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EXPLORING SBA PROGRAMS: REVIEWING THE SBIC AND SBIR PROGRAMS' IMPACT ON SMALL BUSINESSES

HEARING

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OF THE

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EXPLORING SBA PROGRAMS: REVIEWING THE SBIC AND SBIR PROGRAMS' IMPACT ON SMALL BUSINESSES

TUESDAY, APRIL 16, 2024

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SMALL BUSINESS,
SUBCOMMITTEE ON ECONOMIC GROWTH,
TAX, AND CAPITAL ACCESS,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:12 a.m., in Room 2360, Rayburn House Office Building, Hon. Daniel Meuser [chairman of the Subcommittee] presiding.

Present: Representatives Williams, Meuser, Landsman, Chu, and Davids.

Chairman MEUSER. Okay. Ladies and gentlemen, we are ready to get going in our Small Business Committee hearing.

Before we bang the gavel and being our proceedings, I want to recognize the Chairman of the full committee, Roger Williams, to lead us in the pledge and the prayer.

Mr. WILLIAMS. Please rise.

Heavenly Father, God of all people, thank you for allowing us to be here today to do what we can to preserve the greatest country in the world we love to call the United States of America. Let us remind of the Book of Romans. It says we all bring different things to the table. We all have opportunities to do great things, put it together and make it work. But you have to come to the table. I hope we do that today. In your name, we pray. Amen. Join me in the pledge.

I pledge allegiance to the flag of the United States of America and to the Republic for which it stands, one nation under God, indivisible, with liberty and justice for all.

Chairman MEUSER. Thank you, Mr. Chairman.

So, good morning, everyone. We now call the Committee on Small Business to order.

Without objection, the Chair is authorized to declare a recess of the committee at any time.

I now recognize myself for my opening statement.

Again, we want to welcome everyone to today's hearing, including the Ranking Member. And, first, I do want to thank our witnesses for joining us here today. Your time is very much appreciated, and we look forward to your testimonies.

Today, our committee, the Subcommittee on Economic Growth, Tax, and Capital Access, will focus on the current function and fu-

ture of the both the SBIC and SBIR programs. Unlike large corporations, small businesses don't share the luxury of utilizing debt and equity markets for financing. Main street is instead forced to bridge the funding gap and utilize resources like SBIC programs where federal funding is matched with experienced private investors at no risk to the American taxpayer.

An SBIC is a privately owned company that is licensed and regulated by the SBA. SBIC has raised capital to invest in small businesses in the form of debt and equity. The SBA doesn't invest directly into small businesses, but it does provide matching funds in the form of loans to qualify at SBICs with expertise in certain sectors or industries. Those SBICs then use their private funds, along with the SBA guaranteed loan, to invest in small businesses.

Through the SBIR and STTR programs, main street is also given the ability to develop and commercialize new products from both government and private sector. For example, SBIR works by infusing federal R&D dollars in phases to small businesses, developing new ideas that align with the needs of the federal agency.

Federal agencies can offer SBIR and STTR awards by either requesting a product that meets specific requirements or by an open topic in which small businesses propose innovative solutions to meet an agency's mission. The flexibility of open topics allows small businesses to propose new solutions that help agencies meet their mission.

The access to and utilization of these two programs is essential to helping many small businesses navigate economic challenges set upon them by Bidenomics and some what one might describe as wasteful, excessive government spending. As we know, it is more expensive than ever to do business because of high interest rates, persistent inflation, and newly proposed banking regulations, such as Basel III, which have forced banks, as we speak, of all sizes to tighten commercial lending standards.

In order to ensure small businesses have continued access to capital, this committee must work to reauthorize the SBIR and STTR programs expiring at the end of next September. Our first duty is to address challenges within the program and explore various solutions that were left on the table during the program's last reauthorization.

As leading voices for main street, it is our job to work to ensure our nation's job creators have an economic and regulatory environment they cannot only survive but thrive in. Reauthorization is crucial but not without necessary adjustments regarding flaws, like the current CCP infiltration into the SBIR program.

During 2022 SBIR and STTR reauthorization, Democrats did not consider the threat China posed in the SBIR, STTR as a serious concern. Republicans successfully fought to combat Chinese infiltration by requiring agencies to develop a due diligence program. While this program has since assessed security risks, Congress has an opportunity to address weaknesses in the due diligence efforts as their effectiveness is further evaluated.

As we look to the future of the SBIC and the SBIR and STTR programs, one thing remains abundantly clear: We must continue to fight for main street and work to empower our job creators with commonsense, regulatory relief, and reliable methods of access to

capital. These businesses, especially those developing innovative products for federal agencies, work to advance everything from our national security to our education system. We rely on them and their innovation to ensure the U.S. remains a global leader for products across the board. Prioritizing their success and continually motivating their output is essential to America's continued advancement.

With that, I will now yield to our Ranking Member, Mr. Landsman.

Mr. LANDSMAN. Thank you, Mr. Chair, and thank you for holding this very important hearing.

And thank you to all of our guests for being here. Your time is very important, and we truly appreciate your perspective and advice.

The hearing really couldn't have come at a better time. We are seeing a record surge in new startup activity, and it is happening at this really important point in our nation's history. We are working, as the Chair said, to evaluate, reevaluate, in some instances, the role of our startups in the global supply chain and the way in which we source products that are critical to our economy and our national security.

We all know that innovation is a catalyst for economic growth and resilience, and oftentimes the most innovative ideas come from our startup communities. However, these startups often struggle to grow their ideas and be part of the economy because they just don't have the capital that they need. It takes time and money to turn their innovations into real products.

To help, we have prioritized investing in these new startups through important programs at the SBA. The SBA's office of investment and innovation houses two of these programs that we are talking about, the SBIC and the SBIR. Together, these programs help startups research and develop new products and help high-growth companies and disadvantaged communities access private equity capital to grow and scale their businesses.

Let's start with the SBIR program, which creates this partnership between federal agencies and startups to develop technologies to support our economy and national security. This program uses a small percentage of research and development spending through highly competitive grants. This program has helped startup businesses like 23andMe, Sonicare, LASIK, and could bring many more promising ideas to the marketplace.

In the fiscal year 2020 alone, these programs backed more than 4,000 small businesses and 7,200 projects. But developing technology is only the first step as many businesses with great products face other reasonable barriers to funding. That is why Congress created the SBIC program in 1958 to enhance small business access to patient capital.

Under this program, the SBA works with and licenses private institutions to provide financing to small, high-growth companies. In the past, these investments have acted, believe it or not, as a lifeline to firms that have changed the course of history, companies like Apple, Costco, Federal Express, and Intel. Now there are over 300 SBICs. In 2023, they provided $8 billion to over 1,200 startups. This helped create and keep more than 130,000 jobs.

Despite the overwhelming success of these programs, some modernizations need to be made. Just last year, the SBA finalized the SBIC investment diversification and growth rule. The rule updated the program and created two new types of SBICs to create greater flexibility in investment repayment opportunities for firms that may not have fit under the traditional rules.

We are also just over a year away from another reauthorization of the SBIR program. It is my hope that we work together in a bipartisan fashion to address gaps in the program like better serving women and minority owned businesses that have unfortunately been left out of the program in the past.

Once again, I would like to thank the Chairman for holding these hearings, as well as the witnesses for being here today. I look forward to a productive conversation about the state of these programs and hearing ideas to strengthen them, and I yield back.

Chairman MEUSER. Ranking Member yields back.

I now recognize the Chairman of the full committee from the great State of Texas, Chairman Roger Williams, for an opening statement.

Mr. WILLIAMS. Well, thank you, Mr. Chairman.

And good morning to everyone here today. I want to thank Chairman Meuser for holding today's subcommittee hearing that will examine the impact and effectiveness of the SBIC and the SBIR programs.

Main street. Main street is faced with a continuing disadvantage when it comes to accessing capital. With burdens and regulations and high interest rates, banks are being forced to tighten their lending standards, and when this happens, small businesses are often the ones forced to pay the higher price to much needed funds. This is where the SBA steps up to fill these gaps. Through the SBIC and the SBIR programs, main street is able to access funds that will help them grow and expand their operations. These programs have proven to be successful for a wide variety of businesses in almost every industry.

As the authorizing committee of both of these programs, it is our duty to evaluate what is working and what could be done better to ensure that they are helping as many entrepreneurs as possible. I am looking forward to hearing directly from our witnesses today and appreciate all of them being here so we can learn from their firsthand experiences in navigating the SBIC and the SBIR programs. So I want to thank all of our witnesses for being here, for coming here on your own time, and to be with us.

And, with that, I yield back the balance of my time.

Chairman MEUSER. Thank you, Chairman.

I will now introduce our witnesses. Our first witness here with us today is Mr. Angelo Valletta. Mr. Valletta is the president and CEO of Ben Franklin Technology Partners of Northeastern Pennsylvania—I know that neck of the woods a little bit—located in Bethlehem, Pennsylvania. Since 2021, Mr. Valletta has been with Ben Franklin Technology Partners of Northeastern Pennsylvania, which provides investment capital and business support services to both technology startups and established manufacturers.

Prior to his current position, Mr. Valletta held several executive leadership roles at FIS Global, one of the largest fintechs in the

world. He also served as senior vice president and chief bank operations and information officer at Sun National Bank. Mr. Valletta earned his bachelor of business administration from the Fox School of Business at Temple University before going onto his master of business administration from Philadelphia university.

Thank you for joining us here today.

Mr. VALLETTA. Thank you, Mr. Chairman.

Chairman MEUSER. Our next witness is Ms. Amanda Bresler. Ms. Bresler is the chief strategy officer of PW Communications, located in Rockville, Maryland. PW Communications provides full-service proposal preparation, contract performance, and strategic business development support to companies. At PW Communications, Ms. Bresler has used government data to analyze the impact of federal procurement programs, including SBIR on small businesses.

Ms. Bresler currently serves as the global board of directors for AlmaLinks, a global community that connects Jewish CEOs, founders, and seasoned executives to business leaders from Israel and around the world. Ms. Bresler attended the Georgetown University McDonough School of Business, from which she earned her degree in marketing.

Thank you for joining us here today.

Our next witness with us is Mr. Brett Palmer. Mr. Palmer is the president of the SBIC Alliance, Small Business Investor Alliance, located here in Washington. For over 15 years, Mr. Palmer has served as president of the Small Business Investor Alliance, which does represent a variety of funds investing in American private small businesses, including the SBIC companies and private equity funds.

Prior to his current position, Mr. Palmer was managing director of government relations for the National Association of Insurance Commissioners, as well as an Assistant Secretary of Legislative and Government Affairs and Deputy Assistant Secretary for Trade Legislation in the U.S. Department of Commerce. Mr. Palmer was recently appointed to the Small Business Administration's Investment Capital Advisory Committee. Mr. Palmer earned his degree in history from Davidson College.

Thank you very much for joining us today.

I now recognize the Ranking Member from Ohio, Mr. Landsman, to briefly—you don't have to be so brief—but introduce our last witness appearing before us today.

Mr. LANDSMAN. Thank you, Mr. Chairman.

Our final witness today is Mr. Jere Glover, the executive director of the Small Business Technology Council, SBTC, a trade association of small, high-tech companies, most of whom are involved in the Small Business Innovation Research, or SBIR, Program. Mr. Glover is considered one of the fathers of the SBIR program. As counsel to the House Small Business Committee, he directed and organized a set of hearings on small business and innovation that led the groundwork for the program in 1978. Throughout the law's existence, he has been one of its most active supporters.

Mr. Glover has a unique blend of public and private sector experience. For more than 6 years, he was the federal government's lead defender of small businesses in the regulatory process in the

private sector. He has been the CEO or principal of a biotech company, a medical technology company, and a group of medical clinics. He obtained his undergraduate and law degrees from the University of Memphis and an LLM in administrative law and economic regulation from George Washington University.

Thank you, Mr. Glover. We look forward to your testimony.

Chairman MEUSER. Well, before recognizing the witnesses for your opening statements, I would like to remind you all that your oral testimony is restricted to 5 minutes in length. If you see the light turn red in front of you, it means your 5 minutes have concluded and you should wrap up your testimony. If you start hearing this, it means you should really consider wrapping it up, because I don't want to have to wrap this too hard, all right.

I do now recognize Mr. Valletta for his 5-minute opening remarks.

STATEMENTS OF ANGELO VALLETTA, PRESIDENT AND CEO, BEN FRANKLIN TECHNOLOGY PARTNERS OF NORTHEASTERN PENNSYLVANIA; AMANDA BRESLER, CHIEF STRATEGY OFFICER, PW COMMUNICATIONS; BRETT PALMER, PRESIDENT, SMALL BUSINESS INVESTOR ALLIANCE (SBIA); AND JERE W. GLOVER, EXECUTIVE DIRECTOR, SMALL BUSINESS TECHNOLOGY COUNCIL (SBTC).

STATEMENT OF ANGELO VALLETTA

Mr. VALLETTA. Good morning, Chairman Williams, Chairman Meuser, and the esteemed Members of the subcommittee. I am Angelo Valletta, president and CEO of Ben Franklin of Northeastern Pennsylvania and Chair of the Ben Franklin Technology Partners. I am honored to be here today to testify today about the SBIR and SBIC programs' impact.

Ben Franklin has been investing in supporting early-stage, technology-focused startups, innovative manufacturers, and technology incubators for over 40 years and generates $4 for every $1 invested and has supported SBIR and SBIC programs for many years. These programs are often referred to as America's seed fund. These programs are a valuable source of capital to help small businesses commercialize research into useful, launchable products and services.

Ben Franklin has supported these companies through our statewide program called Innovation Partnership, IPart for short. Pennsylvania companies have been successful in leveraging SBIR programs with PA ranking seventh among participating States. PA's IPart assists primarily first-time SBIR applicants and has a 28-percent success rate versus the national average of 18 percent. Our relationship with SBIC program is program in partnership with licensed SBIC firms. We have invested in SBICs, evaluated SBIC licenses, and leveraged separate for-profit funds.

Regulations have limited the use of the SBIC program for early-stage investments. We believe the SBIR and SBIC programs are valuable resources to grow small businesses that translate into highly paid sustainable jobs for the communities that we serve.

SBICs use a rigorous analysis of managers' backgrounds and investing experience and an evaluation of the fund's investment the-

sis, strategy, and structure. The application process to secure an SBIC license can be lengthy and difficult, but it has many benefits. Pennsylvania's SBICs have invested in 84 PA companies in the last 15 years. Of these investments, 81 were at mezzanine, debt, private equity, or other later-stage capital facilities, but only three deals by the same investor were in early-stage funds.

Last year, SBA overhauled aspects of the SBIC capital regulations. SBA made several positive revisions to renew the approval process for new SBIC applicants, such as expanding capital, considering the fund's management team's expertise in capital activity, are open to smaller SBIC investments, and, finally, have lowered its fees and streamlined the committee review for newer program applicants. These positive reforms are significant improvements to the SBIC program, and as such, Ben Franklin is considering an SBIC license for its GO PA Fund.

Ben Franklin is happy to see SBA implementing the alternative funding structures to supply additional capital for early-stage indexing. However, several hurdles remain: SBICs are required to be for-profit; the size of over 3 million can still be a challenge; and, finally, the limitation of leverageable capital could be better defined.

SBIR and STTR programs are referred to as the nation's largest source of early-stage, high-risk funding for startups and small businesses. Again, PA ranking seventh in the amount of SBIRs awarded annually—in the last 5 years, over 1,200 companies receive Phase I and Phase II awards, totaling nearly $850 million in funding, and the Ben Franklin network investing in nearly 25 percent of them, with 27 invested by our IPart program.

There is merit to having the SBIR and STTR awards distributed by a rigorous proposal process, but there is some room for improvement. With over 20 years of assisting small businesses seeking awards, IPart assists many clients submitting proposals for funding. SBIR and STTR agencies could require a similar preliminary, Phase I, presubmission, project-focused document for agency-specific vetting and could be standardized to streamline the application experience and to avoid duplicate proposal submission.

Furthermore, SBA could coordinate solicitation registration requirements and timing of feedback for a single information channel that would significantly enhance the experience of companies seeking awards, increase the number of companies seeking SBIR and STTR awards, and would likely improve the submissions' quality.

I thank you for your time, and I look forward to your questions.

Chairman MEUSER. Thank you very much.

We now recognize Ms. Bresler for her 5-minute opening remarks.

STATEMENT OF AMANDA BRESLER

Ms. BRESLER. Chairman Williams, Chairman Meuser, Ranking Member Landsman, and Members of the subcommittee, thank you for the opportunity to testify today. My name is Amanda Bresler, and I am the chief strategy officer for PW Communications. My firm has won SBIR awards from the Department of Defense, and I have published five independent research papers analyzing the impact of federal procurement policies, including the SBIR program, on small businesses.

The SBIR program is marketed as a way for innovative small businesses to break into the public sector, yet most SBIR funding goes to existing government contractors. Task a group of the world's most accomplished entrepreneurs with identifying and responding to a Phase I, and you will understand why. The process is so arcane that, irrespective of IQ or business acumen, it is nearly impossible for an outsider to navigate.

Many small businesses forego SBIR entirely. Others hire SBIR advisory firms to manage the process in exchange for a percentage of the award funding. It is also why a handful of companies win the lion's share of SBIRs. A recent GAO report showed that a mere 22 companies, less than 1 percent of all SBIR participants, won more than $3 billion in SBIR funding between 2011 and 2020, roughly 10 percent of the entire SBIR budget.

The program is designated for small businesses, yet some of these entrenched SBIR companies generate hundreds of millions in government contracting revenue annually, and some are even publicly traded. Both we and the GAO found that these entrenched SBIR companies don't necessarily transition at higher rates. One firm we analyzed won over $320 million in Phase I/Phase II funding and has generated only $10 million in Phase IIIs.

The SBIR program isn't held accountable for meeting explicit intragovernmental transition goals. So these large SBIR companies that understand the system aren't incentivized to transition; they are incentivized to pursue more SBIRs. However, for the truly small companies that do manage to break into the program, it is often with the expectation that good performance will translate into follow-on government contracts. Yet the program rarely positions them for success in the broader federal market. They don't receive the resources or guidance needed to identify transition partners.

Sam.Gov is poorly designed and has archaic search functionality. It only searches for exact terms within the title and description fields, not the attachments, which is where government stakeholders often outline their needs.

In 2021, we analyzed the readability of over 1 million archived solicitations, and less than 4 percent were written in plain English, meaning small companies can't even wrap their heads around what the government is looking for. Similarly, 70 percent of the analyzed solicitations required responses within 21 days of when they were posted, and 30 percent within 10 days or less.

Ultimately, the only way for most small SBIR companies to win follow-on contracts is if they pay to play. Compounding this challenge, government stakeholders rarely receive information about the SBIR-funded projects within their branch, let alone what is being funded externally. You can't expect capabilities to transition if prospective transition partners don't know they exist.

To address these issues, I offer the following recommendations: Overhaul the SBIR submission process so that small, nontraditional companies can compete. Mandate that a share of Phase Is be awarded to companies with no prior government business.

If the SBIR program is intended to serve small businesses, eligible companies should be small. Limit the SBIR program to companies with $40 million or less in total annual revenue. Make it easi-

er to identify and bid on government contracts. Redesign Sam.Gov, improve its search functionality, require solicitations to be written clearly, and give companies at least 30 days to respond.

Prioritize and incentivize transition. Mandate that SBIR must meet minimum intragovernmental transition goals. Establish a set-aside program requiring government stakeholders and prime contractors to allocate a share of contract dollars annually to SBIR companies who pass a rigorous assessment of technical merit at the end of their Phase II. Provide greater incentives for integrating capabilities initially funded by a different branch. These recommendations stand to benefit small businesses and government. They will make the program more open and competitive, and encourage wider adoption of SBIR-funded capabilities.

Thank you again, Chairman Williams, Chairman Meuser, Ranking Member Landsman, and Members of the subcommittee, for the opportunity to speak.

Chairman MEUSER. Thank you very much.

We now recognize Mr. Palmer for his 5-minute opening remarks.

STATEMENT OF BRETT PALMER

Mr. PALMER. Good morning, Chairman Meuser, Chairman Williams, Ranking Member Landsman, and Members of the committee. Thank you for the opportunity to testify today. My name is Brett Palmer. I am president of the Small Business Investor Alliance. Since 1958, SBIA has been the champion of small business investment companies, America's original venture capital and private equity funds.

Our association's purpose is to support the entire small business investing ecosystem, and our policy goals are focused on maintaining a robust, healthy, and competitive market. Our Members help small businesses grow, and they are rightly proud of what they do and how they do it, and they are proud of the benefits that their actions have on the people and their communities where their businesses are located.

SBICs are an American success story, an example of successful public policy that aligns the power of private markets with the public interest of job creation, economic growth, and global competitiveness. Over the years, SBICs have made over 200,000 investments, totaling over $130 billion, creating millions of American jobs. And SBICs provide many types of capital, including growth equity, minority equity, control equity, mezzanine and private debt, as well as some venture capital and venture lending, and more of that is coming.

SBIC investments are often the first institutional capital to ever be deployed into the small business. Further, once SBIC capital is invested into a small business, then the small business is able to access more conventional bank capital. Small businesses that receive SBIC investments have grown into icons of American industry, including Federal Express, Apple, Intel, Callaway Golf, and many others.

While these are known globally, many more that were backed by SBICs have grown from smaller businesses into robust, sustainable, midsize businesses. For example, Drug Free Sport International, based in Kansas City, Missouri, they provide drug-testing

services that keep athletics fair and safe. Their employment grew 242 percent after the SBIC investment, with their sales growing by 143 percent.

JSI Manufacturers, in Milo, Maine, they sell grocery store displays. They doubled their employment to over 200 employees in a town with a population of around 2,000. Hart Systems in Hauppauge, Long Island, a provider of inventory management systems, they increased their employment 77 percent from 69 to 122. And Behavioral Innovation Systems in Dallas, Texas, was founded by three clinicians, two of whom were women. They provide therapy to children with autism, and they now help thousands of children across Texas, Oklahoma, and Colorado, and now have over 2,000 employees.

The SBIC Program is a private capital amplifier. Most SBICs are leveraged funds, which means those SBICs are able to borrow money from an SBA credit facility. The private sector leads, and the SBIC leverage follows and amplifies. Individual SBICs can reinforce their private capital with up to two tiers of leverage or $175 million in capital, whichever is less. And I want to stress, this leverage is provided at zero subsidy to the taxpayer, and SBICs pay it all back plus interest and fees.

For all companies, small businesses in particular, access to capital often determines success or failure. And the private capital markets are tight right now, and they are particularly tight for small businesses due to higher interest rates, and SBICs are filling some of the capital gaps with record investments that have been—that we have done in recent years.

SBA has made several recent major reforms and has several initiatives to increase equity capital and to diversify the type of investors that can become SBICs. Further, SBA recently announced the Critical Technologies Initiative, which is a partnership with the Department of Defense. This is using SBICs to increase investments in small businesses in critical national security industries and supply chains, not necessarily government contracting, just businesses that—industries we want here.

Now, there is several policies that we encourage Congress to support, and the first one I am going to actually thank you all for voting for, because everyone here did vote for it. You voted for the Investing in Main Street Act, which passed the House with overwhelming bipartisan support earlier this year. That was led by Representative Chu and Garbarino, and we are working on that in the Senate now.

We also strongly support H.R. 5333, the Investing in All of America Act. This is also bipartisan legislation introduced by Chairman Meuser and Skelton, and many Members of this subcommittee are cosponsors. If passed into law, it will bring more private capital into parts of America that are often overlooked and with some of the following benefits: There is no new spending. There is no new mandates, no new subsidies, no subsidies at all, in fact. It is market-led and market-driven. 100 percent of the investments are in American small businesses. It encourages investments in low-income areas, rural areas, and areas of national security importance, and the inflation adjustment allows the program to remain com-

petitive and operational as inflation marches on and time marches on.

So, today, there are nearly 320 SBIC licenses managing over $42 billion in domestic investment. This is extremely strong and getting stronger. There are currently 94 licensed applications that are in the licensing pipeline. To put that in context, SBA normally licenses in a normal year 25 to 28 licenses, and there are 94 in the pipeline coming through. The demand for small business capital is there, and the market is following it. That is about $15 billion to $20 billion of additional small business investment that is coming online in the next couple years once those get through the licensing process.

So I want to thank the Chairman for having this hearing.

Thank you, the Ranking Member, for being here as well, and the full Chairman for joining us for this hearing. Thank you. Happy to take your questions.

Chairman MEUSER. Thank you very much, Mr. Palmer.

We now recognize Mr. Glover for his 5-minute opening remarks.

STATEMENT OF JERE W. GLOVER

Mr. GLOVER. Good morning, Chairman, Chairman, Ranking Member. Thank you for the opportunity of appearing here today. I am Jere Glover, the executive director of the Small Business Technology Council. I got my early experience in the federal innovation and technology area back in 1978 when I staffed a joint Senate and House Committee and report that documented clearly the underutilization of small business by the federal R&D programs.

Next to the GI bill, after World War II, I believe the SBIR program is one of the most significant pieces of legislation Congress has ever passed. Why is it so significant? Well, one, it revolutionized the way government does business. For the first time there was a law that required federal agencies to award a very small percentage of their R&D budgets to small business. This resulted in the creation and support of tens of thousands of new innovations and small businesses.

The benefits of this to the American innovation economy have been tremendous. Two technologies that you use every day: One is the GPS on a chip, which is in your cell phones and on your cars, allows you to track what is going on; the other is the CMOS system, which is the cameras, which are on virtually all cell phones. Those are just two examples of the technology.

Thirty-eight percent of SBIR awards go to new firms every year. That amounts to 1,500 new companies that had never gotten an SBIR program, winning an SBIR award. Ninety-nine new drug approvals in the last 24 years were funded by SBIR. And, if you think those were unimportant drugs, 16 percent of the priority review drugs, meaning those that had made significant health advances over prior treatments were, again, funded by the SBIR program.

When we also look at the return on investment, several economic impact studies have clearly shown that the return on investment is about 25 percent. For every dollar invested in the SBIR program, there are $11 of commercial sales, nongovernment sales at the National Cancer Institute, and $3 of nongovernment sales at the De-

partment of Defense. Eight percent of all venture capital investments go to funds that have received SBIR funding.

Over half of the SBIR Phase II awards go on to be successful. For every dollar invested in the SBIR program, over $3 in taxes are paid State and local. Over 2,800 firms, SBIR firms, and their technologies have been acquired. Over 800 of these SBIR firms have gone public. SBIR firms have acquired 149,000 patents.

The purpose of the Small Business Innovation Research Act is to stimulate innovation, to use small businesses to meet federal research and development needs, to foster and encourage participation by minorities and disadvantaged persons, to increase technology and innovation, and to increase private sector commercialization innovations that derive from research and development.

Has SBIR achieved these goals? Yes. In 18 National Academy of Sciences that the government spent over $20 million to fund over the years, they have looked at these goals and determined that, yes, they meet all of these goals, with the exception of women and socially and economically disadvantaged small businesses.

Recent data from SBA, however, indicates that they are making significant progress, a 33-percent increase in the socially disadvantaged firms winning SBIRs and an 18-percent increase in women-owned businesses. Why does it work? Why does SBIR work? Merit selection based on science and technology, the best proposal wins. It is highly competitive, extremely competitive. Only 1 in 12 proposals get to a Phase II.

SBIR solves our federal R&D challenges and supports the agency missions. Agencies select the topics, select the winners, and make awards to meet their needs. University and small business partnerships drive SBIR and STTR solutions. While some people may focus on the big end of the funnel and fight over the crumbs as to who gets what, we need to focus more on the small end of the funnel and make sure that the primes start adopting outside technology or we have a serious problem.

Recommendations: First, SBIR should be made permanent; secondly, the proposal and contracting process should be simplified and standardized. The SBIR allocations should be doubled. And, for improved transition, prime contractors should be required to use and report on the use of SBIR and nontraditional firms. Thank you for your time.

Chairman MEUSER. Thank you.

We will now move to Member questions under the 5-minute rule. I now recognize myself for 5 minutes.

Mr. Palmer, I will start with you. Real-world examples of what the SBIC has meant to the overall organization, meant to the SBIC, individual companies, and to those that they were providing investments to, and how would the bonus leverage improve things and benefit small business access to capital?

Mr. PALMER. Sure. The SBIC capital, as I mentioned, is the first institutional capital to go into most businesses. So a lot of this is professionalizing the business and helping them scale up. The number of employees increases significantly in almost every case. I can't think of a case where it hasn't been, which has been helpful.

Now, the bonus leverage is designed specifically to make it so there is an incentive, not a mandate but incentive, to look off the

beaten track to parts of the country that haven't been invested in. So, if you have a fund, the funds have a 10-year lifespan, 5 years of which they invest and then 5 years they harvest, in the first 5 years, it is an incentive to look out for low-income areas and rural areas and industries in these national security sectors. And, if you find a business there that you might not have otherwise gone to, you can access more leverage and doesn't preclude you from doing another deal. And so it just is an incentive to look off the beaten track and find more companies in places that otherwise often get passed over.

Chairman MEUSER. Sure. And, in your opinion then, would the SBA, by implementing bonus leverage as drafted in the legislation, Investing in All of America Act, my bill, H.R. 533, would that be advantageous in the manner that it is intended?

Mr. PALMER. It would be very constructive. It would be very constructive for every State in the Union.

Chairman MEUSER. Okay. Adjusting the leverage caps, is that—you believe that is necessary within the SBIC program?

Mr. PALMER. Yeah. So the leverage caps rely—some of them were adjusted back in 2015, some in 2018. And, basically, as inflation has carved up and chewed up 25 percent of the SBIC firepower, as far as under the leverage caps, and so, as time marches on, there just needs to be an inflation adjuster so that they can continue to operate the way they would because just time catches up.

Chairman MEUSER. Mr. Glover, congratulations on everything you have done over time for small business. It is appreciated. Do you agree with what Mr. Palmer is saying?

Mr. GLOVER. I do. It has been the goal of the founders of the SBIR program forever to have venture capitals focus specifically on SBIR firms. A few have done that. Obviously, many of them do it some. But, to have some of them that are specifically focused on equity funding, the SBIC program, we have talked about this, we have worked on it, we have dreamed about it for 40 years, and so I am glad that you are making some steps to make that happen, and hopefully we get to see this legislation go going.

Chairman MEUSER. Good.

Mr. PALMER. Yeah, you are going to see a lot more equity investor funds coming in the pipeline. There are a significant number of those, 94 that I mentioned.

Chairman MEUSER. Sounds good.

Mr. Valletta, SBIC, private investments, fueling the development and innovation of your small business clients?

Mr. VALLETTA. Yes. These American seed funds are paramount to small business innovation as well as growth. And, for organizations like ours, so that our venture investment and development organizations, it is extremely important because part of our program—a portion of our funding comes from public sources like State government, public authorities, or bonds, and federal programs like the Small Business Credit Initiative, the SSBCI, are very important programs.

Now, as we know, most venture development organizations receive returns on their investments. What we would like to do is have a virtuous cycle of business innovation as well as investment

velocity to take our funds that we receive back from those investments, turn them back into SBICs and SBIRs, and so forth, so removing that leverageable capital requirement in regards to being able to leverage those dollars for innovation and investments.

Chairman MEUSER. That is great. And you have really done great things for Pennsylvania over the years, so it is appreciated.

Mr. VALLETTA. Thank you, Chairman.

Chairman MEUSER. Ms. Bresler, so you gave a nice list of ideas and solutions for improvements. Do you find your suggestions as a significant stakeholder here are being heard and that we are advancing in the manner that you would see best?

Ms. BRESLER. Thank you for the question. To some extent, yes, I am here in the room with this audience. And, unfortunately, I think some of the most basic recommendations are some of the hardest to implement anywhere but this room. You know, for instance, the size standards, even if you have buy-in from the people involved in these programs, they understand on paper that a company doing $350 million a year in revenue doesn't sound like a small business in the way that everyday Americans view small.

Chairman MEUSER. Sure.

Ms. BRESLER. They don't have the ability to implement that change. So I think it does depend on having, you know, a caucus of people with, you know, different interests in this broader pool to come together and implement these changes collectively.

Chairman MEUSER. Good. We will work on it. Thank you.

My time has expired.

I am now going to recognize Mr. Landsman for his 5-minute questions.

Mr. LANDSMAN. Thank you, Mr. Chair.

Mr. Glover, a couple things: One, these are two really important programs, but they are not permanent. Can you talk a little bit about the value of making them permanent as we look to reauthorize them?

Mr. GLOVER. Every few years the government thinks——

Chairman MEUSER. Mike.

Mr. LANDSMAN. You might want to grab that. Yes.

Mr. GLOVER. Sorry. Sorry. Every few years, the government thinks, "Oh, this program is going to go away, so we don't have to continue funding. We don't have to make long-range plans. We don't have to make that a critical part of our infrastructure to make innovations great." There is no question innovation and adoption by the federal government in the R&D world is not working as well as it should. We are fighting against China, and we simply aren't there.

But, when—to have one of its critical fundamental programs threatened to be going away every time and have the government think about it going away and to have the businesses not be able to plan long term is very bad.

Mr. LANDSMAN. Yeah. Also, Mr. Glover, the Federal and State Technology, or FAST, Program works with our SBA resource partners to provide technical assistance. Does investing in resources like this help address concerns about diversity in the program?

And the next question gets at some of the really compelling points that Ms. Bresler brought up in terms of diversifying, open-

ing this up. Can you just talk a little bit about some of the things that she mentioned in terms of the update to the process, just simplifying a whole host of things that would make it more competitive and address some of the concerns she raised.

And I ask about the technical assistance in that context because, you know, on one hand, the technical assistance, I am sure, is terribly important; on the other hand, the assertion, if I was correct, is that there is—some folks have more of an advantage than others as they get that technical assistance.

Mr. GLOVER. Well, first, to answer your question about FAST. I think FAST is a critical, money well spent, I think, quite frankly, that should be increased. I think that, quite frankly, there should be some sort of regional development under the FAST Program to help the other—the FAST operations. I believe the FAST Program is responsible for the significant increase in minority——

Mr. LANDSMAN. Sorry, I apologize. Can you repeat the regional piece? Can you explain that a little bit more?

Mr. GLOVER. Yeah. So you would have some sort of super FAST Programs that help work with other smaller FAST Programs.

Mr. LANDSMAN. Oh, I see.

Mr. GLOVER. And, quite frankly, 125,000 or whatever it is, is just simply not enough to run a really good program. So you need somebody to help you, show you how to do it. That is maybe one or two people. So it is not enough. But it has had a critical impact because we are seeing minorities and we are seeing women-owned businesses numbers going up significantly, and FAST is a critical part of that.

As far as to the participation, you know, 1,500 new firms every year, that is a lot of new firms. So we are getting a lot of companies in. Are we perfect? Nothing ever is. In my opinion, it is the best program in federal R&D ever created because it has less—it has a huge return on investment. Over $3 in taxes on loan come back from these programs.

So the government picks the companies, they pick the topics, they pick the winners, and they choose. In many cases, especially in defense, there are technologies that are very sophisticated, and the government needs that. And, quite frankly, the primes aren't providing it. So it is important to have those companies with the knowledge, experience, and background, and equipment, and experts to meet those government needs.

Commercialization is one of four goals, only one, getting a small business percentage. And, as far as size definitions, the general size standards at SBA for R&D is 1,000 to 1,500, not 500. SBA, looking at this and all of the criteria, would be more likely to increase the size standard, not lower it.

Mr. LANDSMAN. So let me thank you for that. I am running out of time, but what I think would be good is if somehow we can get the two of you in a room and sort out what the changes would be. I know that you have different feelings, but it does seem like that could be a very helpful thing as we look to reauthorize, update, improve the process from application to scoring, to—I think, Ms. Bresler, you talked about having a group that could help sort through some of this so that it is not just the same folks. I don't know if you would be interested in that. Maybe our team can follow

up with the SBA to—or this committee to talk through it, but I think that could be very helpful.

Mr. GLOVER. I think that is a very good idea. Thank you. I will look forward to it.

Chairman MEUSER. The gentleman yields.

I agree. I think it is a very good idea, as well.

We now recognize Chairman Williams from Texas for 5 minutes.

Mr. WILLIAMS. Thank you, Chairman.

And, Ms. Bresler, I am a small business owner back in Texas like you are. And you used some words today that the federal government doesn't understand. Okay. It is called "easier, faster," and "incentivize." They don't get that. Okay. They only hear it from the private sector.

So the Department of Defense SBIR program often lacks instructions for small businesses to follow. You have said that, and I agree with you. We have heard from many frustrated small business owners who have left with more questions than answers about the requirements and what would be needed for followup on contracts, when to apply for the SBIR program, or even which DOD innovation initiative actually they should use. So this causes many small business, as you talked about, to walk away from the defense market and not participate in the program because they do not have a clear picture of what the full investment will be and cannot justify navigating the complicated regulations.

So, simply, how can this concern be addressed, and how widespread is the issue?

Ms. BRESLER. Thank you for the question. So I think the easiest way to assess this would be trying to go through this process yourself, having as many people who are involved in designing the process actually go through it and make notes. I think, relative to some of the complex technological challenges that the Department of Defense tackles on a daily basis, this is relatively simple, but the cultural piece is significant.

And you would need to look at not only creating the appropriate systems, policies, having the right tools, but also requiring that new steps be taken, requiring certain metrics to be tracked. So, even this notion of how many new businesses are working in the SBIR program every year, the reason you can hear different numbers is because there isn't a standard way in which they track that, for instance.

Mr. WILLIAMS. Mr. Valletta, your testimony indicated that several hurdles remained to make the SBIC program cumbersome, that make it cumbersome, including the limitation and definition of "leverageable capital," which could be broadened and made clearer. What would you recommend we do on this committee to fix this particular issue?

Mr. VALLETTA. Yes, actually, thank you for that question. We really look for the SBIC program to be expanded from that leverageable capital, with using the venture investment development organizations like ourselves, to be able to use that capital, the returns that we receive from programs, various programs, from State and local and federal, to be able to get that velocity of investments from organizations; and then, on the SBIR and STTR type of programs, leveraging those organizations to make it clear, as Ms.

Bresler mentioned, in regards to maybe using an IPart program, those innovation partnerships like we have in our program at Ben Franklin, to make the process easier and to note that we have a 28-percent success rate versus the national average of 18 percent. So I think all those things combined make it easier for the communities that we serve to refresh, retain, and reimagine jobs for our great country.

Mr. WILLIAMS. Thank you.

Mr. VALLETTA. Thank you.

Mr. WILLIAMS. Mr. Palmer, our government spending is currently on an unsustainable path, in case you were not aware of that.

Mr. PALMER. I am aware of that, yes.

Mr. WILLIAMS. Okay. Overspending poured gasoline on the inflation fire. Every single day every American is currently experiencing these high interest rates for a—and they are going to be a decade long. Simply, how does the current economic climate affect the performance and viability of the SBICs?

Mr. PALMER. The SBIC—the demand for SBIC capital is extremely strong because the banks have had to pull back. The banks are—particularly the smaller and regional banks are struggling with still a loss of deposits. That is a challenge. And the businesses that have floating rate loans, their costs have gone up significantly.

So I was talking to a fund manager the other day; they had a business that was growing at 40 percent a year and just rocking and rolling. And they are down to 5-percent growth, just changes entirely on interest rates, just the cost of borrowing capital to grow. And that is hard. But inflation is difficult on consumers, and it is difficulties on businesses to plan, and it is a challenge.

Mr. WILLIAMS. Real quick, with the time we have got going, as a followup: I always look at, when evaluating any government program or anything, is a return on investment, which they don't understand about here in Washington. But, for those people that may not be familiar with the SBIC program, can you tell us quickly if any taxpayer dollars have been lost, and what would have to occur for the federal funds to be wiped out in this program?

Mr. PALMER. Sure. Excellent question. So it is a zero-subsidy program. So, by law, it cannot. We have to—they charge additional fees on top of it. There are hundreds of millions of dollars, maybe $1 billion to the positive as far as excess fees versus losses that are there. But the key to the program that makes it work and be taxpayer protection is that the private capital has to be lost first before the taxpayer is exposed. And, frankly, I think that should be true for just about any government program that is existing, because you should have your own money at risk before anybody gets exposed.

Mr. WILLIAMS. My time has expired. I yield back. Thank you.

Chairman MEUSER. I now recognize Representative Chu from California for 5 minutes.

Ms. CHU. Mr. Palmer, thank you for your steadfast support for my and Representative Garbarino's bipartisan bill, the Investing in Main Street Act, which would amend an outdated law to finally allow financial institutions to invest up to 15 percent, triple the

current limit of 5 percent, of their capital and surplus into SBICs. And this will help SBICs, I believe, immensely.

The House has overwhelming passed this commonsense change for several Congresses in a row now. Can you discuss why this bill is so needed and what the impact would be on our small business investment ecosystem if the Senate were to finally take up this bill and pass it into law?

Mr. PALMER. Well, first and foremost, thank you for your leadership on it. It would be incredibly helpful. It is just a glitch in the law that different parts of law were written at different times. So banks were allowed to invest in SBICs so that the money can go to small businesses, but the SBICs aren't allowed to accept it, which is just silly. It is just a percentage question.

And so, thanks to your leadership, it has passed several times. The Senate is very difficult to get anything through. There is no cost associated with it. But, as I was saying in my testimony, there is over 90 SBIC funds in the licensing pipeline currently. They normally license around 25 a year. Demand for this capital is off the charts. These funds have to raise, and they need to raise from banks. And there are a lot of banks who would like to invest more, but they are just not allowed to, not because the banking law says they can't; it is the SBICs can't accept it. So it would be very helpful in getting more private capital that would then be amplified through the small business ecosystem.

Ms. CHU. And how would it help small businesses?

Mr. PALMER. There would be more capital available, frankly. There would be more equity capital available under the new programs that the SBA has rolled out, the new models for debentures. There would be more debt capital available too, and there would be more capital in underserved areas that currently aren't being capitalized.

Ms. CHU. Well, thank you for that.

And, Mr. Palmer, I was encouraged to hear in your testimony that, at the end of fiscal year 2023 the amount of capital that SBICs invested in small business was at record levels and that about a quarter of those investments were in minority-, women-, and veteran-owned small businesses or those located in low- to moderate-income areas.

However, despite this promising growth, we know that these types of underserved small businesses still face significant barriers in accessing investment capital. For example, one study found that the average amount of new equity investment in minority-owned businesses are only 43 percent of the average equity investment in nonminority businesses. As another example, in 2020, Black and Hispanic female entrepreneurs received less than half of 1 percent of venture capital investments. So can you discuss how the SBIC program can help close those gaps and what changes in the program might be needed?

Mr. PALMER. Sure. And, actually, the SBA changed their regulations last fall, created a couple new models of the SBIC program underneath the existing debenture program that will allow for more equity investing, because SBICs do invest at a higher rate in women and minorities in equity and in venture than does the

broader venture market, and so they will be able to do more of that. That is helpful.

I think, also, one of the things they came up with is this Reinvestor SBIC, sort of a fund-to-funds model. It gets a little complicated, but basically it is almost like a developmental league or a seed league that they are setting out there to help develop new, smaller funds in smaller areas.

Also, Congressman Meuser's bill, the Investing in All of America Act, has a specific incentive to invest in geographies that are low income or rural, and that is going to benefit more folks there too. So I think you are going to see some—there is no quick fixes, but I think, over the next 5 years, you are going to see a meaningful uptick in a lot of those areas.

Ms. CHU. So I take it you are in support of this rule, the SBIC investment diversification and growth rule?

Mr. PALMER. It has been very constructive, yes.

Ms. CHU. Okay. Very good.

Mr. Glover, we know that underserved small businesses remain underrepresented within the SBIR/STTR programs. As the lead coordinating agency for SBIR and STTR, what steps do you recommend that the SBA take to enhance education and outreach to these groups?

Mr. GLOVER. The SBA, to my knowledge, in the last few years has gone out to historic Black colleges, gone out to areas like that and done a really good job, and the numbers show that they are increasing. The socially disadvantaged numbers are up 33 percent; women-owned businesses are up 18 percent. So we are seeing improvement. They need to do more of that.

And, quite frankly, the SBIR program is underfunded at SBA. They have very few people working there and very little money and a lot of work to do, but they are doing a good job of making that happen. But I think, with more resources and more people, the SBIR office could do a lot more.

Ms. CHU. Thank you. I yield back.

Chairman MEUSER. The gentlelady yields.

We are now going to move into round two of our questions.

So, Ms. Bresler, I am going to recognize myself for 5 minutes and start with you. SBIR access and awareness for small businesses, I am sure you have got a couple of things to say about that, and how to improve it and get more businesses to participate in the program. Could you offer some of your suggestions?

Ms. BRESLER. Thank you for the question. First and foremost, we have to establish metrics that require the program to award a certain share of contracts, Phase I's, every year to new businesses that have never worked in the government space, that would force these program offices to do some of the hard work of not going with the usual suspects, and that is critical. There needs to be metrics. There needs to be requirements, and they need to be held to account.

In terms of the actual work to reach these businesses that have not previously participated in the program, it comes down to awareness in general. I think my experience is that it is an echo chamber. If you go to a program where you are going to learn something about SBIR, you look around and it is the same people

that are in every room just like it learning about SBIR over and over again.

So you have to put yourself in front of audiences that are not already entrenched in these processes. And I think really putting intelligent size standards in place where you can't have multi-billion-dollar, publicly-traded companies participating in the SBIR program will, again, force the program offices to be more effective in their outreach to truly small firms.

Chairman MEUSER. Thank you.

Mr. Palmer, do you run into some of the same situations with the SBIC?

Mr. PALMER. The rules can be complicated. They can be unclear. They have gotten better, significantly better. But it is—but trying to broaden out the awareness of the SBIC program is hard, you know. And I think that that goes to Ms. Bresler's point is, you know, breaking out of the echo chamber, and I spend a lot of time traveling around the country trying to educate on that front. The SBA actually does some of that too, which I found constructive.

To Mr. Glover's point, I think, you know, parts of the SBA, particularly the SBIC program, they are underfunded. They do have too few people doing too much stuff, and when they are over stretched, that is a challenge. So I think having a few more people that can do outreach and education, and putting stuff in plain English, to Ms. Bresler's point, is really critical so people can understand these otherwise complicated programs.

Chairman MEUSER. Okay. Mr. Valletta, I know how close you are to it all. Could you comment on this?

