DOD should set a goal of 5% of all non-SBIR RDT&E funding be spent on SBIR innovations for Phase III follow-ons. This would include funding by primes as well as direct funding by DOD, and its University Affiliated Research Center and FFRDCs. If a component of the DOD does not meet its goal then the funds should be transferred to components that exceed their goal.

II. Concerning technology transition reporting, the law states:

(C) [The Secretary of Defense shall—] submit to the Administrator for inclusion in the annual report under subsection (b)(7)—
(i) the number and percentage of Phase II SBIR and STTR contracts awarded by the Secretary that led to technology transition into programs of record or fielded systems;
(ii) information on the status of each project that received funding through the Commercialization Readiness Program and efforts to transition those projects into programs of record or fielded systems; and
(iii) a description of each incentive that has been used by the Secretary under subparagraph (B) and the effectiveness of that incentive with respect to meeting the goal under subparagraph (A)

These provisions are designed to make sure that the DOD is evaluating, monitoring and improving the CPR and various incentives that DOD is using to improve utilization of SBIR technology. These provisions require that primes, SBIR companies and agency personnel report each SBIR project that has technology transitioned.

This provision also requires DOD to report each specific incentive used and its effectiveness by DOD and its component organizations to meet the goal for transitioning SBIR technology into programs of record.

Recommendation: The Secretary and the agencies should develop a matrix to evaluate each Commercialization Readiness Project (CRP), and report each SBIR technology that is transitioned.

III. Regarding incentives the law also requires the Secretary of Defense to:

(B) use incentives in effect on the date of enactment of the SBIR/STTR Reauthorization Act of 2011, or create new incentives, to encourage agency program managers and prime contractors to meet the goal

We recognize the importance of these statutory incentives. Only if proper incentives are provided to encourage senior acquisition personnel and prime contractors, will the Congressional mandated goal of transitioning SBIR innovations be met. The law requires that DOD create or designate incentives and

report on how successful the particular incentive is working to achieve the goal of SBIR technology insertion. As far back as 2005, the DOD Manager's Guide to Technology Transition presented a comprehensive list and description of incentives to entities and individuals including cash and non-cash incentives and cost-based incentives.

Recommendation: We believe that the goal of delivering to the war fighter new technology faster and more efficiently is critical. These incentives for transitioning SBIR innovations should be bold and significant.

These provisions require that for all new major solicitations, that there be a provision requiring that all proposals include a requirement that the company submitting the proposal submit a subcontracting plan that states clearly how the contractor would include SBIR technology in the project and what specific technology the company planned on using in the project.

Recommendation: DOD should set goals for each new prime contract. We believe the goal should be 5% of the contract value. The use of SBIR innovations should be significant evaluation criteria for all proposals and contracts.

In order for the law to be successful it requires that the Program Managers and PEOs implement the new provisions. The law specifically provides for incentives to encourage the program managers to meet the goals.

Recommendation: These incentives should be at least $5,000 for each Program Manager or PEO that meets the Secretary's goal for SBIR technology insertion (these funds could come from the 3% administrative fees provided in the law.) In addition, incentives should include step-grade or band promotions available to persons of SBIR insertion achievement other than PMs or acquisition executives. The use of SBIR innovations by the program managers and senior acquisition personnel should also be evaluated on their use of SBIR innovations in their programs.

The Assistant Secretary for the Navy (Research, Development and Acquisition) issued a memorandum dated July 19, 2011 that provided that: "Accountability: Senior leadership at the Flag, General Officer and SES level that influence acquisitions will have performance standards established to demonstrate support for Department of the Navy small business mission"

Recommendations: 1) This memorandum should be amended to include specifically SBIR technology transition. 2) Other components of the DOD should issue similar directives to its Senior Acquisition personnel. 3) There should also be a provision for the PM to report on cost savings that result from the use of SBIR technology. 4) Incentives should be provided for PM who use SBIR technology that results in cost saving. 5) DOD should set goals for each PM and PM should be evaluated on the amount and number of SBIR innovations that are inserted in the PM projects.

IV. The law also requires commercialization reporting at **SEC. 5138**:

(kk) PHASE III REPORTING.—The annual SBIR or STTR report to Congress by the Administration under subsection (b)(7) shall include, for each Phase III award—

(1) the name of the agency or component of the agency or the non-Federal source of capital making the Phase III award;

(2) the name of the small business concern or individual receiving the Phase III award; and
(3) the dollar amount of the Phase III award.

These provisions require DOD to monitor which CRP project, the number of Phase III awards and which incentives are effective in transitioning SBIR technology. This requires that each agency, SBIR company and prime contractor report on all Phase III activities.

Recommendation: SBTC believes that DOD and each contractor should report when each new phase III subcontract is issued.

