



Testimony of

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**BEFORE THE COMMITTEE ON SMALL BUSINESS
UNITED STATES HOUSE OF REPRESENTATIVES**

Innovating America: 40 Years of SBIR Success

13 May 2021

On behalf of

The Small Business Technology Council

www.sbtc.org

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



Executive Summary

SBIR/STTR Boosts American Innovation and Economic Infrastructure

In 1982 a bi-partisan Congress and President Reagan created the **Small Business Innovation Research (SBIR)** program. They knew very little Federal R&D was going to small businesses. America was missing the opportunity to better mobilize small business entrepreneurship and innovation to meet Federal R&D needs and to bridge the technology gap eroding American competitiveness and jobs. So, they created this highly competitive program to make sure at least a small fraction of Federal R&D goes to small businesses. Time has shown they were right.

America's basic science is a primary national strength, but converting that science to American innovation and jobs faces increasing international competition. **The SBIR/STTR programs provide seed corn for this challenge, combining private enterprise with American ingenuity to enable new innovations while building new products and businesses transforming American industry.** SBIR asks our nation's small businesses, employing 35% of our scientists and engineers and led by American entrepreneurs, to convert American science into new scientific breakthroughs and useful innovations to meet Federal R&D needs and to commercialize that tech to build their businesses. SBIR firms must be American-based and owned small businesses, with work done in the U.S. The new technology, products and services are selected by the agencies based on merit; meet agency objectives; meet market and societal needs; and create new sustainable high quality, high paying manufacturing and service jobs in the U.S. while raising living standards and making American products more competitive. Today, facing uneven economic growth; aging infrastructure; and international competition, appropriation and intellectual property theft that is draining American jobs, we can strengthen SBIR/STTR¹ investment, further unleashing small business energy and jobs towards a new wave of 21st century American-made products and services.

SBIR solely funds R&D selected by agencies to meet their objectives, but it has created an outsized proportion of America's innovations while addressing agency technology challenges. The follow-on commercialization economics are dramatic. Plus when an American small business creates jobs, the jobs tend to be created in and stay in the U.S.

SBIR/STTR Phase 1 and 2 R&D funding together account for \$3.7 billion, or about 3.5% of Federal **extramural** R&D. Even though small businesses employ some 35% of America's scientists and engineers, overall SBIR/STTR phase 1 and 2 R&D is less than 2% of the total Federal R&D budget. Each year 11 Federal agencies make 7,000 competitively-selected awards based on merit (only 1 in 20 Phase I proposals advances to Phase II). **Initial small Phase 1s** prove the validity and promise of the innovation, with a second competition selecting **larger Phase 2** projects for development. Phases 1 and 2 encourage intellectual property development to support company and product growth and development. They also advance the technology towards **Phase 3 commercialization**, including further R&D with non-SBIR Federal or private sector support followed by product or service sales. For a description of how the program works see www.sbir.gov.

¹ Congress passed and George H. W. Bush signed Public Law No: 102-564, which created a smaller, companion Small Business Technology Transfer (STTR) program in 1992, for academic partnering.



SBIR R&D projects are technology seed corn, planted in small businesses committed to grow them into new products. Despite <2% of overall Federal R&D funding, SBIR/STTR's outsized results are a primary driver of American economic strength. SBIR/STTR firms have created over 20% of the world's major innovations², and as many patents as all universities combined. High quality R&D tackles Federal challenges and creates new innovation while seeding new startups and driving the growth of small businesses with their new technology products and services. Global giants such as Qualcomm, Symantic, Biogen, iRobot, Genzyme, Illumina, and Genentech emerged from SBIR funding. Other SBIR businesses and technologies were sold or licensed, revitalizing older industries while cutting costs and growing competitive strength, and generating new divisions and new jobs located here in America. Follow-on new product investment and sales have totaled many hundreds of billions of dollars.

SBIR firms have produced life-changing breakthroughs in defense, energy, communications, information and bioscience - new tech building blocks for American manufacturing. Agency mission objectives were accomplished. DOD strengthened capabilities while cutting costs. The Air Force saved over \$500M on the F-35 aircraft. A Navy project saved over \$1M per hull on the Virginia Class submarine.

Two technologies initially funded by the SBIR/STTR Program that are in most American's pockets are purses: the technology that allows your cell phone to use GPS on a chip was developed by Dr. Reza Rofougaran under an SBIR award. And the fast CMOS camera technology used by most cell phones and digital cameras was developed for military use under an SBIR award as well.

A primary strength of SBIR/STTR is it invests early in innovation – well before VCs and banks will provide risk capital, although successful SBIR technologies often do advance to use VC and bank lending as they mature towards products. Also SBIR innovation is directed across America's innovation opportunities, not just in VC-investing sectors such as software, internet, telecommunication and healthcare (receiving 83% of VC deals³) but also in higher jobs-producing areas such as manufacturing, defense, energy, and the environment, that are key to building America's good job economy. And small businesses have a great record on keeping their jobs in the U.S.

The data supports SBIR, and suggests doing more can increase its success. The SBIR/STTR program clearly provides a big bang for the federal R&D dollar, an unmatched economic growth engine.

- Around 20 National Academy of Sciences studies have been conducted on the programs, and have concluded that SBIR has met its goals, and showed SBIR/STTR Phase II awards commercializing at rates from 45-70 percent.
- Economic impact studies at the Navy, Air Force, DOD and the National Cancer Institute show remarkable impact on America, e.g. in excess of \$15 to \$23 for every SBIR dollar

² Fred Block and Matthew Keller, *Where Do Innovations Come From? Transformations in the U.S. National Innovation System 1970-2006*, Information Technology and Innovation Foundation, July 2008.

³ Source: PwC/CBI Insights MoneyTree™ data explorer <http://www.pwc.com/moneytree>; VC Seed & Angel Deals By Industry Sector, 2011-2020



over a 14 year period.⁴ Results included improved military strength and capability, significant cost-savings, new industries with new products and services, and new life saving medical techniques and products. Job quality was high, with high average incomes, e.g. \$68,535 in the Navy study.

- The studies understate the impact, not capturing the impact from SBIR technology licenses or business acquisitions on the licensing or acquiring business's sales and competitiveness.
- Tax income in the period more than repaid the SBIR R&D funding: over \$3 in increased Federal, state and local taxes for every dollar spent on SBIR.
- Depending on agency, 45-70% of SBIR small business awardees including university faculty. 70% of all university licenses are to SBIR and other small and startup firms.⁵

Even with a remarkable success record, there is much more than can be done in continuous improvement of the SBIR program, not least to spread the best practices among the agencies. And the DoD Section 809 Panel recommended more than doubling the SBIR allocation, to 7%, and making it permanent.⁶ The European Union is investing 20% of its R&D in small businesses.⁷

SBIR/STTR reaches out to underserved states and groups, broadening the impact and strengthening national STEM results. SBIR/STTR is leveraging the nation's dramatic spread of "innovation hubs" in geographically disenfranchised regions, led by regional industry/academic/ government partnerships, and redefining STEM. New products meeting important American STEM challenges are energizing new generations looking for better and more sustainable jobs. Increased heartland investment in SBIR/STTR can become a keystone of the Rustbelt's manufacturing revival.

