Turbocharging Small Business Innovation

Perspectives to optimize the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs

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- Information Technology and Innovation Foundation
- Via Separations
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- U.S. Department of Energy SBIR Program
- National Science Foundation (NSF) SBIR Program
- AFWERX
- Small Business Administration (SBA)
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This paper provides an overview of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Often described as “America’s Seed Fund™”, both of these congressionally mandated programs operate under the broad guidance of the U.S. Small Business Administration. The first part of the report describes the origins and missions of the SBIR and STTR programs. The second part of the report presents the perspectives of a cross-section of stakeholders that regularly engage with these programs, including congressional staff, federal agencies, small businesses, funders, and academic institutions. The focus of these views was on identifying opportunities to improve the access operations and impact of the SBIR and STTR programs.

This paper provides an introduction to the SBIR and STTR programs. It does not provide detailed specific information about SBIR and STTR implementation by individual federal agencies. Several in-depth reports are available for readers interested in a more detailed analysis; references are provided in an appendix.

**KEY TAKEAWAYS FROM THIS PAPER**

- SBIR/STTR are valuable programs that enable federal agencies to provide necessary investment for small business R&D.
- Establishing robust metrics to measure success in achieving statutory goals could increase program effectiveness.
- Agencies will better meet statutory requirements for fostering participation by women and under-represented groups if they utilize diversity metrics and include these groups in SBIR/STTR program discussions, development and evaluation.
- Agencies can improve small business access by aligning with entrepreneurial practices.
- The National Science Foundation (NSF) has successfully expanded its SBIR program by establishing centralized SBIR administration.
I. An Introduction to the SBIR and STTR Programs

HISTORY AND EVOLUTION

The SBIR program dates back to the 1970s, when concern that the United States could lose its competitive edge, economically and technologically, in an era of increasing globalization combined with a recognition that small businesses play a critical role in innovation and job creation. In 1972, Roland Tibbetts, long recognized as “the father of the SBIR program” was appointed Senior Program Officer at the National Science Foundation (NSF). Tibbetts had held various positions in large and small businesses; understood the importance of small, advanced technology firms; and recognized that small firms could be at a disadvantage in pursuing federal funding for research and development (R&D). With growing congressional interest in directing federal resources to small businesses, SBIR was launched as an NSF program in 1977.

With the passage of the Small Business Innovation Development Act of 1982, the SBIR program changed to its current model and expanded beyond the NSF. Established as a funding set-aside, with sunset provisions, SBIR has been periodically reauthorized, including in 1992, 2000, 2011, and 2016.

Modeled after the SBIR program, STTR was established as a pilot program by the Small Business Technology Transfer Act of 1992. Government agencies with R&D budgets of $1 billion or more are required to set aside a portion of R&D funds to finance STTR activities. The key distinction between the two programs is that STTR requires small businesses to formally collaborate with a research institution such as a university or federal lab. The point of this requirement is to ensure that small business have the resources to transition novel technologies from basic science R&D to successful commercialization. For purposes of the program, research institutions include universities and federally funded research and development centers (FFRDCs). Despite the considerable role that the partner research institution may play, the applicant for an STTR award is always the small business.

Like the SBIR program, STTR has been periodically reauthorized, including in 1997, 2001, 2011, and (with SBIR) in 2016. Most recently, both programs were extended through fiscal year (FY) 2022 by the National Defense Authorization Act for 2019. Today both programs are implemented across multiple federal agencies with the aim of supporting “scientific excellence and technological innovation through the investment of federal research funds in critical American priorities to build a strong national economy.”
MISSION AND GOALS

The SBIR and STTR programs are highly competitive, awards-based programs designed to stimulate technological innovation and encourage domestic small businesses to engage in basic research and research and development (R/R&D). In addition to helping small businesses access federal funding, resources, and support for these activities, the programs are intended to help ensure that government agencies have the technologies and technical solutions they need to carry out their diverse missions.

The specific goals of the SBIR program are to:

- stimulate technology innovation,
- meet federal R&D needs,
- foster and encourage participation in innovation and entrepreneurship by women and socially or economically disadvantaged persons, and
- increase private-sector commercialization of innovations derived from federal research and development funding.

The specific goals of the STTR Program are to

- Stimulate technological innovation,
- foster technology transfer through cooperative R/R&D between small businesses and research institutions,
- foster and encourage participation in innovation and entrepreneurship by women and socially and economically disadvantaged persons, and
- increase private-sector commercialization of innovations derived from federal R/R&D.