These statutory provisions are the strongest Congressional language requiring the DOD and its major Prime Contractors to take significant and meaningful steps to transition SBIR technology into fielded systems and programs of records. This new law builds on prior efforts of Congress and DOD to transition technology into fielded systems.

HISTORY

The strong language that emerged in the 2012 SBIR Reauthorization Act evolved, it can be argued, from various prior efforts by Congress and Federal agencies to work with and develop a viable SBIR program. While there have been some false starts, there has always been a forward thrust. A review of that history of congressional and agency initiatives is valuable background for understanding the significance of this most recent congressional enactment.

Past Congressional efforts on DOD technology transition

Since 1996, there has been a continuous pattern of hearings, proposals and programs before Congress concerning transitioning technology at DOD, especially SBIR technology. DOD has launched a number of Congressionally-sanctioned technology transition programs not focusing on SBIR such as Defense Acquisition Challenge, Technology Transition Initiative, Quick Reaction Fund and Rapid Technology Transition. DOD has almost 50 external funding programs with 20 of those programs designed to rapidly transition technology. Unfortunately, none of these programs have been as successful as Congress or DOD would have been hoped. None of these 20 programs have focused on SBIR technology.

Congress has also enacted a number of SBIR specific programs: Over the past decade Congress recognized the value of rapid transition of SBIR innovations to the war fighters and provided specific SBIR-related programs supporting such efforts. These include:

- ☐ The Commercialization Pilot Program (Section 252 of the National Defense Authorization Act of 2006, PL 109-163), which was a successful SBIR-related pilot program and resulted in the language in the new law requiring commercialization programs at other agencies [Sec. 5123].
- ☐ PL 111-84, the FY2010 National Defense Authorization Act, extended the DOD SBIR Program in the absence of Congressional reauthorization of SBIR for all agencies.
- ☐ Public Law 111-383, The "Ike Skelton National Defense Authorization Act for Fiscal Year 2011" provided the Defense Research and Development Rapid Innovation Program [Sec. 1073] "to accelerate the fielding of technologies developed pursuant to Phase II SBIR projects … to rapidly insert such products directly in support of primarily major defense acquisition programs."
- ☐ [House Report 112-331 House Defense Appropriations Subcommittee creates 200 million to transition technology to be spent on SBIR and other technology transition. http://thomas.loc.gov/cgi-bin/cpquery/?&dbname=cp112&sid=cp1126p9Uf&refer=&r_n=hr331.112&item=&&&sel=TOC_46776&]
- ☐ In addition to these laws, the House Armed Services Committee has created a special panel on Challenges to Doing Business with the Department of Defense. This panel has held a number of

hearings around the country. This Panel issued its report on March 19, 2012. Much of this report deals with SBIR. The Panels hearings began with testimony on the importance of the SBIR Program to DOD. In a hearing before this Panel on September 29, 2010 DOD reported its SBIR commercialization rate:

> "the DOD SBIR Program has over $21 billion in cumulative commercialization reported by over 7,500 projects since the inception of the Program. As a rough comparative indicator the direct SBIR investment over the 2000-2009 period was $9.6 billion."[6]

Congress recognized that not enough had been done to transition SBIR technology. The Armed Services Committees and the Small Business Committees dramatically strengthened the SBIR Reauthorization ACT to require better transitioning of SBIR technology.

THE PROVSIONS IN THE 2012 DEFENSE AUTHORIZATION ACT ON SBIR ARE THE STRONGEST PROVISIONS PASSED BY CONGRESS ON TECHNOLOGY TRANSITON AND SHOULD BE IMPLEMENTED BY DOD QUICKLY AND EFFECTIVELY.

Congress has taken many steps in the past to strengthen Federal agency utilization of innovations emerging from the SBIR program. The government's investment in R&D needs to be transformed into products of value that advance agency objectives. With the enactment of the 2012 Defense Authorization Act on SBIR Congress has made its intentions very clear that agencies need to issue more Phase III SBIR awards. It has proposed several innovative steps it wants agencies to adopt, steps which agencies cannot ignore.

Past DOD Efforts

Top DOD leadership and many agency leaders have understood the value of the SBIR programs in providing advanced technology to the war fighters faster than many traditional acquisition strategies. Yet, more can be done to improve the process.