Mr. VALLETTA. Yes, absolutely Congressman. We believe the SBIR and STTR award capabilities could be better suited with leveraging organizations like the Innovation Partnership, the IPart program that I mentioned, you know. We have 20 years of assisting Pennsylvania's small businesses, and the complexity of the application process is real. And those small businesses and creating those programs to increase the quality of proposals, provide better customer service, and drive that program applicants to improve the effectiveness is real and very important.

So organizations across the country like ours, the IPart program assists, right. So we, Ben Franklin, provide funding for this IPart program across the State to increase the level of those submissions so we can increase the level of wins, which I stated in the past that we have a win rate of 28 percent versus 18 percent. So the capabilities of organizations like the Innovation Partnership reap benefits for the constituents that we serve.

Chairman MEUSER. Great. I want to ask something about the TCJA, the Tax Cuts and Jobs Act. We passed a bill in the House regarding both depreciation, hundred percent R&D reduction, as well as dealing with the Small Business Tax Deduction.

It is—I hope the word "languishing" is too strong. I hope it is being dealt with within the Senate.

Mr. Palmer, just quickly, your thoughts on the importance of the passage.

Mr. PALMER. I think it would be particularly helpful, particularly that R&D side. A lot of smaller businesses that do research and development were surprised at sort of the way that the tax law

was being applied, and so I think it would be very helpful, particularly for small businesses doing really innovative stuff.

Mr. MEUSER. Thanks.

Mr. Valletta?

Mr. VALLETTA. Yes, actually, it is real, and our small businesses beg us to work with our local lawmakers, as well as our federal lawmakers, to get that passed, especially in the Senate, so agreed.

Mr. MEUSER. Ms. Bresler—thank you—thoughts?

Ms. BRESLER. I think it is probably further down in terms of the bottlenecks that the small businesses that I am working with deal with, but anything to offset the burdens of working with the government or trying to operate in today's economy are important.

Mr. MEUSER. Thanks. My time has expired.

I now recognize the Ranking Member for 5 minutes.

Mr. LANDSMAN. Thank you, Mr. Chair. I heard—since we are sort of in problem-solving consensus mode here, and trying to be—and that was the purpose of the hearing, so again want to thank the Chair for doing this. It is incredibly helpful—and the staff for putting this together.

It seems like there are some consensus on the importance of diversifying. And including more and more businesses—small businesses—is happening. The question is, you know, what more can be done?

I assume that this idea of measures and accountability to see more and more of that is probably worth pursuing. How it is pursued, is a question. The awareness piece and outreach gets at something I think most people have said or most of you have said, which is that there is a staffing issue, and how do you ensure that the programs have the staffing they need or the resources to get in front of these small—some of it can be staff, but a lot of it, you know, so many of these folks are on—well, everyone is online—and is there the kind of digital outreach that has proven to be incredibly successful in other programs to get in front of the intended audiences?

And the simplification of the process from application to what is on the website, there seems to be consensus there. So I am curious if—what pieces—and maybe just go across the board and finish with you, Jere—sorry, Mr. Glover—if you could pick three big changes, or small, but changes that you would think would have the most impact, what would those three be?

And then we will end with Mr. Glover and just get your thoughts on those changes and how we can make them happen, because it does seem like there is consensus on areas for improvement.

Mr. VALLETTA. Thank you for that question. From my perspective, being able to drive the dollars to venture investment development organizations and changing the complexity with allowing us to leverage the capital of investments that we receive from our investments, right? That would be one.

Second is that the—really driving the investments to below $3 million, right? So we at Ben Franklin invest in very early stage. So it is important that—and we are typically the first dollars after friends and family. So that would be the second change.

And then the third, and most important, is the requirement for being—for being for-profit. We are nonprofit. So, it is important that maybe some nonprofit organizations can get into the game.

Mr. LANDSMAN. Got you. Very helpful.

Ms. Bresler?

Ms. BRESLER. Thank you. First would be overhaul the size standards, which I have discussed. The second would be a full overhaul of the government solicitation process, which would include SBIR submissions as well as every type of solicitation that the government issues.

And then third is incentivizing transition of the best and brightest technologies, specifically bringing the primes into the mix, so that government stakeholders and prime contractors are required to integrate a certain subset of SBIR-funded companies that have demonstrated their technical proficiency and to encourage a breakdown of these stovepipes that have been challenging to deal with, offer a greater incentive to integrate something initially funded by a different branch.

Mr. LANDSMAN. Got it.

Mr. Palmer?

Thank you.

Mr. PALMER. First, I would say nothing should change that reduces taxpayer protections——

Mr. LANDSMAN. For sure.

Mr. PALMER.—in any way, shape, or form. That is foundational.

Mr. LANDSMAN. Yes.

Mr. PALMER. But I think we should—you know, the passage of the Investing in All America Act being—adjustments to the leverage limits would be incredibly helpful. Expediting the licensing process for repeat funds so that they are spending their time for new funds coming in and not people they have known forever.

And then, finally, you know, as far as adequate funding for it, keeping the fees that we are paying inside the program that we are paying for because we are the only one that is not.

Mr. LANDSMAN. Yeah. Smart.

Mr. Glover?

Mr. GLOVER. First, if you want to increase the diversity in things, double the program. It hasn't been increased in over a decade. It should be increased. That will quickly double the number of new firms, number of minorities, and so forth, proportionally.

Secondly, make the primes use SBIR in new technology and incorporate it. They are—the law lets them do that. The law encourages them. Army has just started doing it a little bit.

Mr. LANDSMAN. You got one more. Sorry.

Mr. GLOVER. And, number three, it is—we have tried for years, and we got and then lost—simplify, standardize the contracting procedures.

Mr. LANDSMAN. Okay.

Mr. GLOVER. But I have got to say, the 174 deduction issue is going to blow up in everybody's face, because once you realize you are going to pay taxes upfront on work you don't get—you know, profits you don't get downstream, it is devastating.

Mr. LANDSMAN. Thank you all very much.

I yield back. Sorry.

Mr. MEUSER. The gentleman yields.

Yes, thank you all very much. We want to just formally thank you, all of our witnesses, for all of your testimony here today.

Without objection, Members have 5 legislative days to submit additional materials and written questions for the witnesses to the Chair, which will be forwarded to the witnesses. And we do ask the witnesses to do your best to respond promptly.

Today, there is a lot going on, which tends to be the case here in Washington these days, so we didn't have all that many Members within the committee because of other duties that were compelling, but we greatly appreciate the information that was received.

I think the questions were excellent, and I think we derived a lot of the ideas that we will work on, and we will continue to work on as was mentioned.

So, if there is no further business, without objection, the committee is adjourned.

[Whereupon, at 11:21 a.m., the subcommittee was adjourned.]

APPENDIX



Dear Charmain Meuser and Members of the Subcommittee:

Ben Franklin Technology Partners of Northeastern Pennsylvania (BFTP NEP) is pleased to submit the following testimony about the impact of the Small Business Investment Company (SBIC) Program and the Small Business Innovation Research (SBIR) Program (including the strongly related Small Business Technology Transfer or STTR program).

BFTP NEP has been investing in and supporting early-stage, technology-focused startups and innovative manufacturers for more than 40 years. As a member of the statewide Ben Franklin Technology Partners (BFTP), we have helped support SBIC funds, invested in and supported successful SBIR/STTR companies, raised and invested in venture funds, and helped to create and support a fertile ecosystem for startup and small business activity in Pennsylvania.

The SBIR/STTR programs are often collectively referred to as "America's Seed Fund." They are a valuable source of capital to help small businesses commercialize research into useful products and services and launch those products and in the marketplace. BFTP NEP has supported these companies through investment, mentoring, and technical assistance in their pursuit of SBIR/STTR grants through both internal programs and through a statewide collaborative program called the Innovation Partnership (IPart). Pennsylvania companies have been successful in leveraging the SBIR/STTR programs with Pennsylvania ranking 7th among states receiving the highest amount of SBIR/STTR funding. Pennsylvania's IPart assists primarily first-time SBIR/STTR applicants and, over its years of operation, has a 28% submittal to award, success rate.

Our experience and relationship with the SBIC program has been largely in partnership with licensed SBIC funds. We have invested in SBICs, evaluated SBIC licenses and leverage for separate for-profit funds we have managed/raised, and, in limited cases worked with SBICs to provide follow-on funding to our small business portfolio or co-invest alongside SBICs. Several structural program regulations have limited the use of the SBIC program for early-stage and startup investments, which we will comment on in this testimony.

Ben Franklin Technology PArtners
Northeastern Pennsylvania

Both the SBIR/STTR and the SBIC programs are valuable resources to support small businesses in Pennsylvania. Our mission to grow the Pennsylvania economy and create family-sustaining jobs for Pennsylvania citizens is strongly aligned with the missions and goals of both the SBIR/STTR and the SBIC programs. Congress should continue to evaluate each program's impact and its implementation to consider additional reforms or tweaks such as H.R. 5333 – Investing in All of America Act of 2023 that will continue to expand and improve the reach of one or more of these important small business support programs.

About the Ben Franklin Technology Partners

The Ben Franklin Technology Partners (Ben Franklin or BFTP) are a network of four independent non-profit organizations that collectively cover all 67 Pennsylvania counties to support technology-based startups, innovative manufacturers, and the entrepreneurial ecosystem. Founded more than 40 years ago, the network and program remain one of the most widely emulated state technology-based economic development programs in the nation.

The four Ben Franklin Technology Partners collectively invest in approximately 120-140 unique early-stage companies per year and help client companies create and retain thousands of jobs, generate billions of dollars of revenue and secure millions of dollars of follow-on funding. Independent third-party analysis shows that Ben Franklin has boosted the Pennsylvania economy by more than $30 billion since inception, helping clients generate 58,000 jobs, plus an additional 101,000 spinoff jobs for a total of 159,000 jobs that otherwise would not have existed. The same independent analysis shows that BTFP returns $4 in additional state taxes to Pennsylvania for every $1 the state invests in the program.

Nationally, Ben Franklin works closely with similar Venture Development Organizations (VDOs) and a national association, State Science and Technology Institute (SSTI), to create economic development through investments in research and development, turning research into commercial products and services, creation of startups and growth of technology and innovation led early-stage companies and manufacturers.



SBIC Program – Impact and Suggestions

History of the Small Business Investment Companies Program

The Small Business Investment Companies (SBIC) Program was created by Congress as part of the Small Business Investment Act of 1958 to stimulate investments in U.S. small businesses. The Small Business Administration (SBA) manages the program.

SBIC's are typically structured as a for-profit venture capital or private equity fund. Funds are typically managed by a General Partner that structures each SBIC fund a unique for-profit legal entity and then raises capital commitments from Limited Partners to use to make investments in small businesses. The SBA licenses SBICs using a rigorous analysis of managers' backgrounds and investing experience, and an evaluation of the proposed fund's investment thesis, strategy and structure.

The application process to secure an SBIC license can be lengthy, difficult and time consuming, however, the license delivers several benefits. Investors in a licensed SBIC fund may count those investments toward their Community Reinvestment Act (CRA) requirements, which makes SBIC funds an attractive investment opportunity for banks, insurance companies and other financial institutions that are subject to CRA requirements. Licensed SBICs are also permitted, though not required, to access leverage through the program's debenture program. The program's leverage can significantly expand a fund's available capital under management and potentially increase the fund's returns to its limited partners.

Historically, the SBA has used a debenture as the primary instrument to provide leverage capital to SBICs. These debentures require semi-annual payments of interest and fees, and repayment of principal under certain qualifying events or when certain distributions are made to the fund's limited partners. The requirement to make current semi-annual payments of interest and fees has made the debenture program challenging for SBIC funds to make investments in early-stage businesses and/or with investment instruments that do not provide consistent current cash flow back to the fund. SBIC funds have typically

favored debt or mezzanine type investments in more established companies that have available cash flow to meet these current pay requirements.

Under the debenture program, the SBA's earnings from SBIC funds are capped at the total of interest and fees earned on the debentures. Over the history of the SBIC program, the SBA has utilized other capital structures, most notably the Participating Securities program authorized by Congress in 1992 that ran through 2004. Under the Participating Securities program, the SBA participated in SBIC funds like other limited partners. This exposed the SBA to the potential for increased earnings if the SBIC fund generated significant returns and much greater losses if a fund was unable to return invested capital or significantly underperformed. The Participating Securities program was suspended in 2004 as the SBA suffered some substantial losses, particularly due to the tech bubble and related recession in the early 2000's.

Impact and Analysis of the SBIC Program in Pennsylvania

The Small Business Investor Alliance (SBIA) which serves as an industry association and advocate for SBIC funds and the SBIC program lists 22 SBIC funds managed by twelve general partners in Pennsylvania over the past 15 years. Eleven of the 22 funds are currently active. None of the 22 funds indicate that they invest in early-stage companies with most funds investing in mezzanine, debt, private equity or other types of later stage capital in more established funds.

According to Pitchbook, a venture capital industry data service and deal tracking platform, Pennsylvania SBIC's invested in 84 Pennsylvania companies in the last 15 years. Only one of the twelve SBIC fund managers did any venture capital investments, and that manager only did 4 venture capital deals (with only 3 of the investments considered early-stage venture) out of the 84 companies funded. Every other SBIC investment was in mezzanine, debt, private equity or other later stage capital. These fund managers should not be faulted for their decision to structure their investments as debt or other later stage capital instruments. The structural and administrative hurdles native to the SBIC program make these types of investments the logical choice for SBIC funds and their managing general partners.



Challenges of the SBIC Program and Suggested Improvements

Ben Franklin's interests, mission, and goals are closely aligned with the stated mission and purpose of the SBIC Program. Similar to the SBIC program, Ben Franklin seeks to help small businesses, primarily startups, secure the capital they need to grow and thrive in all regions of Pennsylvania. BFTP has 40 years of experience investing in early-stage companies in every region of the commonwealth and has developed strong connections with various private capital sources that provide follow-on funding to both our portfolio companies and other small businesses including commercial banks, angel investors and groups, venture capital funds, private equity funds, SBIC funds, as well as other public and private lenders and investors.

Ben Franklin has experience with various aspects of the SBIC program, from working with SBIC funds that invest in our portfolio companies to serving on the investment committee of a New Markets Venture Capital Fund. Innovation Works (the Ben Franklin Technology Partner for Southwestern PA) also considered applying for a leveraged SBIC license when they raised a separate, for-profit venture fund (Riverfront Ventures) in 2013. Innovation Works eventually decided not to pursue an SBIC license due to several hurdles including the requirement to pay current interest & fees to SBA, the subordination of private limited partner interests to the SBA leverage, and the lengthy approval and underwriting process to secure a license.

In late 2023, SBA overhauled several aspects of the SBIC regulations including the addition of accrual debenture and reinvestment licenses and the ability to secure leverage through an accrual debenture. The addition of the accrual debenture license and leverage are positive improvements to the SBIC program and may make both the license and the leverage significantly more attractive to VDOs and other private investors looking to invest in earlier stage companies. A primary advantage of the new accrual debenture license and leverage is that the SBIC repays the SBA at the end of the 10-year term or when making non-tax distributions to other limited partners. This deferred repayment structure better aligns the loan payments to SBA with the unpredictable nature of early-stage equity investments.



SBA also made several positive revisions to the review and approval process for new SBIC applicants. Some of the more notable revisions include:

- SBA has indicated that it will give greater consideration to a fund's management team experience in related areas of capital activity. This is a welcome improvement to a historically limiting hurdle to SBIC licensing. As an example, 1855 Capital, a fund that Ben Franklin has invested in and works with closely, was denied an SBIC license because the two managing partners had not invested together previously. The two managers had significant venture investing experience (90+ investments) and had raised venture capital as executives for two semiconductor companies.
- SBA has indicated they are open to SBIC eligibility for small funds. This is also a welcome improvement. While SBA regulations technically allow funds with as little as $5 million in leverageable capital (or as low as $3 million in limited cases) to be approved for an SBIC, the agency has historically has not approved funds will less than $20 million. This artificial minimum capital limit put funds in the $5-20 million range in a tough position – technically allowable under the regulations but unlikely to be successful given the agency's historical approval process.
- SBA has lowered its fees and streamlined part of its committee review steps for newer program applicants. The agency has also implemented a new process for considering SBIC applications on a quarterly basis, prioritizing in order: all applications from the previous quarter, then applications from under-licenses states, follow-up funds and underserved markets, then all other applications. This streamlined review process, and lower fees is a welcome improvement to a historically challenging process that was expensive and sometimes uncertain.

The positive changes and reforms SBA has suggested and begun implementing are significant improvements to the SBIC program and make the program much more attractive to VDOs considering the development of a for-profit fund to enhance private investment in early-stage technology or other small businesses. In light of the new changes, streamlined approach and the new accrual debenture program, the statewide Ben Franklin Technology Partners are considering an accrual debenture SBIC license and leverage for the Global Opportunity Pennsylvania Fund II, LP which launched in late 2023 and recently made its first investment in an early-stage company. Time will tell whether the SBA's new licensing



approach proves easier and more accessible to VDO organizations and whether the new accrual debenture license and leverage provide the necessarily flexibility to weather the lumpy cash flow cycles of early stage investing.

Ben Franklin is happy to see the SBA making positive changes and implementing additional funding structures that can make the SBIC leverage more accessible and supply additional capital for early stage investing, however several hurdles remain that make the program cumbersome or significantly throttle the ability of prospective qualified managers from pursuing either an SBIC license or leverage.

- SBICs are required to be for-profit entities. The for-profit requirement is not necessarily an insurmountable challenge in and of itself. Ben Franklin and other VDOs often create for-profit venture funds as part of their mission to support early-stage firms for economic development. The challenge, however, is that SBA frowns upon non-profit ownership and/or control of the for-profit venture fund when considering and applicant for SBIC approval. The non-profit mission of the VDO and/or the unique approach to handle fund carry incentives can cause challenges with the SBA review process or disqualify the fund from and SBIC even though the fund is formed to achieve market-based returns and governed in a similar way as other for-profit SBICs.
- Fund size can still be an issue. SBA has indicated a willingness to consider smaller entities and funds for SBIC approval. In practice, however, this willingness remains untested. Allowing smaller funds to seek SBIC licenses and leverage would encourage further investment in early-stage small businesses. Funds seeking to make seed and Series A investments, particularly in currently underserved markets, often find it challenging to raise the de facto $20 million in private leverageable capital SBA requires. Furthermore, larger fund sizes could be challenging to deploy in markets where seed and early-stage investments are in the hundreds of thousands of dollars versus several million.
- The limitation and definition of leverageable capital could be broadened and made clearer. Venture Development Organizations, like Ben Franklin, frequently receive a significant portion of their funding from public sources such as a state government, public authority or bond, or a federal program such as the State Small Business



Credit Initiative. These public funds are then used to make investments in small businesses. Ben Franklin, like other VDOs, receives returns on these investments that are retained and reinvested in additional small businesses for additional returns, creating a virtuous cycle. SBA has very specific requirements regarding the types and sources of capital that may be counted and used for SBIC leverage requirements. We believe that funds that have been returns to us from previous investments and that are retained and reinvested at our discretion should be counted as a private match for SBIC leverage.

- The Accrual Debenture is still a loan. The accrual debenture proposed by SBA will increase an SBICs flexibility to repay the loan and should allow for the lumpy cash flow cycles of early stage investing better than the traditional debenture program. Because the debenture is still a loan, however, the SBA still retains a senior position to the limited partners in an SBIC fund. This senior position can create challenges with raising funds from other qualified limited partners, particularly limited partners who are not familiar with an SBIC or may be newer venture capital investing, such as high net-worth individuals or family offices. Smaller and/or first-time funds often raise significant portions of their capital from these types of limited partners and the SBA's requirements may be too arduous a hurdle for these funds.

SBIR/STTR Program – Impact and Suggestions

History and Structure of the SBIR/STTR Program

The Small Business Innovation Research Program (SBIR); and the Small Business Technology Transfer Program (STTR) were established by Congress in 1982 to provide research and development (R&D) grant funding to technologically innovative project solutions, moving them closer to commercialization. These initiatives, the SBIR and STTR programs, are sometimes called the Nation's largest source of early stage/high-risk funding for start-ups and small business. Venture capital funds (including in limited cases SBIC funds) highly value companies that have received one or more awards through the SBIR/STTR programs for several reasons: SBIR/STTR grants are highly competitive, the proposal development and submission process is intentionally rigorous, successful applicants are typically aligned with key federal agency research interests, and the awards

provide non-dilutive risk capital that allows a small business to advance and derisk their technology(ies) before raising dilutive outside capital.

To be eligible, a small business must be American owned, organized as a for-profit entity, and have less than 500 employees. Eleven (11) Federal Agencies participate annually in the SBIR/STTR programs. Six (6) agencies provide BOTH SBIR/STTR funding opportunities: Department of Energy (DOE), Department of Defense (DOD), National Institutes of Health (NIH), National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and the U.S. Department of Agriculture (USDA). The Department of Commerce (DOC), Department of Transportation (DOT), Department of Education (DptEdu), Environmental Protection Agency (EPA), and the Department of Homeland Security (DHS) offer only SBIR funding opportunities. The size of the Agency's Extramural R&D budget is the determining factor for SBIR/STTR program offerings.

Throughout the course of a year's cycle, these Federal Agencies designate R&D topics of interest and/or priority via the issuance of Funding Opportunity Announcements (FOAs) or Solicitations, and accept proposals from qualifying, small businesses. SBIR/STTR awards fund innovative research that will meet the objectives of the offering Agency and address their designated topics with proposed, innovative solutions. SBIR/STTR grant awards can range from $80 thousand for a Phase I R&D project, up to over $2 million for a Phase II project, moving the technology closer to commercialization. Award amounts and duration of project can vary, depending upon the offering agency.

Impact and Analysis of the SBIR/STTR Program in Pennsylvania

Pennsylvania currently ranks 7th in the amount of SBIR/STTR award dollars annually. From 2018 to 2023, more than 1200 companies received an SBIR/STTR Phase I or Phase II award totally nearly $850 million in SBIR/STTR funding to Pennsylvania companies during those five years. The statewide BFTP network invested in nearly 25% of those companies and IPart assisted 27 of those companies with their submissions. The DOD provided the most awards to Pennsylvania companies, followed by NIH, NASA, DOE and NSF.

Challenges of the SBIR/STTR Programs and Suggested Improvements



While there is much merit to having SBIR/STTR awards predicated on a rigorous proposal preparation process, agency-specific, mandated registrations and submission portals, there may still be room for improving these programs across all offering federal agencies. Understanding that the SBA is the SBIR/STTR administrator for all agency programs, they have the ability to recommend program-enhancing changes across all agency SBIR/STTR programs. Section 9 of the Small Business Act (the Act), 15 United States Code (U.S.C.) 638(j) and (p), requires that the Small Business Administration (SBA) issue a policy directive setting forth guidance to the Participating Agencies. The SBIR/STTR Policy Directive outlines how agencies must generally conduct their programs. Each Participating Agency, however, may tailor its program to meet the needs of the individual Agency, as long as the general principles of the program set forth in the Act and directive are followed. Therefore, when incorporating SBIR/STTR policy into agency-specific regulations and procedures, Participating Agencies may develop and apply processes needed to implement the policy effectively; however, no Participating Agency may develop and apply policies, directives, or clauses that contradict, weaken, or conflict with the policy as stated in the Policy Directive.

Using their role as administrator, SBA recommended SBIR/STTR policy changes related to foreign investments in SBIR/STTR companies, as well as certain aspects of awardee reporting, which became effective on May 1, 2023. Congress should encourage SBA to continuously evaluate the efficiency and effectiveness of various agency SBIR/STTR programs and to make ongoing recommendations to improve their performance as needed.

With more than 20 years assisting Pennsylvania small businesses seeking SBIR/STTR awards, IPart has developed several insights that could improve small business access to the program, increase the quality of proposals, provide better customer service to program applicants and improve the effectiveness of consultants and professionals assisting prospective SBIR/STTR applicants with their proposal preparation and submissions.

IPart engages many clients submitting SBIR/STTR proposals to fund the development of and further exploration into the commercialization of technologically innovative solutions for sector-specific problems. Several SBIR/STTR agencies offer preliminary services to help

both the company and the agency determine whether the effort to prepare and submit and full SBIR/STTR proposal will be worthwhile. Examples of these preliminary services include:

- The NSF Project Pitch is a preliminary, Go/No-Go review of a planned project. The Project Pitch after being reviewed by topic-appropriate NSF Program Manager(s), results either in an invitation to the client to submit a full proposal, or a decline of invitation to submit a full proposal. The NSF Project Pitch has specific prompts, word-count limitations, and quick turn-around time, which are all highly beneficial and efficient for both SBIR/STTR applicants and supporting counselors.
- The DOE requires applicants to submit a Letter of Intent to confirm the agency's interest in a proposed project and that the project aligns with the DOE SBIR/STTR program before a company commits to a formal proposal.
- The DOD directs potential applicants to submit preliminary 'white papers' or 'quad charts' to verify appropriate alignment with DOD program goals and interests.

All SBIR/STTR-offering agencies should require a similar preliminary Phase I, pre-submission, project-focused document for agency-specific vetting. These preliminary submissions should be standardized as much as possible across all agencies with similar prompts and defined response times that allow for timely feedback and re-evaluation by both the agency and the prospective company. Mandating a preliminary SBIR/STTR project vetting by agency personnel is beneficial for the following reasons:

- For SBIR/STTR clients who do not have a planned project aligned well with the agency's mission/focus/topics, a decline in submission offer saves the client time, effort, and money, as this rejection occurs well before the bulk of proposal development and preparation occurs. This affords timely ability for clients to pursue other forms of funding that may be more productive and/or forces them to reevaluate their planned project. It greatly benefits local SBIR/STTR client assistance professionals by affording them insights into better understanding what the agencies are looking for in a competitive SBIR/STTR proposed project, as well as helping them better manage their resources for assisting SBIR/STTR-worthy clients.
- Preliminary vetting of planned SBIR/STTR projects by agency managers saves their time too. NSF typically sends their Project Pitch response to clients within a few days of its submission. This timely review/feedback of a preliminary instrument, also results in more than half of the proposers being eliminated from submitting a



full proposal, thereby, providing the agency with the ability to have a more calculated idea of how many actual proposal submissions they can expect, while also being able to assemble appropriate review panels well in advance of actual proposal review.

Navigating the myriad technical aspects to prepare an SBIR/STTR submission is unnecessarily complicated. In addition, each agency mandates their own unique registration process, could have multiple extraneous proposal requirements, uses several websites and often fails to provide timely feedback to clients. SBA can and should use their administrative oversight role to work on standardizing as much of the SBIR/STTR proposal process across agencies as possible. Furthermore, SBA should coordinate solicitations, registration requirements and timing of feedback through a single website or information channel. This would significantly enhance the experience of companies seeking awards, increase the number of companies seeking SBIR/STTR awards and likely improve the quality of those submissions.

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Written testimony of
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for the
U.S. House Small Business Committee
hearing entitled

"Exploring SBA Programs: Reviewing the SBIC and SBIR Programs' Impact on Small Businesses"

2360 Rayburn Building at 10:00AM

April 16, 2024



The Small Business Investor Alliance

SBIA was formed in 1958 to represent Small Business Investment Companies, the original American venture capital and private equity funds. As the small business investing market grew more complex, so did SBIA. SBIA now includes Small Business Investment Companies (SBICs), Rural Business Investment Companies (RBICs), Business Development Companies (BDCs), conventional private equity funds, private debt funds and other funds investing in American private small businesses. We also represent the institutional investors (e.g. community banks, university endowments, pension funds) who invest into these small private funds. Our association's purpose is to represent the entire lower middle market investing ecosystem, both General Partner and Limited Partner. As such, our public policy goals are balanced and focused on maintaining a robust, healthy, and competitive market for investing in American businesses.

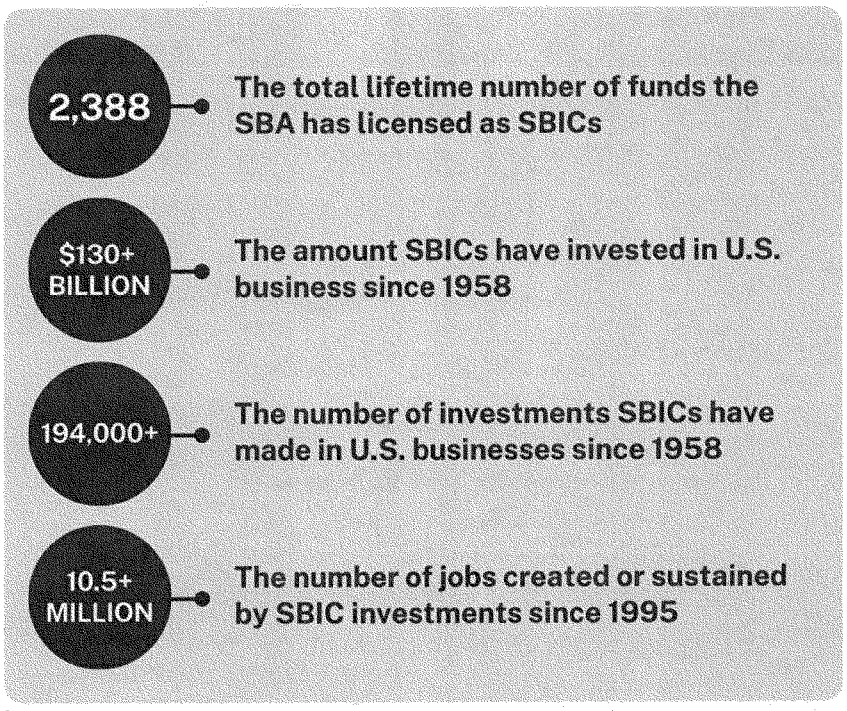
Overview of the Small Business Investment Company Program

SBICs are an American success story and example of a successful federal public policy that aligns the power of private markets with the public interest of job creation and economic growth. Congress declared in its original authorizing legislation that the SBIC program should "stimulate and supplement the flow of private equity capital and long-term loan funds which small business concerns need for the sound financing of their business operations" while also stimulating the national economy and job growth.[1]

SBICs invest exclusively in domestic small businesses, creating jobs and empowering U.S. small businesses to compete in a global economy. Companies that in their early stages received SBIC investments and have subsequently grown into icons of American industry include Federal Express, Apple, Intel, and Callaway Golf. While these are recognized companies globally, many more small businesses backed by SBICs have grown from smaller businesses into robust, sustainable mid-sized businesses. Since inception, 2,388 SBICs have made over 194,000 investments in U.S. small businesses totaling $130 billion. These investments are in real companies with real staying power and real growth potential.

[1] Small Business Investment Act of 1958, Pub. L. 85-699 (Aug. 21, 1958). 15 U.S.C. 661.

SBIC History by the Numbers



[2]

Types of SBICs

Most SBICs are levered (debenture) funds, which means those funds are authorized to borrow money from a federally-guaranteed credit facility using the Federal Home Loan Bank system. Federal leverage permits individual SBICs to multiply paid-in private capital up to two times capital or $175 million, whichever is less. Almost all SBIC Funds have a finite term, with an investing period of 5 years and then a harvesting period of another 5 years. As such, SBICs commonly have several SBIC funds that are in different parts of their investing/harvesting life cycles (investing, harvesting, and then forming their next fund). The maximum leverage for an SBIC family of funds (a group that holds multiple SBIC licenses) is currently $350 million. Leverage is provided at a **zero-subsidy rate**, with no annual appropriations

[2] Jobs are a sum of findings from Library of Congress report entitled "Measuring the Role of the SBIC Program in Small Business Job Creation" from 1995-2014 and data from SBA SBIC annual reports 2014-2023.

necessary to fund up to $6 billion a year (FY2024 enacted), which is eventually paid back in full to the SBA with interest and fees. (*See Appendix for the typical lifecycle of a traditional SBIC*).

In August 2023, SBA introduced several new tools to allow different types of capital to fill more types of capital access gaps: Accrual and Reinvestor SBICs. Accrual SBICs are also leveraged funds but interest accrues and is paid back by the SBIC at the end of the 10-year debenture period to better align with the cash flows of long-term, equity-oriented funds. Reinvestor SBICs are a subset of Accrual SBICs for the express purpose of reinvesting in a portfolio of smaller investment funds to increase the geographic reach of the SBIC program. Reinvestor funds are market-driven developmental league to provide more capital to a next generation of emerging small business investors.

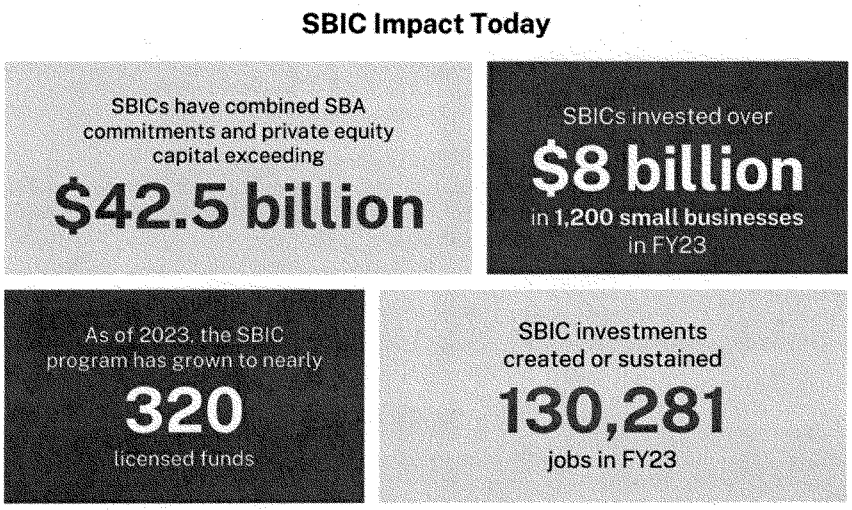
Also in 2023, SBA announced the SBIC Critical Technologies Initiative (using the accrual debenture license) in partnership with the Department of Defense (DOD) to increase early-stage investment in startups and small businesses in critical national security industries and supply chains, that are not supported through procurement. SBA and DOD have identified gaps in the credit markets for high-tech startups and small businesses that could produce the technology needed for future national security efforts.

SBIC License Types

License Type	Investment Strategy	Details
Standard SBIC	Private Credit, Structure Equity or Mezzanine	• Uses Standard Debenture • Eligible for up to 2 tiers of leverage • $175M for one fund or $350M for family of funds
Accrual SBIC	Venture, Growth or Buyout	• Uses Accrual Debenture • Eligible for up to 1.25 tiers of leverage • $175M cap for one fund, $350M for family of funds
Non-Leveraged SBIC	Benefits of an SBIC license, without SBA leverage	• No funding from SBA • Typically established and owned by a bank • Provides financial institutions with opportunities to receive Community Reinvestment Act credit and a limited exemption from the Volker Act
Reinvestor SBIC	Fund-of-Funds	• Uses Accrual Debentures • Must invest ≥ 50% of capital in private funds • Eligible for up to 2x tiers of leverage • $175M cap for one fund, $350M for family of funds

Current Impact of SBICs on small business economy

At the end of FY2023, the capital committed to U.S. small businesses from licensed SBIC funds was at a record level nearly 40 percent higher than five years earlier (2019). Nearly one in four investments, moreover, were made in small businesses that were either women-, minority- or veteran-owned, or located in LMIs areas.[3] During 2023, the SBIC program had more than 300 active funds[4]. SBICs are a critical part of the small business capital markets. SBICs investments are overwhelmingly the first institutional capital to ever be deployed into the small business they are backing. Further, once SBIC capital is invested into a small business then the small business is often able to access more conventional bank capital. SBICs are only able to make a profit by successfully growing small businesses.



State of Small Business Access to Capital

For all companies, small and medium-sized businesses in particular, access to capital is a distinguishing feature that often determines success or failure. It is much more difficult for smaller businesses to access long term patient capital than it is for medium-sized or larger businesses.

Traditionally, community and regional banks generally help finance small businesses that have assets to borrow against. Unfortunately, the smaller and more rural the businesses the more difficult it is to access traditional sources of capital. Also, many small businesses do not have adequate assets to access the amount of bank loans that they need. Smaller businesses are seen as too risky for most banks and larger financial institutions.

[3] Id.
[4] Id.

The rapid rise in interest rates in 2022 and the imbalance of assets and liabilities on bank balance sheets has had a material negative impact on lending to small businesses. The private capital markets are tight, particularly for small private businesses with values below $50 million. Access to senior credit is more difficult now than it was a year ago, it is more expensive, and lenders have regulatory concerns for not extending new loans or not renewing existing facilities (like lines of credit). Conventional private investment funds have also pulled back on making investments in small businesses because economic and market conditions forced them to reevaluate and adjust investment strategies. SBICs are available filling the gap, but capital demand has outstripped supply.

Additionally, smaller businesses need hands-on help to manage growth while some need help to navigate changes in the competitive landscape. Some family-owned small businesses need help to transfer ownership when the original founders are ready to retire but want to maintain the business as a going concern. This is the kind of help that SBIC funds can provide.

SBIA Policy Recommendations

While the SBIC program has shown record growth over the past 5 years, there are policies this committee can consider to expand access to capital in unserved geographies, ensure the SBICs remain on par with rising inflation, and provide the Office of Investment and Innovation with the resources necessary to administer the program.

SBIA thanks Members of the Committee for supporting H.R. 400, the Investing in Main Street Act

During the first weeks of the 118th Congress, the House passed H.R. 400, the Investing in Main Street Act with a near-unanimous bipartisan vote.[5]

The bill, introduced by Rep. Judy Chu (CA-28) and Rep. Andrew Garbarino (NY-2), would rectify a historical disconnect between banking law and small business investment law and allow a bank or federal savings association to invest up to 15% of their capital and surplus in SBICs, while still subject to the approval of the bank regulator if above 5%. This would dramatically increase the amount of private capital in the SBIC program, which will then be deployed to domestic small businesses, at no cost to taxpayers.

The bill has passed the House of Representatives the last four Congresses. The Senate version was introduced in February 2024, by Senators Todd Young, Tammy Duckworth, and Jim Risch and is awaiting Senate vote.

SBIA strongly supports passage of H.R. 5333

SBIA strongly urges Congress to consider and pass H.R. 5333, the Investing in All of America Act, to increase access to capital through the SBIC program. This bipartisan legislation, introduced by Reps. Meuser and Scholten, will encourage private capital investments in the parts of America that are often overlooked. SBIA wants to thank Reps. Meuser and Scholten for their leadership.

[5] House Roll Call No. 35. 411-13.

The Investing in All of America Act reforms the Small Business Investment Company program at SBA to encourage private capital investment in underserved areas and industries with the following benefits:

- No new spending.
- No new mandates.
- No subsidies.
- 100% of investment is in American small businesses.
- Encourages investment in Low-income and Rural Areas.
- Encourages investment in industries that are vital to national defense.
- Inflation adjustment allows the program to remain competitive as prices rise.
- Market-led and market-driven.

The Investing in All of America Act provides SBICs with bonus leverage to invest solely in rural, low-come, and national security-focused businesses. Investments eligible for bonus leverage under the legislation include smaller enterprises in low income or rural areas. These are businesses that are smaller than small businesses by definition and are in areas that are traditionally underserved. Bonus leverage is also available for investments in small businesses that are in industries critical to national security. It should be noted that bonus leverage for investing in rural and low income areas does not change the cost or risks of the program because it maintains the private capital ratio to SBA leverage determined during the licensing process.

H.R. 5333 would streamline the current bonus leverage provisions to make them simple and straightforward, with no need for new appropriation for implementation as drafted. SBA already captures zip codes and NAICS codes of the small businesses financed. Simply adding check boxes and drop-down menus on the Form 1031 (Form 1031 must be completed by SBICs and submitted to SBA for every financing made to a small business. It includes details of the financing and information on the small business) for "rural", "low-income", and "critical technology" captures the remaining data needed to exclude the cost basis of the investment when calculating an SBIC's outstanding leverage.

The legislation would also adjust the leverage commitment levels by a factor of inflation from the last time they were adjusted in statute and make annual adjustments thereafter. This ensures successful SBICs do not grow out of the program and can continue assisting job-creating small businesses across the country for years to come.

The SBIC program had an inflation adjuster for many years prior to raising the caps in emergency legislation (ARRA) during the Great Recession. However, the leverage caps have not been adjusted since 2015 for single licensees and 2018 for a family of funds. In that time, inflation has risen nearly 30%. In the face of current and future inflationary pressure, reinstating the inflation adjuster is necessary to ensure the program's investment power remains consistent with the broader markets and small businesses can continue to receive the capital they need.

SBIA urges Congress to ensure all fees charged to, and collected from, SBICs are used by OII exclusively to administer the SBIC program.

The SBIC program has experienced significant growth recently. As mentioned previously, today there are nearly 320 licensed funds with combined SBA commitments and private capital exceeding $42.5 billion. There has also been record-setting interest from prospective and returning licensees. There are currently

94 SBIC license applications that have been submitted to SBA for approval. To put that in context, SBA normally licenses 25-28 funds a year. The market has recognized the need for SBIC capital, but we need to get these applicants processed. That is at least $15 billion dollars in capital that is waiting for permission to be deployed into American small businesses.

Ensuring the fee revenues collected from SBICs by the Office of Investment and Innovation are used to provide the personnel and resources to process and manage the influx of new and existing licensees is critical.

SBIA recommends the SBA publish timelier and more detailed SBIC program data.

There is a long precedent of providing Congress and the public with detailed program data on SBA's other access to capital programs. SBA publishes a weekly lending report on the 7(a), 504, and Community Advantage loan programs which include demographic data on borrowers, loan size breakouts, urban and rural delineations, and cumulative loan volume, among others.

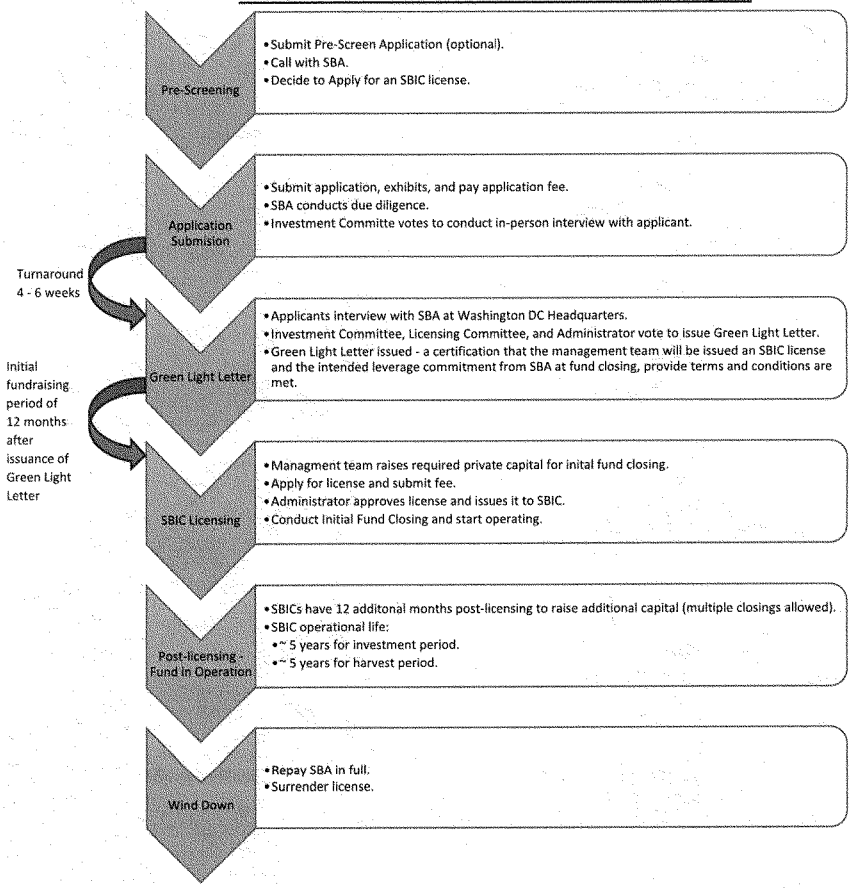
The Office of Investment and Innovation (OII) collects similar data on each small business investment made by SBICs via form 1031. OII also collects fund-level performance data from each SBIC on a quarterly and annual basis using form 468. SBIA understands that sensitive information about small businesses and SBICs is also captured on these forms, but this should not prevent SBA from providing aggregated anonymized data about the program to Congress and the public.

SBA should also make data releases timelier – SBA has not provided new data since it released the year-end FY2023 report nearly 5 months ago.

SBIA thanks the Committee for holding this important hearing and looks forward to working with Members on bipartisan legislation that will increase capital access for all of America's small businesses.

APPENDIX

Phases of a Debenture SBIC License Lifecycle



Testimony of Amanda Bresler
Chief Strategy Officer, PW Communications, Inc.

House Committee on Small Business
Subcommittee on Economic Growth, Tax, and Capital Access

“Exploring SBA Programs: Reviewing the SBIC and SBIR Programs' Impact on Small Businesses”

April 16, 2024

Background & SBIR Expertise

Chairman Williams, Ranking Member Velazquez, Subcommittee Chairman Meuser, and Ranking Member Landsman, thank you for the opportunity to testify today. My name is Amanda Bresler, and I am the Chief Strategy Officer for PW Communications. Over the last 7 years, I have published five independent research reports through the Naval Postgraduate School (NPS) that analyze the impact of federal procurement policies, including the Small Business Innovation Research (SBIR) program, on small businesses. These reports have been cited by the Defense Innovation Board, the Commission on Planning, Programming, Budgeting, and Execution (PPBE) Reform, Contract Management Magazine, Bloomberg Government, the Ronald Reagan Institute, Defense News, and others. A key research recommendation from my 2018 paper also resulted in Section 220 of the 2019 NDAA: *The Establishment of the Innovators Information Repository in the Department of Defense.*

Since 2019, my firm has also participated in the SBIR program. We have won a Phase I and two subsequent Phase II awards sponsored by the Department of Defense (DoD), to develop a capability called SHELDON. SHELDON is a data-driven advisory firm that provides stakeholders in the federal government with transparent data and analytics products to facilitate better adoption of government-funded capabilities, reduce duplicative research and development efforts, enable greater situational awareness of the available market for goods and services in the public sector, and more. At the direction of our customers from the U.S. Navy and the U.S. Air Force, we have analyzed the composition and performance of SBIR portfolios; and conducted hundreds of surveys of SBIR program participants.

As such, the perspective and recommendations I offer today are the result of a comprehensive understanding of the program gained through independent research and analysis; firsthand experience navigating the program as a SBIR company; and as someone building tools designed to improve the adoption of federally-funded technologies across the government. This written testimony includes references to analyses undertaken as part of our NPS research. For more detailed information on how we conducted these analyses, including the data sets we used, please see the full reports, which are included in the Appendix.