STATUTORY REQUIREMENTS

Requirements for the SBIR and STTR programs are outlined in Title 15 § 638 of the U.S. Code — “Research and Development.” As of 2020, federal agencies with an extramural budget for research or research and development in excess of $100 million are required to expend 3.2 percent of their R/R&D budget for the SBIR program. Federal agencies with an extramural budget for research or research and development in excess of $1 billion are required to expend 0.45 percent of their R/R&D budget for the STTR program.
Per Title 15 §638, each federal agency is responsible for 1) determining categories of projects in its SBIR program, 2) providing guidance to issue SBIR solicitations in accordance with a schedule determined cooperatively with the U.S. Small Business Administration, 3) determining research topics, 4) evaluating and selecting SBIR proposals, and 5) communicating award information and expenses and payments to SBIR awardees. Federal agencies must also report to the SBA and the Office of Science and Technology Policy (OSTP). Each agency’s SBIR and STTR programs must fully implement the requirements of Executive Order No. 13329, “Encouraging Innovation in Manufacturing.”

II. Program Implementation

Administrative Structure

Although the U.S. Small Business Administration (SBA) has an oversight role, the SBIR and STTR programs are implemented by individual federal agencies. Funding for the programs comes from the budgets of the implementing agencies, which can tailor their use of SBIR and STTR to meet agency-specific needs and priorities, provided the programs’ overarching principles are followed. The agencies designate R&D topics and accept, review, and select proposals. Each agency sets its own requirements for SBIR and/or STTR funding.

Although the two programs are separate, and have separate budgets, they are often referenced together and administered by the same program office within the participating agency (note that some agencies implement the SBIR program only, and not STTR).

SBA has broad authority to direct participating agencies in the administration of SBIR and STTR; within SBA, the Technology Program Office serves as the coordinating agency for both programs. SBA also reviews program progress, prepares annual reports to Congress (specifically, to the Senate Committee on Small Business and to the House Committees on Science and Small Business), and serves as the information link to both programs.

Finally, Congress plays a role—both in providing direction and guidance to SBA and individual agencies on SBIR and STTR implementation and by periodically renewing statutory authorization for these programs.
FEDERAL AGENCIES

In FY2019, 12 federal agencies participated in the SBIR program; five of these agencies also participated in STTR (Table 1). The two agencies with by far the largest SBIR/STTR budgets are the Department of Defense (DoD) and the Department of Health and Human Services (HHS), which includes the National Institutes of Health (NIH). The Department of Energy (DOE), the NSF, and the National Aeronautics and Space Administration (NASA) have the next largest budgets—they comprise the three additional agencies that administer both programs. (A more detailed discussion of funding across different agencies is provided in a later section.)

### FY2019 SBIR/STTR Budgets by Agency

<table>
<thead>
<tr>
<th>Agencies</th>
<th>Hosts</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Defense (DoD)*</td>
<td>SBIR, STTR</td>
<td>$1.80 B</td>
</tr>
<tr>
<td>Department of Health and Human Services (HHS) including the National Institutes of Health (NIH)</td>
<td>SBIR, STTR</td>
<td>$1.15 B</td>
</tr>
<tr>
<td>Department of Energy (DOE), including Advanced Research Projects Agency — Energy (ARPA-E)</td>
<td>SBIR, STTR</td>
<td>$308 M</td>
</tr>
<tr>
<td>National Science Foundation (NSF)</td>
<td>SBIR, STTR</td>
<td>$212 M</td>
</tr>
<tr>
<td>National Aeronautics and Space Administration (NASA)</td>
<td>SBIR, STTR</td>
<td>$183 M</td>
</tr>
<tr>
<td>U.S. Department of Agriculture (USDA)</td>
<td>SBIR</td>
<td>$30 M</td>
</tr>
<tr>
<td>Department of Homeland Security (DHS)</td>
<td>SBIR</td>
<td>$17 M</td>
</tr>
<tr>
<td>Department of Commerce: National Oceanic and Atmospheric Administration (NOAA)</td>
<td>SBIR</td>
<td>$9.5 M</td>
</tr>
<tr>
<td>Department of Education (ED)</td>
<td>SBIR</td>
<td>$8.4 M</td>
</tr>
<tr>
<td>Department of Transportation (DOT)</td>
<td>SBIR</td>
<td>$5.2 M</td>
</tr>
<tr>
<td>Department of Commerce: National Institute of Standards and Technology (NIST)</td>
<td>SBIR</td>
<td>$3.9 M</td>
</tr>
<tr>
<td>Environmental Protection Agency (EPA)*</td>
<td>SBIR</td>
<td>$3.6 M</td>
</tr>
</tbody>
</table>

**Total of all FY2019 SBIR/STTR Budgets across agencies**  
$3.73 B

SBIR: $3.28 B, STTR: $453 M = $3.73 B Combine SBIR & STTR Budget

*Budgeted Amount; other Agencies Obligated Amount; **Provides grants and contracts
III. SBIR/STTR Phases

The Small Business Innovation Development Act of 1982 established a three-phase structure for implementing the SBIR program; the same structure was later extended to STTR and is now uniformly applied across federal agencies.