Examples of past DOD top leadership initiatives towards improved SBIR transition and insertion include:

- ☐ Jacques Gansler, USD (A&T) wrote in his 24 February 1998 memo, *SBIR Program*, "I am requesting that you … Establish quantifiable, performance-based metrics of SBIR program outcomes in phase III …"
- ☐ Dr. James Finley, DUSD-Acq. & Tech., in late 2006 declared his intention to lead improvement of DOD technology transition overall. "My duties," he said, "are to support the Secretary … with matters relating to acquisition and the integration of technology. I have three major goals: One to reduce cycle time; two, to increase competitiveness; and three to broaden communications." [4] [Dr. Finley received the Tibbett's award in 2007 for his leadership.]
- ☐ DOD component SBIR programs – led by the Navy – have pushed down the technology transition path, securing over $21 billion in cumulative commercialization reported by over 7,500 projects since the inception of the Program. As a rough comparative indicator the direct SBIR investment over the 2000-2009 periods was $9.6 billion."[7]. In 2008 the Navy issued a report on their successes, entitled, *A Report on the Navy SBIR Program: Best Practices, Roadblocks and Recommendations for Technology Transition*,[5] in which they reported:
  "As a whole, the Navy SBIR program has the highest transition success across the DOD and has that honor because of the dedication of the people that are involved. Nevertheless, we must continually study our processes and techniques in our desire to increase Phase III transitions and value to the

[6] [Testimony of Ms. Linda Oliver, Acting Director, Office of Small Business Programs, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics) before the House ASC, Subcommittee on Terrorism, Unconventional Threats and Capabilities, September 29, 2010.]

Fleet." [Page IV.]

- DOD has issued guidelines to agency program managers to improve the process of incorporation of SBIR innovations into fielded programs such as:
  - *Small Business Innovation Research, Small Business Technology Transfer, Program Manager Checklist*, v02-04/29/11
  - *DOD Program Manager Tools, Using SBIR for Risk mitigation*; which states:
    "SBIR can be employed during the Technology Development Phase for technology risk reduction, competitive prototyping and the identification of the appropriate set of technologies to be integrated into a full system. One way to derive maximum value from SBIR is to include specific award fee clauses in contract language to target and reward incorporation of SBIR technologies by prime contractors. This following is an example of appropriate language to encourage use of SBIR technology:

    "Two percent of the total award fee pool shall be dedicated to an evaluation of success in applying technology from SBIR projects."DOD component SBIR programs – led by the Navy – have pushed down the technology transition path, securing $2.8B in Phase III contracts since 2005[2]."

Recent DOD Efforts

Within the past year DOD has issued a number of Memorandums and efforts supporting increased use of small business.

1. July 19, 2011 Assistant Secretary of Navy, Sean J. Stackley
   Subject: Increased Use of Small Business Concerns includes specific SBIR provisions
   [https://acquisition.navy.mil/rda/content/view/full/8550]
2. August 5, 2011 Under Secretary of the Navy, Robert O. Work Subject: Maximizing Department of the Navy (DON) Opportunities for Small Business
   [https://acquisition.navy.mil/rda/content/view/full/8545]
3. February 10, 2012 Deputy Secretary of Defense, Ashton B. Carter, Memorandum Subject: Advancing Small Business Contracting Goals in FY 2012
   [http://contractingacademy.gatech.edu/wp-content/uploads/2012/02/Advancing-Small-Business-Contracting-Goals-in-FY12-Ashton-Carter-02.10.2012.pdf]
4. March 13, 2012 USD (AT&L) Under Secretary of Defense for Acquisition, Technology and Logistics, Frank Kendall, Subject: 10 point increase in prime contract and dollars going to small business
5. April 10, 2012 Assistant Secretary of Navy (Acquisition, Technology & Logistics, Principal Civilian Deputy, and James E. Thomsen Subject: Improving Small Business and Competition Opportunities in Services Acquisitions includes specific SBIR provisions.
   [http://www.nsba.biz/docs/small_business_memo_4-10-12.pdf]
6. The Air Force recently held a conference with its major primes that focused on SBIR transition best practices.

The thrust of these efforts is to put Small Business First. The thrust of the new SBIR provisions in the law is to make small business and SBIR technology a critical component of DOD decision making. These new Small Business memorandums provide guidance and direction impacting all small business procurement. These memos will certainly help many small businesses. The SBIR provisions in the 2012 National Defense Authorization Act require new initiatives on transitioning SBIR technology that should build on these recent efforts.

SBTC Recommendations

With the approval of the Congressional Senate and House Armed Services Committees, Small Business and Entrepreneurship Committees and House Science Committee the 2012 National Defense Authorization Act provides important incentives, goaling and reporting requirements for DOD departments, DOD Program Managers and PEO's, and for DOD Prime Contractors. SBTC believes that DOD should take this opportunity to dramatically improve technology transition and technology insertion. Specifically SBTC recommends:

1. SBTC believes that the Secretary should set a goal of 5% of all non-SBIR RDT&E funding for SBIR innovations for Phase III follow-ons. These goals should flow down to the PEO and PM levels. This would include funding by primes as well as direct funding by DOD, and its University Affiliated Research Center and FFRDCs. If a component of the DOD does not meet its goal then the funds should be transferred to components that exceed their goal.