Further American economic infrastructure revitalization offers the same opportunity for improved performance via SBIR/STTR innovation and new STEM impacts that have transformed the defense, energy, bioscience, communication, and information industries. SBIR/STTR infusion offers the potential for simultaneous performance improvements and dramatic cost reductions throughout our economy as we reinvigorate and grow our economy, export base and competitive strength.

As we consider how to sustainably grow America's economy with new products and jobs capable of fully engaging and employing America's workforce with high quality jobs, **SBIR/STTR offers a highly-efficient proven innovation lever for American economic infrastructure revitalization that creates new technology and jobs while solving agency R&D challenges and within existing R&D budgets.**

⁴ Swearingen, Will and Jeffrey Peterson, "National Economic Impacts from Air Force and Navy SBIR/STTR Programs, 2000-2013"; "1998-2018 National Economic Impacts from the National Cancer Institute SBIR/STTR Programs"; and "National Economic Impacts from the DOD SBIR/STTR Programs 1995-2018" Techlink

⁵ Association of University Technology Managers (AUTM), *FY2016 AUTM US Licensing Activity Survey, 2018*

⁶ DOD Section 809 Panel, Jan. 2018: "Report of the Advisory Panel on Streamlining and Codifying Acquisition Regulations", Sub recommendation 21b.

⁷ <https://ec.europa.eu/programmes/horizon2020/en/area/smes>



We should build on programs that work in creating economic strength, and make them stronger. The new Administration and the 117th Congress have an opportunity to improve the impact of American skill and entrepreneurship building on America's scientific strength, with the SBIR/STTR program as the fulcrum for creating new innovations and better jobs.

Recommendations:

1. *Make SBIR/STTR permanent*
2. *Increase SBIR allocation increase to 7%*
3. *Increase STTR allocation to 1%*
4. *Ensure agencies follow SBIR/STTR policies, including for Phase III recognition and support. Ensure further streamlining of proposals, admin and accounting.*
5. *Maintain strong IP protection for these new technologies and businesses. Support the STRONGER Patents Act*
6. *Support the DOD Rapid Innovation Fund (RIF). Develop similar programs at other agencies.*
7. *Require updates of FAR and DFAR regulations to match Congressional law*
8. *Don't weaken SBIR/STTR selection criteria that focus on merit*
9. *Expedite Security Clearances for SBIR/STTR firms*
10. *Require all agencies to set goals of at least 15% of all R&D goes to small business,*
11. *Require all agencies publish all on their website required reports as soon as possible and no later than when they are submitted to other organizations or SBA*



DISCUSSION

SBIR/STTR: Innovation-focused R&D for New Products, Services and High-Quality Jobs

Planned by Congress to ensure American R&D competitiveness, the program has a simple three-phase structure (Figure 1), with competition as its keystone: just one in eight Phase I proposals is awarded, and only 1 in 20 of initial proposals go on to Phase II. Annually, about 30 percent of awardees are new to SBIR/STTR.

Phase I: Feasibility study, typically 6-9 months, \$80-\$150K. Proof of concept.

Phase II: R&D/prototyping, 24 months, up to \$1.5 M. Additional Phase IIs possible.

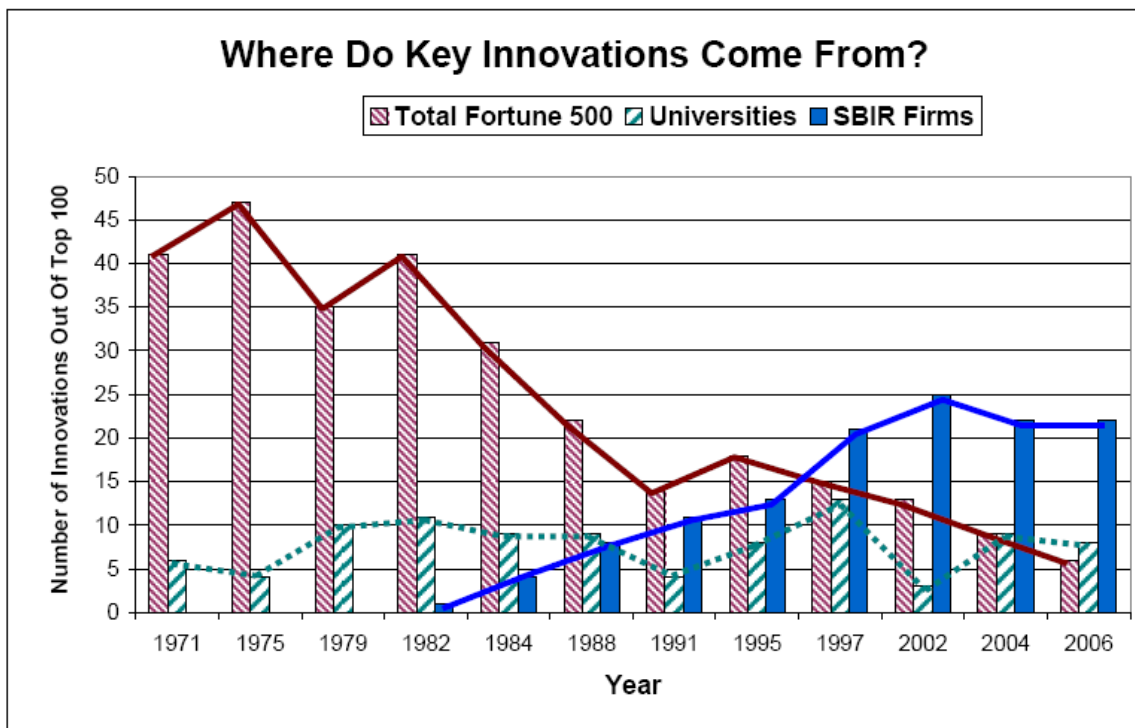
Phase III: Commercialization from Federal government or private sector outside of SBIR/STTR funding. Includes further R&D with non-SBIR funding and/or sales of products or services

Objectives include stimulating innovation, meeting agency R&D needs, stimulating the growth of small and start-up businesses, and broadening the reach of Federal R&D. Phases I and II are funded within large agency R&D budgets, targeted to meeting agency mission objectives, in a disciplined, highly competitive structure. Phase III describes follow-on activity outside of SBIR funding, wherein the newly created innovations enter the economy through Federal or private sector follow-on R&D and/or product or service sales. The Phase I/II SBIR R&D dollars are leveraged by the follow-on R&D and sales, as well internal investment and energy from the small business. Around 14 percent of all SBIR firms have eventually received venture capital and one of every eight dollars invested by VCs is to an SBIR/STTR involved firm. Many large companies have acquired smaller growing firms driven by SBIR technology, for both the products and the technology, transforming themselves with the infusion of the new technology.