Phase I (Concept phase) — Phase I lasts six to twelve months and supports efforts to explore the technical merit or feasibility of an idea or technology. This phase includes an evaluation of the commercial potential of proposed R/R&D efforts and considers the performance of the small business recipient prior to providing further federal support in Phase II. Phase I awards are generally in the range of $50,000–$250,000 for six months in the SBIR program or for one year in the STTR program.

Phase II — Phase II awards may last up to two years and are intended to help recipients expand on their Phase I R&D results. Funding is based on the results achieved in Phase I and on scientific and technical merit and commercial potential. Typically, only Phase I awardees are eligible for a Phase II award. Phase II awards are range from $500,000 to $1,500,000; a typical award would be $750,000 for two years.

Phase III — Phase III is intended to help small businesses pursue the commercialization objectives that emerge from Phases I and II. The SBIR and STTR programs do not provide funding in Phase III; rather, this phase may involve follow-on contracts with the U.S. government for products, processes or services.

Research Topics

As already noted, each agency defines its own project categories and research topics for the SBIR and STTR programs. For example, DOE’s SBIR/STTR Programs Office works collaboratively with the Department’s 13 program offices. Specific research topics for the SBIR and STTR programs are developed by DOE technical program managers. Examples of topic areas include fossil energy, advanced scientific & computing research, environmental management, and nuclear physics.
NSF, to give another example, focuses on transformative, high-risk technologies in areas such as advanced manufacturing, medical devices, photonics, and robotics, among others. The agency’s emphasis on technologies that are unproven and need further testing but have potential to meet a critical market need is more important than whether or not the technology fits within a particular topic area in driving SBIR/STTR funding decisions.

**REPORTING REQUIREMENTS**

The SBA is required by law to prepare an annual report on the SBIR and STTR programs for the Senate Committee on Small Business and the House Committees on Science and Small Business. The annual report includes several types of information:

Data on output and outcomes collected pursuant to Small Business Act (Small Business Act of July 30, 1953):

a. subsections (g)(8) for SBIR and (o)(9) for STTR (these requirements are described in the next section on federal agency responsibility);

b. The number of proposals received from, and the number and total amount of SBIR and STTR awards to, HUBZone small business concerns and firms with venture capital, hedge fund, or private equity firm investment (including firms that are majority-owned by multiple venture capital operating companies, hedge funds, or private equity firms);

c. A description of outreach and awards to firms owned and controlled by women or by socially or economically disadvantaged individuals;

d. General information about the allocation of funds to firms owned in majority part by venture capital operating companies, hedge funds, or private equity firms;

e. A detailed description of appeals of Phase III awards and notices of noncompliance with the SBIR and STTR Policy Directives filed by the SBA with federal agencies;

f. An accounting of funds, initiatives, and outcomes under the Commercialization Readiness Program; and

g. A description of the extent to which federal agencies are providing timely information to maintain the database described in subsection (k) of the Small Business Act.
FEDERAL AGENCY RESPONSIBILITY

Per Small Business Act subsection (g), each federal agency required to establish an SBIR and (where applicable) STTR program must collect the information necessary to support the SBA’s reporting requirements (described above) and to maintain a public and government database for the programs (described in subsection (k) of the Act). This includes information on award types, amounts, and recipients as well as information about the number of proposals received from, and number and amount of awards to, HUBZone businesses, among other categories of small businesses.