The Top of the Funnel: Small Businesses & The SBIR Program

The SBIR program is marketed as a way for innovative small businesses to break into the public sector. However, the majority of SBIR participants are entrenched government contractors. For instance, in our 2020 NPS paper, analyzing data from fiscal years (FY) 2010-FY2019, we determined that **more than 90% of DoD Phase I funding was awarded to existing government contractors.**

Task a group of the world's most accomplished entrepreneurs with identifying and responding to a Phase I SBIR proposal, and you will understand why. The process for identifying, preparing, and submitting a Phase I/Phase II proposal is so arcane and complex

that, irrespective of IQ or business acumen, it is nearly impossible for someone outside of the traditional government industrial base ("nontraditionals") to navigate. Proposal preparation instructions can be 50+ pages long, and–as we encountered when we prepared our Phase I submission–often contain contradicting sets of instructions. They are rife with jargon and requirements that are incomprehensible to nontraditionals.

Many innovative small businesses forgo the SBIR program entirely. Others hire insiders, in the form of "SBIR advisory firms," to help them navigate the process in exchange for a percentage of the award funding. From our research, the typical fee structure for a SBIR Advisory Firm approximates to:

i) Contract Value (CV) <$2 million: Fee = 5% (total contract value)
ii) CV $2 million to <$5 million: Fee = (CV-2 million)*1.67%+$100K
iii) CV $5 million+: Fee = (CV-5 million)*0.6%+ $150K *maximum fee of $500K*

In addition to this share of the award funding, SBIR Advisory Firms typically charge an additional retainer, in the range of $3,000-$7,500. Ultimately, the complexity of the process levies a tax on the innovator. **They are forced to redirect a significant share of funding that is designated for research and development, into paying a gatekeeper.**

The early phases of the SBIR process come with other challenges. For instance, even after receiving notice that the government intends to award your Phase I/Phase II contract, contracting officers are not required to adhere to a set, "post-award" timeline. As a result, official award timelines are opaque and ever-changing.

These delays can be materially damaging for small companies, something we learned firsthand: PW Communications' follow-on Phase II contract award was delayed nearly a full year, as a result of a government contracting officer incorrectly inputting our "firm-fixed price" contract as "cost-plus fixed fee." Rather than correcting the error, she not only subjected us to an unnecessary Defense Contract Audit Agency (DCAA) audit, but also became completely unresponsive to subsequent inquiries regarding an estimated award date. Over the course of these delays, some of our key engineers and other members of our team–who had expected to begin work–were forced to pursue other opportunities. Eventually, after our CEO expended significant time and energy to elevate the issue, the contract was reassigned to a new contracting officer. This individual processed it within a matter of days, allowing the work to move forward. The fact that the issue was resolved quickly by a different contracting officer illustrates that the system *can* work properly and efficiently, depending on the circumstances.

Our experience is not the exception. Several SBIR program offices have acknowledged that complex solicitations and prolonged award timelines make it difficult for small firms to compete. For instance, in 2018, to address these challenges, the Air Force SBIR program established the "Open Topic" program and "Pitch Days." While the results of these initiatives have been mixed thus far, they are intended to streamline SBIR proposal submission

requirements and accelerate award timelines, as a means of helping the Air Force better attract innovative new companies.

Entrenched SBIR Companies

The fact that it is so difficult for nontraditionals to break into the SBIR program also explains why such a significant share of SBIR funding is awarded to a small subset of companies. In our 2023 NPS research report, we determined that **the top 5% of companies with the most DoD-funded Phase I/Phase II awards from FY2012-FY2021–about 235 companies–collectively received 49% of *all* DoD Phase I/Phase II funding.**

As shown in Figure 1, **the 25 DoD SBIR companies that received the most Phase I/Phase II funding from FY2012-FY2021 cumulatively received $2.3 billion–or 18% of all DoD Phase I/Phase II funding–during that period.** Similarly, a GAO report released in March of 2024 revealed that 22 companies–representing fewer than 1% of all SBIR participants–received more than $3 billion in SBIR funding–roughly 10% of the entire SBIR budget– from FY2011-FY2020.

Figure 1: Top 25 SBIR Companies' DoD Phase I/Phase II Funding, FY2012-FY2021

Company	Total DoD PI/PII Funding, FY2012-FY2021	% of Total DoD PI/PII Funding, FY2012-FY2021
PHYSICAL OPTICS CORPORATION	$198,222,973	1.51%
INTELLIGENT AUTOMATION INC	$172,174,305	1.31%
PHYSICAL SCIENCES INC	$168,520,875	1.28%
CREARE INCORPORATED	$158,034,669	1.20%
CHARLES RIVER ANALYTICS INC	$153,639,314	1.17%
TRITON SYSTEMS INC	$121,816,610	0.93%
LUNA INNOVATIONS INCORPORATED	$115,727,487	0.88%
CFD RESEARCH CORPORATION	$103,029,444	0.79%
LYNNTECH INC	$95,715,220	0.73%
TOYON RESEARCH CORPORATION	$92,398,212	0.70%
ARETE ASSOCIATES	$86,856,904	0.66%
PROGENY SYSTEMS CORPORATION	$76,422,839	0.58%
SA PHOTONICS INC	$75,002,150	0.57%
MAINSTREAM ENGINEERING CORPORATION	$70,653,705	0.54%
APTIMA INC	$70,561,859	0.54%
CORVID TECHNOLOGIES LLC	$64,965,146	0.50%
SOAR TECHNOLOGY INC	$67,302,292	0.51%
CORNERSTONE RESEARCH GROUP INCORPORATED	$59,984,693	0.46%
ENGINEERING AND SOFTWARE SYSTEM SOLUTIONS INC	$57,145,087	0.44%

TDA RESEARCH INC	$56,439,024	0.43%
INTELLISENSE SYSTEMS INC	$55,685,545	0.42%
MAXENTRIC TECHNOLOGIES LLC	$55,054,742	0.42%
OCEANIT LABORATORIES INC	$54,091,626	0.41%
FIRST RF CORPORATION	$53,791,669	0.41%
SYSTEMS TECHNOLOGY RESEARCH LLC	$52,631,563	0.40%
Total	**$2,335,867,952**	**18%**

SBIR Participants: Small by What Standards?

Although the SBIR program is designated for small businesses, the Small Business Administration (SBA) allows certain companies to qualify as "small" irrespective of revenue, as long as they have fewer than 500 employees. In the case of these entrenched SBIR companies, some generate hundreds of millions in government contracting revenue annually, and some are publicly-traded.

Many of these companies win Phase I/Phase II awards for projects that span a wide range of unrelated topics.

One firm received Phase I/Phase II funding for projects including, but not limited to:

- Data analytics for ship maintenance
- Decision support systems to assist Army soldiers with career planning
- Wearable sensors for Navy divers
- Algorithms to enhance robotic caregivers
- The development of "smart fabrics" that incorporate sensors and communication networks, and more.

Another received Phase I/Phase II funding to develop:

- Artificial intelligence for unmanned systems
- Coatings for missiles
- Cyber detection and attack tools
- Remote unmanned refueling systems
- Night vision cameras and more.

A third won Phase I/Phase II awards to develop:

- Cyber security for unmanned aerial systems
- Self-serve kiosks to display human performance information
- Platforms to manage food service on Navy ships
- Augmented reality displays for submarine command teams, and more.

It is hard to imagine how any company, let alone a small business, can be at the cutting-edge of innovation in dozens of unrelated fields. Based on publicly-available information about these entrenched SBIR companies, it is unclear how they manage to compete for and win research and development (R&D) contracts for such wide-ranging projects. It appears that some of these entrenched SBIR companies function as integrators for small/independent research entities that do not have the resources or wherewithal to pursue SBIRs directly. The entrenched SBIR company takes a share of the award funding, in exchange for managing the process. In other cases, entrenched SBIR firms seem to pivot their capabilities internally to align with the latest government priorities. Ultimately, these ostensibly large companies' greatest competitive advantage is having the resources and expertise required to effectively navigate the SBIR program.

Transition Rate

In our 2018 and 2023 NPS papers, as well as under the auspices of our Phase I/Phase II contract work, we have analyzed the extent to which companies funded through the SBIR program subsequently deliver their capabilities to government end-users ("transition"). We found that a significant share of SBIR-funded capabilities do not transition.

For instance, in our 2023 NPS paper, we analyzed the extent to which 52,746 defense-funded Phase I/Phase II awards from FY2012-FY2021 ("analysis group") were subsequently leveraged, directly or indirectly, by defense end-users ("intragovernmental transition rate," "transition rate"). Because the SBIR program does not adhere to a standard taxonomy or set of metrics to define intragovernmental transition rate, we formulated our own definition that includes three metrics:

1) **Phase III awards** attributed to the companies in our analysis group, subsequent to our analysis date. Phase III awards are identified in the Federal Procurement Data System (FPDS), making them the most explicit indicator that a company's SBIR-funded capabilities were subsequently procured by the USG.
2) **Non-SBIR DoD-funded procurement contracts** attributed to the companies in our analysis group, subsequent to our analysis date. Some procurement contracts awarded to SBIR/STTR companies should be marked as Phase IIIs in the data but are not. While there is no way to know if a subsequent contract, if it was not coded as a Phase III, was related to a company's SBIR project, we wanted to consider the possibility that participants transitioned via non-Phase III contracts.
3) **DoD-funded subcontract awards** attributed to the companies in our analysis group, subsequent to our analysis date. Given the complexity and costs associated with pursuing government contracts, some SBIR companies have neither the ability nor the desire to contract with the DoD directly. Instead, they may deliver their capabilities to the DoD by subcontracting to a prime contractor. While there is no way to know definitively if a subsequent DoD-funded subcontract award was related to a company's SBIR/STTR

research, we wanted to consider the possibility that some SBIR companies transition through a prime.

Due to limitations in how the publicly-available data is coded, we treated all subsequent non-SBIR DoD procurement contracts and DoD subcontracts as indicators that SBIR/STTR capabilities transitioned to the warfighter. Consequently, we gave the program more than its due credit.

As shown in Figure 2, only 16% of DoD SBIR companies in our analysis group won Phase III awards. While the transition calculation improved when including non-SBIR procurement and subcontracts, as previously mentioned, it is difficult to draw conclusions about the nature of these awards.

Figure 2: DoD SBIR Intragovernmental Transition Rate by Metric

Total SBIR Companies	SBIR Companies w/ PIII Award(s)	% SBIR Companies w/ PIII Award(s)	SBIR Companies w/ PIII Award(s) and/or non-SBIR DoD Procurement	% SBIR Companies w/ PIII Award(s) and/or non-SBIR DoD Procurement	SBIR Companies w/ PIIIs and/or non-SBIR DoD Procurement and/or DoD Subcontracts	% SBIR Companies w/ PIIIs and/or non-SBIR DoD Procurement and/or DoD Subcontracts
4703	748	16%	2731	58%	2949	63%

For each SBIR company that transitioned, we then compared their total transition funding (the amount of revenue they generated across our three transition metrics), to the total amount of DoD Phase I/Phase II funding they received.

- Of the companies that won Phase IIIs, only 39% generated more in Phase III contract dollars than they were awarded in non-dilutive Phase I/Phase II funding. Taken as a percentage of our overall analysis group, just 6% of SBIR companies generated more in Phase III contracts than they were awarded in Phase I/Phase II funding.
- 49% of companies that transitioned via Phase III and/or non-SBIR procurement contracts consumed more in Phase I/Phase II funding than they generated in transition revenue. Taken as a percentage of the overall analysis group, just 29% of all SBIR companies generated more in Phase III funding and/or non-SBIR procurement contracts than they were awarded in Phase I/Phase II funding.
- Adding DoD-funded subcontract awards to the calculation, 42% of companies that transitioned via one or more transition metric consumed more in Phase I/Phase II funding than they generated in subsequent transition revenue. Taken as a percentage of the overall analysis group, just 36% of all SBIR companies generated more in Phase III awards and/or non-SBIR procurement contracts, and/or DoD-funded subcontracts than they were awarded in Phase I/Phase II funding

Calculating transition revenue and the ratio of Phase I/Phase II funding to subsequent non-SBIR contracts for the top 25 SBIR companies with the most in Phase I/Phase II funding, as shown in Figure 3, **we found no consistent relationship between the amount of Phase I/Phase II funding a company receives, and transition rate.** The recent GAO report similarly concluded that the 22 firms they analyzed–collectively in receipt of the most in government-wide SBIR funding—did not necessarily transition at rates higher than companies with fewer awards.

Figure 3: Transition Metrics for the Top 25 DoD SBIR Companies, FY2012-FY2021

Company	Total DoD PI/PII $	Total PIII $	Ratio PIII $ vs. PI/PII $	Total PIII + non-SBIR $	Ratio PIII + non-SBIR $ vs. PI/PII $	Total PIII + non-SBIR + DoD Subcontract $	Ratio PIII + non-SBIR + DoD Subcontract $ vs. PI/PII $
PHYSICAL OPTICS CORPORATION	$198,222,973	$296,550,639	150%	$506,752,621	256%	$543,835,766	274%
INTELLIGENT AUTOMATION INC	$172,174,305	$14,607,362	8%	$68,236,490	40%	$86,709,123	50%
PHYSICAL SCIENCES INC	$168,520,875	$10,303,411	6%	$74,941,384	44%	$101,913,061	60%
CREARE INCORPORATED	$158,034,669	$53,366,123	34%	$85,743,425	54%	$88,505,471	56%
CHARLES RIVER ANALYTICS INC	$153,639,314	$15,930,109	10%	$206,213,710	134%	$241,430,984	157%
TRITON SYSTEMS INC	$121,816,610	$6,430,752	5%	$35,544,912	29%	$36,091,069	30%
LUNA INNOVATIONS INCORPORATED	$115,727,487	$3,616,872	3%	$32,884,666	28%	$36,422,619	31%
CFD RESEARCH CORPORATION	$103,029,444	$450,378	0%	$21,122,072	21%	$53,267,339	52%
LYNNTECH INC	$95,715,220	$3,849,136	4%	$20,586,029	22%	$20,742,065	22%
TOYON RESEARCH CORPORATION	$92,398,212	$19,174,422	21%	$129,289,686	140%	$228,169,816	247%
ARETE ASSOCIATES	$86,856,904	$125,140,457	144%	$179,414,186	207%	$231,727,064	267%
PROGENY SYSTEMS CORPORATION	$76,422,839	$875,436,015	1146%	$1,326,867,356	1736%	$2,068,581,929	2707%
SA PHOTONICS INC	$75,002,150	$11,267,031	15%	$82,407,497	110%	$205,665,144	274%
MAINSTREAM ENGINEERING CORPORATION	$70,653,705	$143,565	0%	$26,159,461	37%	$51,320,790	73%
APTIMA INC	$70,561,859	$82,468,290	117%	$193,482,868	274%	$276,564,268	392%
CORVID TECHNOLOGIES LLC	$64,965,146	$26,602,284	41%	$112,915,222	174%	$201,785,024	311%
SOAR TECHNOLOGY INC	$67,302,292	$5,760,555	9%	$104,177,240	155%	$213,942,061	318%
CORNERSTONE RESEARCH GROUP	$59,984,693	$4,820,260	8%	$20,992,906	35%	$27,303,828	46%

INCORPORATED							
ENGINEERING AND SOFTWARE SYSTEM SOLUTIONS INC	$57,145,087	$66,924,136	117%	$177,492,020	311%	$178,879,990	313%
TDA RESEARCH INC	$56,439,024	$610,100	1%	$17,383,352	31%	$18,439,670	33%
INTELLISENSE SYSTEMS INC	$55,685,545	$15,624,644	28%	$31,418,599	56%	$58,408,779	105%
MAXENTRIC TECHNOLOGIES LLC	$55,054,742	$6,290,024	11%	$22,033,549	40%	$27,717,398	50%
OCEANIT LABORATORIES INC	$54,091,626	$22,630,526	42%	$52,124,554	96%	$53,565,949	99%
FIRST RF CORPORATION	$53,791,669	$33,006,900	61%	$70,982,752	132%	$468,983,023	872%
SYSTEMS TECHNOLOGY RESEARCH LLC	$52,631,563	$49,937,790	95%	$594,811,635	1130%	$677,348,738	1287%

This inconsistent and sometimes poor rate of transition among entrenched SBIR firms reveals a disconnect between the stated objectives of the program, and how the performance of SBIR program offices is measured. SBIR program offices are not held accountable for meeting specific intragovernmental transition goals. Rather, they are held accountable for awarding the requisite amount of total funding to "eligible" firms every year; and for ensuring program participants deliver compliant milestones over the course of their projects. Measuring the program by these standards not only results in a small number of entrenched SBIR companies receiving a significant share of funding, but also incentivizes entrenched SBIR companies to focus their resources on pursuing *more* SBIR awards, rather than transitioning.

Transition Challenges for Nontraditionals

Unlike entrenched SBIR companies, many nontraditionals view the SBIR program as a means of breaking into the federal market. They invest the time and resources required to win a SBIR with the expectation that good performance will lead to follow-on government contracts. However, they are rarely positioned for success in the broader government market for a variety of reasons:

- The SBIR program does not follow a standard protocol for connecting program participants with prospective government customers. The government stakeholder overseeing their SBIR project may not have the funding or the authority to award a follow-on contract; and may not have relationships with the government stakeholders that do.
- Sam.gov, the site where government stakeholders are required to post open requirements, is impossible to navigate. If you manage to find the landing page designated for open opportunities, the search functionality is extremely limited. For instance, search results only include matches where the exact terms

searched are contained in the title and/or description fields of an opportunity. SAM.gov does not search for matched terms in attachments, despite the fact that attachments often contain the most critical and detailed information about the needs of the government customer. Also, queries do not return opportunities that contain synonyms for the terms searched; i.e., searching the term "DRONE" will not produce results that include "UAV."

- Government solicitations are not written clearly. In our 2021 paper, we analyzed the text contained in the description fields of more than one million archived solicitations using a Flesch-Kincaid Score for readability and grade level. **We found that fewer than 4% of descriptions were written in plain English.**
- Many solicitations omit critical information, such as contract value (estimated or actual); or performance period. This information is essential for a small business to determine if an opportunity is feasible and/or worth the expense of submitting a proposal.
- Government stakeholders are not required to coordinate their requirements, which results in significant duplication of efforts, as well as an overwhelming number of demand signals for small firms to manage. For instance, on a single day in October 2020, we identified 132 open requirements related to UAVs. SBIR companies with little experience in the public sector cannot reasonably respond to dozens, or potentially hundreds, of relevant opportunities; and they lack the insider knowledge to effectively prioritize them.
- Nontraditionals do not have ample time to prepare and submit proposals. Of the more than one million solicitations we analyzed in 2021, 70% required responses within 21 days of when they were posted, and 30% required responses within 10 days or less. In the absence of existing relationships with the customer or knowledge of the solicitation prior to its release, it is nearly impossible for small firms to complete.

The limitations of SAM.gov are one reason that dozens of firms have built a business around charging for repackaged SAM.gov data. The existence of a secondary market for publicly-available government data testifies to the fact that SAM.gov fails to serve as a viable resource for this information.

Ultimately, to successfully capture government business after completing a SBIR Phase I/Phase II requires significant investment. Many nontraditionals— particularly those with viable commercial revenue streams—choose to abandon the public sector altogether, rather than "pay to play."

Furthermore, the SBIR program offers no clear instructions to companies regarding internal systems–such as cybersecurity systems and/or new accounting systems–that may be required to qualify for follow-on contracts. Small companies not only walk away from the government market because they cannot justify the investment, but also because they simply cannot get clear information on what the required level of investment will be.

Compounding these challenges is the fact that the SBIR program does not effectively market participants' capabilities to potential government customers. One of the most frequent comments we have heard from government stakeholders over the last 7 years is that they rarely receive information about the SBIR-funded projects within their own branch, and almost never receive information about the capabilities being funded elsewhere in the government. **You cannot expect capabilities to transition, if prospective transition partners do not know they exist.**

The fact that information about participants' capabilities remains siloed has negative consequences for both the small businesses and the government. Rather than leveraging existing investments, government stakeholders conduct redundant market research, or fail to modernize altogether. Meanwhile, small businesses fail to realize their full potential in the government market.

Recommendations

To address these issues and better align the SBIR program with its stated objectives, I offer the following recommendations.

- Overhaul the SBIR submission process to make it easier for small, nontraditional companies to compete.
- Mandate that a share of Phase I funding be awarded to companies with no prior government business.
- Make it easier for companies to identify and bid on government contracts. Specifically, redesign SAM.gov; improve SAM.gov search functionality; require solicitations to have a response time of at least 30 days; require solicitations to be written in plain English; and require government stakeholders with similar requirements to coordinate their outreach and communication efforts.
- Limit the SBIR program to companies with a maximum of $40 million in total annual revenue. If the SBIR program is intended to serve small businesses, eligible companies should in fact *be* small.
- Codify a formal definition for "intragovernmental transition"; require that sufficient data be reported to track these metrics, including a specific code to indicate if a company's subsequent non-SBIR contract and/or sub-contract relates to prior SBIR work; and establish clear intragovernmental transition metrics for SBIR program offices.
- Ensure that when a company submits a Phase I/Phase II SBIR proposal, the ratio of its total prior Phase I/Phase II funding relative to the amount of direct and/or indirect intragovernmental transition revenue it has generated is an important evaluation criteria. Firms with $10 million or more in cumulative Phase I/Phase II SBIR funding must meet minimum intragovernmental transition thresholds, in order to remain eligible for additional Phase I/Phase II funding.
- Incentivize government stakeholders and prime contractors to integrate capabilities funded and fielded through the SBIR program. Specifically, establish a "proven innovators" set-aside program.

- SBIR companies would undergo a rigorous assessment of technical merit upon completion of their Phase II. Based on this assessment of technical merit, a subset of companies would be deemed "Proven Innovators." Much like existing set-aside programs require government stakeholders and prime contractors to award a certain percentage of contracts to historically-disadvantaged businesses, they should be required to allocate a certain share of contract dollars annually to these "proven innovators." There should be an even greater incentive to integrate a capability initially funded by a different branch.
- Companies would be required to renew their "proven innovator" set-aside, via a rigorous assessment of technical merit, every 12-24 months, depending on the nature of the technology.

Of note, these recommendations must be implemented in concert with one another. Implementing *some* but not all of these recommendations will fail to address the underlying issues at play. It could also create conditions for the most entrenched SBIR companies to capture even greater market share, at the expense of truly small companies.

Conclusion

America has thrived by encouraging entrepreneurship and rewarding the best ideas, and these are the merits that the SBIR program claims to uphold. Yet our findings illustrate that there is a disconnect between the stated objectives of the program, and how it functions in reality: it rewards knowledge of the system above technical merit.

Taken collectively, our recommendations stand to reorient the program towards its stated purpose. These recommendations will benefit small businesses and the government. They will make the program more open and competitive, allowing it to attract innovative commercial companies that, thus far, have been deterred by the bureaucracy; and they will encourage wider adoption of SBIR-funded capabilities. Thank you again, Chairman Williams, Ranking Member Velazquez, Subcommittee Chairman Meuser, and Ranking Member Landsman, for the opportunity to speak today.

Appendix

Attached herein are copies of five research reports, published through the Naval Postgraduate School Acquisition Research Symposium.



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2018-04-30

Bridging the Gap: Improving DoD-Backed Innovation Programs to Enhance the Adoption of Innovative Technology Throughout the Armed Services

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ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
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Bridging the Gap: Improving DoD-Backed Innovation Programs to Enhance the Adoption of Innovative Technology Throughout the Armed Services

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Abstract

For over 60 years, Department of Defense (DoD)–backed innovation programs have played an outsized role in the narrative surrounding military innovation. While these programs provide valuable benefits, this paper specifically evaluates their effectiveness as a means of enhancing the adoption of innovative new technology throughout the armed forces. To assess how companies that participated in DoD-backed innovation programs performed in the defense sector subsequent to program completion, we compiled a data set of more than 1.29 million defense contract awards over seven years and analyzed the distribution of these awards across a data set of more than 8,000 DoD-backed innovation program award recipients. The results demonstrated that nearly half of participants achieved no meaningful growth in their defense business after program participation; and the small, innovative companies that did successfully bridge program participation into additional DoD business rarely contracted with customers outside of their initial branch sponsor. Through surveys and interviews of key stakeholders, we identified several causes for the low rate of adoption of participants' technology across the armed forces, and we present concrete recommendations for how the Department can address these problems to better leverage DoD-backed innovation programs as a means of enhancing force readiness.

Introduction

America emerged from World War II as the world's leading economic, political, and technological superpower, and this position remained largely uncontested for the duration of the 20th century. Post 9/11, however, the global landscape began to shift. Intensified competition with rival powers, including Russia and China, the advent of information warfare and a proliferation of threats, and the Global War on Terror and conflicts in the Middle East now pose acute challenges for both American hegemony as well as national security. Additionally, while in decades past Department of Defense (DoD) research often produced revolutionary technological breakthroughs for the civilian sector, commercial innovation now increasingly outpaces the DoD. The Department must therefore attempt to modernize as a whole, while it simultaneously competes to identify and integrate the most cutting-edge technological innovation. Furthermore, as elucidated by Defense Secretary James Mattis in the 2018 National Defense Strategy, "Success no longer goes to the country that develops a new technology first, but rather to the one that better integrates it and adapts its way of fighting" (DoD, 2018). To maintain a strategic overmatch demands mission planning and execution across the forces and requires unprecedented levels of Department-wide cooperation and communication. Just as innovation can serve as a force multiplier, it can also severely degrade military productivity and lethality if it is siloed within a single service

branch or command structure. The DoD, therefore, faces a dual challenge today: it must not only identify and attract innovative and modernizing solutions providers, but also integrate revolutions in military technology across the forces as quickly and seamlessly as possible.

The DoD has widely acknowledged that the prowess and success of America's armed services demand ongoing, supported collaboration with private sector innovators, and increasingly so in light of 21st-century military and national security challenges. For more than 60 years, DoD-backed innovation programs have played an outsized role in the narrative surrounding military innovation. They consume billions of taxpayer dollars annually; enable thousands of disruptive technologies to enter the highly adaptive, risk-averse DoD ecosystem every year; and produce a network of companies with a rare combination of innovative prowess and DoD past performance.[1] Given that a competitive advantage in today's mission environment demands rapid, force-wide integration of innovative technologies, it is essential that these programs also connect the capabilities that they foster to as many prospective DoD customers as possible. However, while these programs implicitly and explicitly market themselves as "points of entry" for small, innovative companies into the overall DoD market, limited scholarship exists to evaluate how participant companies perform in the defense sector in the years following program completion, and if their capabilities are leveraged by the military at large. Our research sought to fill this gap; specifically, we were interested in understanding if and how DoD-backed innovation programs have evolved to ensure that the military remains flexible, agile, and advanced in an environment where rapid integration is essential.

DoD Innovation Programs

To evaluate DoD-backed innovation programs as a means of enhancing the adoption of new technology across the forces, it is important to first understand their history, how the largest are structured, and where they fit within the broader landscape of DoD innovation. The history of America's DoD-backed innovation programs begins in 1957, when the Soviet Union's surprise launch of Sputnik left the American people and its leaders fearful that the United States had lost its technological edge. President Eisenhower responded by creating the Advanced Research Projects Agency (later renamed the Defense Advanced Research Projects Agency, or DARPA) the following year. According to the DARPA website, it has a "singular and enduring mission: to make pivotal investments in breakthrough technologies for national security." Today, DARPA runs over 250 research and development (R&D) programs, all designed to further their core mission (DARPA, n.d.). DARPA is unique in the DoD innovation community as it exists as a stand-alone research agency that funds innovative research within industries and also conducts its own research. DARPA uses contracting authorities to solicit solutions directly and participates in the Small Business Innovation Research program (SBIR) and the Small Business Technology Transfer program (STTR) to fund research conducted by small businesses.

[1] In the Department of Defense's Fiscal Year 2019 Budget Request, $13.6 billion has been earmarked by the DoD for Science and Technology research in FY19. Over $286 billion has been requested for modernization efforts across the Department (Office of the Under Secretary of Defense, 2018).

The Small Business Administration (SBA) launched the SBIR program in 1977 to "support innovation through the investment of federal research funds in critical American priorities to build a strong national economy" (Small Business Association, n.d.-a). It established its identically-structured sister program, the STTR program, in 1992, designed to help further scientific research with potential for broader commercial benefit. SBIR/STTR programs run in three phases, all of which are restricted to small businesses.[2] In Phase I, companies establish the technical merit, feasibility, and commercial potential of their project over the course of one year in exchange for $150,000 in federal funding. For Phase II, participant companies continue to grow and develop their technology with additional funding not to exceed $1 million over a two-year period. A product with "commercial potential" may then proceed to Phase III. SBIR/STTR does not fund Phase III directly, but many federal agencies with SBIR/STTR authority provide follow-on contracts or funding to support this additional development. Phase III is intended to be the primary means of transitioning new technologies into the broader service branches or agencies that need them. The armed services and defense agencies each run their own SBIR/STTR programs and define the topics for which they are seeking small business applicants.

Based on the success of SBIR/STTR and the need to accelerate the fielding of innovative technology, the DoD created the Rapid Innovation Fund (RIF) in 2011, marketed on the DoD's Defense Innovation Marketplace site as "a collaborative vehicle for small businesses to provide the Department with innovative technologies that can be rapidly inserted into acquisition programs that meet specific defense needs." Much like SBIR/STTR, the armed services and various defense agencies run their own RIF programs and define their own project specifications. However, unlike SBIR/STTR, and despite its mission statement, RIF permits companies of any size to participate. The RIF process starts with a Broad Agency Announcement (BAA) and the request for companies to submit a white paper. The sponsoring agency reviews all submissions and invites shortlisted companies to submit a full-scale proposal. The company with the most competitive proposal receives the RIF award. One of the primary objectives of RIF is to better and more rapidly connect research and technologies developed in the SBIR/STTR program to a wider audience within the DoD. As such, from 2011 to 2015, RIF awarded more than half of its $1.4 billion in contract awards to companies that had previously participated in SBIR/STTR (Bujewski & Purdy, 2017).

In 2015, Secretary of Defense Ash Carter established Defense Innovation Unit Experimental (DIUx) in support of the Third Offset Strategy initiated by Chuck Hagel in 2014. DIUx, like its predecessors, is designed to fund innovative companies with the purpose of solving national defense problems. It determines project specifications and areas of interest in concert with DoD entities. Companies of any size can respond to a DIUx solicitation by submitting a solution brief. According to DIUx's website, briefs are typically evaluated within 30 days, and shortlisted companies are then invited to submit a full-scale proposal and begin negotiations for a pilot contract. Unlike the other DoD innovation programs, however, DIUx utilizes "Other Transaction Authority" (OTA), a contract vehicle that streamlines the funding process and according to the DIUx website, enables them to fund projects in 90 days or fewer. According to U.S. Code 10 2371b, OTA funds include a designation for

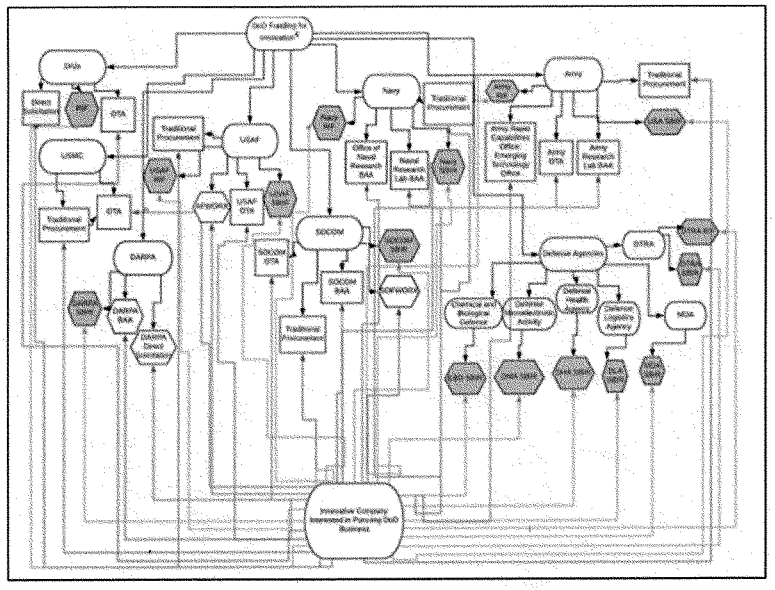
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[2] The SBIR size compliance guide defines a *small business* as "a business with 500 employees or fewer."

prototype projects deemed critical to enhancing the mission effectiveness of the military or to improve systems already in use by the armed forces. The armed services may contract up to $250 million annually for projects that meet OTA criteria, provided the primary awardee for a given project represents a "nontraditional defense contractor" or a small business. As such, OTA also affords DIUx greater latitude in allocating funding, making it more agile and more appealing to nontraditional solutions providers.

In addition to these five DoD-backed innovation programs, the DoD has approximately 50 additional external funding programs, 20 of which are designed to rapidly integrate technology (Small Business Technology Council, 2014). The DoD also continuously stands up new DoD-backed innovation programs and utilizes OTA funds independently to support internal innovation efforts.[3] This process compounds across the DoD, and innovative companies interested in pursuing the defense market—and the service branches and Departments that seek to collaborate with them—face a paralyzingly complex web of prospective routes and access points, as shown in Figure 1.

[3] Since January 2015 alone, the DoD has created DIUx, the Warfighting Lab Incentive Fund, AFWERX (an Air Force innovation initiative), SOFWERX (SOCOM's innovation initiative) among others (Gibbons-Neff, 2016; Kaplan, 2015; West, 2018).



Note. Programs reflected in our data set are highlighted in green.

Figure 1. Access Points for Innovative Companies into the DoD

This bloated, hyper-bureaucratic system also elucidates the Department's cripplingly risk-averse culture, one of the most acute obstacles thwarting DoD innovation efforts. Paralyzed by a "fear of failure," decision-makers are unwilling to experiment, collaborate, and take risks. This culture has resulted in countless "stove-piped" initiatives that are developed without cross-communication and operate in parallel. Given the Department's ongoing struggle to modernize and remain innovative, it should invest in building robust, long-term relationships with the innovative companies that do manage to navigate this web successfully and achieve proven DoD past performance. Consequently, rather than evaluating the effectiveness of innovation programs as a means of addressing singular, branch-specific requirements, our research sought to evaluate if and how the largest and most prominent DoD-backed innovation programs improve the rate of adoption of innovative technology force-wide.

Program Participants

In order to determine whether the companies fostered in DoD-backed innovation programs achieved force-wide adoption, we first looked at how those companies performed in the defense sector after program completion. Although there is no data available to determine the results of these programs in general, one indicator of a company's DoD performance is the number of defense contracts that it wins. Thus, we began by examining the number of defense contracts won by DoD-backed innovation program participants in the years following program participation. We focused our quantitative research on SBIR/STTR and RIF for several reasons: they are the largest of the DoD-backed innovation programs

and the only hubs that publish complete lists of their program participants, which made it possible for us to gather a significant data set; and because all branches of the armed forces and all defense agencies participate in both SBIR/STTR and RIF, the data set is not only large but also comprehensive.

We first combined the publicly available lists of RIF project award recipients between 2011 and 2015 (103) and DoD-sponsored SBIR/STTR award recipients between 2013 and 2016 (8,158) from the SBA database. Both RIF and SBIR/STTR are rife with serial users, which means there were dramatically fewer unique companies in this ecosystem relative to total awards. For instance, from 2013–2016, the Physical Optics Corporation received 236 DoD sponsored SBIR/STTR awards, and Charles River Analytics received 129. Intelligent Automation received 138 SBIR awards from 2013–2016 and won seven RIF contracts from 2011–2015.[4] As such, we adjusted the 8,261 total awards to control for repeat usage and isolate unique companies, which resulted in a data set of "Program Participants" that contained 1,140 companies.

In order to understand how these 1,140 companies performed in the defense sector subsequent to their program participation, we scraped and filtered more than seven years' worth of publicly available defense contract award data from FBO.gov from January 1, 2011–January 15, 2018.[5] Because FBO.gov publishes only unclassified prime contract awards, our data did not include classified contracts or information about companies' performance as a subcontractor or teaming partner on DoD contracts. Nevertheless, the set contained more than 1.29 million defense contract awards, which we then filtered to isolate the defense contracts specifically awarded to the 1,140 companies in our Program Participant data set: a total of 13,449 defense contracts.

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[4] While the SBA system is rife with flaws in how it reports and names companies, our data tool controlled for these errors to an extent by removing duplications and recognizing slight differences in company names to avoid errors in contract attribution (Cordell, 2018).

[5] These timeframes were selected to enable analyses of complete data sets. At the time this information was compiled, RIF awards were publicly available from program inception in 2011 through 2015. SBIR awards are all publicly available but the most recent, complete data is from 2013–2016.



Supplier Retention

The distribution of these 13,449 contracts across the 1,140 Program Participant companies in our data set produced striking results, as shown in Figure 2.

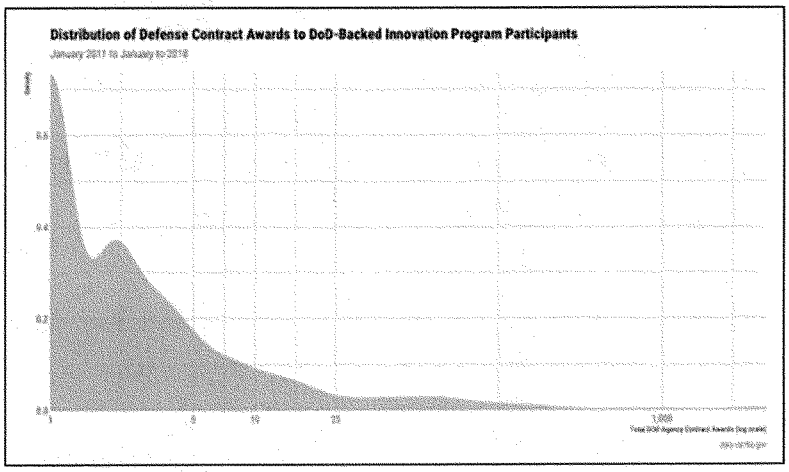


Figure 2. Distribution of DoD Contracts to Companies That Participated in a DoD-Sponsored SBIR/STTR Program or RIF Program (2013–2016 and 2011–2015, Respectively)

It is immediately apparent that a majority of participant companies won few if any follow-on defense contracts, as demonstrated by the concentration of companies on the left-tail of the distribution.

In fact, we determined that a startling 26% of the companies in our vast data set (~296 Program Participant companies) won zero defense contracts after completing their DoD-backed innovation programs.[6] Another 22% of companies in our set (~250 Program Participant companies) won only one single defense contract following their RIF/SBIR/STTR award. In other words, nearly half of the program graduates (48%) received fewer than 2% of the total 13,449 defense contract awards.

The format of publicly available data limited our ability to control for specific timeframes, as contract award data was fixed from January 1, 2011 to January 15, 2018 (per the parameters of the "scraper" we used). We assessed the entire data set of participant companies over this period of time; thus a company that completed SBIR/STTR or RIF in 2011 was evaluated over seven years, while a company that graduated in 2016

[6] ~296 companies exist as one contract in our data, but that contract is their award from SBIR/STTR or RIF.

was evaluated over two years. However, all companies in the data set had at least 13 months to win defense contracts, and given the size of our overall data sets and the overwhelming share of companies that failed to win DoD contracts following program participation, it is unlikely that the timeframe limitation significantly affected our results. Additionally, we recognize that small, innovative companies often lack the capacity and infrastructure to bid/perform as Prime contractors and instead subcontract or team with large Strategic Integrators (SIs) to expand their defense business. Unfortunately, we could not examine innovation hub participants' performance as subcontractors or teaming partners because no large, publicly available data sets exist containing that information. Presumably, a portion of program participants that won few or no defense contracts as a Prime did achieve some growth in their defense business indirectly. However, the significant and stark results of our data incontrovertibly reveal a trend and thus remain deeply troubling. Namely, that a significant share of participant companies went through the involved and drawn-out process of applying for an innovation hub, proved their relevance to a branch-specific requirement and received an award, and expended significant resources to develop the capabilities requested by their branch sponsor; and these efforts failed to bridge into any meaningful growth in their direct defense business. The implications are perhaps most concerning with respect to force readiness. The capabilities of these ~547 companies were honed by initial branch sponsors based on critical requirements for which private sector collaboration was deemed essential. For almost 300 of these companies, their capabilities were never procured directly by other defense customers, or from within the sponsor branch, or from other branches, and the other ~200 companies faced essentially the same fate.

The distribution of the 13,449 contracts across the 1,140 companies also made it clear that a small subset of companies won a disproportionate share of the remaining 98% of contracts in our data set. While RIF describes itself as a "vehicle for small businesses," the Participant Data data set includes names like 3M, BAE Systems, General Dynamics, Raytheon, and other experienced contractors. To better understand the effects of these outliers on our data, we isolated companies from our Participant Data data set that had won 50+ DoD contracts from January 1, 2011 to January 5, 2018. Forty companies in our data set fit those criteria.

These 40 companies, or approximately 3.5% of our total Program Participant data set, collectively received a staggering 80% of the defense contract awards in our overall defense contract award data set, as depicted in Figure 3.

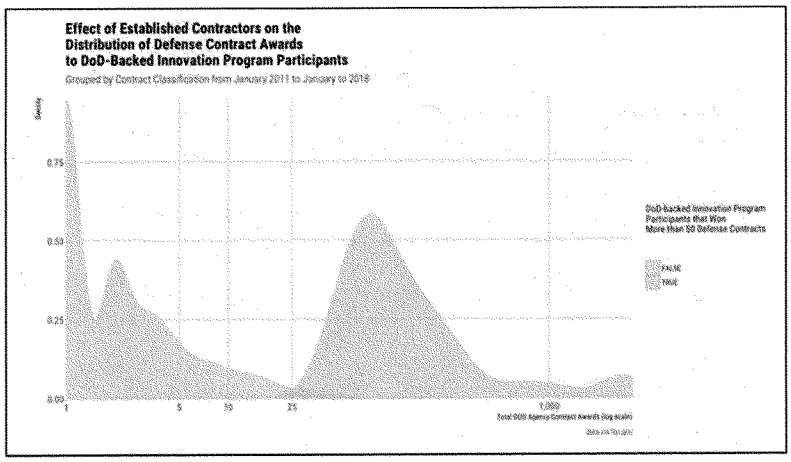


Figure 3. Distribution of DoD Contracts to DoD-Sponsored SBIR/STTR Participants and RIF Participants (2013–2016 and 2011–2015, Respectively) by Company Size

Removing these outlier companies from the data set, the percentage of the remaining 1,100 companies that won zero defense contracts after their SBIR/STTR or RIF participation also jumped by 10%, from 26% to 36%.

For the companies that stand to gain the most benefit from these programs, the reality—that the programs contributed to no meaningful growth in participants' direct defense business—is even more acute. Furthermore, these programs are designed to provide the forces with greater access to emerging technologies, whereas our forces are otherwise limited to the technologies that the established DoD contractors present to them. Our data suggests that these innovation hub programs have in fact become yet another channel for legacy contractors to gain DoD market share.

Customer Diversity

While our initial analyses demonstrated that innovation hubs fail to convert a large portion of participants into viable DoD suppliers, we also sought to examine, for emerging technology companies that did manage to survive the transition from DoD-backed innovation program into the defense market, how broadly their capabilities were integrated across the forces. To do so, we examined whether participants won contracts with defense customers other than their initial sponsor branch. Limitations to the functionality of our data analytics tools meant that we could not examine customer diversity for our entire data set, so we created a subset of our Participant Data to include companies that won between two and 12 defense contracts subsequent to program completion: 360 companies, or 32% of our Participant data set. As 48% of participants won zero or one defense contract after program completion and 3.5% of participants accounted for a startling 80% of all defense contract awards, the data left a narrow subset of companies that fell somewhere in the "middle"—that is, non-entrenched contractors that had successfully bridged the gap from program participation into a healthy, modest defense contracting business. By focusing on

companies that won between two and 12 contracts, we were able to test customer diversity using a sizable data set from this narrow middle.

Our research found that, for a striking 76% of companies in this subset, all of their defense contract awards came from their initial sponsor branch.

In other words, 76% of these companies achieved no customer diversity, suggesting that even when the DoD manages to retain a supplier honed in an innovation hub, it largely fails to integrate the company's capabilities across the forces.

DIUx: Micro-Analysis

DIUx has garnered widespread attention as an especially promising approach to the DoD's innovation problem (Kaplan, 2016; Maucione, 2018; Williams, 2017). Its funding is slated to increase by more than 70% in Fiscal Year 2019, and Secretary Mattis recently lauded it, saying, "There is no doubt in my mind that DIUx will not only continue to exist, it will actually … grow in its influence and its impact on the Department of Defense" (Lanier-Chappellet, 2017). Although DIUx data was too limited to include in our broad quantitative analyses and despite the more acute impact of limitations on a small sample size, we felt it nevertheless important to determine if DIUx retains and disseminates its participants' capabilities more effectively than its predecessors.

We created a "DIUx Participants" data set using the company names marketed on the DIUx website as of Q4 2017 (31 companies). We then filtered our DoD contract data set to isolate DoD contracts awarded to these 31 companies from January 1, 2015 (the year DIUx was founded) through January 15, 2018: a total of 440 defense contracts. We immediately recognized that entrenched government contractors have utilized DIUx as well, which profoundly affected the results. Specifically, Rockwell Collins was one of the 31 companies in our "DIUx Participants" data set. The company is a legacy DoD contractor; thus unsurprisingly it won 408 of the 440 total defense contract awards from our FBO award data set. The distribution of the remaining 32 contracts across the 30 other DIUx participants in our data set reflected the same troubling trends we identified in our SBIR/STTR/RIF analyses:

Four DIUx participants won between three and six DoD contract awards after program completion, and the remaining 26 companies—or 81% of DIUx participants in our set—won zero or one DoD contract.

Despite its laudatory attention, DIUx, like its predecessors, does not appear to position private sector innovators for long-term success in the defense sector. Rather, DIUx engages with participants solely to address singular, branch-specific projects and does not disseminate supported capabilities to other prospective DoD customers thereafter.