Why SBIR works: designed for success

- Federal R&D directed to solve Federal R&D challenges in support of agencies' missions
- Agencies select topics, select winners, make awards to meet their needs
- Taps small business entrepreneurship, innovation, drive and competitive flexibility
- Merit selection based on science and technology
- Highly competitive: Only 1 in 20 proposals advances to the main Phase 2 R&D work.
- Leverages university research: some 50-70% of SBIR work is done either with direct university faculty involvement or employing former university faculty, focused into small business growth drivers.
- Stimulates innovation for Phase 3 follow-on by mainline Federal R&D or private sector
- While performing R&D for Federal purposes, SBIR/STTR is simultaneously a unique seed fund for American technological innovation, stimulating early stage innovation in pre-commercial technologies prior to stages at which Venture Capital or banks are interested.
- The impact on American industry is broad, not just on medical, software and IT, reinvigorating American industry from the ground up.
- At the same time, firms with SBIR-validated technologies attract subsequent VC investment as they advance towards products and market entry.

- American manufacturing on-ramp: SBIR focus on products is re-invigorating American manufacturing with a flow of new products designed and made in America.
- Small technologies businesses tend to grow their employment base in the U.S., and are less likely to outsource the jobs their technologies create.
- SBIR supports new startup formation and provides technical and commercialization business assistance, a virtual incubator for entrepreneurs across the country including in non-traditional locations for technology businesses including center cities and rural areas.
- Focus on intellectual property development and protection to support business growth, development and high quality jobs.
- Small business performance has been demonstrated to be remarkably high
- SBIR/STTR program has been continuously improved over time



The SBIR Program started with a modest \$45 million (only 0.2% of the extramural R&D budget). To date over 28,000 firms have received SBIR over 127,000 awards. Today, the SBIR/STTR program has grown to 3.65% of extramural R&D funds, over \$3 billion dollars and 7,000 awards per year. The European Union is investing 20% of its R&D in small businesses.¹ And France recently announced a \$13 Billion fund for “disruptive technologies”.² (See Appendix C: History of SBIR)



National Academy of Sciences: Repeated Stamps of SBIR Approval

While the Government Accountability Office and Office of the Inspector General have scrutinized and reported on SBIR/STTR Program mechanics more than 25 times since 2000, NRC made a definitive SBIR assessment in a series of reports from 2004 to 2009, comprising thousands of pages, on the SBIR programs at the Department of Defense (DoD), National Institutes of Health (NIH), National Aeronautics and Space Administration (NASA), Department of Energy (DoE), and National Science Foundation (NSF)—the five agencies responsible for 96 percent of SBIR operations. **The Rate of technology commercialization across these agencies were found to be from 45 to 70 percent**, and direct university collaboration in between 33 and 63 percent of SBIR awards.

The Market loves SBIR

The Federal government benefits from SBIR technology. But the market also appreciates SBIR technology. Some facts that show that SBIR makes a difference include:

- 10% of all VC investments go to SBIR firms
- Universities license 70% of all their technology to small business, and are using SBIR and STTR to help get their technology into the market. VC have invested twice as much as the Government in SBIR firms
- 19% of IN-Q-Tel (DARPA) investments are in SBIR
- 829 SBIR related firms have gone public
- 2120 SBIR firms have been acquired
- L3 Com, GE, SAIC,BAE,Lockheed Martin, Raytheon, Gen Dynamics, Philips, Teledyne have each acquired 10 or more SBIR Firms One firm L3 Com has acquired 43 SBIR Firms
- Many SBIR companies have licensed their technologies, with the licenses reinvigorating the technologies of the typically larger and older-technology firms that are granted licenses.
- The DOD Section 809 Panel Recommends doubling SBIR and RIF for DOD
- The SBIR/STTR Programs have been copied by seventeen countries around the world. While the SBIR/STTR program accounts for only 3.65% of the Federal extramural R&D budget over the last 4 years, SBIR has created 22% of our key innovations.



National Cancer Institute

One agency's remarkable success story

The recently finished SBIR/STTR economic impact study for the National Cancer Institute showed a return of \$3.68 in taxes for every dollar invested. (It's like printing money without the inflationary effect.) New innovations, good jobs, and we get back more in taxes than we invested. The study looked at 12 years and 690 NCI Phase II SBIR/STTR awards totaling \$787 million dollars to develop new medical devices, drugs, research tools and in-vitro diagnostics for treating cancer. The results were \$9.1 billion in sales, \$2.9 billion in tax revenues, and 107,918 new jobs, as well as 45 spinouts, 103 licenses, \$4.26 billion in added outside investment, and 103 of the companies being sold for another \$21 billion to invigorate the larger companies looking for new technologies. SBIR is a GDP and jobs engine producing high leverage economic power. SBIR success stories were for Breast, Lung, Prostate and multiple other cancers. There are literally thousands of success stories here, and all of our lives are better for them.

<i>*dollar amounts in millions</i>	NCI ('98-'10)	
Total Awards	690	
Total SBIR/STTR Award Investment	\$787	
Rate of Commercialization	53%	
Cumulative Sales	\$9,144	\$11:1
Follow-on R&D	\$957	\$1.2:1
Total Value of Acquired Firms	\$21,630	\$27:1
Total Outside Investment Funding	\$4,260	\$5:1
Total Economic Output	\$26,100	\$33:1



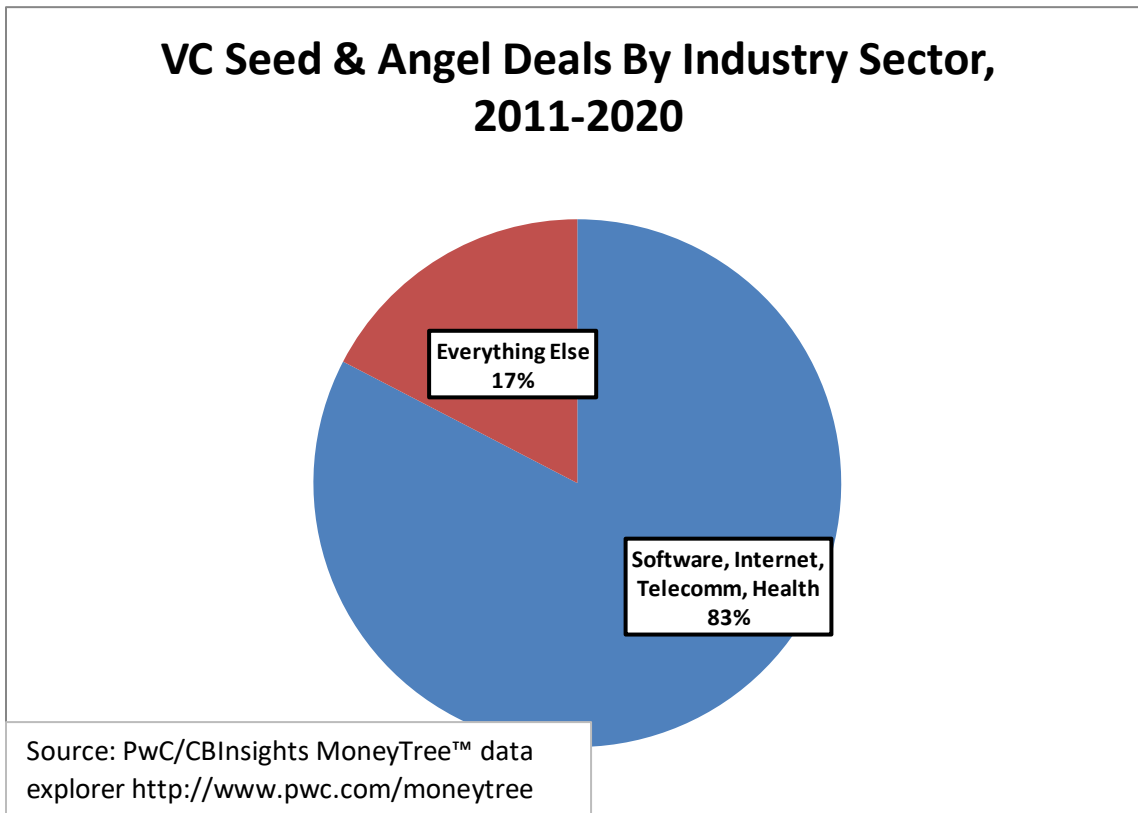
DOD SBIR/STTR Has Also Been Tremendously Successful