2. SBTC believes that DOD should establish significant incentives to encourage Program Managers and PEO to meet the SBIR transitioning goals and to reward senior acquisition personnel for transiting SBIR innovations into programs of record. These incentives should be at least $5,000 for each Program Manager or PEO that meets the Secretary's goal for SBIR/STTR technology insertion.

3. Cash and non-cash incentives (including promotions and other professional recognitions of merit) for utilizing SBIR innovations should be created for DOD senior leadership personnel at Flag, General Officer and SES level that influence acquisitions (See Navy July 19, 2011 memorandum), and separately for lower-level acquisition personnel.

4. DOD senior leadership personnel at Flag, General Officer and SES level that influence acquisitions should include meeting SBIR transition goals in their performance evaluations. (See Navy July 19, 2011 memorandum that provides "**Accountability: Senior leadership at the Flag, General Officer and SES level that influence acquisitions will have performance standards established to demonstrate support for Department of the Navy small business mission**"). **The Navy memorandum should be amended to include SBIR transition goals and other components should issue similar memorandums.**

5. The law requires the DOD establish specific subcontracting goals for SBIR transitions for each major contract. SBTC believes that the Secretary should set the goal of at least 5% of all contracts in excess of 100 million dollars should be used to transition SBIR innovations.

6. There should be a specific requirement in all major solicitations that companies submitting a proposal include a specific subcontracting plan that state clearly how the contractor would include SBIR technology in the project, what specific technology the company planned on using in the project and the dollar amount to be spent on SBIR innovations.

7. Solicitations should include contract award criteria that incorporates the use of SBIR innovations in major DOD prime contracts. "Subcontracting: Acquisition strategies for all ACAT I and ACAT II programs must address Small Business and SBIR/STTR engagement through the next milestone decision or during program sustainment, as applicable. The Technology Insertion Plan should identify specific SBIR technologies to be transitioned to meet program capability gaps and a schedule to deploy these capabilities"

8. A small business subcontracting plan, specifying SBIR inclusion not less than 20% of the overall subcontracting level of effort, should be a mandatory evaluation element for DOD program proposals. (see related recommendation #12, below)

9. All major contracts should contain provisions requiring the contractor to adhere to and implement their SBIR subcontracting plans and require that the contractor meets its SBIR subcontracting goal.

10. Program managers and contracting officers should include a Small Business Innovation Incentive Fee for major contractors who meet subcontracting levels where incentive fees are used. The *Manager's Guide to Technology Transition already provides for* profit incentives are another form of cost-based incentive. The DFARS now include a provision to increase the negotiated fee according to the contractor's use of innovative technology. This incentive is based on a Congressional desire to encourage innovation and is completely consistent with DOD's objectives."[8] The Navy also provides incentive fees for SBIR innovations. *"Program manager and contracting officers should include a Small Business SBIR transitioning Incentive Fee for meeting specific small business and SBIR subcontracting levels in contracts where incentives are used."*[9] Share-in savings (SIS) provisions are cost-based incentives, now referred to by DOD as 'efficiency savings.' An SIS contract encourages contractors to use their ingenuity and innovation *to get the work done quickly and efficiently to share in the* savings attributed to their planning and execution. Savings can be shared.

11. Where SBIR subcontracting goals are set by the DOD program office in the RFP as an explicit percentage of the total contracted effort, penalties such as fee reduction (or incentives such as award fee increases) should be employed to encourage prime contractor fulfillment of those goals.
SBIR transition Incentives have worked *"Two percent of the total award fee pool shall be dedicated to an evaluation of success in applying technology from SBIR projects."DOD component SBIR programs – led by the Navy – have pushed down the technology transition path, securing $2.8B in Phase III contracts since 2005.*[10]

12. Another incentive involves IR&D. Some adjustment to the companies IR&D could make for meeting the SBIR innovation goals. For every prime RDT&E contract in excess of $100M, the prime contractor shall subcontract not less than five per cent (5%) of the contract value to small businesses that have completed relevant Phase II SBIR or STTR programs and can meet or exceed the technical requirements of the prime contract. The determination of the ability of a technology to meet these requirements shall be made jointly by the Agency SBIR innovations transition manager and prime contract project manager. For example for every one per cent (1%) of the prime contract subcontracted to small businesses to meet or exceed this goal, the prime contractor shall be entitled to a credit of ten per cent (10%) of its audited Independent Research and Development (IR&D) expenses by the Department of Defense. For example, meeting the goal of 5% subcontracted to SBIR companies will entitle the prime contractor to recover 50% of its IR&D expenses up to the amount allowable.