Surveys Methods

While we concluded that DoD-backed innovation programs are not effective distribution channels for small, innovative companies into the broader defense market through our quantitative analyses, to better understand potential causes of these program failures, we conducted surveys and interviews with individuals from three key stakeholder groups:

- Representatives from DoD-backed innovation programs
- Representatives from companies that participated in a DoD-backed innovation program
- Members of the DoD community

We developed unique survey and interview questions for each of these stakeholder groups and contacted a total of 159 prospective respondents. While our quantitative analyses were limited to SBIR/STTR and RIF data and a small set of DIUx data, our qualitative research encompassed the broader landscape of DoD-backed innovation programs. We received a total of 20 responses: seven representatives who work for a DoD-backed innovation program, three of whom elected to participate in an in-depth follow-on interview; five representatives from participant companies, one of whom elected to participate in an in-depth follow-on interview; and 10 individuals from the general DoD community, three of whom elected to participate in an in-depth follow-on interview.

Survey & Interview Feedback

The anecdotal evidence consistently pointed to the same programmatic failures we identified in our quantitative analyses and most significantly, helped us better understand the reasons for these problems. The key issues revealed by our survey and interview data include the following:

- *DoD-backed innovation programs do not educate participants on how to succeed in the broader defense sector.*

  The majority of participants surveyed noted that their innovation program offered no instructions/education for how to identify or bid on government contracts after program completion. They also indicated that the program did not prepare them to support a broad base of DoD customers. Likewise, when program managers were asked how their program helps a participating company identify other relevant DoD requirements, it was clear that no formal, institutionalized process exists. For instance, one program manager explained, "We naturally become aware of [relevant opportunities] from our contractors, conferences, even our customers sometimes," and another stated that they rely on "collaborative conversations" to find additional DoD opportunities for participants with promising capabilities. Similarly, when asked how they would improve the DoD innovation program, one respondent recommended, "Provide some sort of bridge to help small business survive the gap between the end of the 'innovation contract' and the follow on sustainment work." Given that the innovation programs do not educate participants on how to find and bid on government contracts, it is therefore not surprising that, as indicated by our quantitative data, nearly half of program participants fail to win defense contracts after program participation.
- *DoD-backed innovation programs do not market participants' capabilities to the broader armed services community.*

More than half of the program managers that provided feedback indicated that their programs have no formal process for circulating information about participants' capabilities to the broader armed services community. One of the most frequent comments from members of the DoD community was that they receive very few briefings on the projects their own branch funds and almost never receive information on the capabilities of companies funded by other branches. When members of the DoD do learn about the capabilities of companies that have participated in a DoD-backed innovation program, it is not because the programs are marketing them effectively. According to those surveyed, at best they might hear about a company through a random, one-off initiative like a "quarterly update" mailer that references an innovative technology, or "infrequent[ly] hosted industry days." Usually, they learn about the technology through a chance meeting with a colleague who is familiar with it. Our quantitative results are further explained by the fact that the innovation programs do little if any marketing of participants' capabilities to the broader DoD community. Simply put, a customer cannot buy something it does not know exists.

- *DoD-backed innovation programs do not track the performance of participant companies in the years following program completion.*

  Our qualitative research confirmed the troubling fact that DoD-backed innovation programs do not follow a systematic, consistent process for tracking the performance of participant companies after program completion. Many DoD-backed innovation programs do not track program participants at all; others may track some companies inconsistently or on an ad hoc basis. Without tracking participants, DoD innovation programs cannot discern how these companies fare in the defense sector or at large. They do not see changes in a company's performance year to year; they do not receive updates on a company's capabilities developments; and if a company changes its name, changes its leadership, or moves its headquarters, that information is not recorded in a central database. Perhaps most concerning, they do not monitor the long-term effectiveness of significant investments of public funds into DoD-backed innovation programs. The absence of a formal process for tracking the long-term performance of participants is the equivalent of a venture capital firm not tracking the performance of its portfolio companies. It elucidates these programs' egregious supplier retention problems and signals that these programs are not concerned with the long-term success of the companies that they fund.

- *A company's failure to win DoD contracts after program participation does not necessarily correlate to a lack of demand for that company's capabilities.*

  Our survey and interview feedback also demonstrated that, while in some cases innovation program participants may not achieve widespread adoption across the DoD due to the specificity of a sponsor project, a company's failure to win DoD contracts after program participation does not necessarily correlate to a lack of demand. For example, we interviewed the CEO of Monterey Technologies Incorporated (MTI), a company that develops mission planning software systems and has been an active defense contractor since 1984. MTI received one Navy-sponsored RIF award in 2012 and six Navy-



sponsored SBIR awards between 2013 and 2016, and between January 1, 2011 and January 15, 2018, MTI won three defense contracts, all from Navy customers. While MTI has only won Navy contracts, there have been 144 DoD contracts awarded for "mission planning services" over the past five years alone, signaling Department-wide demand for their solution. The CEO shared that recently an Army Airborne officer serendipitously learned about MTI through a Navy contact. The Army had been handling mission planning by hand, and MTI had the potential to address this ongoing problem. He called MTI's CEO directly, and as a result of the ad hoc outreach they are now collaborating on a pilot project. This example demonstrates not only bona fide demand for MTI, but also the inadequacy of current communication channels across the services.

The interview also offered valuable insights relative to how small, innovative companies attempt to stay competitive in the defense sector. In addition to their own disparate business development efforts, MTI pays a business intelligence firm to compile a monthly report of relevant federal opportunities. MTI then undertakes an involved process to qualify relevant opportunities, many of which are designed for larger contractors. As such, after identifying a relevant opportunity, MTI must then develop a strategy to identify and engage with the appropriate teaming partners. Large integrators, from MTI's experience, do not give preference to companies that have participated in DoD-backed innovation programs. While their program participation has provided them with valuable funding and strategic customer opportunities within the Navy, SBIR/STTR and RIF have not offered them unique leverage in the defense market.

The experience of another company in our Participant data set, "Enomalies," tells a similar story. In 2016, Enomalies participated in Phase II of an SBIR project and, like many DoD-backed innovation program participants, has not won a single defense contract since. Enomalies specializes in advanced imaging and field-ready prototyping, and the Navy sponsored its SBIR project to further develop a Rapid Synthetic Environment Tool (Small Business Association, n.d.-b). The tool scans an area and quickly creates a 3D model that strategists and planners can walk through and interact with. Enomalies's tools also have the ability to rapidly scan objects and print prototypes on 3D printers (Enomalies, n.d.). Despite the fact that Enomalies has not won any follow-on defense contracts, since 2016 alone, there have been 26 defense contract awards for 3D printing systems and four for 3D scanning services. According to their website, Enomalies supports a broad range of commercial customers and appears to remain a viable company. Presumably, then, it is neither a lack of demand nor an inability to perform that has kept Enomalies from winning a defense contract since its SBIR award. Instead, it suggests that DoD innovation programs fail to adequately connect their participants to prospective DoD customers.

Further Analysis & Recommendations

The fact that DoD-backed innovation programs fail to market their participants to prospective DoD customers has myriad consequences. It results in lost revenue for the innovative companies who, as our data illustrated, do not become robust DoD suppliers. Perhaps more concerning, however, are the consequences for the strength and readiness of our forces at large. If the armed services are not made aware of the capabilities supported in DoD-backed innovation programs, they cannot adopt them—instead, they either do not modernize, or they conduct redundant market research. Furthermore, these programs introduce private sector innovators into the defense ecosystem, provide them with past performance, and then fail to nurture them as long-term suppliers. These results are costly, and they also damage the reputation of the Department: innovative suppliers undertake the complex, expensive, and time-consuming process of participating in a DoD-backed innovation program only to find that it does not contribute to meaningful growth in their defense business. They are expected to undertake full life-cycle sales processes for each individual DoD customer, in contrast to how large commercial customers operate (where new vendors typically undergo a vetting period and if successful, their product or service is distributed across the organization's broader portfolio). If these problems are not addressed, innovative companies will increasingly forgo public sector opportunities altogether, and innovation programs will both fail to attract top innovators and fail to realize their full potential as force multipliers. However, with the proper reforms, DoD-backed innovation programs do have the potential to drive vast improvements in the readiness of our armed forces. As stewards of significant tax dollars, the defense sector should focus on maximizing their investments in innovation and R&D over the long term. To do so first and foremost requires that DoD-backed innovation programs maintain consistent, clean, and accessible records about their projects and program participants.

As such, we first and foremost recommend creating an "innovators database"—a central, searchable database containing information about all DoD-backed innovation program participants.

The innovators database would be populated by innovation hub program managers and the companies themselves, and would contain company basics, information about the company's capabilities, and details about the projects that the company has supported for both government and commercial customers. A company would be required to maintain updated records in the database or face penalties. Likewise, program managers would be held accountable for maintaining these records for the five to 10 years following a company's program completion. The innovators database would enable DoD-backed innovation programs to easily share information with stakeholders across the armed forces on the capabilities of their participant companies. These stakeholders could access the database directly and search its rich pool of proven solutions providers to identify prospective suppliers. It would reduce redundancy in market research and requirements development and improve the likelihood of broader, more rapid integration of proven capabilities. Furthermore, the money saved by eliminating redundancy could be reallocated across the Department. A version of the innovators database would be made available to Prime Contractors and SIs as well, to help facilitate teaming arrangements.

For an entity as rigid and adaptive as the DoD, simply making more information available to key stakeholders will not drive change. The Department must encourage key stakeholders to better leverage DoD-backed innovation programs.

Specifically, we recommend that the DoD implement an incentive program that requires defense contracting entities and large defense contractors to allocate a set

percentage of business to "Proven Innovators," or companies that have graduated from a DoD-backed innovation program.

This incentive program would be similar to existing set-aside programs designed to increase opportunities in the federal market for various historically disadvantaged groups. Proven Innovators would earn their "set-aside" status upon completion of their DoD-backed innovation program. Like the existing cadre of set-aside programs, contractors and contracting officers would be required to achieve minimum engagement levels with Proven Innovators and would be motivated to do so through tax incentives and other benefits. This system would force broader adoption of leading technologies across branches, as the different branches (and the contractors that serve them) would be required to stay abreast of various sponsors' projects by using the innovators database, and it would force collaboration and cross-communication in an otherwise siloed environment. This incentive program would also add tremendous value to participant companies, lending them a concrete advantage in the broader contracting environment. Participants would see an increase in their federal business overall and an increased willingness on the part of large integrators to support and engage with them.

To that end, in addition to these initiatives, DoD innovation hubs must also educate their participants on the fundamentals of the defense contracting sector—how to identify and bid on contracts, how to find and team with other firms, how to register for set-asides, etc.—in order to make them more competitive.

Innovation hubs could potentially partner with the SBA, which already offers similar training. The more benefits DoD-backed innovation programs can offer, the better positioned they are to attract and serve the most discerning, talented technology companies.

Conclusions and Future Work

While the aforementioned recommendations are crucial first steps toward improving the efficiency and functionality of DoD-backed innovation programs, further research is required to fully understand participants' experience in the defense sector after program completion. First and foremost, additional research is required to further analyze the large data sets we compiled. A more sophisticated analytics tool would enable us to draw additional and more extensive conclusions, such as if and how non-DoD agencies leverage the technologies fostered by DoD-backed innovation programs and the impact of the rampant serial usage on the effectiveness of these programs as a whole. Additional data and analyses are also needed to evaluate participants' performance as subcontractors and teaming partners on defense contracts. Relative to our recommendations, further research is also required to determine how best to structure the "Innovators Database" as well as the set-aside incentive program to enhance supplier retention and broad integration.

Once DoD-backed innovation programs are reformed and improved, additional research is needed to understand the most effective ways to market-to and attract the best and brightest innovators into these programs. Additional research is also needed to better understand opportunities for streamlining, merging, or eliminating redundant or ineffective entities throughout the vast, complex DoD innovation landscape, including the individual, specialized innovation programs within each branch and combat command. From the vantage points of both national security and efficiency, it is also critical that cutting-edge capabilities are integrated throughout the whole of the government. Therefore, further research is required to determine how to position participants in DoD-backed innovation programs for success as suppliers to both DoD and non-DoD customers.

It is essential for America's national security that the armed services have access to the best and brightest new technologies, and the continuous investment in DoD-backed innovation programs over the last 60+ years has resulted in a vast infrastructure of programs and access points for new, cutting-edge solutions. DoD-backed innovation programs provide both participants and the Department with valuable benefits. Participant companies benefit tremendously from the funding these programs provide, which allows them to grow their business, develop new research and prototyping, and commercialize. The programs also introduce participants to the various idiosyncrasies of the contracting space and to the unique challenges facing the armed forces. However, today's adversaries and threat environment demand unprecedented synchronicity and collaboration across the armed forces. It is, therefore, essential that all branches of the military adopt revolutions in technology as quickly and seamlessly as possible to ensure consistent standards in warfighting capabilities; to ensure fighters across the services can communicate and share information; and to ensure that the Department leverages its full potential and buying power to appeal to the small, private sector innovators it so desperately seeks to attract and retain. Unfortunately, DoD-backed innovation programs have failed to serve as viable entry-points for emerging capabilities into the broader defense sector and have failed to enhance the integration of these emerging capabilities across the forces. A superior military not only serves domestic national security interests, but also enables the United States to fulfill its role in safeguarding peace, prosperity, and freedom. As such, the DoD must stop at nothing to keep the forces agile, modern, and at the forefront of new technologies, and that includes adapting its existing resources—in this case, its vast network of innovation hubs—to be as effective as possible.

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The Effect of Defense-Sponsored Innovation Programs on the Military's Industrial Base

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Abstract

The Department of Defense (DoD) spends billions of dollars annually to fund innovation programs, rapid acquisition programs, and small business outreach programs ("innovation initiatives") with the stated or implicit objective of attracting innovative commercial companies outside of the traditional defense industrial base. However, by analyzing publicly-available DoD contract award data from 2010 through 2019 and government records for thousands of participants in DoD innovation initiatives, this paper demonstrates that the majority of companies that participated in innovation initiatives over the last decade had existing ties to the defense market. In addition to quantitatively analyzing the types of companies that leveraged these programs, this paper also explores the history of the DoD's innovation initiatives, how the department markets these programs, and why these programs have largely benefited firms already entrenched in the federal market. We also make a series of concrete recommendations for how the DoD can better market and structure these programs to attract and engage new, innovative companies.

Introduction

The rapid pace of technological development in the private sector, coupled with today's threat environment, has forced the Department of Defense (DoD) to rethink how it sources and funds new technologies. While policies of containment and counterterrorism dominated military and foreign policy post-9/11, over the last five years, the United States has reoriented its national security and defense strategies toward an explicit focus on exigent threats posed by China and Russia. Whereas in decades past, the DoD was at the forefront of technological innovation and exported its technologies to the commercial sector, today that paradigm has shifted to a point where many companies outside of the military's traditional suppliers increasingly drive advancements in areas of critical importance to national defense.

It is vital for the DoD to attract and integrate the technological innovations emanating from the private sector not only to preserve our own military superiority, but also as a proactive measure to slow the flow of these technologies overseas, particularly to China. China has prioritized gaining access to promising American dual-use technology companies as part of its multifaceted plan to displace the United States and has employed a variety of nefarious strategies to do so. As one such example, China has made it easy and financially attractive for these companies to transact with investors and/or customers tied directly or indirectly to the Chinese Communist Party, with the purpose of stealing their intellectual property and exploiting their capabilities for military and economic gain. While the U.S. government has recently taken measures to curb China's predatory behavior, the DoD is uniquely positioned to support these efforts. To the extent that the military can leverage its own resources, buying power, and

legitimate need for innovative new technologies to make it easier and more appealing for these companies to do business with the DoD, these companies would have less of a need to seek capital and/or customers from China—or from any overseas partners. As the DoD evolves its strategies in response to present realities and risks, it must take these factors into consideration and make a concerted effort to engage companies that have not previously worked with the DoD.

Over the years, the DoD has tried to accelerate the adoption of innovative commercial technologies through continuous investment in dozens of innovation programs, rapid acquisition programs, small business outreach programs and accelerators ("DoD innovation initiatives" or "initiatives"). However, limited scholarship exists to determine whether these initiatives have proven effective at attracting newcomers with no prior DoD experience into the defense market, versus the extent to which they are leveraged by existing DoD vendors. Our research aimed to fill this gap by evaluating the number and composition of new vendors that have entered the defense market annually, along with the number and composition of new versus existing vendors that have participated in different DoD innovation initiatives over the last decade.

Sizing the Defense Industrial Base

To analyze the effectiveness of innovation initiatives as a means of attracting new vendors into the DoD, we explored the composition of the defense industrial base, in general, over the last decade. We focused our research on the period from 2010 through 2019 because it encompassed the recent shifts in military strategy described previously. This 10-year period was also one of relative economic stability and excluded the substantial outlying factors we would have had to consider using data from 2008–2009. Furthermore, USASpending data became more complete around 2010.

First, we sought to determine the overall size of the DoD's supplier base in each of the last 10 years. Then, we could analyze how many vendors in each year were doing business with the DoD for the first time, compared to the number of vendors with existing DoD revenue. We began by acquiring publicly available data on government expenditures from 2010 through 2019 from the Federal Procurement Data System (FPDS) and USASpending. We then isolated the data for contracts awarded by the DoD.[1] Next, we filtered the data by fiscal year (FY) and, for each year, isolated the total number of contract actions, or instances in which the DoD is required to enter an action into FPDS ("DoD contract actions").[2] Annually, the number of DoD contract actions is significantly higher than the number of vendors because many vendors win multiple contracts. Therefore, we needed to determine the number of unique vendors associated with the overall number of contract actions. To do so, we grouped each contract action by its associated Data Universal Numbering System (DUNS) number and calculated the tally of unique DUNS numbers contained in the data each year.[3] For companies with multiple vendor DUNS numbers, we resolved back to the parent DUNS number.[4] The total count of distinct DUNS numbers each year became our parent universe of DoD vendors, which can also be understood as the DoD's annual base of suppliers. *As demonstrated in Figures 1 and 2, the*

[1] Contracts awarded by the DoD include contracts awarded and funded by the DoD and contracts awarded by DoD with other funding partners. DoD awards are categorized with CGAC code 097 or 97.
[2] Contract events include a broad range of activities, including instances in which the government awards a new contract, funds a new or existing contract or modifies a contract (https://www.fpds.gov/wiki/index.php/FPDS-NG_FAQ February 25, 2020).
[3] Every contract action in FPDS contains a field for the DUNS number.
[4] The exception was for government entities such as state universities, where we kept vendor DUNS numbers independent of the parent.

number of suppliers to the defense department over the last decade has declined dramatically, even as the number of DoD contract actions has grown.

Budget Year	DOD Contract Actions	Unique DOD Vendors
2010	1,525,150	79,993
2011	1,506,404	77,195
2012	1,419,824	71,884
2013	1,299,282	64,685
2014	1,317,268	62,080
2015	2,985,513	61,095
2016	3,417,134	59,101
2017	3,430,958	57,165
2018	4,490,945	54,535
2019	4,315,586	51,239

Figure 1: Count of DOD Contract Actions & Unique DOD Vendors by Year
(PW Communications, n.d.)

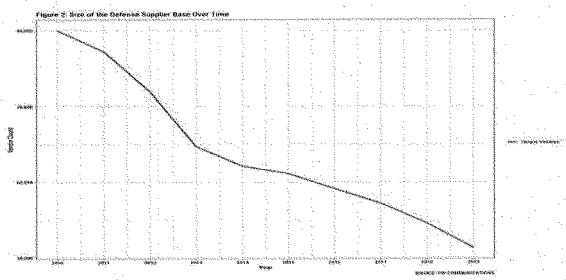


Figure 2: The Shrinking Defense Industrial Base

Right-Sizing the Defense Industrial Base

A number of factors have contributed to the consolidation of the DoD supplier base, which began in the early 1990s, including uncertainty in government spending and procurement, a shortage of skilled labor, and a desire among the largest prime contractors to achieve greater economies of scale (Tirpak, 2008). Furthermore, as noted in *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States,* prepared by the Office of the Under Secretary of Defense for Acquisition and Sustainment in 2018, "Many of the current policies and practices of the U.S. Government, and DoD in particular, strain the industrial base and reduce incentives to supply to DoD" (p. 32). There are advantages and disadvantages to a smaller supplier base. It potentially affords the customer with more leverage, better pricing, and fewer suppliers to manage. Conversely, it may increase risks as the operational health of the military becomes dangerously intertwined with the health and performance of a small number of companies. We recognize that the overall size of the

defense supplier base should reflect a balance between these pros and cons. However, strategic consolidation in certain categories should be offset by the introduction of new vendors in areas where the commercial sector drives technological leadership—the ostensible purpose of DoD innovation initiatives. As such, we were interested in understanding how many companies entered the defense market for the first time each year ("first time vendors"), what capabilities these first time vendors possessed, and the extent to which innovation initiatives helped the DoD attract innovative commercial firms with no prior defense experience.

Calculating First Time Vendors

To calculate the number of first time vendors that entered the defense market each year, we isolated the year in which each unique DUNS number contained in our total universe of DoD vendors had its first recorded DoD contract action, dating back to the 1950s.[5] If the first recorded contract action for a given DUNS number was 2010, the entity associated with that DUNS number was classified as a "first time vendor" in 2010. Conversely, if a DUNS number contained in the 2010 vendor data was associated with a DoD contract action in an earlier year, it was classified as an existing vendor. Likewise, for 2011, DUNS numbers that were not contained in DoD contract data in 2010 or earlier were classified as first time vendors, and the remaining DUNS numbers were classified as existing vendors, and so forth. *Figure 3 shows the breakdown of existing versus new vendors in each year, demonstrating a substantial decline in new vendors year to year over the last decade. Additionally, as demonstrated in Figure 4, in seven of the last 10 years, the number of first time vendors relative to total vendors each year experienced an even sharper decline.*

Budget Year	Unique Vendors	Existing Vendors	New Vendors
2010	79,993	64,761	15,232
2011	77,195	66,356	10,839
2012	71,884	63,466	8,418
2013	64,685	58,382	6,303
2014	62,080	55,726	6,354
2015	61,095	54,898	6,197
2016	59,101	53,270	5,831
2017	57,165	51,792	5,373
2018	54,535	49,634	4,901
2019	51,239	46,981	4,258

Figure 3: Composition of the Defense Industrial Base, By Year
(PW Communications, n.d.)

[5] USASpending data begins in 2001. The FPDS contains partial data dating back to the 1950s and substantial data dating back to the 1970s.

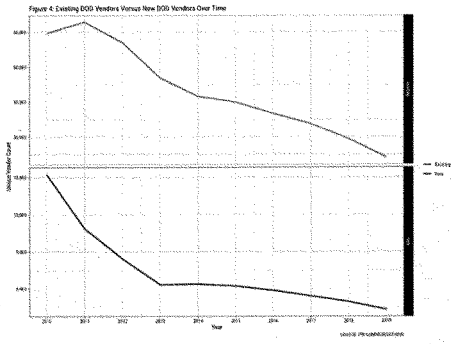


Figure 4: Dramatic Decline in New Vendors Over Time

As stated in a 2014 Defense Business Board (DBB) report, "considerable technology leadership critical to our nation's defense has moved from within the Department and the Defense Industrial Base to companies outside the traditional base" (p. 9). Because the DoD can no longer rely on its traditional suppliers to deliver the innovation required to preserve America's military superiority, the number of new vendors entering the defense market should be rising accordingly. Consequently, a decline in new vendors may suggest the DoD is not accessing the innovative capabilities it needs to remain competitive.

Composition of New Vendors

The implications of this downward trend are considerably greater, given that first time DoD vendors are not strictly innovative commercial technology companies. For example, contracting with a new hotel for overnight travel, buying commodities from a new supplier, or leasing a new building from 2010 through 2019 counted in our data as a new first time vendor. *By linking detailed records from USASpending and FPDS about the first time vendors in our data set and analyzing the Product and Service (PSC) codes associated with their initial contract actions, we determined that the majority of first time vendors over the last decade were not innovative commercial technology companies.*[6]

Categorizing a PSC as unlikely to be associated with an innovative nontraditional supplier is subjective. However, by taking into consideration only the most obvious "non-innovative" PSCs represented in our first time vendors' initial contract actions, it was clear that over 50% of first time vendors were contracted for goods or services unrelated to commercial innovation. For instance, 5.5% of first time vendors corresponded to the code for "Utilities and Housekeeping." Another 4.9% of first time vendors corresponded to "Maintenance, Repair, Rebuild - Equip;" 1.5% corresponded to "Lease/Rent Equipment" or "Lease/Rent Facilities;" and 4.9% corresponded to "Transport, Travel, Relocation." Many other first time vendors corresponded to PSC codes such as "Medical Services," "Social Services," "Construction of Structures/Facilities," and "Musical Instruments." The composition of first time vendors indicated not only that the number of new vendors has declined year to year, but also that the majority of these new vendors were not innovative commercial technologies.

[6] The government uses thousands of PSC codes to describe the goods and services it procures.

Joint Ventures/Special Purpose Vehicles

As we continued to explore the features of first time vendors' initial contract actions, we also noticed that 40 first time vendors had initial contract awards in excess of $100 million. Looking at the contract action details more closely, we realized that an existing government supplier can form a Joint Venture (JV) or Special Purpose Vehicle (SPV) and register it as a completely independent entity.

For example, one company in our 2018 new vendor data set was Fluor Marine Propulsion, with an initial contract of more than $1.2 billion. While Fluor Marine Propulsion is not linked to Fluor Corporation's parent DUNS number, we were able to determine through additional research, including verifying that the two entities share the same mailing address, that Fluor Marine Propulsion is a subsidiary of Fluor Corporation, a large legacy government contractor. Despite Fluor Marine's relationship to Fluor Corporation, based on our computational approach, it was counted as a new vendor. Another example was a first time vendor with an initial contract of $479,000,000 that, upon further analysis, corresponded to "Balfour Beatty/DPR/Big-D, A Joint Venture." Based on records in the FPDS, individually Balfour Beatty, DPR, and Big-D have each been contracting with the government for more than a decade. Their collective JV, however, registered in our system as a new entity.

Our research is concerned with understanding how the DoD attracts and engages companies with no prior defense experience. It is clear that JVs and SPVs can create the appearance of a new vendor entering the supply chain, while in fact serving as a tool for legacy contractors to gain additional market share. The majority of these 40 outliers appeared to correspond to a JV/SPV; however, for this research, we were unable to analyze each arrangement individually to determine if it involved one or more existing DoD vendors. Likewise, we were unable to identify and resolve other instances in which an entity appeared to be a first time vendor but was affiliated with an existing government contractor through a JV/SPV. This research limitation caused some degree of inflation to our count of first time vendors and suggests that an even smaller share of them were innovative commercial technology companies.

Research Limitations

Our macroeconomic analyses, as well as our forthcoming analyses of innovation initiatives, are subject to two additional research limitations. First, we had no access to classified contract data. If we had the ability to consider classified vendors, the overall size of the DoD's supplier base and the number of new vendors annually might change. However, we do not believe this limitation substantially impacted our results because contractors that performed on both classified and unclassified DoD contracts were counted. Additionally, we had no access to subcontracting data. We recognize that innovative commercial companies may engage with the DoD for the first time through a subcontracting arrangement with an existing prime contractor. While these instances are excluded from our data, we do not feel that this limitation materially impacts the efficacy of our findings given the starkness of the trends we identified.

Defense Innovation Initiatives: A Source of New Suppliers?

Based on our analyses of the overall composition of the defense industrial base over the last decade, we concluded that the total size of the DoD supplier base has been shrinking year to year, and the number of new vendors entering the defense market has been shrinking year to year. Furthermore, most new vendors over the past decade were not innovative commercial technology companies. In the face of these concerning trends, we sought to determine if, at the microeconomic level, DoD innovation initiatives have proven more effective at attracting new vendors into the defense market versus the extent to which they have benefited existing DoD

suppliers. Our research focused on three DoD tools/initiatives: the Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) program, Other Transaction Agreements/Other Transactions (OTAs or OTs), and Prize/Challenge Competitions. We selected these three because they consume billions in DoD funding annually and they share a set of fundamental objectives: to help the DoD stimulate innovation and research and development (R&D), to engage innovative nontraditional or small businesses to help solve critical national security and defense challenges, to accelerate the identification and adoption of leading commercial technologies forcewide, and to help the DoD appeal to innovative commercial companies that, historically, have been deterred from working with the government (AcqNotes, 2019; General Services Administration [GSA], n.d.; SBIR, n.d.).

SBIR/STTR

SBIR and STTR are among the government's oldest and most well-funded innovation programs. The Small Business Administration (SBA) launched SBIR in 1977 to "support innovation through the investment of federal research funds in critical American priorities to build a strong national economy"—specifically, by investing these funds into small businesses with dual-use potential (SBA, n.d.-a). In 1992, it established STTR as an identically-structured sister program designed to help further scientific research with potential for broader commercial benefit. The SBIR/STTR program is divided into three phases. In Phase I, companies are awarded funding to establish the technical merit, feasibility, and commercial potential of their project. In Phase II, companies are awarded funding to continue the efforts initiated in Phase I (SBIR, n.d.). Solutions with commercial potential can proceed to Phase III, which "refers to work that derives from, extends, or completes an effort made under prior SBIR funding agreements, but is funded by sources other than the SBIR Program" (Boyer, 2017). Because Phases II and III are generally limited to companies that previously won a Phase I, we focused our analyses on Phase I recipients.[7]

SBIR/STTR awards are explicitly identified in contract data. Therefore, to determine how many new vendors entered the DoD through the SBIR/STTR program, we returned to our data set containing all first-time vendors from 2010 through 2019 and their corresponding initial contract actions. We then isolated instances in which initial contract actions indicated a DoD-sponsored SBIR/STTR Phase I award. *Figure 5 shows the count of first time vendors that leveraged a Phase I SBIR/STTR award to enter the defense market, annually, over the last 10 years ("SBIR/STTR gateway vendors").*

[7] In 2011, SBIR/STTR initiated a "Direct to Phase II" program that allowed the DoD and other agencies to award Phase IIs to companies that had not completed a Phase I. The pilot program expired in FY2017 and was relaunched in 2019 (https://www.sbir.gov/tutorials/program-basics/tutorial-4). We excluded this data to keep our analyses consistent.

Budget Year	Gateway SBIR/STTR Vendors
2010	223
2011	176
2012	148
2013	123
2014	112
2015	115
2016	109
2017	128
2018	122
2019	408

Figure 5: First Time Vendors that Leveraged SBIR/STTR to Enter the Defense Market, By Year
PW Communications (n.d.)

Comparing the count of SBIR/STTR gateway vendors to the total number of first time DoD vendors each year, as shown in Figure 6, it is clear that the vast majority of new vendors over the last decade did not leverage the SBIR/STTR program to enter the defense market. This finding is consistent with our previous analyses, insofar as the vast majority of new vendors were not innovative commercial companies with dual-use potential—the stated audience of the DOD SBIR/STTR program.

Budget Year	Total New Vendors	Gateway SBIR/STTR Vendors	% New Vendors that Leveraged SBIR/STTR
2010	15,232	223	1.46%
2011	10,839	176	1.62%
2012	8,418	148	1.76%
2013	6,303	123	1.95%
2014	6,354	112	1.76%
2015	6,197	115	1.85%
2016	5,831	109	1.87%
2017	5,373	128	2.38%
2018	4,901	122	2.49%
2019	4,258	408	9.43%

Figure 6: Share of New Vendors that Entered DOD Through SBIR/STTR
PW Communications (n.d.)

Total Universe of DoD SBIR/STTR Companies

Next, we sought to evaluate the overall composition of the SBIR/STTR program, namely, to what extent SBIR/STTR has benefited companies with no previous defense experience versus experienced DoD suppliers. To do so, we first needed to determine the total number of companies awarded DoD-sponsored Phase I SBIR/STTRs annually. Then, for each year, we could subtract the number of gateway SBIR/STTR vendors from the total and compare the results. To establish the total number of DoD-sponsored Phase I SBIR/STTR companies, we aggregated complete historical SBIR award data from USASpending and filtered the data to isolate Phase I SBIR/STTR awards that were funded and awarded by the DoD from FY2010 through FY2019. We then filtered the award data to isolate unique DUNS numbers, resolving to a parent DUNS number as needed. ***Figure 7 shows the total number of DoD Phase I SBIR/STTR participants by year.***

Budget Year	Count of Phase I Companies
2010	1287
2011	1262
2012	1158
2013	1045
2014	1014
2015	991
2016	973
2017	983
2018	949
2019	1354

Figure 7: Total Unique Phase I DOD SBIR/STTR Participant Companies, By Year
PW Communications (n.d.)

For each year, we then subtracted the gateway SBIR/STTR vendors from the total to calculate the number of SBIR/STTR participants that had existing defense business ("existing SBIR/STTR vendors"). *As shown in Figure 8, the vast majority of SBIR/STTR participants every year had existing defense business.*

Budget Year	Total DOD Phase I SBIR/STTR Companies	Count of Existing Vendors	Count of Gateway Vendors	% Existing Vendors	% Gateway Vendors
2010	1287	1064	223	82.67%	17.33%
2011	1262	1086	176	86.05%	13.95%
2012	1158	1010	148	87.22%	12.78%
2013	1045	922	123	88.23%	11.77%
2014	1014	902	112	88.95%	11.05%
2015	991	876	115	88.40%	11.60%
2016	973	864	109	88.80%	11.20%
2017	983	855	128	86.98%	13.02%
2018	949	827	122	87.14%	12.86%
2019	1354	946	408	69.87%	30.13%

Figure 8: Gateway Versus Existing SBIR/STTR Vendors, By Year
PW Communications (n.d.)

Next, we linked the award values into our data set to explore how the funding was distributed between gateway and existing vendors. *As shown in Figure 9, SBIR/STTR participants with existing defense business received the vast majority of DoD Phase I SBIR/STTR funding.*

Budget Year	DOD Phase I SBIR/STTR $	$ to Existing Vendors	$ to Gateway Vendors	% Existing Vendors	% Gateway Vendors
2010	$255,683,405	$232,785,007	$22,898,397	91.04%	8.96%
2011	$264,218,019	$244,559,237	$19,658,782	92.56%	7.44%
2012	$259,796,590	$240,817,498	$18,979,092	92.69%	7.31%
2013	$231,966,167	$216,416,149	$15,550,018	93.30%	6.70%
2014	$229,929,835	$215,293,300	$14,636,535	93.63%	6.37%
2015	$213,344,281	$197,160,681	$16,183,600	92.41%	7.59%
2016	$191,459,321	$177,139,330	$14,319,991	92.52%	7.48%
2017	$219,760,816	$202,491,532	$17,269,285	92.14%	7.86%
2018	$188,905,420	$171,659,902	$17,245,518	90.87%	9.13%
2019	$278,207,223	$241,677,692	$36,529,531	86.87%	13.13%

Figure 9: Share of DOD SBIR/STTR Phase I Funding Allocated to Existing vs. Gateway Vendors
PW Communications (n.d.)

The SBIR/STTR Program: Big Business

Analyzing the details of the contract actions associated with the universe of existing SBIR/STTR vendors, we recognized that some vendors won hundreds of Phase I SBIR/STTR awards worth tens of millions of dollars over the last decade. In other words, rather than deriving substantial defense revenue by transitioning their products or services into programs of record, they derived it from continuously winning SBIR/STTRs. ***Figure 10 highlights the four companies that won the greatest number of SBIR/STTR Phase I awards over the last decade.*** These findings suggest that, despite its stated objective, SBIR/STTR has largely failed to serve as a gateway for new vendors to enter the DoD, has disproportionately benefited companies with existing defense business, and permits serial usage.

Vendor	Total Count of Phase I Awards	Total Value of Phase I Awards
PHYSICAL OPTICS CORPORATION	472	$62,310,358
INTELLIGENT AUTOMATION, INC	288	$40,134,060
PHYSICAL SCIENCES INC	238	$34,729,760
CHARLES RIVER ANALYTICS INC	228	$32,065,168

Figure 10: Summary of SBIR/STTR Awards for the 4 Largest Serial Winners, 2010-2019
PW Communications (n.d.)

2019 SBIR/STTR Analysis

Despite these overall trends, for 2019, we noticed a significant increase in the number of gateway SBIR/STTR vendors, along with a relative increase in the share of funding allocated to gateway SBIR/STTR vendors. *Isolating the 2019 gateway SBIR/STTR vendor data and exploring the features in more detail, we found that approximately 85% were sponsored by the Air Force, as shown in Figure 11.*

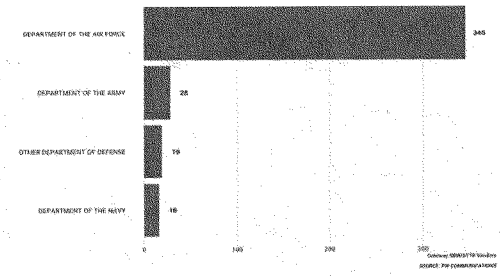


Figure 11: 2019 SBIR/STTR Gateway Vendors, by Branch Sponsor

In 2019, the Air Force's innovation team (AFWERX) launched two new initiatives within the framework of the Air Force SBIR/STTR program: the SBIR/STTR Open Topic model and Pitch Days. Both initiatives modify certain aspects of the traditional SBIR/STTR program with the goal of making it easier, faster, and more appealing for innovative technology companies to engage with the Air Force (AFWERX, n.d.). We were interested in exploring whether these initiatives caused the spike in gateway SBIR/STTR vendors in 2019, but due to limitations in the data, we were unable to quantitatively distinguish between traditional Air Force SBIR/STTR awards and Open Topic/Pitch Day awards. The SBIR/STTR data does not explicitly indicate whether an award corresponded to Pitch Day/Open Topic, and the Air Force has not published a list of Open Topic and Pitch Day participants. Furthermore, many contract identification numbers and DUNS numbers were omitted or reported incorrectly in the 2019 Air Force SBIR/STTR data. Nevertheless, we manually explored the project descriptions associated with the 2019 Air Force gateway SBIR/STTR vendors, searching for the terms "Open Topic," "Special Topic," and "Pitch Day." At least 25% of Air Force gateway SBIR/STTR vendors appeared to be associated with Pitch Day or Open Topic. While we cannot conclusively attribute the growth in new vendors to these AFWERX initiatives, based on these general findings and the timing of the rise, we can infer that they had some effect.

SBIR/STTR Conclusions

It could benefit other DoD stakeholders to study and consider adopting AFWERX's approach. In fact, other branches have launched Pitch Days and the Open Topic model for 2020. However, we recommend that the DoD consider the number of awards made to companies with no previous DoD experience as one explicit measure of success for Pitch Days and Open Topic. Otherwise, these initiatives risk becoming channels for existing DoD suppliers to expand their DoD market share. Likewise, we recommend that all DoD SBIR/STTR programs require a minimum number of Phase Is be awarded to companies with no prior defense business annually. Further research is required to determine the appropriate number. We also recognize that the commercial market is more robust in certain fields of interest to the DoD than others–for example, cyber security versus hypersonic missiles. It would be appropriate to vary the allocation of awards to new vendors, depending on the field.

Other Transaction Authority

After completing our SBIR/STTR analysis, we next analyzed how many new vendors entered the DoD through OTAs. An OTA is a legally binding contract generally exempt from some of the most onerous aspects of traditional federal procurements (Schwartz & Peters,

2019). OTAs first appeared in 1958, when the United States established the National Aeronautics and Space Administration (NASA). The intention at the time was to provide NASA with the "necessary freedom to carry on research, development, and exploration ... to insure the full development of these peaceful and defense uses without unnecessary delay," specifically by granting them the authority to "enter into and perform such contracts, leases, cooperative agreements, or other transactions as may be necessary" (Schwartz & Peters, 2019, p. 1). Authority to use OTAs expanded to the DoD over the course of FY1990 and FY1991, and this authority was expanded further in the 2016 National Defense Authorization Act (DiNapoli, 2019). Richard Dunn, former general counsel for the Defense Advanced Research Projects Agency (DARPA), championed the efforts to allow defense agencies to utilize OTAs and ultimately wrote the statute that expanded OTA authority to the DoD in the early 1990s. He explained to us in an interview on March 9, 2020, that the intention had been to help the DoD overcome its prevailing "costs too much, takes too long" system, to in turn increase efficiency, better attract nontraditional innovators that would otherwise be unwilling or unable to comply with traditional procurement regulations, and create a more open system (R. Dunn, personal communication, March 9, 2020).

In order to explore the degree to which OTAs attracted new vendors into the DoD over the last decade, we first needed to isolate contract actions from 2010 through 2019 that corresponded to an OTA. While USASpending data does not contain a field for OTAs, OTAs are designated in FPDS data through a field called "Nontraditional Government Contractor participation" (NGC).[8] As such, we aggregated FPDS data from 2010 through 2019, filtered the data to include transactions classified as NGC, and isolated NGCs funded and/or awarded specifically by the DoD. To determine the number of unique vendors represented in the OTA data, we filtered and grouped the transactions by DUNS number, resolving back to a parent DUNS number as needed. *Figure 12 shows the count of unique OTA vendors by year.*

Budget Year	Total Unique OTA Vendors
2010	22
2011	33
2012	42
2013	36
2014	41
2015	39
2016	54
2017	123
2018	221
2019	420

Figure 12: Unique OTA Vendors By Year
PW Communications (n.d.)

To determine how many OTA vendors each year had no prior defense business, we searched each OTA vendor's DUNS number in our FPDS/USASpending database to identify its

[8] We concluded that NGC corresponds to OTAs by analyzing the features of NGC contracts. We determined that they align with the requirements of an OTA, as all NGC transactions contained additional fields to denote which OTA requirements were satisfied, such as if the transaction was associated with a prototype, whether there was cost sharing, and/or whether the recipient was a nontraditional or not-for-profit entity.

first DoD contract action. Entities with no DoD contract actions prior to their first DoD OTA between 2010 and 2019 were classified "gateway OTA vendors," and entities with DoD contract actions prior to their first OTA award between 2010 and 2019 were classified as "existing OTA vendors." *As shown in Figure 13, more than 75% of OTAs were awarded to existing OTA vendors every year, and even as use of OTAs expanded, the majority of contracts were awarded to companies with existing defense business.*

Budget Year	Total OTA Vendors	Gateway OTA Vendors	Existing OTA Vendors	% Gateway Vendors	Distinct OTA Contracts	# of Contracts Awarded to Gateway Vendors	% of Contracts to Gateway Vendors
2010	22	5	17	22.73%	23	5	21.74%
2011	33	4	29	12.12%	36	4	11.11%
2012	42	7	35	16.67%	46	8	17.39%
2013	36	5	31	13.89%	39	5	12.82%
2014	41	4	37	9.76%	47	4	8.51%
2015	39	7	32	17.95%	47	7	14.89%
2016	54	11	43	20.37%	68	11	16.18%
2017	123	32	91	26.02%	148	36	24.32%
2018	221	33	188	14.93%	296	33	11.15%
2019	420	84	336	20.00%	685	93	13.58%

Figure 13: Gateway Versus Existing OTA Vendors By Year
PW Communications (n.d.)

Next, we linked in the contract values to explore the amount of funding that was allocated to gateway versus existing OTA vendors. *As demonstrated in Figure 14, nearly all DoD OTA funding was awarded to existing OTA vendors over the last decade, and even as the number of gateway OTA vendors increased year to year, existing OTA vendors continued to receive the vast majority of OTA funding.*

Budget Year	Total OTA Obligations	Obligations to Existing OTA Vendors	Obligations to Gateway OTA Vendors	Share of Funding to Existing OTA Vendors	Share of Funding to Gateway OTA Vendors
2010	$201,449,780	$192,409,666	$9,040,114	95.51%	4.49%
2011	$371,869,569	$362,413,408	$9,456,161	97.46%	2.54%
2012	$467,005,596	$452,882,912	$14,122,684	96.98%	3.02%
2013	$340,559,773	$307,429,862	$33,129,910	90.27%	9.73%
2014	$522,839,408	$521,082,772	$1,756,636	99.66%	0.34%
2015	$694,883,318	$683,122,982	$11,760,336	98.31%	1.69%
2016	$1,432,545,330	$1,410,981,232	$21,564,098	98.49%	1.51%
2017	$2,096,054,328	$1,901,940,280	$194,114,048	90.74%	9.26%
2018	$4,031,138,879	$3,984,702,929	$46,435,949	98.85%	1.15%
2019	$7,385,238,011	$7,158,073,697	$227,164,313	96.92%	3.08%

Figure 14: Share of OTA Funding Awarded to Existing vs. Gateway Vendors by Year
PW Communications (n.d.)

Large Primes Leveraging OTAs

One potential explanation of these findings is the fact that the DoD has authority to award OTAs to large legacy government contractors if at least one nontraditional defense contractor is participating in the project to a significant extent or if there is a cost sharing arrangement in which at least one-third of the cost of the OTA comes from non-federal sources (AcqNotes, 2019). *As shown in Figure 15, by linking the vendor names into the data set, we found that the five largest DoD contractors have derived millions of dollars in OTA revenue over the last decade.*

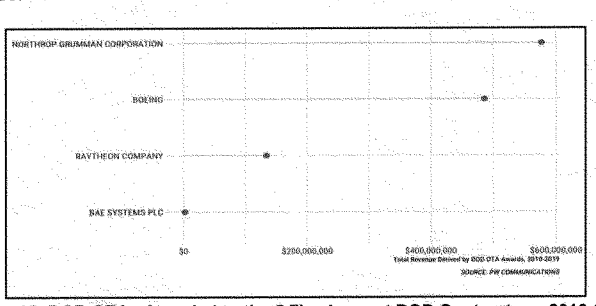


Figure 15: DOD OTAs Awarded to the 5 Five Largest DOD Contractors, 2010-2019

It is important to note that the statutory definition of "nontraditional defense contractor" is "an entity that is not currently performing and has not performed, for at least the one-year period preceding the solicitation ... any contract or subcontract for the Department of Defense that is subject to the full coverage under the cost accounting standards prescribed pursuant to Section 1502 of title 41 and the regulations implementing such section" (AcqNotes, 2019). Small business exemptions from CAS are irrespective of the share of revenue these businesses derive from the government (GSA, 2020). Thus, requiring nontraditional participation does not guarantee that the arrangement provides the government access to innovative capabilities that have previously remained out of their reach.

Given the implications of this arrangement on how OTA funds have been used, we recommend that the government modify the definition of nontraditional participation for OTAs to mean companies that have derived no revenue from the defense market in the previous five years. Doing so would put the onus on large legacy contractors to enhance outreach efforts in commercial communities of interest, beyond the scope of the traditional defense industrial base. Furthermore, the policy would be enforceable: as demonstrated through this research, sufficient publicly available data exists to easily determine if a firm has previous defense business.