SBIR is often the only source of funding for innovation research

SBIR innovations reflect the needs of America across the nation. In many cases there is no other source of funds for developing early stage technology in America, and this holds true even for advanced stage technologies outside of the favored venture capital/angel industry sectors of software, internet, telecommunications, and healthcare that comprise 83% of the VC deals. All other industry sectors combine for only 17% of the total funds VC invests in seed and angel stage deals. VCs are also focused on only a few states, with most flowing to California and Massachusetts. SBIR funds **7000** deals last year with **\$3,700,000,000** dollars across a wide spectrum of technology, industries and regions.

SBIR/STTR invests at the innovation stage – well before VC and banks will provide risk capital. Successful SBIR technologies do advance to use VC and bank lending as they mature towards products. Also SBIR innovation is directed across America’s innovation opportunities, not just in VC-investing sectors such as software, internet, telecommunication and healthcare (receiving 83% of VC deals) but also in higher jobs-producing areas such as manufacturing, defense, energy, and the environment, that are key to building America’s good job economy. And small businesses have a great record on keeping their jobs in the U.S.



Many universities and government labs have had difficulty translating their research into inventions. A recent Association of University Technology Managers study shows that less than 1% of their licenses generate more than \$1 million, and that 70% of university licenses are with



SBIR firms.³ Small business and SBIR/STTR are now a huge part of how universities and their professors advance their technologies out of the lab.

But those who can't find funding in the U.S. are turning overseas for help commercializing their research. One Chinese organization, BICI has developed 158 U.S. research projects and has funded over \$616 million for commercialization of U.S. funded research, moving the commercial jobs from U.S. research to China. So far BICI has commercialized 108 such projects.⁴

Success stories

You probably use technologies initially funded by the SBIR/STTR Program on a daily basis, and probably have at least two of these in your pocket or purse right now. The technology that allows your cell phone to use GPS on a chip was developed by Dr. Reza Rofougaran under an SBIR award. And the fast CMOS camera technology used by most cell phones and digital cameras was developed for military use under an SBIR award as well.

<p>GPS/WiFi/Bluetooth Chips Physical Research/ Broadcom</p> <p>GPS on a chip, and combined WiFi and Bluetooth communications used globally in cell phones and U.S. military systems, are derived from a DoD SBIR award to Dr. Reza Rofougaran.</p>		<p>CMOS Cameras Photobit/Micron</p> <p>SBIR supported Photobit in developing fast CMOS imagers for military use, now used in all cell phones and most other digital cameras.</p>	
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Successful alumni of the SBIR program include: Qualcomm (cell phone communications), Symantec (computer security), Genzyme (biotech therapies), Affymatrix (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), 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. (For more success stories see Appendix D).

Phase III is another area of success. In recent years, the Navy has entered to \$2.5 billion dollars of Phase III contracts, the Air Force over \$1.5 billion contracts and the GSA has entered into contracts that could be worth \$4 billion. All three agencies have shorten the time it takes to get some Phase III contracts awarded.



SBIR Job Creation

The DOD Economic Impact Study shows that the Phase II award winners had \$121 billion in sales and added 1,500,000 jobs in America between 2000 and 2013, more than the combined total employment of Google, Apple, Cisco, and Microsoft.⁵

Ann Eskesen, CEO of the Innovation Development Institute of Swampscott, MA (IDI), is a pioneer in the SBIR movement. Ann has supplied data and information in support of the SBIR Program for 45 years. IDI has tracked the SBIR program beginning. Appendix A shows the number of STEM and overall SBIR jobs created by state. When looking at the entire SBIR program nationwide, SBIR involved firm's employ 883,000 graduate-level engineers & scientists across every field of industrial/technical endeavor, which is arguably largest single concentration of demonstrated technical talent.⁶

While virtually all states do better with SBIR than with venture capital, some states do better than others. The Fast Program at SBA resulted in SBIR awards of 111 million dollars. Two states, Oklahoma and Montana, have done an excellent job of increasing SBIR outreach and awards. For more information on Oklahoma and Montana's FAST successes, see Appendix A.

Other indicators of SBIR success

SBIR acquisitions

2,120 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.

https://www.innovation.com/images/SlidesForSenate_ContextGroup_5_Page_4.jpg

Corporations having acquired multiple SBIR-involved <i>Italics=SBIR involved firms June 2017</i>		
L3 Communications <small>Recently, L3 divesting several</small>	L3:41	25
<i>Titan Corporation (acquired by L3)</i>		16
SAIC; General Electric Company		13
Raytheon Company, Lockheed Martin Corporation		11
Agilent Technologies Inc.; BAE Systems; ECO Corporation; General Dynamics Corporation; <i>Invitrogen Corporation</i>		10
JDS Uniphase Corporation; Philips		9
Johnson & Johnson; Northrup Grumman Corporation (Litton); PerkinElmer, Inc., Pfizer Inc.; Teledyne Technologies, Inc; Thermo Fisher Scientific, Inc		8
Becton, Dickenson & Company; <i>Sierra Nevada Corporation</i>		7
<i>Amgen</i> ; ATK Inc.; Beckman Coulter, Inc; Boeing Company, BristolMyers Squibb; Charles River Laboratories; Corning, Inc.; Danaher Corporation, <i>Genzyme Corporation</i> ; ICx Technologies, Inc.; ManTech International Corporation; Novartis AG; Medtronic, Inc.; Qiagen NV; Roche Holdings AG; Ultra Electronic Holdings		6

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SBIR Patents

Another indication on innovation success is the number of patents that have been issued. There have been **137,443** patents issued to SBIR firms. In most years SBIR firms receive more patents than all colleges and universities combined.