13. Reporting is critical to the success of the SBIR transitioning efforts. SBTC believes that SBIR companies should report each Phase III follow on contract within 90 days and that prime contractors should also report all Phase III contracts within 90 days. Further, since the SBIR reauthorization statute stipulates that industry shall report its contributions to SBIR commercialization but does not specify a mechanism or process, OSD Office of Small Business

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[8] *Manager's Guide to Technology Transition in an Evolutionary Acquisition Environment* – Version 1.0; Office of the Under Secretary of Defense (Acquisition, Technology and Logistics); January 31, 2003; pp. 2-27 – 2-28.
[9] Navy July 19, 2011 Memorandum Assistant Secretary, Sean Stackley, Subject: Increased Use of Small Business Concerns
[10] A STRATEGY FOR EXPANDING SBIR/STTR OPPORTUNITY in ACAT PROGRAMS: CONTRACTING INCENTIVES and PROGRAM REQUIREMENTS; 5 March 2011; Navy SBIR Program Office

Programs should work with SBA to develop a mechanism or process for inclusion in the SBIR and STTR Policy Directives.

Incentivization Case Study: NAVSEA PEO Submarine

A practical and successful approach to cash incentives used for enhancement of SBIR Phase III activity in DOD programs has been in place since 1988 in Program Executive Office – Submarine, a Naval Sea Systems Command (NAVSEA) office. Under the leadership of Richard McNamara, Executive Director of PEO SUB, over $1B in Phase III work in key submarine programs has been generated since 1988, from an SBIR investment of ~$150M. PEO SUB's Phase III total is 82% of total NAVSEA Phase III awards between 1988–2004. McNamara, in his June, 2005 address at The National Academies of Science symposium on SBIR Phase III issues, credited PEO SUB's open competition and incentives policies for helping achieve this notable success.[11]

PEO Submarine is an example of where the proper use of incentives resulted in the transitioning of SBIR technology with significant cost and delivery time savings to the government. McNamara estimated that the use of SBIR innovations reduces the cost to the Navy by 25% and the delivery time was also reduced by 25%.

[11] For an independent look at PEO SUB's unique technology transition strategy, see: Johnson, William; "Delivering Combat Power to the Fleet, Now! A Case Study in Rapid Acquisition"; *Naval Engineers Journal;* Fall, 2004

These next two pages are Appendix 1 to Appendix D.

Small Business Technology Council of the National Small Business Association
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APPENDIX I

Summary of Information Pertinent To Defense Prime Contractors And To SBIR/STTR Awardees By SBTC From The

NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 2012, Public Law No: 112-81

SECTION 1. SHORT TITLE.
This Act may be cited as the "National Defense Authorization Act for Fiscal Year 2012".

SEC. 2. ORGANIZATION OF ACT INTO DIVISIONS; TABLE OFCONTENTS.

(a) DIVISIONS.—This Act is organized into five divisions as follows:
(1) Division A—Department of Defense Authorizations.
(2) Division B—Military Construction Authorizations.
(3) Division C—Department of Energy National Security Authorizations and Other Authorizations.
(4) Division D—Funding Tables.
(5) Division E—SBIR and STTR Reauthorization

Selected Sections of:

DIVISION E—SBIR AND STTR REAUTHORIZATION ACT OF 2011

SEC. 5108. SBIR AND STTR SPECIAL ACQUISITION PREFERENCE.
Section 9(r) of the Small Business Act (15 U.S.C. 6 638(r)) is amended by adding at the end the following:

(4) PHASE III AWARDS.—To the greatest extent practicable, Federal agencies and Federal prime contractors shall issue Phase III awards relating to technology, including sole source awards, to the SBIR and STTR award recipients that developed the technology.

SEC. 5122. COMMERCIALIZATION READINESS PROGRAM AT DEPARTMENT OF DEFENSE. [For both SBIR and STTR Programs:]

(5) INSERTION INCENTIVES.—For any contract with a value of not less than $100,000,000, the Secretary of Defense is authorized to—

(A) establish goals for the transition of Phase III technologies in subcontracting plans; and

(B) require a prime contractor on such a contract to report the number and dollar amount of contracts entered into by that prime contractor for Phase III SBIR or STTR projects.