Consortium Management Firms: The Multibillion-Dollar Black Box

OTAs can also be structured in a variety of different ways, including as joint ventures or partnerships, with multiple agencies joining together to fund an agreement encompassing multiple providers, or, as is most common, through a consortium (Schwartz & Peters, 2019). A consortium is an organized group of companies, academic organizations, or nonprofits that specialize in a particular technology area. They pay membership fees to join the consortium, which is typically managed by a not-for-profit consortium management firm (CMF) that serves as the intermediary between the members and the government. Although our data treats each CMF as a unique vendor, the CMF does not actually conduct the research or prototyping; it

administers subcontracts to its members, much like a traditional prime contractor–subcontractor relationship. CMFs operate in a black box because they are not required to report which members receive the subcontract awards. While they claim to serve as a "single entry point to hundreds of innovative organizations, many that traditionally do not do business with the government," due to the lack of transparency in the data, we could not verify this claim (Dolan, 2019).

To gauge the potential implications of this lack of transparency on our results, we isolated the OTAs associated with CMFs in our data and calculated the share of total OTA funding they represented. To do so, we searched the features of our OTA data to identify mentions of "consortium" in the vendor name or the contract action description and cross referenced a publicly available list of CMFs from the MITRE website (AiDA - MITRE Corporation, 2020). We determined that 14 of the unique vendors in our OTA data set were CMFs. *As shown in Figure 16, by linking the contract values associated with these 14 CMFs, we concluded that 67% of the total DoD OTA dollars over the last decade were allocated through a consortium.* The fact that the majority of OTA dollars were funneled through CMFs meant we had no ability to audit the recipients of the majority of OTAs.

Type	Total OTA Funding	Unique Contracts
Consortium Management Firm	$11,738,265,037	165
Non-Consortium Management Firm	$5,805,318,954	712

Figure 16: OTA Funding Awarded to CMF vs. Non-CMF Vendors, 2010-2019
PW Communications (n.d.)

Consortia: Redundant Technological Priorities

A lack of transparency was not our sole concern regarding consortia. Reviewing the list of consortia and their priority technology areas on the MITRE website, we also found that many CMFs share many of the same priority technology areas (AiDA - MITRE Corporation, 2020). For example, Figure 17 provides a snapshot of consortia that listed *Artificial Intelligence/Machine Learning*, *Sensors*, and/or *Analytics* as technological priorities as of February 20, 2020.

Topic Area	Supply Chain Consortium Initiative (SCCI)	Consortium for Command, Control, and Communications in Cyberspace (CS)	Naval Surface Technology and Innovation Consortium (NSTIC)	Undersea Technology Innovation Consortium (UTIC)	Sensors, Communications and Electronics Consortium (SCEC)	Space Enterprise Consortium (SpEC)	Engineer, Research, and Development Center (ERDC) Consortium	Information Warfare Research Project (WRP)
Artificial Intelligence/ Machine Learning	X	X	X	X				
Sensors		X		X	X	X	X	
Analytics	X	X	X				X	X

Source: MITRE

Figure 17: Redundant Technological Priorities in Consortia

This redundancy raises questions. If an innovative commercial company sees that its capabilities align with multiple consortia, how does it decide which to join? Is it expected to join multiple, which requires both money and time? Commercial companies outside of the traditional defense ecosystem are largely unfamiliar with how the government conducts market research in general; why does the DoD assume that the nuances of the consortium process are somehow better understood? Furthermore, membership in a consortium does not guarantee a company

will be awarded government funding; the company is still required to bid on opportunities made available through the CMF. Even to the extent innovative commercial companies are aware of the consortium process, can the DoD assume that the opportunity is appealing, particularly for companies with robust private sector revenue streams?

Consortium Conclusions

We recommend the DoD revises the consortium model. First and foremost, CMFs must be required to report how funds are awarded. In the absence of this transparency, it is impossible to evaluate the extent to which CMFs facilitate government access to the best and brightest innovative technology firms versus the extent to which they simply benefit firms affiliated with a CMF who may or may not possess the most applicable or advanced capabilities. The intended purpose of OTAs is to make it faster, easier, and less cumbersome for companies to do business with the government, yet the majority of OTAs were funneled through bureaucratic entities that essentially levy a tax on the innovator. To ensure OTAs achieve their primary objectives, until the composition of CMF members can be verified, we recommend the DoD requires that the majority of OTAs awarded annually are awarded to non-CMF entities.

Non-CMF OTAs

Our research did reveal a substantial increase in non-CMF OTA vendors, both gateway and existing, from 2017 through 2019. Non-CMF OTA award data is far more transparent than CMF data, as it includes the names of specific vendors performing the work as well as a description of the intended purpose of the project. *To explore factors that may have contributed to the rise, we began analyzing the contracting office codes and contracting office names associated with the OTAs awarded to non-CMF vendors from 2017 through 2019, as shown in Figure 18.*

Contracting Office ID	Contracting Office Name	Total Non-CMF OTA Vendors	Non-CMF Existing OTA Vendors	Non-CMF Gateway OTA Vendors
W15QKN	W6QK ACC-PICA	196	142	54
HR0011	DEF ADVANCED RESEARCH PROJECTS AGENCY	142	127	15
HQ0034	WASHINGTON HEADQUARTERS SERVICE	47	36	11
W911QY	W6QK ACC-APG NATICK	43	40	3
FA8649	USAF SBIR STTR CONTRACTING	35	24	11
N00014	OFFICE OF NAVAL RESEARCH	21	17	4
W52P1J	W4MM USA JOINT MUNITIONS CMD	20	16	4
M67854	COMMANDER	15	13	2
W900KK	W6QK ACC – ORLANDO	15	14	1
FA8650	WSAF AFMC AFRL PZL RAK RXK	9	4	5
W909MY	ACC-ABERDEEN PROVIDNG GROUNDS CONT C	8	6	2
S2206A	DCMA BOSTON	7	7	0

Figure 18: Non-CMF OTA Awards by Source, 2017-2019

PW Communications (n.d.)

While the vast majority of vendors from 2017 through 2019 continued to be those with existing defense business, we noticed that the greatest number of non-CMF OTAs were awarded by two offices: W15QKN/W6QK ACC-PICA, and HR0011/Defense Advanced Research Projects Agency (DARPA). We could explicitly see from the contracting office name that the second-largest source of non-CMF gateway OTA vendors entered the DoD through DARPA, which suggests that DoD stakeholders could benefit from learning more about, and potentially adopting features of, DARPA's approach to marketing and administering OTAs. To better understand the gateway OTAs that correspond to W15QKN/W6QK ACC-PICA, we linked and explored the contract requirement descriptions. *As highlighted in Figure 19, these contract descriptions referenced "Defense Innovation Unit" (DIU), formerly known as the Defense Innovation Unit Experimental (DIUx).*

Contracting Office	Contract Description
W6QK ACC-PICA	PROJECT AWARD IN SUPPORT OF THE DIUX CSO PROGRAM IS ENTITLED AUTONOMOUS TACTICAL AIRBORNE DRONE.
W6QK ACC-PICA	BASE OTA AWARD FOR SAILDRONE, INC IN SUPPORT OF **DIUX** AND NAVAL SPECIAL WARFARE. SUPPORTING R&D EFFORTS FOR UNMANNED MARTITIME SURFACE VESSEL RELEVANT TO ENHANCING THE MISSION EFFECTIVENESS OF MILITARY PERSONNEL
W6QK ACC-PICA	PROJECT AWARD IN SUPPORT OF DIUX PROGRAM ENTTITLE US NAVY EXPLOSIVE ORDINANCE DISPOSAL
W6QK ACC-PICA	OPEN ARCHITECTURE DATA MANAGEMENT AND ADVANCED ANALYTICS IN SUPPORT OF **DIUX**
W6QK ACC-PICA	AWARD UNDER DIUX AOI HARDWARD TO SOFTWARE TRANSFORMATION
W6QK ACC-PICA	THE PURPOSE OF THIS ACTION IS TO AWARD AN OTHER TRANSACTION AGREEMENT OTA, W15QKN-18-9-2002, BETWEEN THE UNITED STATES ARMY CONTRACTING COMMAND – NEW JERSEY PREVALENT, INC. IN SUPPORT OF THE DEFENSE INNOVATION UNIT **DIU**
W6QK ACC-PICA	THE PURPOSE OF THIS ACTION IS TO AWARD AN OTHER TRANSACTION AGREEMENT OTA, W15QKN-18-9-2002, BETWEEN THE UNITED STATES ARMY CONTRACTING COMMAND AND STRATEGY ROBOT, INC. IN SUPPORT OF THE DEFENSE INNOVATION UNIT DIU
	THE PURPOSE OF THIS MODIFICATION IS TO PROVIDE CLARIFICATION TO THE **DIU** STRATEGY ROBOT SOW. THE VALUE AND PERIOD OF PERFORMANCE REMAIN UNCHANGED.
W6QK ACC-PICA	AWARD OF DIU PROTOTYPE PROJECT TO AIRMAP UNDER GROUP 1 UNMANNED ARCHITECTURE
W6QK ACC-PICA	THE PRINCIPLE PURPOSE OF THIS OTA IS TO PROVIDE DRAGONEYE STABILIZED MICRO EO/IR CAMERA SYSTEMS FOR ALL UNMANNED AERIAL SYSTEMS SUAS IN SUPPORT OF THE DEFENSE INNOVATION UNIT **DIU**
W6QK ACC-PICA	AWARD OF SHORT RANGE RECON PROTOTYPE PROJECT IN SUPPORT OF **DIU** AND PEO AVIATION
W6QK ACC-PICA	PROTOTYPE PROJECT UNDER THE DEFENSE INNOVATION UNIT **DIU** SMALL RESPONSIVE LAUNCH SRL
W6QK ACC-PICA	EXTEND POP TO OTA WITH SRI INTERNATIONAL IN SUPPORT OF DIU AOI HARDWARD TO SOFTWARE TRANSFORMATION
W6QK ACC-PICA	MODIFICATION TO OTA TO VOLANS-I IN SUPPORT OF **DIU** AOI CRITICAL SUPPLY DELIVERY – PHASE 4 AND OPTION PHASE 5

Figure 19: Snapshot of Contract Description, W15QKN/W6QK ACC-PICA
PW Communications (n.d.)

DIU Microanalysis & OTA Conclusions

DIU was established in 2015 with a stated mission similar to that of AFWERX: to strengthen national security "by accelerating the adoption of leading commercial technology

throughout the military and growing the national security innovation base" (DIU, n.d.). According to its website, DIU utilizes Other Transaction authority to award prototype contracts in 90 days or less. Prototype projects typically run from 12–24 months, and upon completion, successful prototypes may transition to follow-on production OTAs or FAR-based contracts (DIU, n.d.). While W15QKN appeared to correspond to DIU, DIU does not publicly report its award data. Consequently, we were unable to verify if all W15QKN vendors in fact participated in the DIU program, or if DIU administered OTAs through other contracting offices. Nevertheless, we could infer that W15QKN corresponded to DIU and based on that assumption, concluded that DIU was the largest source of non-CMF gateway OTA vendors from 2017 through 2019. While DoD stakeholders might benefit from studying and potentially adopting aspects of DIU's approach, it is important to consider that, when comparing the share of W15QKN vendors that were gateway versus existing vendors, only 28% of DIU vendors from 2017 through 2019 had no prior defense business. These findings suggest that if the DoD keeps expanding the use of OTAs without adjusting how they are marketed and administered, they will continue to be disproportionately leveraged by existing DoD suppliers.

Prize Competitions & Challenges

In addition to the SBIR/STTR program and OTAs, the DoD also uses Prize Competitions/Challenges to incentivize innovation and to engage problem solvers (Gallo, 2020). Congress provided DARPA with Competition authority in FY2000 and extended it to other military departments in FY2007 (Gallo, 2020). The authority states that the DoD can award monetary prizes "in basic, advanced, and applied research, technology development, and prototype development that have the potential for application to the performance of the military missions of the Department of Defense" (Gallo, 2020, p. 5). As a result of the America COMPETES Reauthorization Act, which expanded the authority for agencies including the DoD to conduct Prize Competitions, use of Prize Competitions has grown substantially since 2010 (Gallo, 2020). According to a White House Report on Federal Prize implementation, DoD prize investment increased from $6.75 million in 2016 to $18.8 million in 2018 (White House Office of Science and Technology Policy, 2019).

Although we were interested in evaluating the extent to which Prizes attracted new vendors into the defense market, the government classifies them as grants rather than procurements. As a result, they are not subject to consistent reporting requirements, and we were precluded from obtaining a comprehensive data set of participants. While we could not analyze Prizes at scale over the 2010–2019 period, we elected to conduct a microanalysis of one DoD Prize initiative, the Army's Expeditionary Technology Search Prize, or xTechSearch. We selected xTechSearch because we were able to acquire a list of 24 xTechSearch finalists from 2019 through the xTechSearch website (xTechSearch, n.d.). Additionally, the Army website describes xTechSearch as a "contest for small businesses to develop and demonstrate new and emerging technologies that will help solve the Army's modernization challenges," launched as a way to transform how "the Army attracts and encourages innovation." It was our intention, through this microanalysis, to determine whether the Army had met this objective.

A Note About the Microanalysis

The small sample size of the xTechSearch participant data set allowed us to explore features of xTechSearch companies that we were unable to consider in our broader quantitative analyses. Specifically, when we analyzed the overall DoD supplier base, SBIR/STTR participants, and OTA recipients, the size of the data sets precluded us from considering a company's previous contracts from government customers outside the DoD. Additionally, we only considered a company's prior *contract* awards; we could not explore non-contract federal funding (known as federal assistance), which includes federally-funded research and

development grants, prize awards, and non-DoD SBIR awards. Excluding these features from our broader analyses, we could not distinguish between companies that were truly engaging with the DoD for the very first time from companies that had not received a previous DoD contract or DoD-sponsored SBIR, but had received prior DoD grant/assistance funding. Furthermore, the essence of our research sought to better understand how the DoD attracts companies that have remained out of reach. There is a difference between a company that does business with the DoD for the first time but has years of experience supporting other federal customers compared to a company with no prior government experience whatsoever.

With 24 companies, we could consider whether a company had received any previous federal funding, including non-DoD contracts and/or federal assistance. While doing so introduced some inconsistencies between how we analyzed xTechSearch data relative to the other innovation program data, it allowed us to more comprehensively evaluate the program's ability to attract new vendors. It also allowed us to test an approach that could be replicated across the broader data in conjunction with follow-on research at a future date.

xTechSearch

To analyze the composition of the xTechSearch participants, we identified and linked the DUNS numbers for each of the 24 companies. We then searched each DUNS number against our FPDS and USASpending data to identify all related contract actions, regardless of the contracting agency. Lastly, we linked Assistance data from USASpending and searched the DUNS numbers for prior Assistance awards.

We found that 13 of the 24 companies had prior government business. Two of the companies had been doing business with the government for more than 10 years, five had generated more than $10 million in government revenue, and an additional four had generated between $1 million and $9.9 million in government revenue. Three of the 24 companies had initial contract actions in 2019, and the features of these contracts align with the terms of the xTechSearch prize (dollar amount and date of award). Therefore, we could infer that these three companies had no prior defense or government business before participating in xTechSearch. For eight of the 24 companies, we found no records of them in FPDS or USASpending. In other words, according to publicly available data, these companies had received no funding from the federal government. This finding contradicts the list of finalists on the xTechSearch website and is likely the result of the inconsistent and/or nonexistent reporting requirements for prize awards. Although we could infer that they had no prior government contract awards, as those would have produced DUNS matches in FPDS or USASpending, we were unable to ascertain whether or not they had previous grants or assistance.

While further research is required to determine if the composition of xTechSearch participants is consistent with other DoD prize initiatives, these results, while limited, indicate that despite their stated mission, Prizes, like the SBIR/STTR program and OTAs, have disproportionately benefited existing vendors. Additionally, these results indicate that it is critical for the government to implement consistent reporting standards for prize/challenge data to ensure that program outcomes can be tracked and that recipients of grant funding, in general, can be included in analyses of the government's industrial base.

Conclusions & Recommendations

Despite the fact that DoD leadership has articulated an urgent need to engage commercial technology companies outside of the traditional defense industrial base, the macroeconomic data demonstrates a continuous decline in new vendors year to year. While further research is required to analyze the composition of other DoD innovation initiatives including Army Futures Command, SOFWERX, and an expanded data set of AFWERX and

Prize participants, our analyses of SBIR/STTR, OTAs and the xTechSearch prize yielded conclusive results. Rather than expanding the defense industrial base, the DoD's continuous investment in innovation initiatives has enabled entrenched defense suppliers to expand their market share. In addition to the program-specific recommendations offered previously, we suggest the DoD takes the following measures to improve its ability to attract new vendors:

- **Add a "First Time Vendor" field to SAM profiles.** DoD stakeholders cannot be held accountable for increasing the number of first time vendors they engage if they have no easy way to determine if a company has previous DoD experience. As demonstrated through our analyses, the DoD already collects much of the data required to distinguish a company as new versus existing. As such, we recommend that a company's SAM profile automatically update to indicate the date it first receives federal funding and the date it first receives DoD funding, and update two "First Time Vendor" fields accordingly—one to indicate companies with no prior federal business, and one to indicate no prior defense business.
- **Require consistent reporting standards for assistance/grant data and consortium data, as discussed previously.**

New Vendor Gateway

As demonstrated in our research, efforts to streamline the regulatory requirements and accelerate award timelines fail to mitigate the underlying factors that have thwarted the growth of the defense industrial base. We strongly recommend that the DoD establishes a "New Vendor Gateway"—a single gateway for innovative commercial technology companies with no prior defense business—that, if structured appropriately, would allow the DoD to better attract, access, and integrate the technologies of innovative new suppliers. Companies with no previous DoD experience are largely unfamiliar with how the government posits demand, and despite some media buzz related to AFWERX and DIU, information about the DoD's innovation initiatives rarely reaches audiences with no previous connection to the DoD market. As a result, these firms remain unaware that there may be demand for their products/services in the public sector. The new vendor gateway would allow disparate DoD stakeholders with similar requirements to pool their marketing resources/efforts and direct potential vendors to a single initial resource.

If and when an innovative technology company becomes aware that demand for its products or services exists in the defense market, it faces additional obstacles—including the number of disparate and seemingly redundant DoD innovation initiatives. There are no clear instructions for how companies should determine whether to join a consortium related to their technology, apply for a SBIR/STTR related to their technology, or apply for a DoD Prize related to their technology. Out of sheer frustration and confusion, companies will abandon the defense market altogether, in which case the fact that one program offered a streamlined submission process or an accelerated award timeframe had no bearing. The New Vendor Gateway would allow DoD stakeholders to help direct a company to the most appropriate opportunity using a variety of criteria. Additionally, a chat-bot system would allow the companies to ask clarifying questions.

Furthermore, even for the DoD's newest innovation initiatives that boast streamlined submission processes, the application process remains complex, confusing, and time-consuming. For instance, PW Communications undertook the Phase I and Phase II AFWERX submission processes and encountered multiple inconsistencies in the proposal instructions, delays in the timelines, and a general lack of clarity on expectations of the project. These issues dissuade companies, particularly those with robust private sector opportunities, from pursuing

business with the DoD. The New Vendor Gateway could include additional support tools/resources for companies in certain technology areas deemed critical to the DoD to help them navigate the submission process.

Because the process of identifying a relevant opportunity and successfully submitting a proposal is complicated, the programs ultimately favor companies that have already gone through the process. In other words, the more familiar a company is with the process, the more they can take advantage of these opportunities. A company's institutional knowledge of the process therefore becomes more relevant than the innovativeness of their solution. As mentioned previously, the DoD must institute minimum new vendor requirements for innovation initiatives, and the New Vendor Gateway will be a valuable tool to help the DoD achieve these thresholds.

Conclusions

It is more essential than ever for America's economic and national security that the DoD has access to the most state-of-the art technologies. With strong leadership and a well thought-out restructuring of its resources and approaches, we believe the DoD can become "the customer of choice" among the nation's leading commercial innovators.

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Why Marketing Matters: Strengthening the Defense Supplier Base Through Better Communication with Industry

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Why Marketing Matters: Strengthening the Defense Supplier Base Through Better Communication with Industry

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Abstract

This paper demonstrates that the Department of Defense (DoD)'s primary methods of marketing requirements and soliciting information from prospective suppliers inhibit the military's access to innovative nontraditional companies. To conduct this research, we leveraged qualitative and quantitative research techniques, including assessing the features of more than one million DoD solicitations from https://beta.sam.gov and surveying small businesses on the readability of DoD requirements. Our results concluded that DoD solicitations are not conducive to attracting nontraditional suppliers because they are difficult to discover, lack ample response time frames, are not easy to read or understand, and lack critical information. These and other factors deter innovative, nontraditional companies from participating in the DoD's market research process, in turn limiting the pool of suppliers available to the military. We offer recommendations for how the DoD can improve the way it writes and markets solicitations to attract and engage innovative, nontraditional companies more competitively.

Introduction

Over the last 2 decades, companies outside of the U.S. military's traditional industrial base—rather than entrenched defense contractors—have increasingly driven advancements in areas of critical importance to national defense. This paradigm shift has forced the Department of Defense (DoD) to rethink how it sources and funds new technologies and has prompted continuous investment—to the tune of billions of dollars annually—in innovation initiatives and rapid acquisitions programs whose stated purpose is to accelerate the adoption of commercial technologies. In spite of these efforts, we demonstrated in research we published in 2020 that the vast majority of DoD suppliers, including participants in DoD innovation programs, continue to be legacy contractors (Bresler & Bresler, 2020). We posited that one reason why the DoD does a poor job of attracting innovative new vendors ("nontraditionals") is its failure to adequately market its requirements to communities outside of the traditional defense industrial base (DIB).This research aims to explore that hypothesis in more detail. Specifically, we sought to analyze how the composition and marketing of DoD requirements impacts the military's efforts to attract innovative, nontraditional suppliers.

Research Approach

This paper begins by providing an overview of the DoD's current methods of marketing open requirements ("opportunities" or "requirements") and soliciting information from prospective suppliers ("supplier outreach"), including the Federal Acquisition Regulation (FAR),

which dictates these procedures. Next, employing quantitative and qualitative research techniques, we analyzed the extent to which these methods enable the DoD to engage innovative, nontraditional companies outside of the DIB. We primarily focused our analyses on the following criteria:

- **discoverability:** the extent to which nontraditionals can find relevant DoD opportunities
- **response time:** the number of days between when an opportunity is posted and when responses are due
- **content:** the extent to which requirements are written in a clear and readable fashion and the extent to which requirements contain the information needed for nontraditionals to adequately evaluate them
- **redundancy:** the extent to which multiple DoD/government entities are simultaneously seeking similar solutions and how redundancy may affect nontraditionals' ability to prioritize relevant opportunities

In each section, we demonstrate that the DoD's methods of marketing its requirements and conducting supplier outreach substantially inhibit the military's access to companies outside of the DIB. This finding offers important context relative to our 2020 research results insofar as it makes clear a driving factor behind the DoD's failure to introduce a significant number of innovative new suppliers into the defense market over the last decade. Throughout the paper, we offer concrete recommendations for how the DoD can improve the way it communicates with industry to reach and engage a broader and more diverse audience of potential suppliers, thereby ensuring that the warfighter has access to the cutting-edge technologies necessary to fight and win.

How the DoD Markets Requirements: Federal Acquisition Regulation

The primary ways in which the DoD markets requirements and conducts supplier outreach in the procurement process are dictated by Federal Acquisition Regulation (FAR). These regulations create a set of rules that government stakeholders must comply with when procuring products and services. Certain exceptions exist within contract administration that allow contracting personnel to employ non-FAR contract strategies, such as Other Transactions, Procurements for Experiments, and Research and Development (R&D) Agreements (Defense Acquisition University, n.d.). However, the majority of contracts are FAR based, and non-FAR contracts are not always precluded from the marketing-specific requirements most relevant to this research.

For the purposes of this research, it is important to understand FAR Part 5, Part 6, and Part 10. FAR Part 5 requires contracting officers to "disseminate information on proposed contract actions ... expected to exceed $25,000, by synopsizing in the Governmentwide Point of Entry (GPE)" (FAR 5.1, 2021). The website https://beta.sam.gov (hereafter referred to as *beta.sam*), which replaced legacy site FedBizOpps in 2019, serves as the GPE. Thus, to comply with the FAR, all contract actions are made public on beta.sam, and the archived and active data on the site serves as a primary resource for our quantitative analyses. FAR Part 6 requires "with certain limited exceptions, that contracting officers shall promote and provide for full and open competition in soliciting offers and awarding Government contracts" (FAR 6.1, 2021) and

> contracting officers shall provide for full and open competition through use of the competitive procedure(s) contained in [the FAR] subpart that are best suited to the circumstances of the contract action and consistent with the need to fulfill the Government's requirements efficiently. (FAR 6.1, 2021)

In short, FAR Part 6 requires government stakeholders to ensure that opportunities are marketed competitively.

Additionally, and of particular import, FAR Part 10 explicitly addresses the "policies and procedures for conducting market research to arrive at the most suitable approach to acquiring, distributing, and supporting supplies and services" (FAR 10, 2021). These policies dictate that government stakeholders must follow a number of steps during the market research process, including but not limited to the following:

- **Conduct market research appropriate to the circumstances-**
  - Before developing new requirements documents for an acquisition by that agency; ...
  - On an ongoing basis, take advantage (to the maximum extent practicable) of commercially available market research methods in order to effectively identify the capabilities of small businesses and new entrants into Federal contracting that are available in the marketplace for meeting the requirements of the agency.
- **Use the results of market research to-**
  - Determine if sources capable of satisfying the agency's requirements exist;
  - Determine if commercial items or, to the extent commercial items suitable to meet the agency's needs are not available, nondevelopmental items are available that-
    - Meet the agency's requirements;
    - Could be modified to meet the agency's requirements; or
    - Could meet the agency's requirements if those requirements were modified to a reasonable extent;
  - Determine the extent to which commercial items or nondevelopmental items could be incorporated at the component level; ...
- **When conducting market research, agencies should not request potential sources to submit more than the minimum information necessary. (FAR 10, 2021)**

While the intention of these and other FAR clauses may be to foster competition, we sought to analyze, in practical terms, the extent to which these objectives are met. Furthermore, the importance of broadly marketing requirements and fostering healthy competition go beyond regulatory requirements. As we mentioned previously, now more than ever, the military needs innovative capabilities originating outside of the DIB, yet the DoD has continued to fall short in the critical mission of engaging these types of firms. This trend has persisted in spite of the FAR requirements and in spite of substantial investments into defense-sponsored innovation initiatives.

Discoverability

Beta.Sam Awareness

In our 2020 research, we argued that one reason why legacy contractors continue to receive the vast majority of DoD contracts is because there is a general lack of awareness among companies outside of the DIB on the basics of how to identify and engage with military customers (Bresler & Bresler, 2020). While the majority of this paper is concerned with whether or not specific features of DoD opportunities inhibit the military's ability to engage nontraditionals, it is first important to consider whether or not nontraditionals can discover DoD opportunities at all. Simply put, are nontraditionals aware of beta.sam, and do they know how to leverage it to identify prospective opportunities?

We do not have access to information about website traffic to beta.sam, precluding us from quantitatively assessing the reach and composition of the site's audience. However, we

can tell from site embeddings that the government does track critical data, such as overall site traffic, the number of unique visitors, the locations of visitors, and more. We encourage the DoD to make use of this information to assess the effectiveness of its marketing initiatives and to shape the development of future marketing and search engine optimization (SEO) strategies.

In the absence of site traffic data, we nevertheless have reason to believe that many nontraditionals are unfamiliar with beta.sam and/or struggle to navigate it. For instance, in addition to the multibillion dollar lobbying and consulting industry centered around helping firms navigate the defense market, companies such as GovWin, Bloomberg Government, and GovShop charge firms a subscription fee in exchange for repackaged opportunity data from beta.sam. The existence of a secondary market for publicly available government opportunity data suggests that beta.sam fails to serve as a viable resource for this information. The result of this "pay to play" paradigm is that the DoD does not see companies with the most cutting-edge capabilities. Rather, the military's requirements primarily reach only those companies willing to pay for access. While service providers and relationships will always play a role in navigating an organization as large and bureaucratic as the DoD, it is important that basic information about the military's requirements be accessible to a wide and diverse audience.

While the remainder of our analyses make the assumption that nontraditionals can successfully reach beta.sam, there is clearly a need to market the site better overall. Further research is required to determine the appropriate level of investment the DoD should make to broaden awareness of the site, along with how to allocate those resources. For starters, we suggest that they invest in SEO to ensure that beta.sam is returned at the top of all search engine searches for queries related to selling products/services to the government. Additionally, we suggest that the DoD engage a marketing firm to develop a strategy for promoting the site in places heavily trafficked by nontraditionals, like *Bloomberg Businessweek*, Crunchbase, LinkedIn, *The Wall Street Journal*, and more.

Site Design

Assuming companies successfully reach beta.sam to explore potential DoD opportunities, they face yet another obstacle: how to navigate the site. It is clear from the landing page, a snapshot of which is provided in Figure 1, that it is not designed with supplier outreach in mind. Rather, it explicitly states that it is "for people who make, receive, and manage federal awards" (General Services Administration, n.d.). These distinct stakeholder groups have markedly different purposes for visiting the site and have markedly different levels of familiarity with government data and terminology.



Figure 1. Beta.Sam Landing Page

Nontraditionals face an immediate challenge of trying to decipher the wide array of links and drop-down menu options to determine what content is relevant to them. References to topics such as "Wage Determinations" and "Contract Data Reports" confuse and intimidate companies unfamiliar with the government market. Furthermore, there is no explicit call to action on the homepage for companies interested in learning more about selling their products/services to the government—only a drop-down menu that allows a user to select "Contract Opportunities" and small text towards the bottom of the page that says "Learn More" followed by "Contract Opportunities (FBO)."

Rather than relying on a single site to serve multiple distinct stakeholder groups, we recommend that the federal government create a separate site specifically for suppliers. The site would speak directly to prospective and current suppliers using simple, clear, and straightforward language. It could be linked to the "New Supplier Portal" we recommended in our 2020 research paper—a resource specifically for companies with no prior experience selling to the government (Bresler & Bresler, 2020). There would be a prominent search feature with an explicit call to action to the effect of "Interested in Selling Your Products/Services to the

Government? Search for Open Opportunities Here." Additionally, we suggest that investments made by the DoD to market beta.sam be specifically focused on marketing this offshoot, supplier-specific site.

Search Functionality

If and when users reach the landing page associated with "Contract Opportunities," they can input keywords to conduct Boolean searches for relevant opportunities. Two significant limitations to this search functionality include:

- When inputting a search term, beta.sam only returns matches that reference the exact term searched; it does not stem the search term to generate matches for related terms. For instance, if a company searches "UAV," they will not see matches for "drone" (unless the "drone" opportunity also contains the term UAV). As it stands, the scope of relevant opportunities presented to a company is substantially limited, which in turn limits the pool of prospective suppliers that participate in a given DoD opportunity. We recommend that the federal government at large, including the DoD, incorporate related terms to beta.sam's search function. They can leverage resources such as the Defense Technical Information Center (DTIC) thesaurus to do so in a consistent fashion.
- Beta.sam only searches for the input term in the title and description of that opportunity—it does not search for the term in the attachment data. DoD customers often outline their needs in attachments rather than in the description, particularly in calls for market research. As it stands, companies who rely solely on beta.sam searches miss out on many potentially viable opportunities. We recommend that the DoD either mandate stakeholders to outline their needs areas in the description field or enable queries to search attachment data.

Of note, identifying too many opportunities can also be problematic, so it is important that the opportunities presented are easy to assess and understand. These nuances are addressed in greater detail in the Readability and Redundancy sections below.

Response Time

Acknowledging that a lack of awareness of beta.sam, coupled with challenges posed by the design of the site, greatly inhibit the DoD's ability to reach a broad audience, we now shift our focus to assess the features of DoD opportunities. These analyses make the assumption that companies know beta.sam exists and are using it to search for potential DoD opportunities. The first feature we explored is the length of time a company has to prepare and submit a response from when an opportunity is made public to when submissions are due. Response time is an important metric for competitiveness because companies need adequate time to identify an opportunity, to evaluate whether the opportunity is worth pursuing, and to prepare and submit a compliant response.

To quantitatively analyze the response time frames associated with DoD solicitations, we aggregated the archived solicitation data from beta.sam in each year from 2002 through 2020, starting in 2002 because the data sets become more complete in that year. After joining and cleaning 18 years' worth of data, we filtered the data to isolate solicitations issued by the DoD. To ensure we counted only distinct solicitations, we also filtered the data to include just the most recent solicitation listing associated with a particular solicitation identification (solicitation ID) and title. Additionally, we excluded solicitations that contained no text in the name or the solicitation description and/or listed a response date that occurred prior to the publishing date.

We also excluded

- Solicitations associated with notice types for "Sale of Surplus Property," "Modification/Amendment/Cancel," and "Foreign Government Standard"
- "Award Only" notices
- "Justifications"

We excluded these listings because they contain features inconsistent with the majority of the data and are generally unrelated to the market research process.

Our resulting data set of total DoD solicitations for analysis was 1,050,933. Figure 2 shows the total number of DoD solicitations by year.

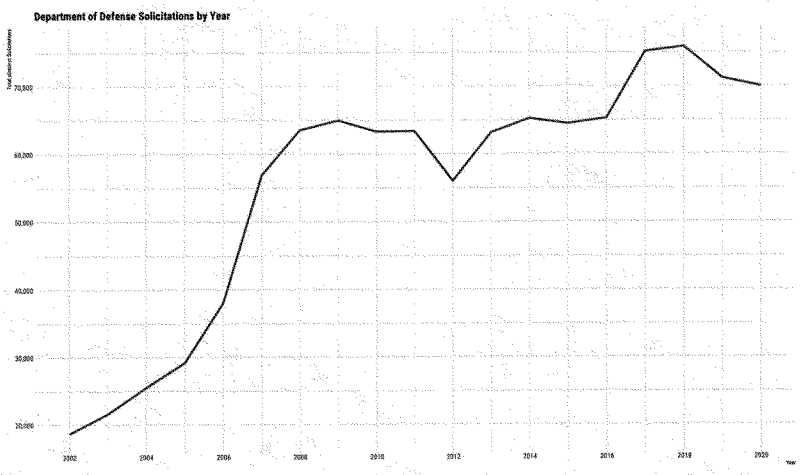


Figure 2. Total DoD Solicitations by Year

We then determined the response time frame for each solicitation by calculating the number of days between the date the solicitation was published and the date by which a response was due, both of which are standard data fields. As shown in Figure 3, every year from 2002 through 2020, 22% to 35% of all DoD solicitations had a response time of 10 days or less, and 45% to 87% of all DoD solicitations had a response time of 21 days or less. In each year over the last decade, 70% or more of all DoD solicitations had a response time of 21 days or less; and with the exception of 2020, at least 30% of all solicitations annually required responses within 10 days.

Department of Defense Solicitation Response Time by Year

Year	Total Distinct Solicitations	Count Response Time <= 10 Days	Count Response Time 11-21 Days	% Response Time <= 10 Days	% Response Time 11-21 Days	% Response Time <= 21 Days
2002	18,612	4,255	4,487	22.86%	24.11%	46.97%
2003	21,569	4,818	4,994	22.34%	23.15%	45.49%
2004	25,496	5,742	6,289	22.52%	24.67%	47.19%
2005	29,157	6,915	9,734	23.72%	33.38%	57.10%
2006	38,042	9,793	15,905	25.74%	41.81%	67.55%
2007	56,854	14,783	26,043	26.00%	45.81%	71.81%
2008	63,532	15,918	28,197	25.06%	44.38%	69.44%
2009	64,953	19,384	26,448	29.84%	40.71%	70.56%
2010	63,289	19,501	26,483	30.81%	41.84%	72.66%
2011	63,368	18,804	28,692	29.67%	45.28%	74.95%
2012	55,975	16,212	26,666	28.96%	47.64%	76.60%
2013	63,162	18,656	31,058	29.54%	49.17%	78.71%
2014	65,229	22,079	31,486	33.85%	48.27%	82.12%
2015	64,462	22,288	28,515	34.58%	44.24%	78.81%
2016	65,248	23,126	29,963	35.44%	45.92%	81.36%
2017	75,106	25,152	35,897	33.49%	47.80%	81.28%
2018	75,808	26,460	33,793	34.90%	44.58%	79.48%
2019	71,139	23,218	30,287	32.64%	42.57%	75.21%
2020	69,933	18,533	42,253	26.50%	60.42%	86.92%

Figure 3. DoD Solicitation Response Time by Year

While these turnaround times may not violate the FAR, it is unreasonable to expect that companies with little or no experience in the public sector will have ample time to participate in the market research process for opportunities open 21 days or less, and a time frame of 10 days or less is that much more challenging. Furthermore, as the data show, the problem has become progressively worse over the last 2 decades. This trend is especially concerning since, over that same time frame, the military has become increasingly reliant on technologies being developed outside of the traditional DIB. In other words, as the need to engage nontraditionals has grown, the process for companies to do so has become more anticompetitive.

Response Time by Notice Type

According to the DoD *Guidebook for Publicizing Notices in Contract Opportunities*, government stakeholders are required to publish notices for "proposed contract actions valued at more than $25,000," which include "announcements through official solicitations in the pre-award process, and up through award" (DoD, 2020, p. 3). As such, each opportunity corresponds to a specific notice type, depending on the purpose of the particular contract action. Each of the 1,050,933 opportunities in our data set corresponded to one of the following notice types, as defined by the *Guidebook for Publicizing Notices in Contract Opportunities* (DoD, 2020, p. 5):

- **Special Notice:** To increase competition and broaden industry participation, a special notice may be used to announce small business conferences, business fairs, long-range procurement estimates, pre-bid or preproposal conferences, meetings, and the availability of draft solicitations or draft specifications for review.
- **Sources Sought:** Use the sources sought notice type for Requests for Information (RFI) and other types of market research. An RFI is used when the Government does not presently intend to award a contract, but wants to obtain price, delivery, other market information, or capabilities for planning purposes. Responses are information only and shall not be used as an offer or proposal.

- **Presolicitation:** In appropriate cases, use a presolicitation notice to advise suppliers on the scope and purpose of the acquisition and to invite potential offerors to submit information. This allows the Government to advise the offerors about their potential to be viable competitors. Responses are information only and shall not be used as an offer or proposal. The FAR requires that a presolicitation notice be published in advance of a solicitation notice unless the combined synopsis/solicitation is used.
- **Solicitation:** Requests for proposals (RFPs) are used in negotiated acquisitions to communicate Government requirements to prospective contractors and to solicit proposals.
- **Combined Synopsis:** Use a combined Synopsis/Solicitation when the procurement meets the applicable conditions outlined in the FAR to reduce the time required to solicit and award contracts for the acquisition of commercial items. This notice type combines the synopsis and the issuance of the solicitation into a single document.

The purpose of Special Notices, Sources Sought, and Presolicitations is to allow the DoD to collect information from a broad range of suppliers about what capabilities they possess and how they would approach solving the DoD's stated problem(s). The DoD then uses the feedback gathered to shape and inform future requirements. It is especially important that nontraditionals participate in these types of information exchanges. Otherwise, the military's view of how problems can be solved is shaped exclusively by entrenched suppliers, which is inherently limiting as they do not always possess the most cutting-edge capabilities and may not be incentivized to encourage the DoD to consider new approaches. As such, we were interested in understanding how response times varied across these different notice types, and—in particular—for Special Notices, Sources Sought, and Presolicitations.

As shown in Figures 4 and 5, the vast majority of Special Notices and Sources Sought, and nearly half of all Presolicitations, have a turnaround of 21 days or less. Based on response time alone, suppliers unfamiliar with the DoD's supplier outreach methods are effectively closed off from participating in these critical calls for market research.

Department of Defense Solicitations, by Notice Type and Response Time

Notice Type	Count Response Time <= 10 Days	Count Response Time 11-21 Days	Count Response Over 21 Days
COMBINED SYNOPSIS/SOLICITATION	197,454	332,578	35,559
PRESOLICITATION	72,472	99,069	208,678
SOURCES SOUGHT	32,431	28,144	18,857
SPECIAL NOTICE	10,818	5,444	2,564
SOLICITATION	2,462	1,952	2,452

Figure 4. Response Time by Notice Type

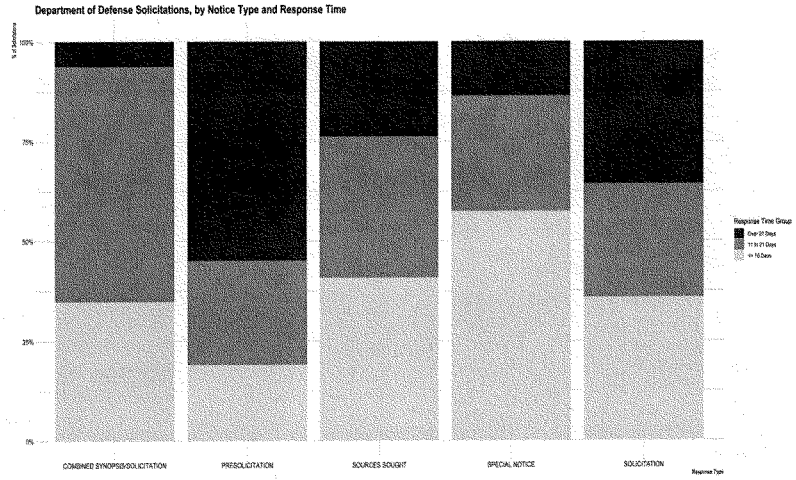


Figure 5. Percentage of DoD Solicitations, by Response Time and Notice Type

While technically speaking, the DoD may comply with FAR Parts 5 and 6 by making these opportunities public, one could argue they fail to meet the objective of FAR Part 10 by virtue of these short turnaround times. Furthermore, DoD opportunities with aggressively short turnaround times are often referred to in industry as "wired" (Walinskas, 2017). A wired opportunity is one where the customer has already identified its vendor, and the formal bid process exists only for compliance purposes. The odds of another supplier winning a future contract are effectively zero.

We recognize the importance of DoD stakeholders being able to engage with suppliers swiftly—in fact, allowing companies to contract quickly is critical for attracting innovators. However, the volume of opportunities with anticompetitive turnaround times indicates a disconnect between the intent of the regulatory standards and how they are employed in practice. To the extent that DoD stakeholders are making opportunities public for 21 days or less as a loophole to award contracts to suppliers they have already identified illustrates that there is a need to allow DoD stakeholders the ability to quickly engage certain suppliers, without doing so at the expense of the military's overall marketing and outreach strategies. Specifically, we recommend that DoD stakeholders be required to make solicitations active for at least 30 days or be able to formally justify circumventing this requirement to bring a supplier on more quickly, similar to the use of sole-source justifications. If no such justification exists, a suitable response window—coupled with aggressively marketing the DoD requirements in general, as previously discussed—is essential to ensuring that the military has the ability to reach and engage nontraditionals.

Content

Readability: Reading-Ease & Grade Level

In order to ensure fair competition, opportunities not only need a reasonable response time but also must be written clearly so that potential suppliers can understand the requirements. Directly to this point, we sought to evaluate the content of DoD solicitations to determine the extent to which they are readable and easily understood by a wide audience.

To do so, we utilized the Flesch–Kincaid (F–K) readability tests. The two F–K tests, the F–K Reading-Ease test and the F–K Grade Level test, weigh features such as total words, total sentences, and total syllables to indicate how difficult a passage is to understand ("Flesch–Kincaid readability tests," n.d.). For the F–K Reading-Ease test, a low score indicates that a passage is difficult to read, while a high score indicates that a text is easier to read. The F–K Grade Level test scores text based on U.S. grade levels or the number of years of education generally required to understand the text. The scores correspond to one another, insofar as text that is classified as "Difficult to Read" is equivalent to the "College" grade level, "Very Difficult to Read" is equivalent to "College Graduate" grade level, and so forth. Figure 6 lists each F–K Readability Group and its corresponding F–K Grade Level.

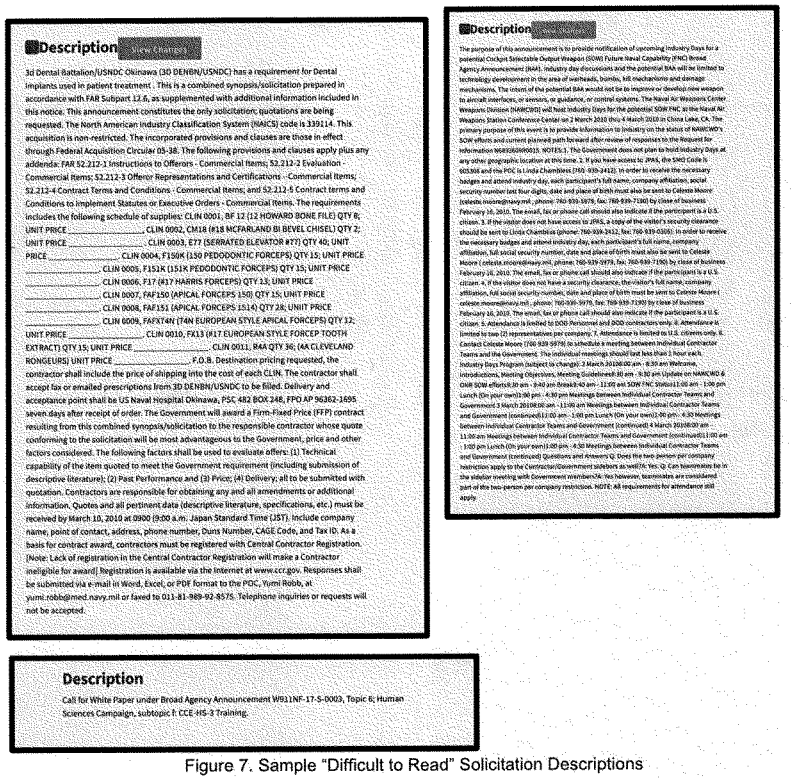
To calculate the F–K scores of the 1,050,933 solicitations in our data set, we assessed the text contained in each solicitation description. As shown in Figure 6, which presents the breakdown of the solicitations by F–K Reading-Ease and Grade Level, the majority of solicitation descriptions analyzed were "Difficult" or "Very Difficult" to read. Nearly 59% of all solicitations require some college-level education, and another nearly 20% of solicitations are suited for individuals that graduated from college. By comparison, fewer than 3% of solicitations are written in plain English.