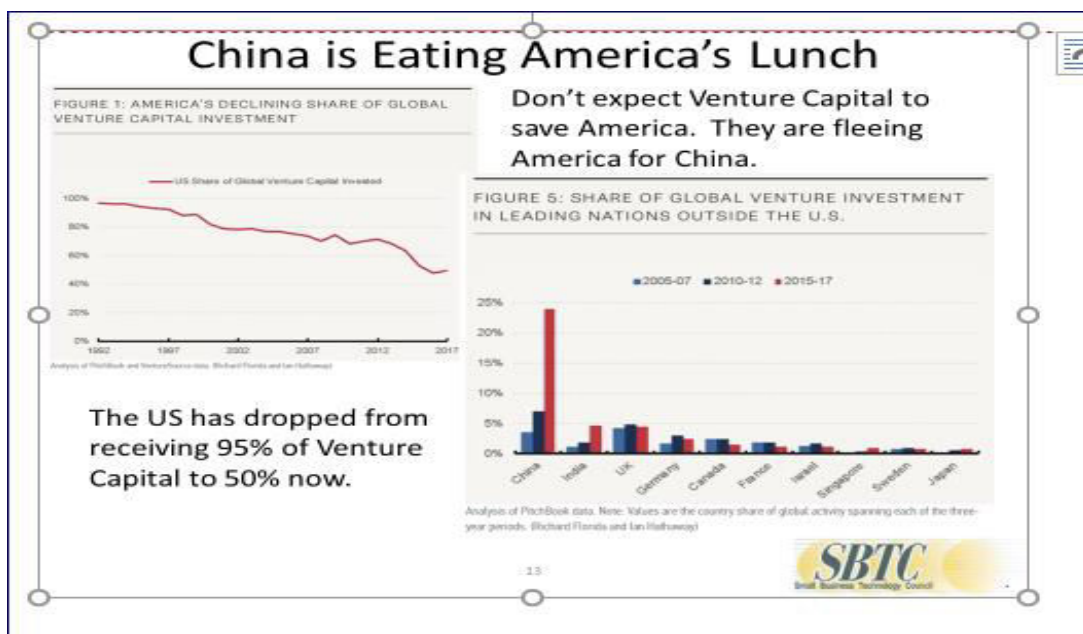
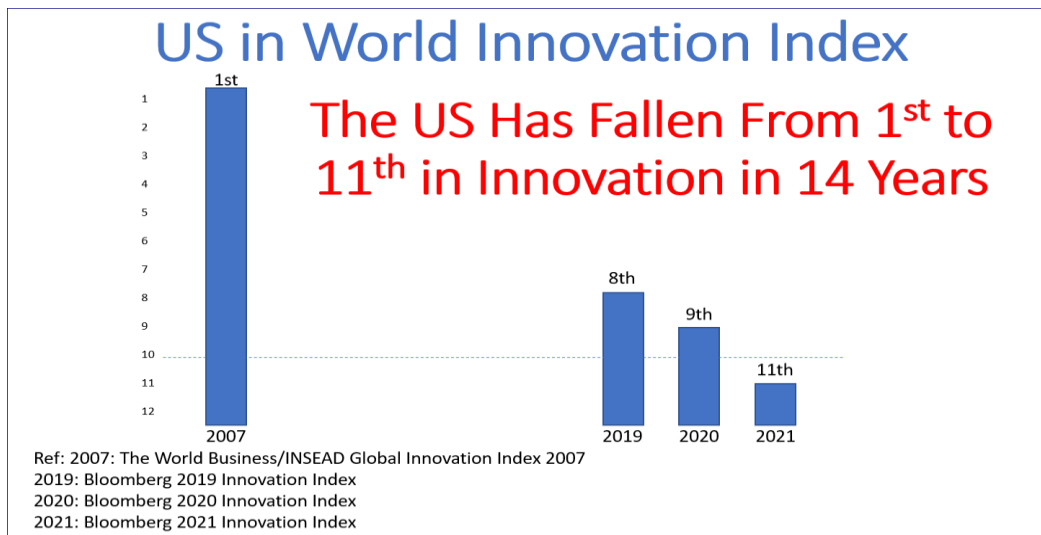
Taxes

The NCI Study states that every dollar invested in SBIR at NCI results in **\$3.68** in state, local and Federal taxes.

U.S. innovation leadership in the World is challenged

When the SBIR was created, the United States was the undisputed leader in innovation. All venture capital was invested in U.S. companies and we had a very strong patent system. Today our leadership in innovation is threatened, other countries are doing more to support small business and innovation in their countries. The European Union has committed to investing 20% of its R&D in small businesses.⁷

France has created a \$13 billion dollar fund. China is eating our innovation lunch. American venture funds are investing in Chinese firms. China has close relationships with many U. S. universities to develop U.S. funded technology and even has a 616 million dollar fund to commercialize U.S. university research. America has dropped to #11 in the Bloomberg Innovation Index. Foreign firms file more patents in the U.S. that resident firms.





- **Beijing Institute of Collaborative Innovation (BICI)** is a non-profit innovation institute jointly established by 14 U.S. universities including Peking University and Tsinghua University in 2014
- BICI is industry-oriented and has set up 18 Innovation Centers focusing on robotics, optoelectronics, structural and functional materials, energy technology, water treatment and biomedical engineering.
- So far, around 150 projects have been invested since the establishment of BICI, among which 108 projects have been commercialized upon completion
- Meanwhile, BICI has set up a four-billion RMB investment fund to support the commercialization of completed projects and to make direct equity investment in other deep-tech startup companies.
- Link <http://innovator.co/>

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 \$)
China	715,843
Hong Kong	322,039
Korea	208,678
Germany	208,678
United States	156,074
Singapore	150,959
Source: http://wdi.worldbank.org/table/5.13	

The amount that the US exports High Tech has become anemic, only 21.8% of China’s. We are only slightly above the tiny city/state of Singapore, a country whose land mass is 0.007% of the US.⁸

VC Investment in SBIR Firms



Has SBIR been a “Good Investment” *what does VC SBIR involvement suggest?*

Given the serious uptick recently in VC investment levels overall: total number and size of investments -- \$192B in the THREE years 2014-2016 -- an amount that required SIX years to achieve even after 2008 recession -- it is still the case that

**ONE in every TEN Dollars
of VC Investment in US
recently has involved
an SBIR firm**

(down from One in SIX-SEVEN)

Appendix A

SBIR Impact on Job Creation & STEM Employment

- SBIR involved firms – current or previous - collectively have been factor in some 9.26% of US STEM jobs
- ...yet as firms, SBIR Awardees in almost every state consistently factor to significantly less than One-Quarter of ONE percent of establishments.

US House of Representatives Small Business Committee: by Member State SBIR employment: STEM Employment Impact						
State	Total Employment ¹	STEM Employment ²	% STEM Related	Calculated SBIR-STTR Employment (Note 1)	% Stem Jobs SBIR related	SBIR % State Establishments ³
CA	16,430,660	1,307,860	7.96%	224,098	17.13%	0.35%
CO	2,578,000	244,390	9.48%	20,884	8.55%	0.43%
FL	8,441,750	427,060	5.06%	20,935	11.60%	0.12%
GA	4,308,600	272,580	6.33%	7,958	2.92%	0.15%
IL	5,627,670	337,880	6.00%	11,329	3.35%	0.19%
KS	1,331,960	79,110	5.94%	1,342	1.70%	0.13%
MD	2,523,030	256,930	10.18%	40,301	15.59%	0.75%
ME	575,230	30,010	5.22%	2,676	8.92%	0.23%
MN	2,708,760	199,150	7.35%	16,375	8.22%	0.21%
MO	2,691,620	156,370	5.81%	5,334	3.41%	0.13%
NJ	3,782,740	264,950	7.00%	30,488	11.51%	0.49%
NY	8,691,440	489,030	5.63%	1,410	7.80%	0.21%
PA	5,512,120	350,520	6.36%	1,190	8.98%	0.32%
TX	12,102,370	811,360	6.70%	1275	4.22%	0.17%
WI	2,709,940	167,970	6.20%	13,834	8.24%	0.21%
US Total	142,628,620	9,539,180	6.69%	883,460	9.26%	0.09%