(6) GOAL FOR SBIR AND STTR TECHNOLOGY INSERTION.—The Secretary of Defense shall—

(A) set a goal to increase the number of Phase II SBIR contracts and the number of Phase II STTR contracts awarded by the Secretary that lead to technology transition into programs of record or fielded systems;

(B) use incentives in effect on the date of enactment of the SBIR/STTR Reauthorization Act of 2011, or create new incentives, to encourage agency program managers and prime contractors to meet the goal under subparagraph (A); and

(C) submit to the Administrator for inclusion in the annual report under subsection (b)(7)—

(i) the number and percentage of Phase II SBIR and STTR contracts awarded by the Secretary that led to technology transition into programs of record or fielded systems;

(ii) information on the status of each project that received funding through the Commercialization Readiness Program and efforts to transition those projects into programs of record or fielded systems; and

(iii) a description of each incentive that has been used by the Secretary under subparagraph (B) and the effectiveness of that incentive with respect to meeting the goal under subparagraph (A).

SEC. 5124. INTERAGENCY POLICY COMMITTEE.

(a) ESTABLISHMENT.—The Director of the Office of Science and Technology Policy shall establish an Inter-agency SBIR/STTR Policy Committee.

(b) MEMBERSHIP.—The Interagency SBIR/STTR Policy Committee shall include representatives from Federal agencies with an SBIR or an STTR program and the Small Business Administration.

SEC. 5138. TECHNOLOGY INSERTION REPORTING REQUIREMENTS.

Section 9 of the Small Business Act (15 U.S.C. 638), as amended by this title, is further amended by adding at the end the following:

(kk) PHASE III REPORTING.—The annual SBIR or STTR report to Congress by the Administration under subsection (b)(7) shall include, for each Phase III award—

(1) the name of the agency or component of the agency or the non-Federal source of capital making the Phase III award;

(2) the name of the small business concern or individual receiving the Phase III award; and

(3) the dollar amount of the Phase III award.

Appendix E

Data has shown that the percentage of newcomers to the SBIR program has declined noticeably over the past twenty years. DoD components have declined by 20% in the last 10 year and 30% in the last 20 years.

Agenc	1994						
	Total Awardees	First Time Awardees[1]	% New/ oldcomers	# Agency Returners[2]	% Agency Returners	First time in agency[3]	% agency first time[4]
DOD	888	298	33.56%	506	56.98%	84	9.46%
NIH	510	220	43.14%	250	49.02%	40	7.84%
NASA	319	97	30.41%	172	53.92%	50	15.67%
DOE	189	55	29.10%	95	50.26%	39	20.63%
NSF	241	87	36.10%	106	43.98%	48	19.92%
DHS							
USDA	60	37	61.67%	11	18.33%	12	20.00%
DOT	32	11	34.38%	8	25.00%	13	40.63%
EPA	29	8	27.59%	14	48.28%	7	24.14%
DoEd	18	6	33.33%	7	38.89%	5	27.78%
DOC	40	14	35.00%	4	10.00%	22	55.00%
Minimal SBIR participation agencies							
NRC	11	3	27.27%	4	36.36%	4	36.36%
Dept of Defense: all Agency Data and by Service Breakout							
DOD	888	298	33.56%	506	56.98%	84	9.46%
AF	336	101	30.06%	174	51.79%	61	18.15%
Army	164	41	25.00%	70	42.68%	53	32.32%
Navy	252	57	22.62%	128	50.79%	67	26.59%
MDA	107	29	27.10%	56	52.34%	22	20.56%
DARPA	263	82	31.18%	98	37.26%	83	31.56%
DMEA							
DTRA	13	1	7.69%	8	61.54%	4	30.77%
CBD							
OSD							
SOCOM	18	8	44.44%	0	0.00%	10	55.56%
NGA							
DHP							
Source: Innovation Development Institute, LLC., Swampscott, MA							1994

Agenc	2004						
	Total Awardees	First Time Awardees[1]	% New/ oldcomers	# Agency Returners[2]	% Agency Returners	First time in agency[3]	% agency first time[4]
DOD	1224	340	27.78%	799	65.28%	85	6.94%
NIH	947	364	38.44%	527	55.65%	56	5.91%
NASA	249	60	24.10%	159	63.86%	30	12.05%
DOE	226	62	27.43%	121	53.54%	43	19.03%
NSF	165	63	38.18%	70	42.42%	32	19.39%
DHS	88	36	40.91%	0	0.00%	52	59.09%
USDA	97	51	52.58%	27	27.84%	19	19.59%
DOT	13	8	61.54%	2	15.38%	3	23.08%
EPA	40	8	20.00%	17	42.50%	15	37.50%
DoEd	43	20	46.51%	14	32.56%	9	20.93%
DOC	48	13	27.08%	15	31.25%	20	41.67%