Department of Defense Solicitations, Scored by Reading-Ease & Grade Level

Flesch Readability Group	Flesch-Kincaid Grade Level	Total Solicitations	% of Total Solicitations
DIFFICULT TO READ	COLLEGE	617,516	58.76%
VERY DIFFICULT - READABLE COLLEGE GRADUATES	COLLEGE GRADUATE	209,471	19.93%
FAIRLY DIFFICULT TO READ	10TH TO 12TH GRADE LEVEL	124,176	11.82%
PLAIN ENGLISH - READABLE 13-15	8TH & 9TH GRADE LEVEL	24,111	2.29%
EXTREMELY DIFFICULT - READABLE DOMAIN EXPERTS	DOMAIN EXPERT	23,933	2.28%
EXTREMELY DIFFICULT - READABLE COLLEGE GRADUATES	PROFESSIONAL	18,825	1.79%
FAIRLY EASY TO READ	7TH GRADE LEVEL	17,950	1.71%
EASY TO READ - CONVERSATIONAL ENGLISH	6TH GRADE LEVEL	8,440	0.80%
EASY TO READ - READABLE UNDER 11	5TH GRADE LEVEL	3,834	0.36%
UNSCORED	UNSCORED	2,678	0.25%

Figure 6. DoD Solicitations, Scored by Reading-Ease and Grade Level

Figure 7 provides three examples of solicitation descriptions that were classified as "Difficult to Read," according to the F–K test. They contain esoteric acronyms and range from including excessive information to including almost no information at all.



Description View Changes

3d Dental Battalion/USNDC Okinawa (3D DENBN/USNDC) has a requirement for Dental implants used in patient treatment . This is a combined synopsis/solicitation prepared in accordance with FAR Subpart 12.6, as supplemented with additional information included in this notice. This announcement constitutes the only solicitation; quotations are being requested. The North American Industry Classification System (NAICS) code is 339114. This acquisition is non-restricted. The incorporated provisions and clauses are those in effect through Federal Acquisition Circular 05-38. The following provisions and clauses apply plus any addenda: FAR 52.212-1 Instructions to Offerors - Commercial Items; 52.212-2 Evaluation - Commercial Items; 52.212-3 Offeror Representations and Certifications - Commercial Items; 52.212-4 Contract Terms and Conditions - Commercial Items; and 52.212-5 Contract terms and Conditions to Implement Statutes or Executive Orders - Commercial Items. The requirements includes the following schedule of supplies: CLIN 0001, BF 12 (12 HOWARD BONE FILE) QTY 8; UNIT PRICE _____, CLIN 0002, CM18 (#18 MCFARLAND BI BEVEL CHISEL) QTY 2; UNIT PRICE _____, CLIN 0003, E77 (SERRATED ELEVATOR #77) QTY 40; UNIT PRICE _____, CLIN 0004, F150K (150 PEDODONTIC FORCEPS) QTY 15; UNIT PRICE _____ CLIN 0005, F151K (151K PEDODONTIC FORCEPS) QTY 15; UNIT PRICE _____ CLIN 0006, F17 (#17 HARRIS FORCEPS) QTY 13; UNIT PRICE _____ CLIN 0007, FAF150 (APICAL FORCEPS 150) QTY 15; UNIT PRICE _____ CLIN 0008, FAF151 (APICAL FORCEPS 151A) QTY 28; UNIT PRICE _____ CLIN 0009, FAFXT4N (T4N EUROPEAN STYLE APICAL FORCEPS) QTY 32; UNIT PRICE _____, CLIN 0010, FX13 (#17 EUROPEAN STYLE FORCEP TOOTH EXTRACT) QTY 15; UNIT PRICE _____ CLIN 0011, R4A QTY 36; (4A CLEVELAND RONGEURS) UNIT PRICE _____. F.O.B. Destination pricing requested, the contractor shall include the price of shipping into the cost of each CLIN. The contractor shall accept fax or emailed prescriptions from 3D DENBN/USNDC to be filled. Delivery and acceptance point shall be US Naval Hospital Okinawa, PSC 482 BOX 248, FPO AP 96362-1695 seven days after receipt of order. The Government will award a Firm-Fixed Price (FFP) contract resulting from this combined synopsis/solicitation to the responsible contractor whose quote conforming to the solicitation will be most advantageous to the Government, price and other factors considered. The following factors shall be used to evaluate offers: (1) Technical capability of the item quoted to meet the Government requirement (including submission of descriptive literature); (2) Past Performance and (3) Price; (4) Delivery; all to be submitted with quotation. Contractors are responsible for obtaining any and all amendments or additional information. Quotes and all pertinent data (descriptive literature, specifications, etc.) must be received by March 10, 2010 at 0900 (9:00 a.m. Japan Standard Time (JST). Include company name, point of contact, address, phone number, Duns Number, CAGE Code, and Tax ID. As a basis for contract award, contractors must be registered with Central Contractor Registration. [Note: Lack of registration in the Central Contractor Registration will make a Contractor ineligible for award] Registration is available via the Internet at www.ccr.gov. Responses shall be submitted via e-mail in Word, Excel, or PDF format to the POC, Yumi Robb, at yumi.robb@med.navy.mil or faxed to 011-81-989-92-8575. Telephone inquiries or requests will not be accepted.

Description View Changes

The purpose of this announcement is to provide notification of upcoming Industry Days for a potential Cockpit Selectable Output Weapon (SOW) Future Naval Capability (FNC) Broad Agency Announcement (BAA). Industry day discussions and the potential BAA will be limited to technology development in the area of warheads, bombs, kill mechanisms and damage mechanisms. The intent of the potential BAA would not be to improve or develop new weapon to aircraft interfaces, or sensors, or guidance, or control systems. The Naval Air Weapons Center Weapons Division (NAWCWD) will host Industry Days for the potential SOW FNC at the Naval Air Weapons Station Conference Center on 2 March 2010 thru 4 March 2010 in China Lake, CA. The primary purpose of this event is to provide information to industry on the status of NAWCWD's SOW efforts and current planned path forward after review of responses to the Request for Information N6833609N0019. NOTES:1. The Government does not plan to hold Industry Days at any other geographic location at this time. 2. If you have access to JPAS, the SMO Code is 605368 and the POC is Linda Chambless (760- 939-2412). In order to receive the necessary badges and attend industry day, each participant's full name, company affiliation, social security number last four digits, date and place of birth must also be sent to Celeste Moore (celeste.moore@navy.mil , phone: 760-939-5979, fax: 760-939-7190) by close of business February 16, 2010. The email, fax or phone call should also indicate if the participant is a U.S. citizen. 3. If the visitor does not have access to JPAS, a copy of the visitor's security clearance should be sent to Linda Chambless (phone: 760-939-2412, fax: 760-939-0305). In order to receive the necessary badges and attend industry day, each participant's full name, company affiliation, full social security number, date and place of birth must also be sent to Celeste Moore (celeste.moore@navy.mil , phone: 760-939-5979, fax: 760-939-7190) by close of business February 16, 2010. The email, fax or phone call should also indicate if the participant is a U.S. citizen. 4. If the visitor does not have a security clearance, the visitor's full name, company affiliation, full social security number, date and place of birth must be sent to Celeste Moore (celeste.moore@navy.mil , phone: 760-939-5979, fax: 760-939-7190) by close of business February 16, 2010. The email, fax or phone call should also indicate if the participant is a U.S. citizen. 5. Attendance is limited to DOD Personnel and DOD contractors only. 6. Attendance is limited to two (2) representatives per company. 7. Attendance is limited to U.S. citizens only. 8. Contact Celeste Moore (760 939 5979) to schedule a meeting between Individual Contractor Teams and the Government. The individual meetings should last less than 1 hour each. Industry Days Program (subject to change): 2 March 20100:00 am - 8:30 am Welcome, Introductions, Meeting Objectives, Meeting Guidelines8:30 am - 9:30 am Update on NAWCWD & CNR SOW efforts9:30 am - 9:40 am Break9:40 am - 11:00 am SOW FNC Status11:00 am - 1:00 pm Lunch (On your own)1:00 pm - 4:30 pm Meetings between Individual Contractor Teams and Government 3 March 20100:00 am - 11:00 am Meetings between Individual Contractor Teams and Government (continued)11:00 am - 1:00 pm Lunch (On your own)1:00 pm - 4:30 Meetings between Individual Contractor Teams and Government (continued) 4 March 20100:00 am - 11:00 am Meetings between Individual Contractor Teams and Government (continued)11:00 am - 1:00 pm Lunch (On your own)1:00 pm - 4:30 Meetings between Individual Contractor Teams and Government (continued) Questions and Answers Q: Does the two person per company restriction apply to the Contractor/Government sidebars as well? A: Yes. Q: Can teammates be in the sidebar meeting with Government members? A: Yes however, teammates are considered part of the two-person per company restriction. NOTE: All requirements for attendance still apply

Description

Call for White Paper under Broad Agency Announcement W911NF-17-S-0003, Topic 6; Human Sciences Campaign, subtopic f: CCE-HS-3 Training.

Figure 7. Sample "Difficult to Read" Solicitation Descriptions

To attract a broad audience, requirements must be written in concise, accessible language. Requirements that consist of complex, incomprehensible language limit competition because companies become frustrated by the challenges and effort needed to decipher the text. Furthermore, these poorly written requirements run contrary to the DoD Plain Writing Act of 2010. The act requires federal agencies to write "clear Government communication that the public can understand and use" and stipulates guidelines for compliance that require the DoD to write new documents in "plain language" (Washington Headquarters Services, n.d.).

We recommend that the DoD require all solicitation descriptions to be written in plain English, suitable for an 8th- to 9th-grade reading level. To implement this policy, the government can incorporate a feature on the back end of beta.sam that automatically reads the text of every new solicitation inputted by a DoD stakeholder and calculates its F–K scores. If the scores do not meet the recommended reading level, the system automatically recommends simpler replacement language that the stakeholder can review and approve. Only once the appropriate levels of readability are met can the solicitation be published. We also recommend that text on

all public-facing DoD websites, including beta.sam, as well as text in DoD collateral materials meant for public distribution, be written in plain English.

Readability: Supplier Feedback

In addition to analyzing the readability tests on the 1,050,933 solicitations in our data set, we also surveyed 23 small businesses to gather their feedback on government solicitations. The 23 firms are nontraditional dual-use companies that are currently participants in the Air Force's Small Business Innovation Research (SBIR) program. For each company, we utilized publicly available information, including their SBIR award description and related keywords, to establish a basic understanding of their capabilities. We then identified opportunities via beta.sam that appeared to relate to their capabilities, shared the links to the relevant opportunities with a designated company point of contact using Survey Monkey, and asked them to offer feedback on each match. Because they are SBIR participants, they are inherently more familiar with navigating the DoD's solicitation processes than companies with no prior defense business, which would imply a greater comfort level with deciphering additional DoD opportunities presented to them. On the contrary, the companies were frustrated by how challenging it was to decipher the solicitations. Specific feedback included:

- "I cannot tell from the (Areas of Interest) (AOI) what they are asking"
- "I'm struggling mightily to find the AOIs that say what the DoD really wants."
- "Super annoying that I had to comb through attachments to find the AOI's topic."
- "(Broad Agency Announcements) (BAAs) are complex"
- "These BAAs take quite a while to go through and communicate."
- "That was SUPER painful ... because of the opacity with which those SAM postings are written. There are a couple—even AFTER downloading the documents from SAM—that remain mysterious."

To competitively attract and engage nontraditionals, opportunities must be written clearly and provide the detailed information necessary for a company to evaluate whether or not the opportunity is worth pursuing. The aforementioned feedback highlights another problem with the DoD's marketing and outreach methods: critical information is often buried in cumbersome attachments or omitted altogether. Having to sift through complex files to understand the requirements does not inspire a company to respond to a solicitation. Accordingly, in addition to ensuring that the description text of an opportunity is written in plain English, we also recommend that all opportunity descriptions explicitly state the customer's primary areas of interest.

Requisite Information

By assessing the features of the data contained in our solicitation data set and reviewing publicly available opportunities on beta.sam, we found that the DoD often omits critical pieces of information from opportunity listings altogether. Specifically, there are no structured fields requiring DoD stakeholders to indicate on the landing page of beta.sam the value of the opportunity (estimated or actual) or the performance period (estimated or actual).

We recognize that providing specific contract values or performance periods for all notice types is a challenge for DoD stakeholders, because the market research process is intended to help shape the requirements. However, nontraditionals, especially those with robust private sector revenue streams, are unlikely to invest time and resources to explore an engagement with a DoD customer without some sense of the potential upside and/or when the work might begin.

We suggest that the DoD be required to provide an estimated contract value/range for all opportunities. An algorithmic approach can be employed to generate the estimates, including

aggregating and weighing factors such as average contract size awarded by the corresponding contracting office over the last 5 years; average contract size for the particular product or service the opportunity corresponds to (for instance, if the opportunity relates to drones, calculating the average size of drone contracts in DoD over the last 5 years); budget estimates for that particular product/service as provided by the Office of Management and Budget (OMB); and other related data points. The solicitation would state that the information provided is an estimate and subject to change. While the process for calculating the estimate requires further research and refinement, we believe it is essential for the DoD to invest in providing this data point as part of its marketing and communication efforts. Companies, particularly nontraditionals attempting to scale with limited resources, also need some sense of performance period to prioritize which opportunities to pursue. DoD stakeholders should, therefore, be required to provide an estimated period of performance as well.

Redundancy

Another challenge that companies face when trying to prioritize DoD opportunities is that many of the same technologies are in high demand by stakeholders across all service branches. The DoD's 2020 modernization priorities, for example, emphasize the importance of "the development and procurement of high priority systems—such as artificial intelligence, directed energy, small satellites, hypersonics, a 5G network and unmanned aerial systems" (Vergun, 2020) for the whole of military.

For companies with applicable capabilities, a large addressable market may make investing in the defense sector more appealing. However, as discussed throughout this paper, to capitalize on the market, companies must have the ability to navigate it. In cases where multiple DoD stakeholders are seeking similar solutions ("redundancy"), the challenges we have highlighted are compounded by the fact that a company must identify and decipher the relevant opportunities and then decide which ones to pursue. To assess the scope of this redundancy problem, we sought to explore the extent to which multiple DoD stakeholders are simultaneously seeking capabilities related to two of the military's modernization priorities, unmanned aerial vehicles (UAVs) and artificial intelligence (AI).

Redundancy Analysis

To calculate how many DoD solicitations corresponded to UAVs and/or AI, we employed a more computationally intensive approach that required us to utilize a smaller data set. We focused our analysis on a data set of 69,933 solicitations from the year 2020. Next, we leveraged the DTIC thesaurus to expand the set of terms we used to describe UAVs and AI. The DTIC thesaurus allows for the provision of an input term, such as "unmanned aerial vehicle," and returns a set of related keywords with varying degrees of proximity to the original term. For the purposes of this research, we limited the results to related terms, which can be understood as synonyms.[1] Next, we algorithmically searched for incidences of these terms in

[1] Keyword Corpus: AI APPLICATIONS, AI COMPUTING, APPLIED COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE, ARTIFICIAL INTELLIGENCE COMPUTING, ARTIFICIAL INTELLIGENCE SOFTWARE COMPUTATIONAL PROCESSES, COMPUTER VISION, COUNTER-DRONE TECHNOLOGY, COUNTER-UAS COUNTER-UAV TECHNOLOGY, COUNTER-UNMANNED AERIAL SYSTEMS, DEEP LEARNING, DEEP STRUCTURED LEARNING, DRONE, DRONE CONTROL AIRCRAFT, DRONE SWARMS, DRONES, EXPERT SYSTEMS, HEAVY FUEL ENGINES, HEAVY FUEL UAV ENGINES, HIERARCHICAL LEARNING, INFERENCE ENGINES, INTELLIGENT PERSONAL ASSISTANTS, INTELLIGENT SYSTEMS, LAMP RAY ROV, MACHINE LEARNING, MACHINE PERCEPTION, MICRO AIR VEHICLE, NATURAL LANGUAGE PROCESSING, NATURAL LANGUAGE PROCESSING SOFTWARE, NEURAL NETWORKS, REMOTELY PILOTED AIRCRAFT, SEMI-SUPERVISED LEARNING, SMALL UNMANNED AIRCRAFT SYSTEM, SOFTWARE AGENTS, SUPERVISED LEARNING, SUPERVISED MACHINE LEARNING, SURVEILLANCE DRONES, SWARM INTELLIGENCE, SWARMING DRONES, SWARMING TECHNOLOGIES, SWARMS OF FIXED WING DRONES, TARGET DRONES,

the description, ID, and title for each solicitation. A matched term indicated that an opportunity corresponded to a UAV and/or AI requirement. With this methodology, we identified 42 DoD opportunities in 2020 that corresponded to UAVs and/or AI.

As previously discussed, the DoD often buries critical information, including the areas of interest, in attachments. To more accurately calculate the number of solicitations related to UAV/AI capabilities would, therefore, require searching for the terms in the attachment data. Solicitations can have dozens or even hundreds of pages of attachments across multiple files and file types, and because supporting documents are formatted inconsistently, it was not feasible to incorporate the text and data from attachments for all 69,933 solicitations. Instead, to enhance the search, we decided to incorporate a small subset of attachment data.

Specifically, we first filtered the data to isolate opportunities that corresponded to either a Sources Sought or a Broad Agency Announcement (BAA). While BAAs are not a specific notice type, they—like the DoD's other methods of conducting market research—request "scientific or research proposals from private firms concerning certain areas of interest to the government" (AcqNotes, 2021) and may lead to contract awards. The DoD relies on BAAs to communicate with industry and gather critical market research. For instance, the DoD's SBIR topics are issued as BAAs. To identify BAAs in our 2020 data set, we searched for the terms "Broad Agency Announcement" and "BAA" in the contract ID, solicitation name, and solicitation description. We then combined the BAAs with the opportunities corresponding to a Sources Sought notice type, excluding any Sources Sought that were already counted as BAAs. In total, we identified 2,519 opportunities in 2020 that were either Sources Sought or BAAs. For these 2,519 opportunities, we incorporated the text and data contained in their attachments and utilized optical character recognition (OCR) and other methods of text extraction to search this data for UAV/AI terms.

With this methodology, we identified an additional 22 DoD opportunities in 2020 that corresponded to UAVs and/or AI, bringing the total to 64. In other words, utilizing OCR and text-extraction on just 3.6% of the solicitation data increased the number of matched opportunities by more than 50%. Based on these results, one can assume that the total number of DoD stakeholders that posited demand for UAV/AI capabilities in 2020 was substantially more than 64.

Demand Outside of DoD

Furthermore, our analyses did not include solicitations from federal stakeholders outside of the DoD. When assessing the challenges companies face in trying to prioritize DoD customers, it is worth considering the potential effects of demand from non-DoD customers—particularly because, with the beta.sam process, companies discover DoD and non-DoD opportunities simultaneously. We recommend further research to explore the DoD-level findings we have addressed in this paper across the entirety of government, and we recommend that this further research incorporate attachment data to the best extent possible.

In the interim, we conducted a microanalysis to explore the potential impact of non-DoD demand on our research results. To do so, we aggregated all open federal opportunities—DoD and non-DoD, including attachment data—from a single day—October 8, 2020—and searched

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UAS, UAV, UGV, UNDERWATER DRONES, UNINHABITED AIRCRAFT VEHICLE, UNMANNED AERIAL, UNMANNED AERIAL SYSTEMS, UNMANNED AERIAL VEHICLE, UNMANNED AEROSPACE VEHICLE, UNMANNED AIR SYSTEMS, UNMANNED AIRCRAFT, UNMANNED AIRCRAFT SYSTEMS, UNMANNED AIRCRAFT VEHICLE, UNMANNED GROUND SYSTEMS, UNMANNED GROUND VEHICLE, UNMANNED GROUND VEHICLE SYSTEMS, UNMANNED SYSTEMS, UNSUPERVISED LEARNING, UNSUPERVISED MACHINE LEARNING

for UAV terms across this data set. As shown in Figure 8, on that single day, 132 open opportunities corresponded to UAVs.

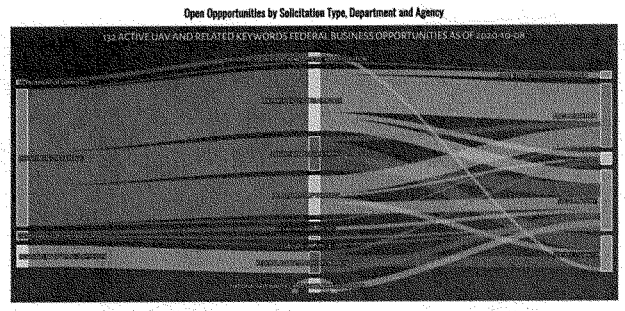


Figure 8. Open Solicitations Related to UAVs on October 8, 2020

Assessing redundancy using any one of the aforementioned methodologies, it is clear that companies with high-priority capabilities can encounter anywhere from dozens to hundreds of prospective DoD and non-DoD opportunities. Therefore, if and when a company identifies and deciphers relevant opportunities, realistically it cannot participate in all of them. The DoD's failure to coordinate its outreach and communication efforts results in negative consequences for both nontraditionals and the warfighter. DoD customers only receive feedback from a small number of firms and are not guaranteed to receive feedback from firms with the most applicable capabilities. As a result, they have a myopic view of how their problems can be solved. Companies interested in serving the needs of government have to decide which customer(s) to engage with the information they have at hand. As a result, they are not necessarily choosing the customers whose use cases align most seamlessly with their capabilities, and they are not necessarily choosing the customers with the most urgent need for their capabilities.

Better intra-government communication would benefit the supplier and the government; thus, it is essential that military stakeholders coordinate their outreach and communication efforts to maximize exposure of their requirements. For priority verticals, we recommend that DoD stakeholders issue joint requirements in the market research/outreach phases. Further research is required to determine the best way to implement this concept, including how to appropriately incentivize DoD stakeholders to take the necessary actions. We suggest that prior to release, the DoD circulate requirements related to priority verticals to designated offices within each service branch. This action will allow DoD stakeholders to incorporate related requirements into the solicitation. In addition to helping the DoD gather information from a wider range of potential suppliers and steer them in different directions more effectively, this approach would allow companies to market their capabilities to multiple prospective customers simultaneously—a major advantage over the current stovepiped system.

Conclusion

In spite of billions in investment for innovation initiatives and unremitting rhetoric from senior leadership about the DoD's commitment to a culture of innovation, our 2020 research proved that the military has failed to attract and engage a significant number of new suppliers over the last decade, which puts the warfighter at risk (Bresler & Bresler, 2020). In this paper, we employed qualitative and quantitative research techniques to illustrate that *how* and *where*

the DoD communicates with industry have contributed to this problem. We identified a series of conditions that must be met in order for the DoD's requirements and messaging to reach suppliers outside of the traditional DIB:

- Companies need to know where to go to search for DoD opportunities, and the search process must be user-friendly and intuitive.
- Companies need enough time to identify, assess, and respond to an opportunity.
- Companies need to easily understand what DoD customers are asking for.
- To determine whether or not an opportunity is worth pursuing, companies need certain pieces of critical information, including the potential contract size.
- The DoD needs to coordinate its marketing and outreach efforts, especially for capabilities in high demand across the government.

The absence of any one of these conditions not only fails to meet the objective of the FAR but also creates a bottleneck that limits industry participation in the market research process. The military, in turn, operates with an incomplete picture of how its problems could be solved and what capabilities exist to solve them. The recommendations outlined throughout this paper are intended to help the DoD address each of these bottlenecks as efficiently as possible and to make the process of engaging with the military more seamless for nontraditionals accustomed to operating in the private sector. Ultimately, the military needs access to the best and brightest suppliers to preserve the strength of the warfighter—and to attract best suppliers, the DoD must behave like a better customer.

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Analyzing the Composition of the Department of Defense Small Business Industrial Base

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Abstract

This paper explores the composition of the Department of Defense (DoD) small business (SB) industrial base by analyzing public records for companies registered to do business with the government and publicly available DoD contract and subcontract award data from 2015 through 2021. We demonstrate that although the amount of money DoD awarded to SBs grew by almost 68% between 2015 and 2021, the total number of SBs in the defense market shrank nearly 23% concurrently. The decline in SBs can be attributed to the fact that SB program policies fail to address the underlying issues that keep small and nontraditional companies from navigating the defense market successfully. Furthermore, SB policies enable the largest SBs–which include companies that generate hundreds of millions or billions of dollars in DoD revenue annually–to expand their market share, irrespective of price, quality, or innovativeness. To contextualize these findings, we provide an overview of the history and stated objectives of DoD SB initiatives and utilize qualitative research to understand the experiences of individual SBs in the defense market. We offer a series of concrete recommendations to improve how the DoD SB program is structured and measured, to enable it to better meet its objectives.

Introduction

For nearly 70 years, the U.S. government (USG) has afforded small businesses (SBs) preferential treatment in the federal procurement process by limiting competition for certain contracts to SBs. Congress justifies SB set-aside contracts ("SB set-asides") on the basis that "the Government should aid, counsel, assist, and protect … the interests of small-business concerns in order to preserve free competitive enterprise … and to maintain and strengthen the overall economy of the Nation" (Small Business Act and Small Business Investment Act, 1). Likewise, the Small Business Administration (SBA) website states that SB set-aside contracts exist to "help small businesses compete for and win federal contracts" and to "help provide a level playing field for small businesses" (U.S. SBA, n.d.-b). In its "Small Business Program Guide for Government and Industry," the Army Corps of Engineers (n.d.) summarizes that the congressional philosophy for the SB program is to

- Utilize the annual federal budget to promote Small Business Programs
- Promote economic stability through the use of Small Businesses to enhance the nation's defense
- Preserve and promote free enterprise
- Maintain a viable industrial base
- Ensure competitive economic climate
- Provide opportunities for entrepreneurship and inventiveness

A 2007 House committee report stated that the basis for SB contracting programs "is the positive economic benefits they provide, as well as assisting small businesses to overcome the complexities of the system" (Dilger & Blackford, 2022). The report emphasizes that SB programs "are designed to increase and diversify small contractors with the intent of expanding the federal supplier base" so as to increase competition and product diversity, improve product quality, and reduce prices. The report also notes that "these contracting initiatives lower barriers to entry in a wide range of markets for small businesses … [which] provides greater market access for small firms' [products] and services. … Such access is critical to generating positive macroeconomic benefits, including higher job creation, wage growth, and greater income distribution."

In spite of these stated objectives, the success of the SB set-aside program has been measured primarily by whether the government meets Congressionally established set-aside procurement goals. Specifically, Congress directs the USG to allocate 23% of eligible procurement spend for SBs annually, with procurement goals from within this spend for subsets of the SB program including woman-owned SBs, small disadvantaged businesses, HUBZone SBs, and service-disabled veteran-owned SBs.

Assessing the amount of money awarded to SBs as a share of overall government spending does little to evaluate the impact of the SB program on the industrial base, the economy, or the competitive environment for products and services in the USG. Our research aimed to provide a more comprehensive assessment of the DoD SB program vis a vis its stated objectives. Specifically, we conducted a quantitative analysis of SB suppliers to DoD annually from Fiscal Year (FY) 2015 through FY2021 and analyzed trends in the data related to SBs' DoD procurement obligations and subcontracting practices. For additional context, we interviewed DoD SBs and reviewed USG contracting policies that impact all suppliers. We conclude that rather than achieving its stated objectives, the DoD SB program reduces opportunities for SBs, creates a less competitive economic climate, and weakens the defense industrial base (DIB); and throughout the paper, we offer a series of recommendations for reforming the program—both how it is structured and how it is measured—to improve its outcome.

Sizing the Small Business Defense Industrial Base

Considering that one objective of the SB set-aside program is to expand and diversify the industrial base, the number of SB contractors supporting the DoD should be increasing over time. We sought to evaluate this metric by calculating the number of SB contractors to DoD (DoD SBs) each year from FY2015–FY2021.

Research Note: Timeframe

We selected FY2015–FY2021 as our analysis period because it allowed us to assess year over year trends as well as a wide range of features associated with DoD SBs. Unless otherwise noted, quantitative analyses referenced in the paper are associated with FY2015–FY2021.

Sizing the Overall DIB

To assess trends in the SB DIB, we needed to identify and isolate SBs from the DoD vendor pool. First we created a mirror of the Federal Procurement Data System (FPDS), the clearinghouse for all USG procurement data. Next, we isolated the data to all DoD-funded procurements from FY2015 through FY2021. To calculate the annual number of DoD-funded vendors, we grouped the data by FY and calculated the number of distinct DUNS numbers across all active procurements from that FY. Table 1 shows the total number of DoD vendors by year.

Table 1. Total DoD Supplier Base, Annually

Fiscal Year	Count of Distinct DoD Funded DUNS Numbers
2015	68,257
2016	66,290
2017	64,184
2018	61,242
2019	57,746
2020	54,418
2021	52,597

Classifying the Small Businesses

Next, we categorized each distinct vendor as either an SB or an entity other than an SB ("large business" or "LB"). Size standards vary based on industry; government reporting on size standards is inconsistent; and company size can change from one year to the next. To classify each DoD vendor, we developed a classification system that weights multiple features associated with a DUNS number using data from FPDS and the System for Award Management (SAM) Entity Registration Database to designate it as an SB or LB accordingly.[1] For instance, some FPDS contract actions indicate the use of an SB in a field labeled "business size determination," and there are other references to set-asides in the FPDS data. So, for each DUNS number, the system considers all historic contract actions from FPDS–not just the contract actions associated with it from FY2015–FY2021. SAM data can also reference features such as "Business Type" and "Set-Aside Type," which often correlate to SBs, so the system considers data from these fields when classifying each DUNS as well. Table 2 outlines the features used to classify each entity by data source.

Table 2. Small Business Classification Features

Data Source	Feature			
	Business Size Determination	Set-Aside Contract Feature	Business Type	Set-Aside Type
FPDS	X	X		
SAM			X	X

Recommendation: "Single Source of Truth" for Defining SBs

The fact that the USG does not adhere to a consistent classification system for defining SBs severely limits any effort to comprehensively evaluate the SB program, including efforts to assess the share of overall DoD spend awarded to SBs.

In a subsequent section, we discuss the need to modify revenue and employee thresholds for what qualifies as "small" by USG standards. However, irrespective of qualification criteria, it is essential that a company's status as small or large is reported consistently across government data sources. We recommend the USG establish and maintain a "small business registry" for all active DUNS numbers containing detailed information about their SB contract

[1] For the purposes of our technical approach, each DUNS number corresponds to either an SB or an LB. FPDS contains a higher volume of features that, while less accurate than SAM features, in some cases allowed us to categorize a business as an SB even if it is not currently active in SAM; or even if is not currently registered as an SB in SAM, but was considered an SB for the majority of our analysis period.

awards and, if necessary, distinguishing between revenue they generated as an SB versus revenue they generated as a large business (since the same company can qualify as "small" for certain contracts but not others). This registry would eliminate the need to cross-reference FDPS and SAM to determine which contract awards were SB set-asides.

Sizing the SB DIB

Using the previously outlined classification system, we calculated the number of distinct SBs contracting with the DoD annually. **As shown in Table 3, over the last 6 years the number of SBs that were awarded defense-funded contracts declined nearly 23%, from 48,322 to 37,294. *Contrary to the stated objectives of the SB set-aside program, the number of small contractors within the defense market is shrinking.***

Table 3. SB Suppliers to DoD

Fiscal Year	Count of Distinct DoD Funded SB DUNS Numbers
2015	48,322
2016	46,952
2017	45,609
2018	43,505
2019	40,940
2020	38,703
2021	37,294

Funding to the SB DIB

Next, we calculated the amount of DoD funding awarded to small versus large businesses. **As shown in Table 4 and Figure 1, while overall defense spending increased by 46%, the amount of money DoD awarded to SBs grew by almost 68%, from ~$54 billion in 2015 to ~$91 billion in 2021.** In other words, ***as the pool of SB vendors contracted, the DoD awarded substantially more in contracts to SBs–both in total dollars and as a share of overall spending.***

Table 4. Breakdown of DoD Spend by Business Size

Fiscal Year	Total DoD Funded Procurement	Total DoD Funded Procurement to SBs	Total DoD Funded Procurement to LBs	% DoD Funded Procurement Awarded to SBs
2015	$294,357,455,264	$54,500,060,463	$239,857,394,801	18.51%
2016	$318,628,870,367	$58,858,890,994	$259,769,979,374	18.47%
2017	$344,813,865,145	$62,493,984,962	$282,319,880,183	18.12%
2018	$386,911,953,179	$74,865,344,991	$312,046,608,188	19.35%
2019	$427,876,600,900	$81,259,290,822	$346,617,310,078	18.99%
2020	$465,451,566,836	$87,928,706,954	$377,522,859,882	18.89%
2021	$428,635,700,550	$91,584,868,966	$337,050,831,584	21.37%
Total	$2,666,676,012,242	$511,491,148,151	$2,155,184,864,091	19.18%

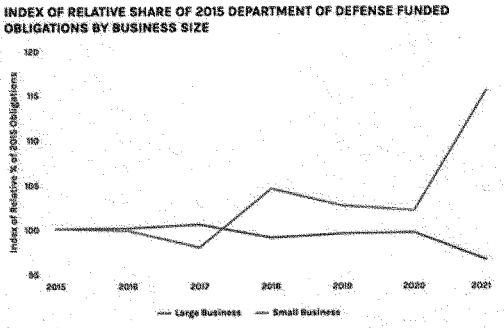


Figure 1. Index of Growth in DoD Procurement to Small vs. Large Businesses

Total Spend to SBs: A Myopic Measure of Success

If you consider the proportion of DoD spend allocated to SBs as the primary performance metric, the DoD SB program appears successful, with nearly 20% of procurement awarded to SBs annually. However, the fact that the pool of SB vendors simultaneously shrank not only runs counter to the intended purpose of the program, but also suggests anti-competitive forces at play. **The more the DoD procured from SBs, the fewer SBs benefited. In a free, competitive market, increasing the amount of money spent on SBs should attract a growing number of SBs into the DIB.**

Rather than providing "greater market access for small firms' goods and services," as the House report asserts, **DoD SB policies have made the DoD increasingly reliant on fewer suppliers, thereby reducing the variety of available products and services and posing risks to the health and resilience of the industrial base.**

The DoD and USG should not measure the success of the SB program exclusively by the share of overall procurement awarded to SBs. **To assess the program relative to its stated objectives, they must consider a subset of key metrics, such as the total number of SB suppliers each year and the number of new SBs working with DoD annually.**

Composition of the SB DIB

For a shrinking number of SBs to receive a substantially greater share of overall DoD procurement suggests that these SBs, or a subset of them, dramatically increased their DoD revenue during our analysis period. To better understand these trends, we explored the distribution of DoD funding to the individual SBs.

SB DoD Revenue

We calculated the total defense funded procurement for each of the 93,306 distinct SB DUNS in our dataset. Table 5 presents the top 20 SBs that received the most DoD funding during the analysis period. It is apparent that **businesses can receive hundreds of millions, or even billions of dollars, in DoD contracts annually and *still* qualify as small.** Furthermore, **the top 20 SBs alone received more than $53.6 billion in DoD funded procurement–over 10% of all DoD funding to SBs.**

Table 5. DoD Procurement to the Top 20 Small Businesses

Company Name	Total DoD Funding, FY2015–FY2021	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
ATLANTIC DIVING SUPPLY INC.	$15,720,363,970	$1,114,565,311	$1,250,613,527	$1,609,645,315	$2,509,511,257	$3,233,362,687	$3,138,616,046	$2,864,049,826
MODERNATX INC.	$8,167,157,644	$0	$0	$0	$0	$0	$1,255,697,789	$6,911,459,855
FEDERAL RESOURCES SUPPLY COMPANY	$3,639,062,189	$191,105,314	$190,329,295	$233,348,924	$288,268,243	$339,501,133	$2,017,338,638	$379,170,642
TORCH TECHNOLOGIES INC.	$2,793,079,298	$230,809,413	$297,477,436	$343,020,172	$407,159,701	$506,888,808	$534,814,811	$472,908,957
AMERICAN ROLL-ON ROLL-OFF CARRIER LLC	$2,127,079,115	$162,123,014	$121,500,994	$299,618,926	$402,194,232	$409,332,723	$401,249,517	$331,059,709
W. S. DARLEY & CO.	$2,116,004,701	$88,187,907	$104,757,067	$137,284,656	$290,071,939	$447,459,381	$619,533,680	$428,710,071
SUPPLYCORE INC.	$2,063,094,270	$216,465,938	$270,658,624	$287,081,017	$483,843,845	$314,088,442	$238,994,116	$251,962,287
NOBLE SALES CO. INC.	$1,596,066,944	$82,503,610	$146,790,206	$214,925,343	$419,501,578	$343,312,708	$163,182,149	$225,851,349
PATRIOT CONTRACT SERVICES LLC	$1,527,239,912	$211,826,458	$208,532,530	$202,886,173	$201,692,062	$229,600,183	$249,576,431	$223,126,075
SCIENCE AND ENGINEERING SERVICES INC.	$1,504,421,418	$161,310,210	$198,748,354	$203,236,582	$230,739,555	$399,540,265	$201,691,936	$109,154,516
INTUITIVE RESEARCH AND TECHNOLOGY CORPORATION	$1,356,791,448	$243,750,490	$271,883,798	$141,934,429	$132,888,518	$161,577,735	$150,588,243	$254,168,235
REDSTONE DEFENSE SYSTEMS	$1,348,465,209	$409,931,908	$290,605,504	$268,598,914	$364,629,509	$20,055,527	-$4,559,932	-$796,221
PETROMAX REFINING COMPANY LLC	$1,318,910,681	$0	$50,639,235	$168,748,000	$289,379,308	$175,004,910	$210,103,376	$425,035,852
AASKI TECHNOLOGY INC	$1,297,017,594	$268,424,777	$185,202,403	$138,632,480	$73,974,621	$185,177,343	$281,011,125	$164,594,844
LINQUEST CORPORATION	$1,242,341,667	$93,040,472	$116,169,557	$145,481,202	$191,800,933	$246,554,703	$226,637,383	$222,657,417
STERLING COMPUTERS CORPORATION	$1,201,066,386	$113,739,696	$139,257,654	$194,142,865	$207,344,777	$206,333,948	$177,827,869	$162,418,578
OASIS SYSTEMS LLC	$1,185,405,811	$46,900,883	$90,364,813	$115,206,223	$137,248,228	$282,548,753	$238,203,287	$274,933,625
RADIANCE TECHNOLOGIES INC.	$1,174,024,159	$74,488,287	$106,085,426	$146,400,995	$160,501,398	$262,801,414	$186,364,266	$237,382,374
PROGENY SYSTEMS CORPORATION	$1,140,344,606	$90,349,414	$187,885,609	$89,783,297	$182,629,973	$172,766,058	$213,144,546	$203,785,709
PLACID REFINING COMPANY LLC	$1,138,393,266	$261,394,162	$137,389,081	$142,381,210	$228,259,639	$53,777,964	$125,369,386	$189,821,824
Total	$53,656,329,288							

As shown in Table 6 and Figure 2, **the number of SBs that received more than $100 million in DoD funded procurement in 2021 was 3.23x that of 2015. By comparison, the number of DoD SBs awarded $1 million or less in DoD procurement *shrank* by 32%. *An increase in SB spend has disproportionately benefited the "largest" SBs, enabling them to dramatically expand their DoD market share while the DoD market became less opportune for the smallest businesses.***

Table 6. Count of SBs with $100M+ in DoD Procurement, Annually

Fiscal Year	Count of SBs with $100M+ DoD Procurement	Count of SBs with <$1M in DoD Procurement
2015	26	34,205
2016	38	32,727
2017	48	31,100
2018	66	29,070
2019	79	26,538
2020	84	24,352
2021	84	23,337

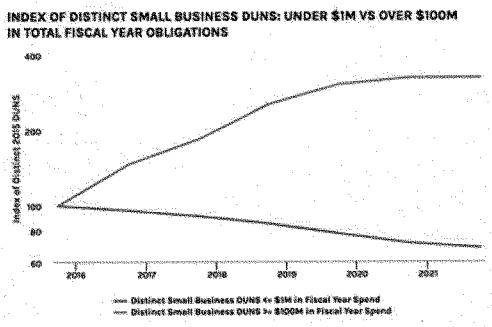


Figure 2. Index of SBs with <$1M DoD Revenue vs. SBs with $100M+ DoD Revenue

Small by What Standards?

The SBA defines an SB based on its average number of employees over the past 12 months or average annual receipts (U.S. Department of State, 2020). In the case of Atlantic Diving Supply, for instance, although it generates billions in DoD revenue annually, it has fewer than 500 employees. Based on its NAICS code, it qualifies it as an SB by SBA standards.[2]

[2] ADS has faced controversy regarding its SB set-aside status, but ultimately had its SB set-aside status reaffirmed.

The fact that a company with billions in DoD procurement can qualify as an SB offers one explanation for a relatively few number of SBs consuming a disproportionate share of overall DoD SB spend. Because the sole measure of success for the DoD SB program is whether the DoD awards 23% of prime contract spend to SBs, **enabling certain types of companies to compete as SBs regardless of their revenue incentivizes the DoD to work with—and award large contracts to—these larger SBs. Since the DoD is not incentivized to exceed the 23% set-aside goal, smaller SBs are in turn crowded out of the defense market.** It also creates an easily gameable system whereby a company can outsource aspects of work to teaming partners and subcontractors in order to keep employee headcount artificially low to maintain its SB status despite significant revenue.

Recommendation: Redefine SBs

Current policies, which enable—even encourage—firms with hundreds of millions or billions of dollars in DoD revenue to compete for SB contracts, have created an inhospitable environment for smaller companies. Based on our analysis, it is evident that the system favors the largest SBs at the expense of smaller ones, which runs counter to the stated purpose of the SB Program. Furthermore, the size standards the SBA and DoD apply to government contractors are unreasonable. Most Americans do not consider a company that generates hundreds of millions or billions of dollars in revenue, or a company with a multibillion dollar market capitalization, to be "small." To the extent Congress and the USG permit procurement policies that afford special treatment to SBs, qualifying companies should, at the very least, *be* small. We therefore recommend that the SBA change the criteria for qualifying as an SB.

Further research is required to determine revenue/employee caps for qualifying as an SB, but as a frame of reference, the average revenue for the largest SBs in the private sector (companies with 100–499 employees) was approximately $41 million in 2007 (Godlewski, 2020). Regardless of NAICS code, revenue, rather than number of employees, should be the primary consideration to qualify as an SB. Employee count is more difficult to track and can be obfuscated through subcontracting/teaming arrangements and/or independent contractors. Additionally, in the age of automation, businesses across sectors can achieve substantial growth without expanding their workforce.

Furthermore, there is a tremendous amount of opacity around size standards in general. The SBA Table of Size Standards is 49 pages long and contains confusing and arbitrary criteria. For instance, NAICS 339112, "Surgical and Medical Instrument Manufacturing," has an SB size standard of 1,000 employees while NAICS 339113, "Surgical Appliance and Supplies Manufacturing" has a size standard of 750 employees (U.S. SBA, 2017). NAICS 448110, "Men's Clothing Stores," has a size standard of $12 million in revenue; NAICS 448120, "Women's Clothing Stores," has a size standard of $30 million in revenue; and NAICS 448130, "Children's and Infants' Clothing Stores," has a size standard of $35 million in revenue. Firms can and do register for multiple NAICS codes, and the government can also issue waivers to enable companies that exceed these standards to qualify as small. Collectively, these inconsistent, complex, and subjective standards are difficult to enforce, favor entrenched businesses that understand the system and how to maximize it to their advantage, and discourage new entrants. We recommend the SBA engage an independent panel of U.S. demographic experts, data scientists, and industry experts to overhaul and streamline SBA size standards.

Subcontracting in the SB Ecosystem

Because a DoD SB, like a large business, can win a contract as the prime and allocate work to teaming partners and/or subcontractors, we sought to evaluate the effects of subcontracting practices on the SB DIB. Depending on the contract type, there are certain

restrictions on how much of the work an SB is permitted to outsource to subcontractors/partners, as shown in Figure 7. **If these requirements are met, SBs can outsource work to subcontractors regardless of size, including large businesses.**

Contract Type	Rule
Services	SB Prime must provide 50%+ of the contract cost for personnel
Supply	SB Prime must perform work for 50%+ of the cost of manufacturing the supplies, not including the cost of materials, unless the business qualifies as a non-manufacturer
General Construction	SB Prime must perform 15%+ of the cost of the contract with its own employees, not including the cost of materials
Specialty Construction	SB Prime must perform 25%+ of the cost of the contract with its own employees, not including the cost of materials
The SB Prime can utilize "similarly situated subcontractors," or subcontractors with the same required size and SB program status as the SB Prime, to meet these performance requirements.	

Figure 7[3]. SB Subcontracting Limitations

Sizing the SB Subcontractor Industrial Base

To analyze the subcontracting data, we leveraged data from USASpending, which contains information about subcontract awards, including instances in which an entity served as the prime contractor, and how much and to whom it awarded subcontracts. We isolated subcontracting data from USASpending for FY2015–FY2021, where the prime contract award was funded by the DoD and where the prime contractor was a vendor from our DoD SB dataset.

For this analysis, we isolated all prime contractor SBs with at least $10,000 in defense-funded procurement between FY2015–FY2021. Doing so streamlined the data and reduced the potential impact of government reporting errors on the results. Of the 76,286 SBs with at least $10,000 in defense-funded procurement, we identified 863 SBs that awarded DoD-funded subcontracts during our analysis period ("SB Primes").

It is important to note that while we were able to associate a subcontract award to its prime contractor and we were able to verify that both prime and subcontract funding came from the DoD, due to computational limitations, we could not link the subcontract action to its specific prime contract award action. To proxy the prime/subcontractor relationships, we linked DoD-funded subcontract awards from FY2015–FY2021 that were affiliated with the 863 SB Primes into our data set.

As shown in Figure 8, these 863 SB Primes received approximately $242 billion in defense funded procurement from FY2015–FY2021. During that same timeframe, they collectively subcontracted ~$91 billion in defense-funded subcontract awards.

[3] These limitations apply to SB set-aside contracts $150K+.

Total SB Prime DoD Procurement, FY 2015–FY2021	Total DoD-Funded Outlays to Subcontractors by SB Primes, FY2015-FY2021
$242,013,278,183	$91,171,095,487

Figure 8. DoD-Funded Subcontract Awards Associated with SB Primes

Who Are the Subcontractors?

Next we sought to analyze the universe of companies that performed as subcontractors to DoD SB Primes ("subcontractors"). Filtering the USASpending subcontracting data associated with our SB Primes to isolate unique DUNS, we determined that the 863 DoD SB Primes collectively worked with 13,924 unique subcontractors. At first glance, we recognized many of the world's largest government contractors among the names. Figure 9 provides a snapshot of 10 large government contractors that perform as subcontractors to DoD SB Primes and the DoD subcontracting dollars awarded to them during our analysis period.