(1) and (2) US Department of Labor: Bureau of Labor Statistics 2020

Note 1: Tracking by Innovation Development Institute (idi) of SBIR-STTR employment is by range: small for lower ranges (1-4; 5-9 etc): large for limited number of larger firms (250-499). Firms exceeding SBIR Size standards (500 employees) designated 500+ (not small). Except for those Awardees recently SBIR-STTR graduated - and then only for employment numbers at time of last award - latter not factored into estimated employment numbers

3. Calculation from Innovation Development Institute, LLC, Swampscott, MA SBIR-STTR tracking systems 2021



Data on this slide specific to states represented on US House of Representatives Small Business Committee May 2021. Anchored in comprehensive, complex (proprietary) SBIR-STTR impact data by arrange of variables assembled and managed by Innovation Development, Swampscott, MA since soon after passage of original SBIR enabling legislation in 1983.
 * SBIR firms are universally tiny percentage of any State's business establishments
 * BUT often represent important percentage of STEM job employment in that state

Analysis of extent to which SBIR-STTR Awardees by State (and overall) are factor in US STEM employment							
State	Total State employment ¹	STEM Jobs in state (2020) ²	STEM employment as % total	Total SBIR-STTR Awardees	SBIR-STTR employment ³ (Note 1)	SBIR related STEM employment	% all US STEM jobs
AK	296,300	19,710	6.65%	37	1213	6.15%	0.21%
AL	1,903,210	112,570	5.91%	351	19436	17.27%	1.18%
AR	1,177,860	48,220	4.09%	90	618	1.28%	0.51%
AZ	2,835,100	193,370	6.82%	481	10410	5.38%	2.03%
CA	16,430,660	1,307,860	7.96%	5724	224098	17.13%	13.71%
CO	2,578,000	244,390	9.48%	954	20884	8.55%	2.56%
CT	1,540,870	113,190	7.35%	394	12596	11.13%	1.19%
DC	687,150	72,750	10.59%	135	3539	4.86%	0.76%
DE	426,380	28,710	6.73%	90	2055	7.16%	0.30%
FL	8,441,750	427,060	5.06%	899	20935	4.90%	4.48%
GA	4,308,600	272,580	6.33%	457	7958	2.92%	2.86%
HI	574,010	28,340	4.94%	116	1689	5.96%	0.30%
IA	1,469,920	81,590	5.55%	169	3410	4.18%	0.86%
ID	718,820	44,080	6.13%	100	2349	5.33%	0.46%
IL	5,627,670	337,880	6.00%	732	11329	3.35%	3.54%
IN	5,627,670	337,880	6.00%	327	5356	1.59%	3.54%
KS	1,331,960	79,110	5.94%	120	1342	1.70%	0.83%
KY	1,782,580	80,010	4.49%	183	1901	2.38%	0.84%
LA	1,801,290	69,150	3.84%	122	4414	6.38%	0.72%
MA	3,349,800	320,080	9.56%	2258	100415	31.37%	3.36%
MD	2,523,030	256,930	10.18%	1295	40301	15.69%	2.69%
ME	575,230	30,010	5.22%	126	2676	8.92%	0.31%
MI	3,924,010	291,370	7.43%	707	15466	5.31%	3.05%
MN	2,708,760	199,150	7.35%	393	16375	8.22%	2.09%
MO	2,691,620	156,370	5.81%	290	5334	3.41%	1.64%
MS	1,076,810	38,200	3.55%	66	1448	3.79%	0.40%
MT	455,450	25,760	5.66%	124	2422	9.40%	0.27%
NC	4,288,450	291,450	6.80%	711	15434	5.30%	3.06%
ND	400,040	17,750	4.44%	38	1858	10.47%	0.19%
NE	942,550	56,440	5.99%	80	1327	2.35%	0.59%
NH	619,430	47,970	7.74%	213	10836	22.59%	0.50%
NJ	3,782,740	264,950	7.00%	776	30488	11.51%	2.78%
NM	785,720	52,690	6.71%	349	8396	15.93%	0.55%
NV	1,250,860	48,330	3.86%	99	2362	4.89%	0.51%
NY	8,691,440	489,030	5.63%	1410	34603	7.08%	5.13%
OH	5,137,540	307,910	5.99%	923	23090	7.50%	3.23%
OK	1,562,780	81,190	5.20%	137	3778	4.65%	0.85%
OR	1,806,950	131,590	7.28%	386	11778	8.95%	1.38%
PA	5,512,120	350,520	6.36%	1190	31485	8.98%	3.67%
PR	819,750	36,430	4.44%	24	219	0.60%	0.38%
RI	442,900	28,730	6.49%	122	4574	15.92%	0.30%
SC	2,015,260	102,520	5.09%	166	2658	2.59%	1.07%
SD	411,250	20,380	4.96%	63	830	4.07%	0.21%
TN	2,903,810	150,610	5.19%	284	6422	4.26%	1.58%
TX	12,102,370	811,360	6.70%	1275	34253	4.22%	8.51%
UT	1,489,020	113,790	7.64%	376	11019	9.68%	1.19%
VA	3,701,220	353,730	9.56%	1304	66447	18.78%	3.71%
VT	281,070	16,440	5.85%	84	1566	9.53%	0.17%
WA	3,195,200	340,330	10.65%	796	24018	7.06%	3.57%
WI	2,709,940	167,970	6.20%	388	13834	8.24%	1.76%
WV	650,010	28,690	4.41%	52	1342	4.68%	0.30%
WY	261,690	12,060	4.61%	69	874	7.25%	0.13%
US	142,628,620	9,539,180	6.69%	28055	883460	9.26%	100.00%

**2020
Tibbetts Award
Recipient for Top
Organization
& Individual!**

OK CATALYST

SPARK OPPORTUNITY. IGNITE CHANGE.

AN OFFICE OF THE TOM LOVE INNOVATION HUB
THE UNIVERSITY OF OKLAHOMA

We're Committed to Transforming Oklahoma Into a Leader of Innovation & Technology!

Through a mix of training, networking, and mentoring we help founders leverage the SBIR/STTR programs to launch new products and grow their business.

Our Programs Offer A Comprehensive Approach to Using SBIR Funding, Not Just Winning It!

We guide companies through every step of the proposal process, from solicitation matching to the art of competitive writing. We also provide technical and business assistance to maximize their startup success.

ROADMAP
From Lab to Market
A crash course in technology commercialization for faculty & grad students at Oklahoma's universities & research institutions.

ACCELERATOR
Setting Innovation in Motion
Intensive 8-week course focused on the DoD, NASA, and NSF SBIR/STTR programs, open to all entrepreneurs in the Heartland.

ENDEAVOR
Now, Go Forth & Conquer!
Business mentorship & commercialization support for Phase I & II SBIR/STTR awarded companies & owners.