Dept of Defense: all Agency Data and by Service Breakout							
DOD	1224	340	27.78%	799	65.28%	85	6.94%
AF	439	88	20.05%	261	59.45%	90	20.50%
Army	317	75	23.66%	165	52.05%	77	24.29%
Navy	445	93	20.90%	253	56.85%	99	22.25%
MDA	252	41	16.27%	163	64.68%	48	19.05%
DARPA	158	39	24.68%	55	34.81%	64	40.51%
DMEA							
DTRA	0	0	0.00%	0	0.00%	0	0.00%
CBD	23	3	13.04%	9	39.13%	11	47.83%
OSD	82	20	24.39%	31	37.80%	31	37.80%
SOCOM	26	6	23.08%	6	23.08%	14	53.85%
NGA	2	0	0.00%	0	0.00%	2	#####
DHP							

Source: Innovation Development Institute, LLC., Swampscott, MA 2004

Breakout SBIR-STTR Awardees By Type & Percentage; By-Agency & Year 1983-2015 October 2015

Agenc	2014						
	Total Awardees	First Time Awardees[1]	% New/ oldcomers	# Agency Returners[2]	% Agency Returners	First time in agency[3]	% agency first time[4]
DOD	715	145	20.28%	550	76.92%	20	2.80%
NIH	706	249	35.27%	426	60.34%	31	4.39%
NASA	20	1	5.00%	16	80.00%	3	15.00%
DOE	178	40	22.47%	104	58.43%	34	19.10%
NSF	301	205	68.11%	57	18.94%	39	12.96%
DHS	32	5	15.63%	15	46.88%	12	37.50%
USDA	3	0	0.00%	1	33.33%	2	66.67%
DOT	18	6	33.33%	6	33.33%	6	33.33%
EPA	21	10	47.62%	5	23.81%	6	28.57%
DoEd	4	0	0.00%	4	100.00%	0	0.00%
DOC	21	4	19.05%	8	38.10%	9	42.86%

Dept of Defense: all Agency Data and by Service Breakout

DOD	715	145	20.28%	550	76.92%	20	2.80%
AF	339	55	16.22%	242	71.39%	42	12.39%
Army	84	12	14.29%	52	61.90%	20	23.81%
Navy	321	53	16.51%	227	70.72%	41	12.77%
MDA	22	1	4.55%	14	63.64%	7	31.82%
DARPA	23	11	47.83%	4	17.39%	8	34.78%
DMEA	2	0	0.00%	0	0.00%	2	#####
DTRA	6	0	0.00%	2	33.33%	4	66.67%
CBD	19	6	31.58%	5	26.32%	8	42.11%
OSD	61	13	21.31%	33	54.10%	15	24.59%
SOCOM	9	0	0.00%	3	33.33%	6	66.67%
NGA							
DHP	25	6	24.00%	10	40.00%	9	36.00%

Source: Innovation Development Institute, LLC., Swampscott, MA 2014

References/Endnotes:

[1] As Counsel to the House Small Business Committee, I helped convene the first joint House-Senate Small Business Committee hearings on the subject in 1978. These hearings and report 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 5% of those R&D contract dollars. And SBIR/STTR accounts for more than half of that. I subsequently testified before Congress regarding small business and innovation on numerous occasions, as Deputy Chief Counsel for Advocacy at SBA during the Carter Administration, as Chief Counsel during the Clinton Administration, and as Executive Director of SBTC during the George W. Bush and the Barack Obama Administrations. SBTC represents more companies that are active in the federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program than any other organization. SBTC also serves as the Technology Council of the National Small Business Association, the nation's oldest nonprofit advocacy organization for small business, which represents over 150,000 small companies across the United States. I appear here today on behalf of both organizations.

[2] From the SBIR/STTR Reauthorization Act of 2011, Section 9(f) of the Small Business Act (15 U.S.C. 638(f)) amended SBIR allocations to:

(1) not less than 2.5 percent of the Agency's extramural research budget in each of fiscal years 1997 through 2011;
(2) not less than 2.6 percent of such budget in fiscal year 2012;
(3) not less than 2.7 percent of such budget in fiscal year 2013;
(4) not less than 2.8 percent of such budget in fiscal year 2014;
(5) not less than 2.9 percent of such budget in fiscal year 2015;
(6) not less than 3.0 percent of such budget in fiscal year 2016; and
(7) not less than 3.2 percent of such budget in fiscal year 2017 and each fiscal year thereafter

3 Department of Agriculture(link is external)
Department of Commerce - National Institute of Standards and Technology(link is external)
Department of Commerce - National Oceanic and Atmospheric Administration(link is external)
Department of Defense(link is external)
Department of Education(link is external)
Department of Energy(link is external)
Department of Health and Human Services(link is external)
Department of Homeland Security(link is external)
Department of Transportation(link is external)
Environmental Protection Agency(link is external)
National Aeronautics and Space Administration(link is external)
National Science Foundation

[4] In part derived from: Fred Block and Matthew R. Keller, "Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006", THE INFORMATION TECHNOLOGY & INNOVATION FOUNDATION, July 2008, http://www.itif.org/files/Where_do_innovations_come_from.pdf?_ga=1.133125959.897409575.1453668309