Subcontractor Name	Total DoD-Funded Subcontract Awards, FY2015–FY2021
ACCENTURE	$7,427,637
BOEING	$183,412,223
BOOZ ALLEN HAMILTON	$1,326,752,662
DELOITTE	$120,403,176
GENERAL DYNAMICS	$542,271,351
HARRIS CORPORATION	$572,658,238
L3	$861,609,111
LOCKHEED MARTIN	$284,056,045
NORTHROP GRUMMAN	$541,770,770
RAYTHEON	$341,913,820

Figure 9. Snapshot of Large Subcontractors

As evidenced by the revenue generated by these 10 companies through DoD SB set-asides, DoD SB policies benefit the most entrenched government contractors. We were interested in understanding the extent to which other LBs also performed as subcontractors to DoD SB primes. We classified the 13,924 subcontractors in the data as "small" or other than small ("large") using the same approach we employed when classifying SBs from the overall pool of DoD vendors. However, the process requires the subcontractor DUNS to be associated with a procurement action directly funded by DoD from FY2015 through FY2021—in other words, for us to determine whether a subcontractor was an SB, that subcontractor also needed to have been a prime contractor to DoD from FY2015–2021. Of the 13,924 subcontractors in the data, 6,537 had no associated DoD prime contract awards during the analysis period. Because we were unable to determine the size of these businesses, we labeled them "unknown."

As shown in Figure 10, 2,177 subcontractors—approximately **16% of all subcontractors to DoD SB Primes during our analysis period—were large businesses. Collectively these LBs were awarded more than $24 billion in DoD-funded subcontract awards, which represents nearly 27% of all DoD-funded subcontract procurement from**

FY2015–FY2021. Taken as a percentage of the total ~$511.4 billion DoD SB procurement during the same period, **$24 billion represents 4% of DoD SB spend.**[4]

Subcontractor Type	Count	Total DoD Funded Subcontracts from DoD SB Primes, FY2015–FY2021
SMALL BUSINESS	5210	$43,194,628,990
OTHER THAN SMALL BUSINESS	2177	$24,207,193,451
UNKNOWN	6537	$23,769,273,045

Figure 10. Breakdown of Subcontractors to DoD SB Primes, by Business Size

Recommendations: Subcontracting Reforms

There are merits to permitting LBs to subcontract to SBs. The policy allows certain SBs to compete for and win work they would be unable to perform without the assistance of a large, experienced contractor. The streamlined procurement process for set-asides also incentivizes LBs to engage with the SB community, which helps SBs' innovative capabilities reach the warfighter. However, the policy has resulted in LBs receiving a substantial amount of money earmarked for SBs. We therefore recommend that contract dollars that flow through SBs to LBs be excluded from SB procurement goals.

Furthermore, there is no evidence to suggest that current subcontracting policies enable more SBs to participate in the defense market—on the contrary, the SB DIB continues to contract in spite of them. Liberal teaming and subcontracting policies also create opportunities for the largest SBs to partner with one another as similarly situated contractors, making the defense market even harder for smaller SBs to penetrate. Just as the USG and DoD must reconsider how they define SBs to be more reasonable and aligned with the views of taxpayers, so too must they reassess subcontracting policies.

Subcontracting Data: Limitations & Further Research

Pursuant to FAR 4.1403(a), all contracts that report to FPDS with subcontracts over $30,000 must report first-tier subcontract data. However, from working with the data, we believe that public records pertaining to government subcontract awards are to some extent incomplete and are less reliable than prime contract award data. There can also be significant lags between when the DoD awards a prime contract and when subcontract dollars are outlaid. Further research is required to ascertain gaps in public records for subcontracting data. While we cannot determine how this limitation may affect the efficacy of our results, the broader trends we identified in the subcontracting data provide valuable insights.

Additionally, as shown in Figure 11, when we analyzed the amount of DoD procurement SB Primes awarded to subcontractors from FY2015–FY2021, we found that 37 SB Primes appeared to have outlaid more in DoD-funded subcontract awards than they received in DoD-funded prime contract awards during the same period. In other words, according to the data, from FY2015–FY2021 Torch Technologies had ~$5.5 billion in DoD-funded procurement, yet there were ~$27.2 billion worth of DoD-funded subcontract awards associated with Torch during that same period. Likewise, A&D Fire Sprinklers received ~$8.8 million in DoD procurement but had ~$71 million in affiliated DoD-funded subcontract awards.

[4] Because we cannot resolve subcontract awards to specific prime contract actions, it is possible that some portion of subcontract awards are associated with prime contract awards that predate our analysis period. It is also possible that some subcontract awards are associated with classified prime contracts wherein the prime contact value is not made public, but certain subcontract procurement data is unclassified. As a result, this calculation is a proxy.

SB Prime	Total DoD Procurement, FY2015–FY2021	Total Associated DoD Subcontract Award Outlays, FY2015–FY2021	%Total DoD Procurement Subcontracted
IE-PACIFIC INC	$414,933,772	$3,951,765,106	952.38%
A&D FIRE SPRINKLERS INC	$8,810,415	$71,040,705	806.33%
TECOLOTE RESEARCH INC	$1,423,163,688	$8,269,466,123	581.06%
RA BURCH CONSTRUCTION CO INC	$627,474,597	$3,371,236,769	537.27%
TORCH TECHNOLOGIES INC	$5,583,425,252	$27,207,753,458	487.30%
ADGC BONITA PIPELINE JV	$9,629,749	$42,865,581	445.14%
A&D-DORADO JOINT VENTURE LLP	$14,576,277	$64,534,551	442.74%
NOREAS ENVIRONMENTAL SERVICES LLC	$81,476,858	$335,706,927	412.03%
ASSURANCE TECHNOLOGY CORPORATION	$812,546,967	$3,256,627,173	400.79%
ALUTIIQ GENERAL CONTRACTORS LLC	$103,568,080	$387,876,239	374.51%
ANALYSIS COMPUTING & ENGINEERING SOLUTIONS INC	$32,076,047	$114,361,141	356.53%
STORMWATER PLANS LLC	$50,045,437	$141,033,739	281.81%
WALGA ROSS GROUP 2 JV	$52,833,910	$148,203,722	280.51%
BLACK RIVER SYSTEMS COMPANY INC	$432,776,550	$1,200,501,496	277.40%
1CYBERFORCE LLC	$13,539,676	$36,611,639	270.40%
ALUTIIQ GENERAL CONTRACTORS LLC	$110,308,752	$294,784,776	267.24%
SOLVUS GLOBAL LLC	$227,036	$600,000	264.28%
APTIMA INC	$395,504,344	$972,253,276	245.83%
MUNRO CONSTRUCTION COMPANY INC	$2,478,218	$5,492,610	221.64%
ALUTIIQ CONSTRUCTION SERVICES LLC	$72,611,308	$150,799,451	207.68%
ROSS GROUP CONSTRUCTION CORPORATION	$328,251,640	$665,465,786	202.73%
WALGA ROSS GROUP JV	$175,234,420	$355,115,556	202.65%
A&D GC INC	$74,203,984	$149,927,006	202.05%
ITSTARS2 LLC	$10,163,613	$19,640,936	193.25%
LUKOS-VATC JV LLC	$199,797,768	$347,746,602	174.05%
H F WEBSTER ENGINEERING SERVICES INC	$7,521,910	$12,840,503	170.71%
WALGA MTE LLC	$17,151,826	$26,804,564	156.28%
SHEFFIELD KORTE TEAM LLC	$56,054,522	$85,963,900	153.36%
MILSUP LLC	$12,326,498	$16,891,230	137.03%
ASRC BUILDERS LLC	$360,278,865	$482,793,017	134.01%
ALUTIIQ COMMERCIAL ENTERPRISES LLC	$845,764,485	$1,112,413,698	131.53%
TECH-MARINE BUSINESS INC	$555,375,489	$696,846,588	125.47%
BRISTOL-CANNON JV LLC	$8,550,879	$10,728,642	125.47%
GRACON LLC	$47,128,505	$55,839,532	118.48%
ALUTIIQ MANUFACTURING CONTRACTORS LLC	$36,366,794	$39,115,654	107.56%
ASSURED INFORMATION SECURITY INC	$1,687,968,801	$1,810,475,399	107.26%
AKIMA GLOBAL LOGISTICS LLC	$2,071,751	$2,129,336	102.78%

Figure 11. DoD SB Primes With More in Subcontracting Outlays Than Prime Contract Awards

We contacted 15 of these companies via email indicating that they appeared to have outlaid more in DoD-funded subcontracts than they received in direct procurements and invited them to provide us with feedback and context. Two companies responded, one via email and one by phone. Both simply stated that the figures we cited were inaccurate but offered no further explanation. Despite their feedback, our data is accurate according to USASpending. We also emailed USG points of contact associated with a subset of Torch Technologies' largest subcontract actions in hopes of gathering more information, but we did not hear back. Additionally, we spoke with several DoD contracting experts about these findings. They were surprised by the data and had no clear explanation as to how or why a contractor would outlay substantially more in subcontracts than it received in direct procurements.

Possible theories included administrative errors (government personnel inputting data incorrectly); instances where monies were awarded to a company in an earlier year and used in later years; and/or instances where classified prime contract award data was not in the public realm, but subcontracting data associated with that contract was publicly available. Further research is required to better understand this finding; if, when and why this activity is permitted in prime/subcontractor relationships; reporting practices inside of the government that obfuscate how companies partner and subcontract; and how these practices affect the composition of the DoD SB industrial base. In future research, we would also strive to link subcontract actions with their prime contract.

Consolidation of the SB DIB

As the largest SBs expanded their DoD market share, thousands of other SBs ceased working in the defense market. As previously referenced in Table 3, the number of DoD SBs shrank nearly 23% from FY2015 to FY2021, from 48,322 to 37,294. While we have concluded that SBA size standards and subcontracting policies favor larger SBs and measuring the success of the DoD SB program based on the share of DoD spend awarded to SBs incentivizes DoD stakeholders to award larger contracts to fewer suppliers, we were interested in understanding other factors contributing to SB attrition from the defense market.

Technical Approach & Research Limitations

For the purposes of our research, we define a company as "leaving" the defense market if it had associated DoD contract actions at one point during our analysis period, but not in the subsequent year(s). For instance, an SB with DoD contract actions in FY2016 and FY2017, but no DoD contract actions from FY2018–FY2021, was treated as "leaving" the DoD market in FY2018.

There are generally four explanations for why a company would no longer appear in the dataset during the analysis period:

- It went out of business entirely.
- It ceased working in the defense market but continued to work commercially.
- It ceased working in the defense market but began working, or continued to work, with other USG customers.
- It was acquired or it merged with another company (and it may or may not continue to support the DoD through this new entity).

We cannot discern which of these explanations applies to an individual SB in our data. We recommend further research to explore the possibility of joining additional data sources for analysis, including non-DoD-funded USG procurement data, to help determine the status of an SB. Irrespective of this limitation, the results of a shrinking SB DIB are the same: a less robust

industrial base, with less supplier diversity. The consolidation also undermines the purported economic benefits of the SB program.

Why SBs Leave the DoD: The Cost of Doing Business

One significant factor that has resulted in SBs leaving the DoD market is the rising costs associated with working with defense customers.

In 2020, the DoD implemented the Cybersecurity Maturity Model Certification (CMMC), a mandatory security requirement for contractors and subcontractors. Compliance burdens companies with numerous hard and soft costs. Companies must now devote internal resources for planning, documentation, training, and assessments. Outsourcing an assessment comes with an estimated cost of $15,000–$45,000, and investments to reach requisite certification levels range from $3,000–$100,000 (Dawson, 2021).

New security requirements have also resulted in additional insurance requirements, including new and/or increased professional liability and cyber insurance policies. According to Insureon, an online insurance marketplace for SBs, the median cost for cyber liability insurance for SBs is $1,675 annually ("How Much Does Cyber Liability Insurance Cost?"). Coverage requirements for DoD SBs, however, often far exceed the average. For example, PW Communications is a certified woman-owned SB that has performed on contracts for the Defense Information Systems Agency (DISA) since 2012. In 2020, PW Communications was required to obtain additional professional liability/cyber insurance policies to continue supporting DISA. PW Communications paid $13,576 for these new policies in 2021, and $18,333 in 2022. Robert Chamberlain, the Founder and President of Monterey Technologies, Inc., an engineering firm that has supported DoD customers since the 1980s, estimates that his firm had to invest more than $100,000 over the last 2 years to satisfy new security requirements.

As these costs rise, larger SBs have the ability to absorb them more easily. They further benefit because these costs, which are untenable for smaller SBs, drive competitors out of the market.

Balancing the Risks

While increased security requirements are necessary to respond to evolving threats, the DoD must be cognizant of the impact current and future requirements have on SBs. At a certain point, SBs will not be able to justify the costs, particularly relative to the ease with which they can work in the commercial market. The DoD should consider offset strategies to reduce the cost burdens on SBs.

Shifting Procurement Strategies

Shifts in DoD and Defense Logistics Agency (DLA) procurement strategies over the last decade have also severely impacted the ability for specialized SBs to support DoD customers. In 2012, the DoD and DLA began implementing a contract bundling practice called "Captains of Industry" (COI) that involves awarding multi-year, multi-billion dollar sole-source contracts to large Original Equipment Manufacturers (OEMs) and large aerospace integrators. These contracts bundle a large number of National Stock Numbers (NSNs) that were historically purchased individually into one single contract. The intention of the COI program was to deliver cost savings, value, and other benefits to the DoD (DoD IG, 2021). According to a February 2021 DoD Office of Inspector General (IG) report along with a study conducted by the Small Business Aerospace Industrial Coalition (SBAIC), there is no indication that COI bundling policies have yielded cost savings or on-time deliveries (Small Business Aerospace Industry Coalition, 2021).

COI has, however, rerouted millions in DoD contract dollars from components manufacturers and other SBs to large integrators and OEMs. **The IG report estimates that SB participation has declined by 61% in the COI program.** SBAIC has reported that many of its 200 member companies—which have gross revenue under $20 million and specialize in manufacturing and supplying military aerospace spare parts, components, and assemblies—have been financially devastated as a result of these bundling policies. Several have gone out of business entirely, with others on the brink of bankruptcy.

Other factors that inhibit small and nontraditional companies' ability to succeed in the defense market, which we identify and explore in earlier research, include but are not limited to:

- Complex, anticompetitive solicitation processes: It is extremely difficult for companies to identify relevant requirements due to the design of SAM.gov. If and when companies find relevant opportunities, the majority of DoD solicitations require responses within 21 days of when they are published, and the vast majority of these solicitations/requirements are not written clearly (Bresler & Bresler, 2021).
- Redundant requirements: USG/DoD stakeholders do not coordinate outreach efforts. As a result, dozens and sometimes hundreds of distinct stakeholders solicit the same capabilities concurrently. SBs cannot participate in all of them and have limited ability to prioritize them.
- Lack of awareness across the DoD about what capabilities SB suppliers possess: DoD stakeholders rely on certain suppliers because they do not know that other qualified vendors exist–even if these alternative vendors already support other defense customers.

Simply limiting competition for certain contracts to SBs does not address these underlying issues. **Until the SBA, DoD, and USG address them, the defense market will continue to prove inhospitable for non-entrenched suppliers.** The fact that the procurement process, even for set-aside contracts, disproportionately benefits companies with institutional knowledge of the system also means that the DoD ends up awarding contracts to SBs that understand the system, rather than companies with the "best" or most competitive offering—particularly considering the DoD is *obligated* to award a certain percentage of annual procurement to SBs. **Thus, just as SB policies contribute to the *failure* of some SBs, they also prop-up certain companies that would and/or should naturally go out of business.** Permitting SBs to evade full and open competition for certain opportunities, in general, is also the opposite of "preserving free competitive enterprise." With a portion of the market excluded from the competitive process, SBs are not incentivized to innovate and/or reduce costs in ways they would be if free market forces were at work.

Conclusions

Rather than "leveling the playing field," government set-aside policies enrich the largest SB vendors and fail to benefit the groups they were designed to serve. They afford preferential treatment to entities that understand the system and how to maximize it to their advantage. As these entities consolidate power, they can withstand the costs and procedural challenges that keep smaller, would-be competitors from succeeding. Compounding these issues is the fact that arbitrariness, opacity, and lack of standardization around USG and DoD size-standards make it difficult to evaluate the results of the set-aside program in general.

While this paper focuses on the SB program broadly, the issues we identified become more acute in the context of set-aside policies for companies that qualify for preferential treatment in the procurement process based on other USG-defined criteria, such as where the

business is located and the socioeconomic and/or demographic features of a company's owners. **These initiatives do not make it easier for members of set-aside communities to navigate the defense market on a practical level. Instead, they create new, increasingly insulated/anticompetitive avenues for entities well-versed in government contracting to exploit the system.**

In conclusion, **until the real challenges keeping small and nontraditional companies from succeeding in the public sector are addressed, the DoD and USG must award contracts based on technical merit, innovativeness, price, and ability to perform**—not based on the size of a company or the demographic features of its owners. They must rigorously analyze the composition of the industrial base on an ongoing basis using consistent, verifiable data; and commit to addressing the underlying causes if and when certain types of businesses are underrepresented.

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Assessing the Effectiveness of Defense-Sponsored Innovation Programs as a Means of Accelerating the Adoption of Innovation Force Wide

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Abstract

The Department of Defense (DoD) invests billions of dollars into innovation programs every year. One primary objective of these programs is to accelerate the adoption of critical new technologies force wide. This paper assesses the extent to which companies funded through defense-sponsored innovation programs ("program participants"), specifically the DoD Small Business Innovation Research (SBIR) program, subsequently deliver their capabilities to the warfighter. By analyzing millions of contracting and subcontracting actions associated with thousands of program participants, we demonstrate that the DoD awards most SBIR funding to a small subset of program participants. Furthermore, companies in receipt of the greatest share of overall program funding are among the least likely to transition their technologies to the warfighter. We analyzed the structure of DoD SBIR to identify potential causes for this poor rate of inter-government technology transition. We determined that this outcome results from misaligned incentives, antiquated policies and regulations, anticompetitive solicitation processes, and the absence of thoughtful, standardized metrics for defining and measuring programmatic success. In conclusion, we offer a series of concrete recommendations to address these issues and position DoD SBIR to more effectively deliver capabilities to the warfighter.

Introduction

The Department of Defense (DoD) invests billions of dollars annually into innovation programs with the stated objective of enabling and/or accelerating the adoption of cutting-edge technologies. However, the DoD does not consistently track how companies engaged in these innovation programs (program participants) perform in the defense market, subsequent to program completion. Our research aimed to fill this gap by evaluating the extent to which program participants' capabilities were subsequently procured by the DoD, either directly or indirectly.

While the DoD funds dozens of innovation programs, we focused our research on the Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) program for several reasons. One primary goal of the SBIR/STTR program is to "support scientific excellence and technological innovation through the investment of Federal research funds in critical American priorities to build a strong national economy and accelerate capabilities to the warfighter" (*DoD Small Business Innovation Research / Small Business Technology Transfer, n.d.*). Other program objectives include investing in research

and development (R&D) that has the potential for commercialization and encouraging "participation in innovation and entrepreneurship by women and socially or economically disadvantaged persons" (*About, n.d.*). The DoD receives more than 50% of the entire more than $4 billion SBIR/STTR budget annually, making it the largest DoD innovation initiative.

Transitioning state-of-the-art capabilities to the warfighter must be the priority of the DoD SBIR/STTR program. In decades past, the DoD was at the forefront of technological innovation and exported *its* technologies to the commercial sector. Today, companies outside of the traditional defense industrial base are driving advancements in areas critical to our national defense. The DoD must identify, engage, and retain these suppliers. Furthermore, as noted by former Secretary of Defense James Mattis in the 2018 National Defense Strategy, "Success no longer goes to the country that develops a new technology first, but rather to the one that better integrates it and adapts its way of fighting" (DoD, 2018). It is not enough for the DoD to simply invest in cutting-edge capabilities; it must integrate these capabilities force wide as quickly and seamlessly as possible.

From a research perspective, SBIR/STTR awards are explicitly identified in procurement data, enabling us to quantitatively analyze a wide range of information about program participants—including subsequent defense business—in great detail. By comparison, no consistent, publicly-available data exists to indicate whether a company participated in other DoD innovation programs.

Analyzing the SBIR//STTR Program

To assess the extent to which investments in the SBIR/STTR program have resulted in new capabilities reaching the warfighter, we first needed to isolate a data set of entities that won defense-funded SBIR/STTR awards for analysis (SBIR companies, DoD SBIR companies). To do so, we aggregated SBIR/STTR contract award data from the Federal Procurement Data System (FPDS), the centralized, real-time database for government procurement transactions. We then filtered the data to include defense-funded Phase I/Phase II SBIR awards from fiscal year (FY) 2012 through FY 2021.

We determined that there were 52,746 defense-funded Phase I/Phase II SBIR/STTR awards totaling approximately $13.1 billion from FY 2012–FY 2021. Table 1 provides a breakdown of the count and total dollar value of DoD-funded Phase I/Phase II awards annually.

Table 1. Sizing the DoD SBIR/STTR Program Annually

FY	Count of Distinct DoD-Funded PI/PII SBIR/STTR Awards	Total DoD-Funded PI/PII SBIR/STTR Funding
2012	4973	$1,090,143,968.02
2013	4901	$988,818,482.23
2014	4796	$1,082,209,915.19
2015	4832	$1,040,778,157.84
2016	4971	$1,105,200,418.39
2017	5190	$1,260,999,327.89
2018	5251	$1,240,980,063.70
2019	5796	$1,691,062,982.31
2020	6046	$1,905,575,032.16
2021	5990	$1,711,005,800.94
Total	52,746	$13,116,774,148.67

Next, we filtered the award data by Unique Entity Identifier (UEI) in each year to calculate the unique number of recipients of Phase I/Phase II awards annually.[1] We excluded entities with less than $50,000 in DoD-funded Phase I/Phase II awards. Doing so produced a cleaner data set that eliminated potential administrative errors or otherwise unexplainable data—namely, companies associated with SBIR/STTR funding below the standard $50,000 minimum award value.

We determined that the 52,746 DoD-funded Phase I/PII awards in our data set were distributed across 4,703 unique entities. These 4,703 companies (SBIR companies, DoD SBIR companies) became our analysis data. Table 2 breaks-down the number of unique companies that received DoD funded Phase I/II SBIR/STTR awards each year.

Table 2. Unique SBIR Companies Annually

FY	Count of Distinct DoD-Funded PI/PII SBIR/STTR Awards	Count of Distinct Entities in Receipt of DoD-Funded PI/PII SBIR/STTR Awards
2012	4973	1584
2013	4901	1627
2014	4796	1609
2015	4832	1648
2016	4971	1625
2017	5190	1695
2018	5251	1660
2019	5796	1999
2020	6046	2276
2021	5990	2190

Multiple Award Winners

The count of distinct contract awards is significantly higher than the number of distinct SBIR companies, indicating that certain SBIR companies receive multiple awards in each year ("multiple award winners [MAWs]"). This finding aligns with earlier research we published, highlighting the fact that certain companies not only win multiple SBIR/STTR awards annually, but also participate in the program year over year. For instance, we determined that from FY 2010–FY 2019, 90% of DoD Phase I funds were awarded to existing DoD vendors. Over that same period, the top 5% of DoD SBIR companies with the most in DoD Phase I/Phase II awards received 51% of all DoD SBIR/STTR Phase I/Phase II funding (Bresler & Bresler, 2020). There is a major difference between a DoD SBIR company with decades of program experience and tens of millions of dollars or more in Phase I/Phase II funding, and a company new to the program with one or two awards. Given the share of SBIR/STTR funding awarded to MAWs, and given that they are well versed in navigating the government ecosystem, transition rates among MAWs should differ from less

[1] In April 2022, UEIs replaced DUNS numbers as the identifier provided by the System for Award Management (SAM)

experienced SBIR companies. To evaluate this, our analyses considered transition rates not only SBIR-wide, but also among MAWs as a group.

Defining Transition

Neither the SBIR/STTR program nor the DoD offer a standard taxonomy or set of metrics to define intragovernmental transition rate. Thus, to conduct this research we first needed to establish a working definition for transition rate along with a set of corresponding quantitative metrics. We define "transition" as a company developing a set of capabilities through Phases I and/or II of the SBIR program and subsequently delivering these capabilities to end-users in the DoD.

We focused on three metrics as a proxy for transition:

1) **Phase III awards attributed to a DoD-funded SBIR/STTR company.** The SBIR/STTR program is divided into three phases. Whereas Phases I and II provide funding for companies to conduct research and development (R&D), Phase III awards are contracts for work that "derives from, extends, or completes an effort made under prior SBIR funding agreements, but is funded by sources other than the SBIR Program" (Boyer, 2017). Phase III awards are identified in FPDS, making them the most explicit indicator that a company's SBIR/STTR innovations were subsequently procured by the DoD.

2) **Non-Phase III DoD-funded procurement awards attributed to a DoD-funded SBIR/STTR company.** Some procurement contracts awarded to SBIR/STTR companies should be marked as Phase IIIs in the data but are not. While there is no way to know if a subsequent contract related to a company's SBIR/STTR research if it was not coded as a Phase III, for the purposes of our analyses we wanted to consider the possibility that the SBIR/STTR program delivers capabilities to the warfighter via non–Phase III contracts. For each company, we considered non-SBIR DoD procurement awarded subsequent to the first DoD-funded SBIR/STTR Phase I/Phase II award during our analysis period.

3) **DoD-funded subcontract awards attributed to a DoD-funded SBIR/STTR company.** Given the complexity and costs associated with pursuing government contracts, some SBIR/STTR companies have neither the ability nor the desire to contract with the DoD directly. Instead, they may deliver their capabilities to the DoD by subcontracting to a prime contractor. While there is no way to know if a subsequent DoD-funded subcontract award related to a company's SBIR/STTR research, we wanted to consider the possibility that some SBIR companies transition their capabilities to the warfighter through a prime. As such, we considered DoD-funded subcontract awards attributed to each SBIR company, subsequent to the first DoD-funded SBIR/STTR Phase I/Phase II award they received during our analysis period.

Research Limitations and Future Research

It is possible that a SBIR/STTR company was wholly or partially acquired by a prime contractor, and that the prime contractor then integrated the SBIR company's capabilities into a DoD contract that it held. We did not have access to a reliable set of commercial acquisitions data, so we were unable to consider this metric. To the extent this information can be compiled in the future, it would be valuable to incorporate into subsequent research.

Our most significant research limitation was the fact that we could not distinguish between which non-SBIR DoD procurement contracts and DoD subcontracts related to a SBIR company's SBIR/STTR work, and which did not. Because we treated all subsequent non-SBIR DoD procurement contracts and DoD subcontracts as indicators that SBIR/STTR capabilities transitioned to the warfighter, we gave the program more than its due credit. Future research could leverage advanced text analysis to compare a company's SBIR/STTR project description with text describing a subsequent contract/subcontract award, to evaluate the possibility that the two are related. Subsequent contracts/subcontracts that appear unrelated to SBIR/STTR work could be excluded. However, the most effective way to reduce false attributions would be to require more comprehensive reporting for Phase III contracts and thereby eliminate the need to analyze non–Phase III procurement contracts entirely. Similarly, the government should establish formal criteria for "Phase III subcontract awards," create a code in USASpending to denote Phase III subcontract awards, and require that they be reported by relevant stakeholders from government and industry. Doing so would make it easier to track when SBIR/STTR capabilities transition to the warfighter indirectly. In light of these limitations, conclusions drawn from this research should place a greater emphasis on coded Phase III transition metrics because of their significantly higher efficacy.

Calculating Transition by Metric

To analyze transition rate across our three metrics, we leveraged procurement data from FPDS and subcontracting data from USASpending. First, we aggregated procurement data from FPDS and filtered it for FY 2012–FY 2021. Next, we isolated DoD Phase III awards attributed to the 4703 SBIR companies in our analysis group. We repeated this process for non-SBIR DoD procurement contracts and subsequent DoD-funded SBIR/STTR Phase I/Phase II awards during the analysis period.

To identify DoD-funded subcontracts awarded to the SBIR companies, we aggregated subcontract award data from USASpending. We filtered the data for DoD-funded subcontracts awarded to the 4703 SBIR companies in our analysis group from FY 2012–FY 2021. We then isolated DoD-funded subcontracts subsequent to their first SBIR/STTR Phase I/Phase II award.

Table 3 provides a breakdown of the total funding amount and number of SBIR companies that transitioned capabilities to the warfighter, based on three increasingly broad ways of measuring transition:

1) Companies that transitioned via Phase III award(s)
2) Companies that transitioned via Phase III award(s) and/or subsequent non-SBIR DoD Procurement contracts
3) Companies that transitioned via Phase III award(s) and/or subsequent non-SBIR DoD Procurement contracts, and/or subsequent DoD-funded subcontracts

Table 3. DoD SBIR/STTR Program Transition Rate by Metric

Total SBIR Companies	Total DoD PIII Funding to SBIR Companies	SBIR Companies w/ PIII Award(s)	% SBIR Companies w/ PIII Award(s)	Total DoD PIII + Non-SBIR DoD Procurement to SBIR Companies	SBIR Companies w/ PIII Award(s) and/or non-SBIR DoD Procurement	% SBIR Companies w/ PIII Award(s) and/or non-SBIR DoD Procurement	Total DoD PIII + Non-SBIR DoD Procurement + DoD Subcontracts to SBIR Companies	SBIR Companies w/ PIII Award(s) and/or non-SBIR DoD Procurement and/or DoD Subcontracts	% SBIR Companies w/ PIII Award(s) and/or non-SBIR DoD Procurement and/or DoD Subcontracts
4703	$10,276,728,376	748	16%	$60,004,772,641	2731	58%	$118,726,886,820	2949	63%

Over the last decade, only 16% of DoD SBIR companies won Phase III awards. The transition rate noticeably improved when considering non-SBIR procurement and subcontracts, but as discussed previously it is difficult to draw conclusions about the nature of these awards.

Assessing the Distribution of Transition Funding

Next, we were interested in assessing the distribution of transition funding across the SBIR companies. Specifically, for the SBIR companies that transitioned, we wanted to determine the extent to which they generated more in subsequent defense revenue across these three metrics, relative to the amount of non-dilutive Phase I/Phase II funding they were awarded. For each SBIR company that transitioned, we compared the total amount of funding they received in DoD Phase I/Phase II awards against the total amount of revenue they generated across these three metrics:

1) Phase III awards
2) Phase III awards and/or subsequent non-SBIR DoD procurement contracts
3) Phase III awards and/or subsequent non-SBIR DoD procurement contracts, and/or subsequent DoD-funded subcontracts

Ratio of Phase I/Phase II Funding to Phase III Awards

As shown in Table 4, of the 748 SBIR companies that transitioned via Phase III awards, only 39% generated more in Phase III contract dollars than they were awarded in Phase I/Phase II non-dilutive funding. Taken as a percentage of the overall DoD SBIR program, just 6% of all SBIR companies generated more in Phase III contracts than they were awarded in Phase I/Phase II funding.

Table 4. Phase III Funding vs. Phase I/Phase II Funding

DoD SBIR Companies	SBIR Companies w/ PIII Award(s)	SBIR Companies w/ more in PIII than DoD PI/PII Funding	% PIII Companies with More in PIII Funding than PI/PII Funding	% All SBIR Companies w/ More in PIII Funding than PI/PII Funding
4703	748	293	39%	6%

Ratio of Phase I/Phase II Funding to (Phase III Awards + non-SBIR Procurement)

As shown in Table 5, nearly half of companies that transitioned via Phase III and/or non-SBIR procurement contracts consumed more in Phase I/Phase II funding than they generated in transition revenue. Taken as a percentage of the overall DoD SBIR program, just 29% of all SBIR companies generated more in Phase III funding and/or non-SBIR procurement contracts than they were awarded in Phase I/Phase II funding.

Table 5. (Phase III + Non-SBIR Procurement Funding) vs. Phase I/Phase II Funding

DoD SBIR Companies	SBIR Companies w/ PIII Award(s) and/or non-SBIR DoD Procurement	SBIR Companies w/ more in PIII and/or non-SBIR procurement than DoD PI/PII Funding	% PIII + Procurement Companies with More in PIII and/or Procurement Funding than PI/PII Funding	% All SBIR Companies w/ More in PIII and/or Procurement Funding than PI/PII Funding
4703	2731	1382	51%	29%

Ratio of Phase I/Phase II Funding to (Phase III Awards + non-SBIR Procurement + DoD Subcontract Awards)

Adding DoD-funded subcontract awards to the calculation, 42% of companies that transitioned via one or more transition metric consumed more in Phase I/Phase II funding than they generated in subsequent transition revenue, as shown in Table 6. Taken as a percentage of the overall DoD SBIR program, just 36% of all SBIR companies generated more in Phase III awards and/or non-SBIR procurement contracts, and/or DoD-funded subcontracts than they were awarded in Phase I/Phase II funding.

Table 6. Phase III + Non-SBIR Procurement Funding + DoD Subcontract Funding vs. Phase I/Phase II Funding

DoD SBIR Companies	SBIR Companies w/ PIII Award(s) and/or non-SBIR DoD Procurement and/or DoD Subcontracts	SBIR Companies w/ more in PIII and/or non-SBIR procurement and/or DoD Subcontracts than DoD PI/PII Funding	% PIII + Procurement Companies with More in PIII and/or Procurement Funding and/or DoD Subcontracts than PI/PII Funding	% All SBIR Companies w/ More in PIII and/or Procurement and/or DoD Subcontracts than PI/PII Funding
4703	2949	1705	58%	36%

Grading Transition Rate: The Jury is Out

Our analysis revealed that a substantial portion of DoD SBIR companies failed to transition their capabilities to the warfighter by any metric, and nearly all that transitioned still consumed more in Phase I/Phase II funding than what they generated in subsequent non-SBIR defense revenue. However, we could not draw conclusions about the success or failure of the SBIR program based on these metrics alone. Investing in early stage R&D means, to some extent, investing in ideas that will fail. If all Phase I/Phase II projects produced usable capabilities, it would signal that the DoD SBIR program was too risk averse. One could also argue that it is worth investing billions into companies that failed to transition if that investment also produced even a small number of capabilities that truly transformed the warfighter.

Additionally, these metrics alone offered no insight into specific factors inhibiting transition rate. Lawmakers and DoD officials often use the term "valley of death" to "[refer] to how many defense technologies fail to transition from prototypes into actual products for the military," citing "the Pentagon's bureaucracy"—the complexity of pursuing and winning DoD contracts—as its primary cause (Luckenbaugh, n.d.). However, our data shows that a subset of DoD SBIR companies won tens of millions of dollars or more in Phase I/Phase II awards annually. If the valley of death is caused primarily by companies lacking resources or expertise, there should be noticeable differences between the transition rates among these MAWs, relative to DoD SBIR companies with less experience. To draw more insightful conclusions about the DoD SBIR/STTR program as a means of delivering capabilities to the warfighter and to begin to understand why certain participants may fail to transition, we coupled our analysis of transition rates across program participants in general with an analysis of transition rates among MAWS specifically.

Assessing the Top SBIR Companies

Our data set includes hundreds of MAWs. For example, the top 5% of DoD SBIR companies in our analysis group with the most in Phase I/Phase II awards—about 235 companies—collectively received 49% of all Phase I/Phase II funding. However, to meaningfully analyze the features and transition rates of MAWs at an individual company level, we focused on a smaller data set. Specifically, we isolated the 25 DoD SBIR companies in receipt of the most Phase I/Phase II funding during our analysis period. As shown in Table 7, the top 25 SBIR companies cumulatively received 18% of all DoD Phase I/Phase II funding—more than $2.3 billion—from FY 2012–FY 2021.

Table 7. Top 25 DoD SBIR Companies' Phase I/Phase II Funding Totals, FY 2012–FY 2021

Company	Total DoD PI/PII Funding, FY 2012–FY 2021	% of Total DoD PI/PII Funding, FY 2012–FY 2021
PHYSICAL OPTICS CORPORATION	$198,222,973	1.51%
INTELLIGENT AUTOMATION INC	$172,174,305	1.31%
PHYSICAL SCIENCES INC	$168,520,875	1.28%
CREARE INCORPORATED	$158,034,669	1.20%
CHARLES RIVER ANALYTICS INC	$153,639,314	1.17%
TRITON SYSTEMS INC	$121,816,610	0.93%
LUNA INNOVATIONS INCORPORATED	$115,727,487	0.88%
CFD RESEARCH CORPORATION	$103,029,444	0.79%
LYNNTECH INC	$95,715,220	0.73%
TOYON RESEARCH CORPORATION	$92,398,212	0.70%
ARETE ASSOCIATES	$86,856,904	0.66%
PROGENY SYSTEMS CORPORATION	$76,422,839	0.58%
SA PHOTONICS INC	$75,002,150	0.57%
MAINSTREAM ENGINEERING CORPORATION	$70,653,705	0.54%
APTIMA INC	$70,561,859	0.54%
CORVID TECHNOLOGIES LLC	$64,965,146	0.50%
SOAR TECHNOLOGY INC	$67,302,292	0.51%
CORNERSTONE RESEARCH GROUP INCORPORATED	$59,984,693	0.46%
ENGINEERING AND SOFTWARE SYSTEM SOLUTIONS INC	$57,145,087	0.44%
TDA RESEARCH INC	$56,439,024	0.43%
INTELLISENSE SYSTEMS INC	$55,685,545	0.42%
MAXENTRIC TECHNOLOGIES LLC	$55,054,742	0.42%
OCEANIT LABORATORIES INC	$54,091,626	0.41%
FIRST RF CORPORATION	$53,791,669	0.41%
SYSTEMS TECHNOLOGY RESEARCH LLC	$52,631,563	0.40%
Total	**$2,335,867,952**	**18%**

To capture a more complete picture of the Phase I/Phase II funding attributed to MAWs, for each of these top 25 companies we expanded the analysis time frame to calculate their total DoD Phase I/Phase II funding, from their first DoD Phase I/Phase II award through the date we ran the analysis (March 29, 2023). Table 8 shows the total amount of DoD Phase I/Phase II funding each company received over its lifetime.

Table 8 Lifetime DoD Phase I/Phase II Funding—Top 25 DoD SBIR Companies

Company	FY of Initial DoD PhI/PhII Award	FY of Most Recent DoD PhI/PhII Award	Lifetime Total DoD PI/PII Award Funding
PHYSICAL OPTICS CORPORATION	1997	2023	$359,325,897
PHYSICAL SCIENCES INC	1997	2023	$321,023,208
CREARE INCORPORATED	1997	2023	$274,156,442
INTELLIGENT AUTOMATION INC	1997	2023	$269,444,012
CHARLES RIVER ANALYTICS INC	1997	2023	$260,141,162
TRITON SYSTEMS INC	1997	2023	$243,888,188
CFD RESEARCH CORPORATION	1997	2023	$213,364,011
LUNA INNOVATIONS INCORPORATED	1997	2023	$199,301,561
LYNNTECH INC	1997	2023	$158,497,089
TOYON RESEARCH CORPORATION	1997	2023	$153,759,374
APTIMA INC	1997	2023	$152,596,850
ARETE ASSOCIATES	1997	2023	$139,482,615
PROGENY SYSTEMS CORPORATION	1997	2023	$133,489,054
TDA RESEARCH INC	1997	2023	$106,391,125
CORNERSTONE RESEARCH GROUP INCORPORATED	1998	2023	$105,438,088
MAINSTREAM ENGINEERING CORPORATION	1997	2023	$102,005,756
SOAR TECHNOLOGY INC	2000	2023	$101,166,814
SA PHOTONICS INC	2003	2023	$98,359,670
INTELLISENSE SYSTEMS INC	2018	2023	$84,704,547
FIRST RF CORPORATION	2003	2023	$84,536,933
CORVID TECHNOLOGIES LLC	2005	2023	$80,279,823
OCEANIT LABORATORIES INC	1997	2023	$76,722,560
ENGINEERING AND SOFTWARE SYSTEM SOLUTIONS INC	2007	2023	$75,206,735
MAXENTRIC TECHNOLOGIES LLC	2005	2023	$71,623,153
SYSTEMS TECHNOLOGY RESEARCH LLC	2011	2022	$53,419,184
TOTAL			$3,558,997,955

All but one of the top 25 companies have received DoD Phase I/Phase II SBIR/STTR awards for more than 10 years, and 20 of the top 25 companies have been awarded DoD Phase I/Phase II funding for more than 20 years.

Transition Rate Among MAWs

For each of the top 25 DoD SBIR companies, we calculated the total amount of Phase III, non-SBIR DoD Procurement, and DoD subcontract revenue generated between

FY 2012–FY 2021. We then compared each metric to the company's total Phase I/Phase II funding during the analysis period to generate a ratio of transition revenue to total Phase I/Phase II funding. As shown in Table 9, only four of the top 25 DoD SBIR companies generated more in DoD Phase III contracts than they received in non-dilutive Phase I/Phase II awards.

Adding non-SBIR DoD procurement to the transition calculation, the majority of the top 25 DoD SBIR companies still received more in Phase I/Phase II funding than they generated in subsequent Phase III and/or non-SBIR DoD contracts. By the most liberal transition metric—subsequent DoD Phase III funding, and/or non-SBIR DoD procurement, and/or DoD-funded subcontract awards—just over half of the top 25 DoD SBIR companies generated more in transition revenue than they were awarded in Phase I/Phase IIs.

Table 9. Transition Metrics for FY 2012–FY 2021, Top 25 DoD SBIR Companies

Company	Total DoD PI/PII $	Total PIII $	Ratio PIII $ vs. PI/PII $	Total PIII + non-SBIR $	Ratio PIII + non-SBIR $ vs. PI/PII $	Total PIII + non-SBIR + DoD Subcontract $	Ratio PIII + non-SBIR + DoD Subcontract $ vs. PI/PII $
PHYSICAL OPTICS CORPORATION	$198,222,973	$296,550,639	150%	$506,752,621	256%	$543,835,766	274%
INTELLIGENT AUTOMATION INC	$172,174,305	$14,607,362	8%	$68,236,490	40%	$86,709,123	50%
PHYSICAL SCIENCES INC	$168,520,875	$10,303,411	6%	$74,941,384	44%	$101,913,061	60%
CREARE INCORPORATED	$158,034,669	$53,366,123	34%	$85,743,425	54%	$88,505,471	56%
CHARLES RIVER ANALYTICS INC	$153,639,314	$15,930,109	10%	$206,213,710	134%	$241,430,984	157%
TRITON SYSTEMS INC	$121,816,610	$6,430,752	5%	$35,544,912	29%	$36,091,069	30%
LUNA INNOVATIONS INCORPORATED	$115,727,487	$3,616,872	3%	$32,884,666	28%	$36,422,619	31%
CFD RESEARCH CORPORATION	$103,029,444	$450,378	0%	$21,122,072	21%	$53,267,339	52%
LYNNTECH INC	$95,715,220	$3,849,136	4%	$20,586,029	22%	$20,742,065	22%
TOYON RESEARCH CORPORATION	$92,398,212	$19,174,422	21%	$129,289,686	140%	$228,169,816	247%
ARETE ASSOCIATES	$86,856,904	$125,140,457	144%	$179,414,186	207%	$231,727,064	267%
PROGENY SYSTEMS CORPORATION	$76,422,839	$875,436,015	1146%	$1,326,867,356	1736%	$2,068,581,929	2707%
SA PHOTONICS INC	$75,002,150	$11,267,031	15%	$82,407,497	110%	$205,665,144	274%
MAINSTREAM ENGINEERING CORPORATION	$70,653,705	$143,565	0%	$26,159,461	37%	$51,320,790	73%
APTIMA INC	$70,561,859	$82,468,290	117%	$193,482,868	274%	$276,564,268	392%
CORVID TECHNOLOGIES LLC	$64,965,146	$26,602,284	41%	$112,915,222	174%	$201,785,024	311%
SOAR TECHNOLOGY INC	$67,302,292	$5,760,555	9%	$104,177,240	155%	$213,942,061	318%
CORNERSTONE RESEARCH GROUP INCORPORATED	$59,984,693	$4,820,260	8%	$20,992,906	35%	$27,303,828	46%
ENGINEERING AND SOFTWARE SYSTEM SOLUTIONS INC	$57,145,087	$66,924,136	117%	$177,492,020	311%	$178,879,990	313%
TDA RESEARCH INC	$56,439,024	$610,100	1%	$17,383,352	31%	$18,439,670	33%
INTELLISENSE SYSTEMS INC	$55,685,545	$15,624,644	28%	$31,418,599	56%	$58,408,779	105%
MAXENTRIC TECHNOLOGIES LLC	$55,054,742	$6,290,024	11%	$22,033,549	40%	$27,717,398	50%
OCEANIT LABORATORIES INC	$54,091,626	$22,630,526	42%	$52,124,554	96%	$53,565,949	99%
FIRST RF CORPORATION	$53,791,669	$33,006,900	61%	$70,982,752	132%	$468,983,023	872%
SYSTEMS TECHNOLOGY RESEARCH LLC	$52,631,563	$49,937,790	95%	$594,811,635	1130%	$677,348,738	1287%

We were interested in seeing how these top 25 companies ranked in terms of the amount of Phase III contract dollars they received, compared to the other companies in our analysis group that received Phase IIIs. We ranked the 748 companies from our analysis group that received Phase III awards, where "1" denoted the company with the most in Phase III funding and "748" denoted the company with the least in Phase III funding. Table 10 shows where each of the top 25 DoD SBIR companies ranked. Only nine of the top 25 companies fell in the top 10% of DoD SBIR companies receiving the most Phase III contract dollars.