21
FIRST TIME EVER
AWARDEES

4X
THE NATIONAL
AVERAGE WIN RATE


16M
TOTAL FUNDING
SECURED

55
JOBS CREATED
SINCE 2017

OK CATALYST'S IMPACT SINCE 2017

- 

Climbed 7 Spots in SBIR/STTR Rankings!
Oklahoma's performance with the SBIR/STTR programs has historically been subpar. Since launching OK Catalyst in 2017, Oklahoma has advanced from #46 to #39, according to the FAST FOA announcements for FY22 and FY17.
- 

Doubled Oklahoma's Annual SBIR Awards!
From 1982-2016, Oklahoma received ~12 SBIR/STTR awards annually. In 2019, 21 Oklahoma companies won SBIR/STTR awards. When complete data is available for the calendar year 2020, we anticipate that number to increase.
- 

Tripled DoD SBIR/STTR Performance!
OK Catalyst has focused on improving DoD SBIR/STTR performance in Oklahoma since 2017, and that focus has resulted in a dramatic improvement in the number of companies winning DoD awards and the total amount of DoD SBIR/STTR award dollars coming to Oklahoma.

15
STATES
CONNECTED

125
OUTREACH
EVENTS

400
TRAINING
OPPORTUNITIES

5K
FUTURE FOUNDERS
MENTORED



Montana Innovation Partnership

powered by TechLink

Growing Montana's Innovation Economy

The Montana Innovation Partnership (MTIP) powered by TechLink is a cooperative partnership between Montana State University TechLink, a center within the Office of Research, Economic Development, and Graduate Education, the Montana Department of Commerce, and the U. S. Small Business Administration through the Federal and State Technology (FAST) program.

We help early-stage tech founders and researchers learn about and compete for SBIR/STTR seed funding through outreach, training, business and technical assistance, and collaboration with university, industry, and economic development partners.

Expert SBIR/STTR Assistance and Collaboration

Clients receive tailored no-cost expert consulting, coaching, and mentoring designed to ensure that SBIR is right for their business, to help them identify agencies and funding opportunities, provide guidance on building their team, protecting their intellectual property, customer discovery, commercialization of new technologies, and in-depth proposal preparation guidance and reviews.

SINCE 2018

45%

APPLICATION SUCCESS

12

FIRST TIME
AWARDEES

35%

OF CLIENTS ARE
UNDERREPRESENTED
SMALL BUSINESSES

\$20M

SBIR/STTR FUNDING TO
CURRENT MTIP CLIENTS

A HISTORY OF INNOVATION

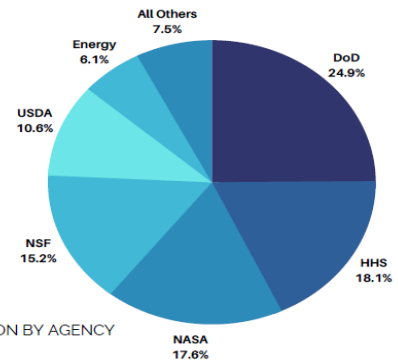
82%

of all Montana SBIR/STTR awardees have received assistance from MTIP/TechLink in the past 21 years

Montana has one of the nation's top **photonics** clusters, a rapidly growing **bioscience** cluster, and cutting-edge research in **agriculture**, **energy**, and **software**. Sectors that drive innovations addressing our nation's technology needs.

Montana small businesses have received **over \$233 million** in SBIR/STTR funding since the inception of the program.

SBIR/STTR seed funding has allowed over **110 Montana small businesses** to launch, scale, and, for many, attract talent and investment capital to the state.



MONTANA SBIR/STTR AWARD DISTRIBUTION BY AGENCY



Worldwide Jobs Added by Big Tech Firms

- SBIR Firms employ over 3X as many American workers than the Google, Cisco, Microsoft, and Apple combined

Employer	Worldwide	References
Google	135,000	https://www.statista.com/statistics/273744/number-of-full-time-google-employees/
Cisco	75,900	https://www.bing.com/search?q=number++of+jobs+at+cisco&qsn&form=QBRE&sp=-1&pq=number+of+jobs+at+cisco&sc=1-23&sk=&cvid=B540C9D3394D4896AD166A44D47FC0AA
Microsoft	175,508	http://news.microsoft.com/facts-about-microsoft/#EmploymentInfo
Apple	80,000	http://www.apple.com/about/job-creation/
Total	466,400	
SBIR Firms	1,508,295 All in US	DOD Economic Impact Study Pg 2



Appendix B

State-by-State SBIR/STTR Figures for House Small Business Committee

California		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	1142	\$561,652,660
2017	1256	\$636,593,030
2018	1111	\$634,459,886
2019	1407	\$730,461,896
2020	1426	\$800,778,016
<i>2016-2020</i>	<i>6342</i>	<i>\$3,363,945,488</i>

Georgia		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	67	\$30,106,675
2017	72	\$41,806,209
2018	58	\$42,136,962
2019	97	\$52,429,524
2020	90	\$55,463,493
<i>2016-2020</i>	<i>384</i>	<i>\$221,942,863</i>

Colorado		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	103	\$117,195,547
2017	126	\$115,208,773
2018	130	\$143,951,628
2019	159	\$165,647,584
2020	177	\$159,436,415
<i>2016-2020</i>	<i>695</i>	<i>\$701,439,947</i>

Illinois		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	137	\$59,315,299
2017	137	\$59,186,158
2018	126	\$69,659,960
2019	159	\$70,261,176
2020	145	\$77,194,992
<i>2016-2020</i>	<i>704</i>	<i>\$335,617,585</i>

Florida		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	153	\$62,352,880
2017	176	\$75,328,717
2018	177	\$84,842,189
2019	211	\$119,737,967
2020	200	\$94,615,785
<i>2016-2020</i>	<i>917</i>	<i>\$436,877,538</i>

Kansas		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	9	\$5,930,196
2017	14	\$6,549,569
2018	22	\$6,914,915
2019	21	\$8,003,117
2020	24	\$9,679,956
<i>2016-2020</i>	<i>90</i>	<i>\$37,077,753</i>

Maine		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	10	\$4,073,289
2017	6	\$4,001,371
2018	9	\$3,940,878
2019	9	\$3,426,856
2020	14	\$5,313,216
<i>2016-2020</i>	<i>48</i>	<i>\$20,755,610</i>

Missouri		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	40	\$17,554,613
2017	44	\$23,364,320
2018	60	\$27,263,342
2019	62	\$31,680,401
2020	56	\$30,876,151
<i>2016-2020</i>	<i>262</i>	<i>\$130,738,827</i>

Maryland		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	129	\$134,642,799
2017	142	\$141,846,940
2018	142	\$148,513,218
2019	169	\$174,584,237
2020	194	\$184,664,077
<i>2016-2020</i>	<i>776</i>	<i>\$784,251,271</i>

New Jersey		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	122	\$56,448,477
2017	121	\$60,681,490
2018	101	\$49,584,048
2019	146	\$71,147,862
2020	128	\$61,782,493
<i>2016-2020</i>	<i>618</i>	<i>\$299,644,370</i>

Minnesota		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	79	\$37,954,870
2017	97	\$50,338,415
2018	78	\$43,648,405
2019	96	\$62,420,237
2020	77	\$53,046,237
<i>2016-2020</i>	<i>427</i>	<i>\$247,408,164</i>