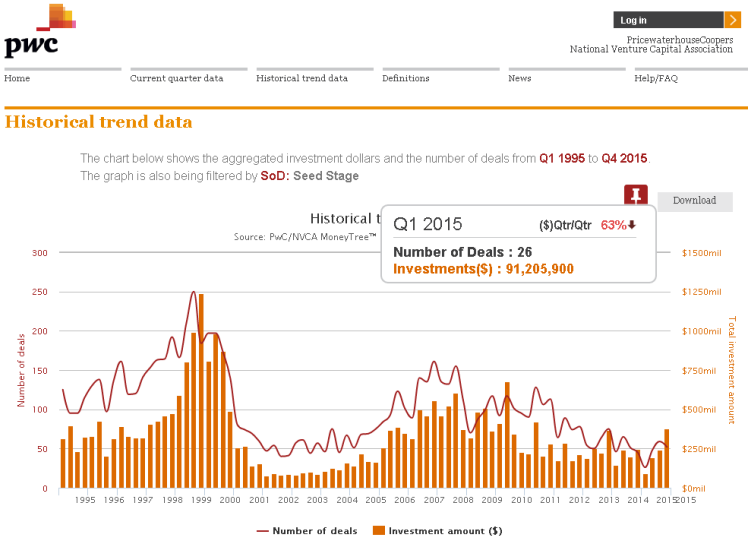
[5] The Air Force Impact to the Economy via SBIR/STTR, 2014 Economic Impact Study, https://www.sbir.gov/sites/default/files/USAF%20SBIR-STTR%20Economic%20Impact%20Study%20FY2015.pdf

[6] https://www.sba.gov/sites/default/files/advocacy/FAQ_March_2014_0.pdf

[7] Performance and Accountability Report FY 2015, United States Patent and Trademark Office, Table 11. http://www.uspto.gov/sites/default/files/documents/USPTOFY15PAR.pdf. Calculation of % = 3.26 + 25.79 = 29.05%.

[8] See Federal Reserve Bank of Cleveland, "Altered States: A Perspective on 75 Years of State Income Growth," *Annual Report 2005*. For more detail, see Paul Bauer, Mark Schweitzer, Scott Shane, *State Growth Empirics: The Long-Term Determinants of State Income Growth*, Working Paper 06-06, Federal Reserve Bank of Cleveland, May 2006, https://www.clevelandfed.org/en/Newsroom%20and%20Events/Publications/Working%20Papers/2006%20Working%20Papers.aspx and then Click on the PDF for WP-06-06 by Bauer *et. al*.

[9] Innovation Development Institute, Swampscott, MA, www.inknowvation.com
[10] Innovation Development Institute, Swampscott, MA, which has for decades compiled list of mergers and venture capital investments. See: www.Inknowvation.com.
[11] See: https://www.pwcmoneytree.com/HistoricTrends/CustomQueryHistoricTrend, and then filter data by Sage, and then f Stage. Move the cursor to the quarter you desire data for. 1Q 2015 26 deals, 2Q 48 deals, 3Q 59 deals, 4Q 52 deals for a total of 185 Seed Stage VC deals in 2015.



10,11,14 See: https://www.pwcmoneytree.com/HistoricTrends/CustomQueryHistoricTrend, and then filter data by State. Once you have your state of interest, filter by Sage, and then Seed Stage.

[12] Venture Capital Update: Software and Expansion Dominate, Midwest Struggles
August 6, 2015, David J. Robinson, http://montrosegroupllc.com/venture-capital-update-software-and-expansion-dominate-midwest-struggles/?utm_source=rss&utm_medium=rss&utm_campaign=venture-capital-update-software-and-expansion-dominate-midwest-struggles&utm_source=Aug+2015+Montrose+Way-No+Greeting&utm_campaign=July2015+Montrose+Way&utm_medium=email

Top Five States for Venture Capital Investment, 1st Quarter, 2015, MoneyTree Report

State	Venture Capital	National percentage
California	$8.0B	60%
Massachusetts	$1.3B	10%
New York	$1.3B	10%
Texas	$426M	3%
Washington	$299M	2%

[13] THE Q3'15 GLOBAL TECH EXITS REPORT, Global tech exits including M&A, IPO trends, and much more, www.cbinsights.com.
[14] See: https://www.pwcmoneytree.com/HistoricTrends/CustomQueryHistoricTrend, and then filter data by State. Once you have your state of interest, filter by Sage, and then Seed Stage.
[15] Chart courtesy of Ann Eskesen, Innovation Development Institute, Swampscott, MA, www.inknowvation.com.