Table 10. Ranking of Top 25 SBIR Companies, Based on Phase III Funding Amount

Company	Company Ranking, Based on Total DoD Phase III Funding
PHYSICAL OPTICS CORPORATION	6
INTELLIGENT AUTOMATION INC	112
PHYSICAL SCIENCES INC	147
CREARE INCORPORATED	40
CHARLES RIVER ANALYTICS INC	104
TRITON SYSTEMS INC	207
LUNA INNOVATIONS INCORPORATED	273
CFD RESEARCH CORPORATION	585
LYNNTECH INC	266
TOYON RESEARCH CORPORATION	91
ARETE ASSOCIATES	18
PROGENY SYSTEMS CORPORATION	1
SA PHOTONICS INC	136
MAINSTREAM ENGINEERING CORPORATION	653
APTIMA INC	27
CORVID TECHNOLOGIES LLC	68
SOAR TECHNOLOGY INC	223
CORNERSTONE RESEARCH GROUP INCORPORATED	247
ENGINEERING AND SOFTWARE SYSTEM SOLUTIONS INC	30
TDA RESEARCH INC	555
INTELLISENSE SYSTEMS INC	106
MAXENTRIC TECHNOLOGIES LLC	210
OCEANIT LABORATORIES INC	80
FIRST RF CORPORATION	56
SYSTEMS TECHNOLOGY RESEARCH LLC	42

The data revealed no consistent relationship between the amount of Phase I/Phase II funding a company received and the extent to which it delivered capabilities to the warfighter. In fact, some MAWs continued to receive a disproportionate share of overall DoD

Phase I/Phase II funding, yet had below average rates of transition. Their inability to transition cannot be attributed to a lack of resources or wherewithal—after all, they have decades of experience in the defense market and tens of millions in non-dilutive contract awards. Instead, the inconsistent and often poor transition rates among MAWs revealed a disconnect between both the stated objectives of the program and the role the program should play, in light of today's threat environment; and how the program functions in actuality.

The DoD SBIR program awards a disproportionate share of Phase I/Phase II funding to a set of companies that, based on extensive past performance data, are unlikely to deliver capabilities to defense end-users. That the most active DoD SBIR companies are not necessarily those with the greatest potential for transition indicates that they are selected for Phase I/Phase II awards based on other, unrelated criteria. As such, "the valley of death" is not simply the result of companies struggling to navigate the bureaucracy associated with transitioning from R&D into a DoD program of record. By continuing to disproportionately fund companies that, based on their extensive past performance, will not transition, the DoD SBIR program effectively guarantees the existence of a "valley of death."

Small By What Standards?

The data related to MAWs brought to light another fundamental issue related to the SBIR program. While the SBIR/STTR program was established to serve small businesses, companies can win tens of millions of dollars or more annually in non-dilutive R&D grants and still qualify by program standards as small. In fact, Phase I/Phase II awards represent only a snapshot of MAWs' overall revenue—many generate tens of millions of dollars or more in government revenue annually from other sources, as demonstrated in Table 9; in addition to commercial revenue. Some, like Luna Innovations, are publicly-traded.

Companies can qualify as "small" by SBIR/STTR size standards irrespective of how much revenue they generate, as long as they have fewer than 500 employees (*DOD Small Business Innovation Research / Small Business Technology Transfer, n.d.*). A significant share of Phase I/Phase II funds are not simply awarded to companies unlikely to transition their capabilities to the warfighter; they are awarded to companies that most reasonable Americans would never consider to be "small businesses."

Additionally, MAWs win Phase I/Phase II awards for projects that span a wide range of unrelated topics. We searched a subset of the top 25 companies by name on the SBIR Award Database website, https://www.sbir.gov/sbirsearch/award/all, to better understand the nature of some of their DoD Phase I/Phase II awards. We found that Charles River Analytics received Phase I/Phase II funding for projects including, but not limited to, data analytics for ship maintenance, decision support systems to assist Army soldiers with career planning, wearable sensors for Navy divers, algorithms to enhance robotic caregivers, the development of "smart fabrics" that incorporate sensors and communication networks, and more. Physical Optics received Phase I/Phase II funding to develop artificial intelligence for unmanned systems, coatings for missiles, cyber detection and attack tools, remote unmanned refueling systems, night vision cameras and more. Progeny won Phase I/Phase II awards to develop cyber security for unmanned aerial systems, self-serve kiosks to display human performance information, platforms to manage food service on Navy ships, augmented reality displays for submarine command teams, and more.

Furthermore, from our earlier research we know that most MAWs not only win DoD Phase I/Phase II awards, but also participate in the SBIR/STTR program across multiple non-defense agencies. To capture a picture of their experience in other agencies' SBIR programs, we linked all Phase I/Phase II SBIR/STTR award data associated with each of

the top 25 companies from FPDS and USASpending, irrespective of funding agency. As shown in Table 11, all but one of the top 25 DoD SBIR/STTR companies generated Phase I/Phase II funding from non-DoD sources.

Table 11. Top 25 DoD SBIR/STTR Companies' Lifetime Phase I/Phase II Funding, DoD and non-DoD Sources

Company	Lifetime Total DoD PI/PII Funding	Lifetime Total PI/PII SBIR/STTR Funding
PHYSICAL OPTICS CORPORATION	$359,325,897	$384,534,627
PHYSICAL SCIENCES INC	$321,023,208	$355,985,614
CREARE INCORPORATED	$274,156,442	$330,887,539
INTELLIGENT AUTOMATION INC	$269,444,012	$313,815,023
CHARLES RIVER ANALYTICS INC	$260,141,162	$281,737,900
TRITON SYSTEMS INC	$243,888,188	$249,656,762
CFD RESEARCH CORPORATION	$213,364,011	$240,851,455
LUNA INNOVATIONS INCORPORATED	$199,301,561	$238,795,534
LYNNTECH INC	$158,497,089	$176,441,321
TOYON RESEARCH CORPORATION	$153,759,374	$165,561,850
APTIMA INC	$152,596,850	$156,214,311
ARETE ASSOCIATES	$139,482,615	$141,259,857
PROGENY SYSTEMS CORPORATION	$133,489,054	$136,432,764
TDA RESEARCH INC	$106,391,125	$129,951,953
CORNERSTONE RESEARCH GROUP INCORPORATED	$105,438,088	$124,861,304
MAINSTREAM ENGINEERING CORPORATION	$102,005,756	$113,875,803
SOAR TECHNOLOGY INC	$101,166,814	$103,579,056
SA PHOTONICS INC	$98,359,670	$99,259,498
INTELLISENSE SYSTEMS INC	$84,704,547	$88,161,845
FIRST RF CORPORATION	$84,536,933	$85,129,445
CORVID TECHNOLOGIES LLC	$80,279,823	$80,653,711
OCEANIT LABORATORIES INC	$76,722,560	$78,712,745
ENGINEERING AND SOFTWARE SYSTEM SOLUTIONS INC	$75,206,735	$76,722,560
MAXENTRIC TECHNOLOGIES LLC	$71,623,153	$73,821,632
SYSTEMS TECHNOLOGY RESEARCH LLC	$53,419,184	$53,419,184

It is hard to imagine how any company, let alone a small business, can be at the cutting-edge of innovation in dozens of unrelated fields. Rather, these companies are experts in navigating the SBIR program. Despite the stated objectives of the program, DoD SBIR program managers are primarily measured by whether or not they award the requisite amount of total funding to eligible firms every year; and whether or not these recipient firms

comply with program rules over the course of their projects. Based on this criterion, companies with expertise submitting SBIR proposals, rather than companies with the best ideas, are the likely recipients of Phase I/Phase II funding. The sheer amount of SBIR/STTR funding attributed to MAWs across the entirety of the program further underscores that poor transition rates cannot be attributed exclusively to a lack of resources. Simply allocating more money to SBIR companies does not address the "valley of death." SBIR program managers must begin to evaluate a company's potential for transition as the primary criterion for award.

For decades, MAWs have comfortably won tens of millions of dollars or more in non-dilutive R&D funding, year in and year out. In spite of the stated objectives of the program and that now more than ever it is critical for the military to harness innovations stemming from the private sector, neither the DoD SBIR program managers nor the participating companies are held accountable for ensuring these investments benefit the warfighter. When making award decisions in relation to MAWs, SBIR program managers must be required to factor the ratio of previous Phase I/Phase IIs awarded to a company, compared to the subsequent Phase III/Phase III subcontracts generated. Additionally, Congress must establish clear Phase III transition requirements for DoD SBIR program offices—specifically, a formal goal for the minimum number of companies awarded Phase III contracts and/or Phase III subcontracts annually. Doing so will direct more SBIR resources to non-MAWs, and/or will force the most active participants in the DoD SBIR program to focus on delivering capabilities to DoD end-users.

Transition Challenges for Smaller SBIR Companies

Clearly, large-scale improvements to the transition rate among DoD SBIR companies will require creating new incentives, changing the eligibility criteria for participants, and changing the metrics for evaluating DoD program offices. That said, we also wanted to consider the unique challenges smaller DoD SBIR companies face when navigating the defense market. Unlike MAWs, smaller companies with less experience in the DoD market often pursue the SBIR/STTR program with the expectation that, if they perform well, it will lead to follow-on defense business. However, the DoD SBIR program rarely positions them for success in the broader defense market for a variety of reasons.

We have interacted with and surveyed dozens of DoD SBIR companies and DoD SBIR program offices over the last five years, both in conjunction with earlier research papers published through the Naval Postgraduate School and as part of work we have undertaken—with Phase I/Phase II funding from the Navy, the Air Force, and the Defense Technical Information Center—to develop solutions to improve defense stakeholders' ability to leverage capabilities funded and fielded through innovation programs.

Through this qualitative research, we identified several specific factors keeping DoD SBIR companies from serving the needs of the warfighter subsequent to program completion (Bresler & Bresler, 2021):

- SBIR companies are not educated on how or where to identify DoD opportunities, and they are unlikely to succeed if and when they attempt to bid on them.
    - The design and archaic search functionality of the website where DoD solicitations are marketed (SAM.gov) make it near impossible for companies to find relevant opportunities.
    - If a company manages to identify a relevant opportunity, the submission deadline makes it nearly impossible to prepare and submit a bid. Our analysis of more than 1 million DoD solicitations from 2002 through 2020 found that



70% required companies to respond within 21 days of when they were posted, and 30% required responses within 10 days or less.

  - DoD solicitations are not written clearly. Evaluating the readability of the description fields associated with more than 1 million DoD solicitations using the Flesch-Kinkaid Readability and Grade Level scores, we found that fewer than 3% of solicitation descriptions were written in "plain English."
  - Government stakeholders do not coordinate their requirements, despite often seeking the same capabilities. For instance, on a single day in October 2020, there were 132 open requirements related to UAVs. Small companies new to the defense market cannot reasonably respond to dozens or hundreds of potentially relevant opportunities, and they lack the insider knowledge to effectively prioritize them.

- The individual that oversees Phase I/Phase II contract work typically does not have the authority and/or resources to fund a follow-on contract/program of record directly. And he/she may not have knowledge of or access to those who do. As a result, in the absence of investing in lobbyists or business development consultants, companies have no way of connecting with their potential DoD customers—regardless of their Phase I/Phase II performance.
- The DoD SBIR program offers no clear instructions to companies regarding internal systems (accounting, cybersecurity, etc.) that may be required to qualify for follow-on contracts. Small companies not only walk away from the defense market because they cannot justify the investment, but also because they simply cannot get clear information on what the required level of investment will be.
- The DoD SBIR program does not effectively market participants' capabilities to the broader armed services community. One of the most frequent comments from DoD stakeholders over the last five years was that they received very few briefings on the projects funded by their own branch, and almost never received information on capabilities funded by other branches. As a result, rather than leveraging existing investments made through the DoD SBIR program, DoD stakeholders either continuously invest in redundant market research or fail to modernize altogether.

Conclusion and Recommendations

On the whole, the DoD SBIR program has failed to incubate capabilities that go on to serve DoD end-users. This poor rate of transition can be attributed to multiple factors. SBIR program managers are not held accountable for funding companies with the greatest promise for transition. Instead, they have directed the majority of Phase I/Phase II funds to companies that have cultivated an expertise in how to navigate the SBIR program. Regardless of SBA size standards, these MAWs look and act like large businesses. They effectively submit winning proposals and deliver compliant milestones. Their institutional knowledge of processes is more relevant than the innovativeness of their solutions. Because these companies can win tens of millions of dollars annually in non-dilutive funding, they have no incentive to transition. In fact, they are incentivized to continue to focus their resources and attention on pursuing *more* SBIR awards, rather than undertake the complex process of pursuing non-SBIR contracts.

Additionally, companies that participate in the DoD SBIR program with the goal of continuing to support the DoD thereafter are not well-positioned to do so. The SBIR program fails to educate them on the requirements associated with pursuing traditional defense contracts. While the SBIR program affords participants with sole-source justification within

scope, it does not facilitate connections between SBIR companies and viable DoD customers. To successfully capture defense business after Phase I/Phase II project completion requires a significant investment. Many small, innovative companies—particularly those with viable commercial revenue streams—choose to abandon the defense market altogether, rather than "pay to play."

To address these issues and position the SBIR program to more effectively deliver capabilities to the warfighter, we offer the following recommendations:

- Require more comprehensive reporting for Phase III contracts to eliminate the need to analyze non-Phase III procurement contracts when measuring transition.
- Create a code in USASpending specifically for Phase III subcontract awards, to denote when a subcontract award relates to a company's SBIR work.
- Overhaul SBA size standards so that the SBIR program benefits *truly* small businesses.
- Establish clear Phase III transition requirements for DoD SBIR/STTR program offices. Specifically, there should be a formal goal for the minimum number of companies awarded Phase III contracts and/or Phase III subcontracts annually.
- When a company submits a Phase I/Phase II SBIR proposal, the ratio of its total Phase I/Phase II funding relative to the amount of revenue it has generated in Phase III contract and subcontract awards should be an important evaluation criteria. Firms with $10 million or more in cumulative Phase I/Phase II DoD SBIR awards must meet minimum Phase III transition thresholds in order to remain eligible for additional Phase I/Phase II funding.
- Incentivize DoD stakeholders to integrate capabilities funded and fielded through the SBIR/STTR program. The incentive program can mirror existing set-aside programs that require DoD stakeholders to award a certain percentage of contract awards to various company types (woman-owned small business, 8a, etc.). There should be goals for awarding a percentage of contracts annually as Phase IIIs or Phase III subcontract awards, to encourage the DoD to leverage investments made through the SBIR/STTR program. Additional credit should be given when a DoD stakeholder awards a Phase III contract or subcontract to a company funded and fielded by a different agency.
- Incentivize prime contractors to integrate capabilities funded and fielded through the SBIR/STTR program. Much like prime contractors have goals for awarding a certain share of subcontracting business to various set-aside companies, they should receive additional credit—beyond what would count towards their small business set-aside goals—when subcontracting for capabilities funded and fielded through SBIR/STTR.
- Make it easier for companies to identify and bid on DoD solicitations. Specifically, redesign SAM.beta to improve search functionality; require solicitations to have a response time of more than 30 days unless a justification is provided; require solicitation descriptions to be written in plain English; and require government stakeholders with similar requirements to coordinate their outreach and communication efforts.

It is essential for our national security that the DoD have access to the most promising new technologies. As the largest and most long-standing defense innovation initiative, the DoD SBIR program must adapt with this imperative in mind. With strong leadership and a thoughtful restructuring of resources and incentives, the DoD SBIR program has the potential to channel its multibillion-dollar budget into solutions that could revolutionize the military.

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Testimony of

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Executive Director
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Before the

United States House Small Business Subcommittee on Economic Growth, Tax and Capital Access

SBIR: Small Businesses Innovating America

April 16, 2024

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.



Chairman Meuser, Ranking Member Landsman, 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 role that SBIR and STTR plays in it.

I am Jere 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. 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 companies across 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 the most significant pieces of legislation ever passed by Congress. After considering his comments, I'm inclined to agree with him.

Today, the SBIR program is the most successful innovation program in government. It has helped fund some of the most important new technologies in the world while generating massive economic returns, while using only 3.5% of the government's extramural R&D spending. Technologies you use every day were developed with SBIR funding, including the GPS on a chip and CMOS camera systems in your smart phone. SBIR is also the principle on-ramp for small businesses to enter the government innovation ecosystem, with around 40% of awards going to first-time winners. That equates to roughly 1,500 new businesses into SBIR every year.

The SBA, on the whole, has done a very good job of managing the SBIR and STTR programs, but they are severely understaffed. Today, the SBIR/STTR is nearly $5 billion a year, but SBA's SBIR office has fewer employees now then when the program was less than $1 billion a year. The office needs more manpower and funding to efficiently manage the program, and perform the duties that Congress requires of them.

One area that the programs could be improved is in the length and complexity of the solicitations, which place a huge paperwork burden on small businesses, particularly those who have not participated in the program before. Over the years requirement and regulatory creep has seen solicitations balloon to as much as 90 pages, and are often filled with dense legalese and regulatory jargon. Streamlining and simplifying the solicitation process would be the most impactful thing Congress could do to encourage new and non-traditional businesses to enter the program.



A second area for improvement would be increased focus on successful outcomes and transitions to new product and services, to further develop how best to recognize and advance the results of this highly productive program. Federal R&D through SBIR provides a country-wide incubator for new technology solutions needed by the Federal government and the economy.

The Market Loves SBIR

The federal agencies that fund SBIR research benefit tremendously from the technology that it produces. But SBIR-funded technology is also found in all sectors of the commercial marketplace. Here are some facts that show that SBIR makes a difference:

- Between 1996 and 2020, 99 new drug approvals (12% of all new drugs approved) were developed by firms that received SBIR/STTR funding
- Over the same period, 16% of "priority review" drugs, representing significant health advances over esisting treatment, were developed by firms that received SBIR/STTR funding.
- 34 new medical devices and 24,475 PMAs or 510 (k) were linked with SBIR/STTR
- Economic Impact studies of SBIR Phase II awards show a return on investment of between $22-33 for every dollar, depending on the agency.
- For every dollar invested in the SBIR/STTR program there are 11 dollars of commercial sales at NCI and 5 dollars of commercial sales at DOD.
- 10% of all VC investments go to SBIR firms
- Secretary of Defense Austin has recommended doubling down on SBIR/STTR
- 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
- 2,120 SBIR firms have been acquired, injecting their innovations into larger companies
- 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.

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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
- 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.
- 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 select industries like medical, software and IT. SBIR R&D reinvigorates 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 US, 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.

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2022 NAS Study on SBIR/STTR at NIH[1]

The most recent study of the SBIR program conducted by the National Academies of Science shed light on just how important SBIR is to the NIH innovation ecosystem. With only 3.5% of extramural R&D funding at NIH, the NAS found that companies in the SBIR/STTR programs "have introduced medicines that have had a profound impact on health and associated sales in the hundreds of millions of dollars." Some of the other findings from this study include:

- From 1996 to 2020, SBIR/STTR awardees have introduced 99 new drugs. This accounts for 12% of all new drugs approved
- Over the same time period, SBIR/STTR awardees generated 16% of "priority review" new drugs approved
- Over the same time period, SBIR/STTR Awardees introduced 13 PMA and 2,475 510(k) approved medical devices. They also produced 8,974 trademarks.
- NIH also found that "small businesses that participate in the NIH SBIR/STTR programs, regardless of whether they are ultimately funded, have a higher potential for growth relative to the average small business in the United States, even after accounting for the fact that these firms are concentrated in high-tech sectors."
- Data also showed that more awards are being made to first-time applicants

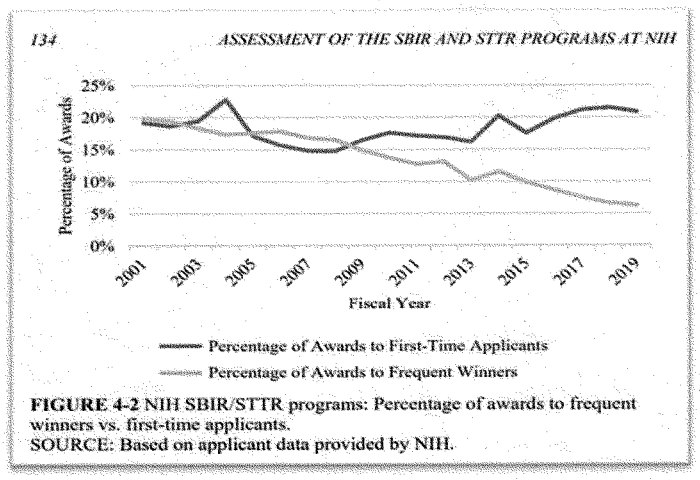


FIGURE 4-2 NIH SBIR/STTR programs: Percentage of awards to frequent winners vs. first-time applicants.
SOURCE: Based on applicant data provided by NIH.

[1] National Academies of Sciences, Engineering, and Medicine. 2022. *Assessment of the SBIR and STTR Programs at the National Institutes of Health*. Washington, DC: The National Academies Press.

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Success Stories

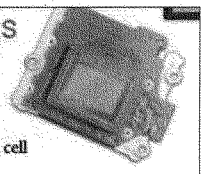
Technologies funded by the SBIR/STTR Program are used by millions of Americans on a daily basis, and at least two of these in your pocket or purse right now. The technology that allows cell phones to use GPS on a chip was developed by Dr. Reza Rofougaran under an SBIR award. And the fast CMOS camera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

GPS/WiFi/Blue-tooth Chips
Physical Research/ Broadcom



GPS on a chip, and combined WiFi and Blue-tooth communications used globally in cell phones and U.S. military systems, are derived from a DoD SBIR award to Dr. Reza Rofougaran.

CMOS Cameras
Photobit/Micron



SBIR supported Photobit in developing fast CMOS imagers for military use, now used in all cell phones and most other digital cameras.

Successful alumni of the SBIR program include: 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), 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.

Phase III awards from government are 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 shortened the time it takes to get some Phase III contracts awarded.

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National Cancer Institute Economic Impact[2]

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.

dollar amounts in millions	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 Had Tremendous Economic Impacts

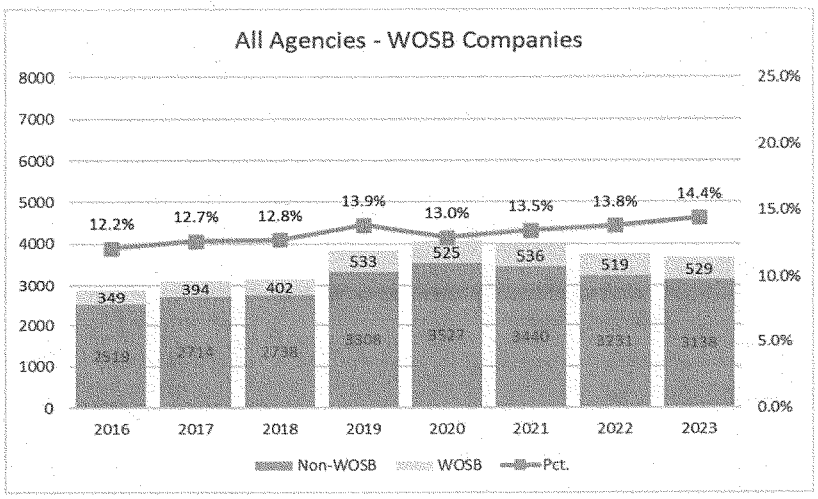


[2] *National Economic Impacts from the National Cancer Institute SBIR/STTR Program.* Techlink, Inc; 2021

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Women and Socially and Economically Disadvantaged Participation[3]

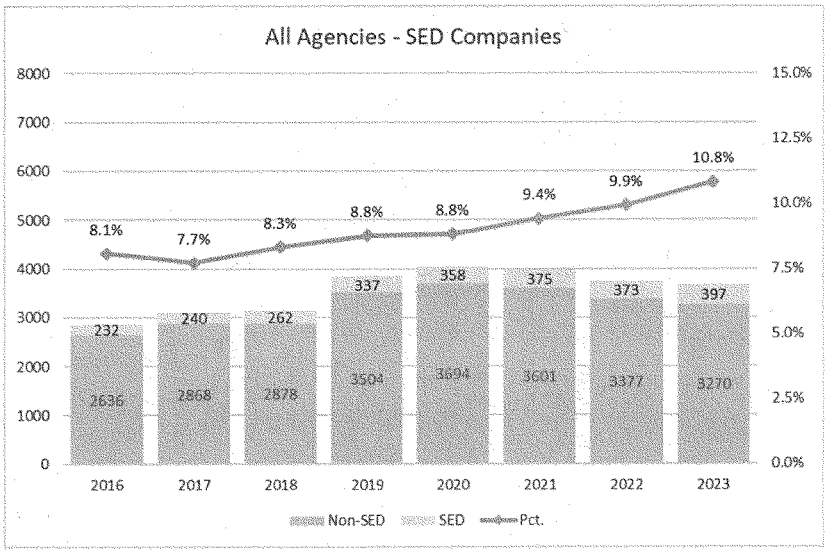
- SBA and the Participating Agencies continue to enhance outreach and provide resources to support women-owned and socially and economically disadvantaged small businesses to participate in the SBIR/STTR Program.
    - In 2020, SBA's Office of Investment and Innovation (OII) partnered with the National Women's Business Council (NWBC) to study's Women's Inclusion and Participation in the SBIR and STTR Programs (https://nwbc.gov/wp-content/uploads/2023/11/Women-In-SBIR-Report_NWBC_Final_2020-08-07.pdf).
    - Between 2011 – 2018, that study found:
        - 13.3% of Phase I awards went to WOSB.
        - The study also found that 13.1% of Principal Investigators (those leading the scientific research and development efforts) are Female, across all companies (WOSB and Non-WOSB).
    - Based on publicly available data on SBIR.gov, the share of WOSB receiving is the highest it's been in recent history, in 2023 14.4% of SBIR and STTR awards went to WOSB.



[3] Data and info from Small Business Administration Office of Innovation

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- Awards to Socially and Economically Disadvantaged Small Businesses are also on an upward trend, with 10.8% of SBIR/STTR Awards going to such firms in 2023 – again amongst the highest in recent years.



- Targeted Outreach, Education, and Engagement
  - A number of outreach initiatives, including the SBA-led and coordinated SBIR/STTR Road Tours – which bring agency representatives into underserved areas (geographic and demographic) to raise awareness about the programs in partnership with Federal and State Technology Partnership (FAST) program recipients. The SBA provides both a week of virtual outreach and engagement and has recently re-launched the in-person tours and have already visited 10 states and Puerto Rico since July 2023, and will visit another 10 states by the summer.
  - Applicant Assistance and Phase 0 Programs – have also been implemented using administrative pilot program funding to help new applicants, including women and socially and economically disadvantaged companies. While not totally attributable, the NWBC women-study noted

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2024 GAO Report on Multiple Award Winners[4]

As part of the 2022 SBIR and STTR Extension Act of 2022, The Government Accountability Office was required to perform a study into the performance of firms that have won 50 or more Phase II awards between 2011 and 2020. The report, released in March 2024reinforced the need for both new and experienced firms in the SBIR ecosystem. It noted that experienced firms often provided capabilities and resources that newer firms couldn't provide. From the report (pg 16):

> *"Officials from six agencies with the highest percentages of awards to multiple awardees said that multiple awardees have helped meet their specific R&D needs.26 The officials provided several explanations for why multiple awardees may be well-suited to meeting their agencies' R&D needs, but they did not cite any specific metrics as part of their explanations:*
>
> ***Alignment with needs.** Department of Energy (DOE), DHS, DOD, and NASA officials said that multiple awardees often work in niche areas that align with agency R&D needs. For example, NASA officials said few businesses have expertise in heliophysics—the study of the sun and how it affects space.*
>
> ***Experience.** DHS, DOD, and NASA officials said that multiple awardees may better understand federal R&D needs because of past experience with the SBIR/STTR programs.*
>
> ***Resources.** DOD, DOE, and NASA officials said that multiple awardees may have more resources than other awardees, which may be used for proposal preparation and equipment investments. DOE officials said that startups may not have the laboratories, equipment, and other necessary physical capital that multiple awardees have."*

The report also strongly pushed back against the argument that the presence of multiple award winners made SBIR less competitive (pg 9):

> *Multiple awardees, which represented less than 1 percent of all Phase II awardees (22 of 6,865), received approximately 10 percent of Phase II awards and dollars from FY 2011 through 2020 (see table 2). For information broken out by each business, see appendix III. However, we found that the SBIR/STTR award process was competitive, based on a common measure of market concentration.*
>
> *We found that the SBIR/STTR programs had a Herfindahl-Hirschman Index (HHI) value of 11 and 10 for Phase II awards and dollars, respectively, from FY 2011 to 2020. HHI approaches zero when a market is occupied by a large number of firms of relatively equal size and reaches its maximum of 10,000 points when a market is controlled by a single*

[4] Government Accountability Office (2024) *SMALL BUSINESS RESEARCH PROGRAMS: Increased Performance Standards Likely Affect Few Businesses Receiving Multiple Awards. GAO-24-106398*



firm. HHI values greater than 1,800 indicate highly concentrated markets that may lack sufficient competition. To calculate HHI, we squared the market share of each small business—in this case measured by the number of Phase II awards or award dollars each business received in the period we reviewed—and then summed the resulting numbers.

Need to Integrate SBIR with Primes and Programs to Unlock Transition

While SBIR has proven to do a tremendous job in bringing in new companies to government innovation, more needs to be done to help transition that technology into the marketplace or programs of record.

In recent years, many efforts have been made by various defense components to speed up technology transitions from high-tech small businesses. Focusing on Dual-use commercial technology, use of other transaction authorities, or OTAs, and enticing Venture Capital-backed firms with matching funds are some of the ways that the DoD and its services have tried to accelerate technology transition and insertion.

In addition, in the past decade there have been numerous board and offices created to advance innovation: Defense Innovation Initiative, Defense Innovation Unit, Strategic Capabilities Office, Defense Digital Service, Defense Innovation Board, Army Futures Command, Joint Artificial Intelligence Center, AFWERX, Naval Army Applications Lab, and the Rapid Defense Experimentation Reserve.[5]

Most of these efforts focus on the large end of the tech transition funnel: getting innovations submitted to and funded by DOD. Where they fail in not addressing the most important pathway for speedy technology transition to DOD: the large prime contractors. This is small end of the funnel. DOD Prime contractors determine what technology they want to put in their program of record, and most of the time they would rather use technology they develop in-house, instead of looking outside for the best technology.

Unless the primes and DOD Program Managers are required to look outside for the best technology available, report on technologies they insert, and are given incentives to find and insert technology, the problems of technology transition at the DOD will continue. DOD can begin by requiring prime contractors and Program Managers to report on the SBIR and non-traditional firm technologies they adopt and provide incentives for the adoption of outside technologies.

The Army's Vista program is a good start, but much more has to be done.

[5] Brown, Mike. "The Big Disconnect: Defense R&D And Warfighter Capabilities" *Forbes.com*. March 26, 2024

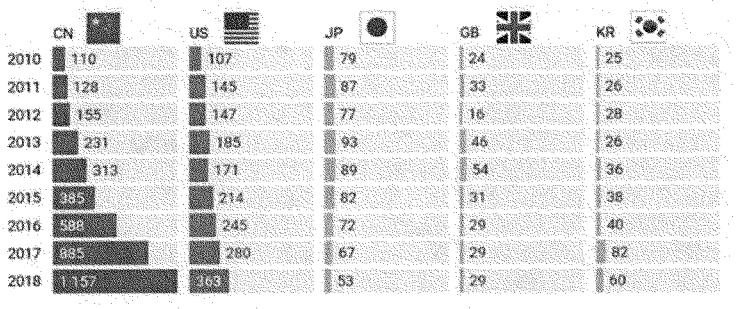
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U.S. Innovation Leadership in the World is Challenged

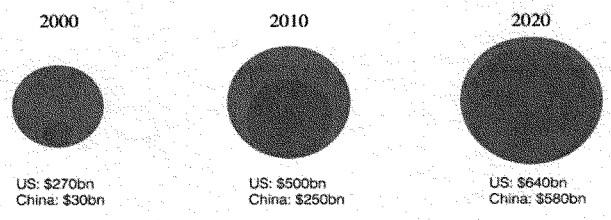
When the SBIR was created, the United States was the undisputed leader in innovation. All venture capital was invested in U.S. companies and we had a very strong patent system. Today our leadership in innovation is threatened, other countries are doing more to support small business and innovation in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

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 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. The need for SBIR and its ability to supercharge American innovation has never been greater.

Quantum Patents Per Year
Source: "Quantum Technologies Patents, Publications & Investments," Le Lab Quantique



U.S. and China Gross Expenditures in R&D
Source: AMACAD "The Perils of Complacency"; OECD Main Science and Technology Indicators



**In billions U.S. 2020 dollars*

https://www.csis.org/analysis/chinas-pursuit-defense-technologies-implications-us-and-multilateral-export-control-and

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SBIR Reauthorization Recommended Provisions

1) Make SBIR/STTR permanent

The SBIR program has a proven, successful track record for nearly 40 years, and STTR for nearly 30 years. Multiple economic impact studies as well as over a dozen NAS studies have been conducted over the decades that have proved the programs innovation and unparalleled productivity of American small business skill, hard work, and entrepreneurship. The time has come to make the programs permanent to enable the sustained investment and returns that come from longer term perspectives.

1a) Make SBIR Phase III Permanent

If permanence for the entire program is not supported, consider including a provision that would only make Phase III permanent. During the last reauthorization period when it looked like there was going to be a lapse in authority, the DOD announced that Phase III preferences and data rights protections would also lapse. This possibility could severely impact the DOD's innovation ecosystem. DOD does over $2 billion a year in Phase III funding and has been heavily using Phase III's sole-source provision to increase the speed with which they can transition technology. Even if there is a lapse in SBIR that means no more Phase I or II awards, Congress should ensure that Phase III mechanisms still remain for legacy SBIR projects.

2) Increase DOD SBIR allocation increase to 7%

Follow the Section 809 Panel's recommendation to double the SBIR allocation to further unleash high-tech small business' innovative and economic potential by increasing the allocation at DOD to 7%. Small Businesses generate 25% of key innovations despite receiving only 3.2% of federal R&D budget. SBIR has proven to be more successful than any innovation program in the government, and should be given greater investment.

3) Increase DOD STTR allocation to 1%

STTR has shown to be successful, but at only 0.3% of the federal extramural R&D is simply too small to make a difference. Increasing the allocation at DOD to 1% will facilitate greater collaboration between universities generating next generation basic research and innovative small businesses who can translate that research into commercializable technologies.

Finally, the Sec. 174 R&D tax amortization requirement continues as a huge burden on small innovative businesses, and a major disincentive to perform research. Firms that participate in SBIR are particularly burdened due to the fact they are required by law to spend nearly 100% of SBIR funds on research, and often don't have cash on hand to pay tax on top of it. While we commend the House of Representatives for passing a Sec. 174 fix in an overwhelming bipartisan vote, it is essential to America's innovative economy that the Senate act to pass it as soon as possible.

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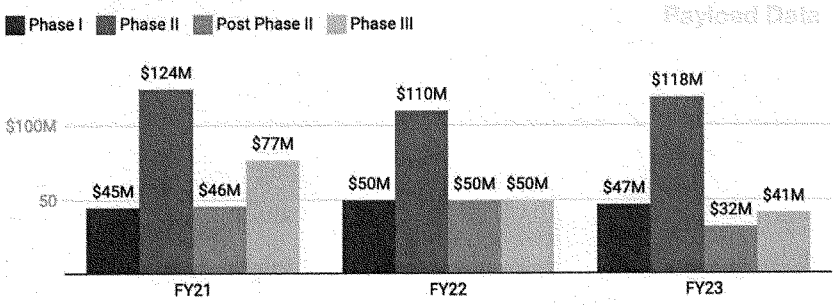
Appendix A

Recent Agency Phase III Data

DOD Phase III Obligations FY2018-May FY2023 By Service

	Navy	Air Force	Army	DOD-Wide
2018	$743,134,063	$391,936,154	$151,651,706	**$1,385,384,688**
2019	$674,313,088	$528,850,815	$113,341,936	**$1,542,102,717**
2020	$893,977,509	$855,060,886	$170,912,517	**$2,225,111,809**
2021	$885,365,745	$937,641,933	$282,145,294	**$2,282,820,127**
2022	$1,082,602,557	$1,091,788,967	$311,936,495	**$2,730,167,580**
2023	$1,195,358,978	$1,543,919,026	$293,837,077	**$3,390,000,915**
Totals	$5,474,751,940	$5,349,197,781	$1,323,825,025	**$10,151,306,888**

NASA SBIR Total Dollars Awarded by Phase



Source: NASA SBIR/STTR Program Management Office

DOE Phase III Guidance

In addition, The Department of Energy, which historically has not utilized Phase III, has for the first time issued guidance on Phase III statutes and policy. SBTC is encouraged by this first step and hopes that DOE will soon embrace Phase III in its procurement.

- https://science.osti.gov/sbir/Phase-III-Guidance

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Appendix B

National Academies of Science Studies of SBIR
(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."

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Appendix C

State-by-State SBIR/STTR Figures for House Small Business Committee[6]

Pennsylvania		
	SBIR/STTR	
Year	# Awards	$ Amount
2019	260	$153,940,871
2020	282	$161,433,610
2021	243	$171,058,185
2022	265	$209,683,206
2023	229	$197,170,232
2019-2023	*1279*	*$893,286,104*

Ohio		
	SBIR/STTR	
Year	# Awards	$ Amount
2019	329	$160,157,955
2020	287	$138,680,250
2021	317	$144,013,879
2022	266	$146,388,779
2023	278	$170,337,880
2019-2023	*1,477*	*$759,578,743*

California
2023 (1233)
2022 (1285)
2021 (1409)
2020 (1496)
2019 (1403)

Minnesota
2023 (73)
2022 (86)
2021 (74)
2020 (79)
2019 (96)

Maine
2023 (17)
2022 (7)
2021 (17)
2020 (15)
2019 (9)

Missouri
2023 (40)
2022 (48)
2021 (51)
2020 (57)
2019 (62)

Kansas
2023 (27)
2022 (20)
2021 (27)
2020 (26)
2019 (21)

Texas
2023 (27)
2022 (20)
2021 (27)
2020 (26)
2019 (21)

New York
2023 (320)
2022 (307)
2021 (296)
2020 (335)
2019 (287)

[6] https://www.sbir.gov/sbirsearch/award/all

April 15, 2024

Re: Hearing entitled: "Exploring SBA Programs: Reviewing the SBIC and SBIR Programs' Impact on Small Businesses"

Dear Members of the House Small Business Subcommittee on Economic Growth, Tax, and Capital Access,

Thank you for your attention to the SBIR program's impact on small businesses. The SBIR program plays an integral role in the startup ecosystem and for companies like mine, and regularly reviewing and improving the program is critical to ensuring policies designed to support founders are actually having the intended impact.

For startups engaged in research and development (R&D), funding can come from many sources—from personal savings, to venture capital, to government funding—including the Small Business Innovation Research (SBIR) program. As the co-founder and CEO of Indianapolis, IN-based startup, MITO Material Solutions—a company that creates additives that improve the durability and toughness of legacy industrial materials, and gives manufacturers the ability to make lighter and stronger products—the SBIR program has been an integral source of capital and has been essential to the commercialization of our technology. And while the SBIR program on the whole is critical to innovation and the success of the startup ecosystem, policymakers should pursue reforms so that it better works for startups and reflects the diversity of U.S. innovators.

The SBIR program has been a particularly successful government effort since its inception in 1977. It has given rise to more than 700 public companies and led to critical technologies that benefit the globe. For my company, the National Science Foundation (NSF) SBIR program has been instrumental in helping us commercialize our technology.

MITO first applied for an STTR through the National Science Foundation and was denied because the university had not licensed the patent to the company. We resubmitted as an SBIR with the option to license in our supporting documentation. We received the official award letter in December 2018, just as we finalized the license agreement from the university the month prior.

We used this grant funding alongside business plan competition winnings to launch MITO. We hired our first two technical hires who started full-time to work on scaling the technology while I secured additional angel funding to purchase assets for the lab and to bring myself on full-time. As we worked through the initial Phase I, we achieved significant technical milestones in our lab. With the testing capabilities of our university partners, we were able to show significant competitive improvements and even make our first sale of sample material to a large chemical corporation. This success led us to apply for the second phase of funding.

During our program we went through three program managers, and the right one can make a difference. Just as we were applying to Phase II, we got a new PM who encouraged me to apply as the Co-PI alongside our PhD in chemistry to show the review panel that our company was more than just a "science project." I believe she is one of the main reasons we received our Phase II funding, which came at the most critical point in MITO's life. At the time, we were running low on investor funding and our grant funding was keeping us alive. We applied for three grants (SBIR and matching Oklahoma State Grants) in Winter 2018, hoping to hear by late spring or early summer if we would be selected (6 months). By June, we had only received the smallest grant we applied for which would not have given us sufficient runway to stay open. By early July, we were accepted into Techstars and soon after that we received the call that our Phase II and our subsequent state grant would be funded to advance our technology further. This meant MITO received $1.1MM in grants that summer alongside acceptance into the largest accelerator program in the world. That moment changed our company trajectory. We were able to secure additional investment because the scientific novelty was validated and de-risked through this prestigious program.

It's not just MITO that has been helped by this program—other startups have similarly found success through the SBIR program. Olivia Walch, CEO of Arlington, VA-based startup, Arcascope, told startup policy organization Engine, "SBIR funding is the only reason my company exists now…SBIR funds gave me the money to build products that showed what we could do and bought me the time to learn how to talk about them to investors." Dr. Chelsea Monty-Bromer, Founder & CTO of Cleveland-OH based startup, SweatID, agreed that SBIR funds were essential to growth, telling Engine, "Without the SBIR/STTR program, we would not have been able to get the capital that we needed to grow. To get venture investment in Ohio, we would have needed to be closer to going to market. That meant the only way we could make it to this point was through SBIR and STTR funding." And Neil P. Ray, founder and CEO of San Ramon, CA-based startup, Raydiant Oximetry, stressed that his company "survived on the SBIR program for initial support…and without the SBIR program, I don't know if we would have been able to make as much progress as we have." And without the support of multiple SBIR awards, they may not have been able to get through "the 'valley of death'—the period between the emergence of a company's new tech and its arrival to the marketplace."

But despite these successes, startups have also faced challenges accessing an SBIR award, many of which are common amongst many government programs. And though I have witnessed some improvements to the program overall—namely, streamlining some processes like letters of intent and enhancing consistency across departments, much work remains. While Congress recently had an opportunity to implement reforms in 2022, the SBIR program was reauthorized without significant change and for just three years, meaning it will once again need congressional action in 2025. Policymakers should begin efforts now to address issues with the program and contemplate plans for reauthorization, including considering a permanent reauthorization, so that this startup-critical program is strengthened and has certainty.

Perhaps most importantly, policymakers should commit to improving the diversity of SBIR awardees to ensure the success of the program and strengthen the innovation resulting from its

awards. Agencies must do more to collect better demographic data about SBIR recipients to have a better understanding of neglected populations, including women, people of color, and those from rural areas/non-technology hubs, and put plans in place to improve outreach to communities so that they know what the SBIR program is, how to apply, and how it could help their startups. Agencies should also work to improve the diversity of reviewers as a means of leading to greater diversity amongst founders receiving awards.

For many startup founders and CEOs, the SBIR program feels out of reach due to the complexity of the application process. Oftentimes applicants and would-be applicants struggle without costly outside assistance and complying with application requirements that vary by agency. Without adequate guidance throughout the application process, many startups are ill equipped to not just locate SBIR opportunities, but also complete the arduous process. Some startups ultimately decide that the process itself is not worth the funding that could result. And while many founders are able to hire outside assistance to navigate the process, the reality is that most startups, particularly those launched by underrepresented founders and those in their early stages, are resource-strapped in terms of both time and money. Policymakers should work to streamline the application process so that it is more accessible to more founders—even clarifying things like preferred language and vocabulary for each agency can alleviate significant headaches for applicants—so applicants do not need to rely on grant writing specialists to be successful.

But it is not just the application itself that poses a problem for founders. In the event a startup is unsuccessful in securing an award they receive a denial with little-to-no direction as to how best to improve their odds of success for future applications. Agencies should work to implement mechanisms to provide feedback to founders so that they know how to best improve their chances for future funding cycles. Without feedback, we may be losing out on countless novel technologies to the complexities and opaqueness of the application process itself.

Application timelines also pose a barrier to startup participation in the SBIR program. While some agencies, like the NSF have improved in this respect, application approval timelines can be lengthy, and for fundraising startups, this can be catastrophic. Many startups in their early stages do not yet have consistent revenue and are consistently on the hunt for sources of capital to continue to build their businesses. This can be particularly acute for founders from underrepresented backgrounds because of additional difficulty accessing capital. Amidst lengthy approval periods, many promising companies may be forced to close their doors because of capital formation issues. Government must explore ways to speed up decision making in funding cycles so we don't lose the next great idea to common startup funding challenges.

Many founders from business backgrounds, as opposed to academic backgrounds, may also find the SBIR process challenging. For example, as an MBA with no scientific background, I believed I was not able to be funded on the initial grant, even though I was managing the project, accounts, and reporting requirements. At some agencies, just ten percent of reviewers come from a non-academic background—but many applicants have business backgrounds like mine and not PhDs, and therefore may struggle with an application process that often

emphasizes academic successes. Having a PhD as a Principal Investigator (PI) I believe made a big difference for the success of our Phase II application and other founders have experienced this as well. Ed Rudberg, CEO of Minneapolis, MN-based startup, Nucleic Sensing Systems affirmed this challenge in a profile with non-profit technology policy organization, Engine, stating:

> We're very lucky that NS²'s team includes several PhDs, but most startups don't have that. I think one of the difficulties with SBIRs is that businesses are often judged by academic standards rather than typical business standards. The SBA asks for applicants to provide publications and other materials that are more aligned with an academic background; there's no real way to show your business acumen. If we didn't have PhDs on our team, getting the funding would have been a lot more difficult.

Government should work to equalize the playing field for non-academic founders by developing more metrics for founders to prove their business success, in addition to academic success. Failing to support applicants with various backgrounds, including in business, means the government is missing out on the technologies created by promising entrepreneurs and may also skew awards toward research as opposed to commercialization.

The emphasis on a desired academic background is also apparent following receipt of an award. SBIR awardees must complete a significant amount of written documentation and accounting. This can be a significant barrier because few private companies are prepared to provide this sort of documentation so early in their lifecycle, and it took me weeks just to get things in order. It can be challenging to keep up with award compliance and startups would benefit from greater clarity on compliance-related issues. It would save founders significant resources if they had a better understanding, for example, of how a grantor wants the accounting related to the grant to be completed.

Finally, policymakers should consider ways to encourage startups to help the government identify its problems and propose solutions to those problems. Today's startups are creating technologies that fix issues the government has yet to even identify. Moving towards open competitions is one solution to encourage more, and more diverse, applicants, and would likely lead to more commercialization. For many startups, they could gain the government as a first, or early customer, setting them up for future success.

Thank you for the opportunity to provide feedback on the importance of the SBIR program, including successes and areas for improvement. This program is essential to the startup ecosystem, policymakers must do everything in their power to ensure the longevity of the program and to welcome more startups into the fold.

Sincerely,
Haley Marie Keith
Co-founder and CEO
MITO Material Solutions

○