New York		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	138	\$120,006,502
2017	140	\$128,829,304
2018	161	\$133,225,262
2019	199	\$151,609,724
2020	236	\$184,930,318
<i>2016-2020</i>	<i>874</i>	<i>\$718,601,110</i>



Pennsylvania		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	214	\$103,906,671
2017	225	\$115,866,142
2018	234	\$133,826,901
2019	260	\$153,940,871
2020	273	\$161,473,794
<i>2016-2020</i>	<i>1206</i>	<i>\$669,014,379</i>

Texas		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	257	\$109,389,808
2017	269	\$121,038,248
2018	254	\$124,272,219
2019	356	\$154,011,974
2020	370	\$160,150,260
<i>2016-2020</i>	<i>1506</i>	<i>\$668,862,509</i>

Wisconsin		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	38	\$24,738,699
2017	45	\$22,629,539
2018	51	\$25,406,240
2019	54	\$26,396,981
2020	39	\$27,153,808
<i>2016-2020</i>	<i>227</i>	<i>\$126,325,267</i>



Appendix C

HISTORY OF THE SBIR PROGRAM

SMALL BUSINESS INNOVATION RESEARCH (SBIR) PROGRAM

1982 Establishment of SBIR: 'Small Business Innovation Development Act of 1982' (P.L. 97-219, S. 881, July 22, 1982)

The federal SBIR program was created more than 25 years ago out of growing concern since the 1960s that, despite the increasing prominence of small businesses in innovation, federal research and development expenditures had disproportionately been awarded to large businesses, colleges, universities, and federally funded research and development centers. As a result, in 1976, Roland Tibbetts, at the National Science Foundation (NSF), took the lead in directing a greater and more significant share of its extramural research and development funds to small business in a new innovation and research program, with a focus on discovering, funding, and evaluating the initial, highest-risk, most cutting-edge exploratory research that is necessary to achieve significant technological innovations and breakthroughs. The purpose was to make small but sufficient awards to test as many ideas as possible. The program at NSF led policymakers to consider taking further steps to unleash the innovative potential of small businesses. 5

[Footnote] On August 9 and 10, 1978, the House and Senate Committees on Small Business held a joint hearing on the underutilization of small businesses in American innovation. There was a clear consensus that small businesses deserved a greater share of federal research and development funds, not only because of the innovative and development successes of small firms, but also because of their achievements in job creation and cost efficiency and their powerful contribution to the greater science and technology communities. The 1980 White House Conference on Small Business echoed these sentiments and recommended legislation to expand the NSF concept to other agencies. 6

[Footnote] The end result of the recommendation was the Small Business Innovation Development Act of 1982, which first authorized the SBIR program (P.L. 97-219, S. 881, July 22, 1982). The bill was introduced by Senator Warren Rudman (R-NH), and had 84 cosponsors, 12 of whom are still serving in the Senate. 7

[Footnote] Senator Snowe, then serving in the House of Representatives, was an original co-sponsor of the SBIR legislation adopted in 1982. The Act creating SBIR had four objectives:

[Footnote 5: Joint Hearings before the U.S. Senate Select Committee on Small Business and the U.S. House of Representatives Subcommittee on Antitrust, Consumer and Employment and Subcommittee on Energy, Environment, Safety and Research of the Committee on Small Business, 'Underutilization of Small Business in the Nation's Efforts to Encourage Industrial Innovation,' 99th Cong. (1978) (Transcript of the two-day proceedings).]

[Footnote 6: National Research Council, *SBIR Challenges and Opportunities*, 1999.]



[Footnote 7: Senators who cosponsored P.L. 97-219 and still serve in the Senate: Max Baucus; Robert C. Byrd; Thad Cochran; Christopher Dodd; Chuck Grassley; Orrin G. Hatch; Daniel K. Inouye; Edward M. Kennedy; Patrick J. Leahy; Carl Levin; Richard G. Lugar; and Arlen Specter.]

1. To stimulate technological innovation;
2. To use small business to meet federal research and development needs;
3. To foster and encourage participation by minority and disadvantaged persons in technological innovation; and
4. To increase private sector commercialization of innovation derived from federal research and development.

The intent of the 1982 Act and the original NSF program was not for the SBIR program to be merely a commercialization program. Small businesses in SBIR were designed to be vehicles for fulfilling the priority research needs of federal agencies and the nation at large while stimulating local economies. Further, as mentioned earlier, the program was designed to fund as many ideas as possible, rather than to take only a few ideas from concept to market or insertion into a government product or technology. The allocation of funds for SBIR in its first year of existence totaled \$45 million, or 0.2 percent of the extramural research and development budgets of federal agencies that had extramural research and development budgets that exceeded \$100 million. Per P.L. 97-219, the allocation was gradually increased over six years, until the final mandated allocation for SBIR of 1.25 percent was reached. Modeled after the NSF program, the program was structured in three phases. Phase I awards were modest and capped at \$50,000 and were meant to test the feasibility of an idea or product. Phase II awards, capped at \$500,000, were meant to be used to begin product development and prototyping. In Phase III, the graduation stage of SBIR, small businesses were to obtain outside funding, whether private funding or non-SBIR federal funding, to continue development toward a commercial product or products or systems to further the mission of an agency.



Appendix D

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 Economic Impact

Dollar amounts in millions

Awards and Sales	DOD ('95-'12)	NCI ('98-'10)
Total SBIR/STTR Award Investment	\$14,400	\$787
Rate of Commercialization	58%	53%
Cumulative Sales	\$121,000	\$9,144
Sales to Investment Ratio	\$8.4:1	\$11.6:1
Military Sales	\$28,000	---
Military Sales % of Total	23%	---
Follow-on R&D	\$15,200	\$957
Follow-on R&D to Investment Ratio	\$1.1:1	\$1.2:1
Total Acquisition Value of Acquired Firms	\$35,600	\$21,630
Acquired Firms Value to Investment Ratio	\$2.5:1	\$27.5:1
Total Outside Investment Funding	\$9,500	\$4,260
Outside Investment to SBIR Investment Ratio	\$0.7:1	\$5.4:1

¹ <https://ec.europa.eu/programmes/horizon2020/en/area/smes>

² [Jean Baptiste Su](https://www.forbes.com/sites/jeanbaptiste/2018/01/17/france-creates-13-billion-disruptive-innovation-fund-hopes-to-become-the-next-startup-republic/#62fcc8e5405e), France Creates \$13 Billion Disruptive Innovation Fund, <https://www.forbes.com/sites/jeanbaptiste/2018/01/17/france-creates-13-billion-disruptive-innovation-fund-hopes-to-become-the-next-startup-republic/#62fcc8e5405e>

³ Association of University Technology Managers (AUTM), *FY2016 AUTM US Licensing Activity Survey*, 2018

⁴ <http://innovator.co/> Beijing Institute of Collaborative Innovation (BICI)

⁵ Swearingen, Will and Jeffrey Peterson, "National Economic Impacts from the DOD SBIR/STTR Programs 1995-2018" Techlink, 2019

⁶ <http://www.inknowvation.com/sbir/about-us#sthash.YfqTc7qg.dpuf>

⁷ <https://ec.europa.eu/programmes/horizon2020/en/area/smes>

⁸ US = 3,797,000 mi². Singapore = 281.2 mi².