AGENCY SPENDING

One of SBA’s primary responsibilities is to determine whether agencies are required to establish SBIR and STTR programs based on their R/R&D budgets. Since minimum funding requirements for each program are based on a defined percentage of agencies’ overall R/R&D spending, the size of the SBIR/STTR Programs in any given year is dependent on the size of participating agencies’ extramural R/R&D budgets for that year.¹⁰

Participating agencies are required to report to SBA the methodology they use to calculate their extramural R/R&D budget not later than four months after the date of the enactment of the agency’s appropriations. Participating agencies also report their total extramural R/R&D funds obligated as part of their Annual Report submissions, which are due to the SBA by March 15 following the end of the prior fiscal year. This enables SBA to evaluate whether agencies are in compliance with minimum spending requirements.¹¹

Award data, including company and demographic information, is available through the public database on the SBIR Award data website for the years 1982 to 2019. Annual reports are located on the SBIR Reports page.
IV. Metrics

Current metrics for the SBIR/STTR programs focus on reporting efficiency and agency spending requirements of agencies. However, no specific metrics have been developed to measure program performance relative to program goals. Addressing this gap presents a significant opportunity for improvement. Relevant metrics could include, for example, commercial success or federal use of technologies developed by SBIR/STTR awardees and year-over-year growth in participation by small businesses owned by women or disadvantaged persons. Other opportunities to address diversity, equity, and inclusion goals in particular are discussed in the next section.

V. Diversity, Equity and Inclusion

A goal of the SBIR and STTR programs is to “foster and encourage participation in innovation and entrepreneurship by women and socially or economically disadvantaged persons.” There continue to be opportunities to increase diversity throughout the SBIR program including in program managers, applicants, reviewers, grant awardees and impact to a diverse community.

The tables below show analysis of FY2019 award data based on demographics. Raw award data is from the SBIR website public database where solicitation year and award year equal 2019. This analysis displays disaggregated data by gender and federal social/economic demographic. This data presents additional information in order to discern social and race-based biased that may exist in award decision and outcomes.

The below chart shows the percent of dollars awarded within four agencies (NSF, NIH, NASA and DOE). These four agencies are represented due to being similar in size.

For this paper groups not defined as Socially and Economically Disadvantaged (SED) are categorizes as White. This is based on the CFR designation of Socially and Economically Disadvantaged (SED) in Title 13 Part 124 of the Code of Federal Regulations.
The Code of Federal Regulations (CFR) provides definitions of the demographic groups:


Notably, NSF awards to companies that identify as being led by a women or socially and economically disadvantaged person are more than twice that of the other agencies represented. NSF has intentionally increased diversity amongst its SBIR program managers, which is comprised of approximately 40% women. It is recommended NSF strategies to increase the diversity if award recipients be further studied.

The SBIR and STTR Programs need diversity, equity and inclusion at all levels to enhance program relevance and impact. "Research by Deloitte suggests companies with an inclusive culture are six times more likely to be innovative."
Specific and recommended strategies to enhance diversity include but are not limited to:

- Integrate agency diversity offices and program offices including in office funding opportunity development
- Utilize agency diversity offices to enable wide and equitable distribution of funding opportunity announcements
- Set diversity goals including goals for outreach, diversity of applicant pool and awards.

Additional insight regarding opportunities to improve diversity are highlighted in the National Academy Report, "Innovation, Diversity, and the SBIR/STTR Programs" (2015) and "Review of the SBIR and STTR Programs at the Department of Energy" (2020).

**DATA ANALYSIS**

SBIR metrics for diversity typically display awards to small businesses owned women and socially and economically disadvantaged people (SDB) and businesses located in Hub Zones. To better understand the diversity and award rates to diverse business owners within the SBIR program this paper introduces and encourages this data to be further disaggregated to show award rates within demographic groups.

More granular data would allow agencies to better track program performance with respect to diversity, equity, and inclusion, and help agencies establish baselines to assess the success of outreach efforts. Data collected should include:

1. awards to a) all women, b) socially and economically disadvantaged women and c) white or non-socially and economically disadvantaged women
2. award rates to a) all Hub Zone businesses, b) Hub Zone women and c) Hub Zone men
3. a) award to all men, b) socially and economically disadvantaged men and c) white/non-socially and economically disadvantaged men

The Urban Institute’s Elevate Data for Equity project, which “aims to help change norms and practices of data use to advance equity and prevent harm to communities of color and people with low incomes” can provide “resources principles, guidance, and templates for equitable data practice.”
REVIEW PROCESS

A best practice for improving diversity outcomes is to diversify reviewers. Private corporations often require diverse interview panels; similarly, federal agencies should ensure that their review panels for SBIR/STTR applications are diverse.

Specific strategies to improve reviewer diversity include:

- identifying organizations that can provide diverse reviewers,
- reaching out to these organizations to recruit diverse reviewers, and
- establishing a baseline and process for ensuring diversity in the review process.

A challenge in this regard is that many agencies rely heavily on reviewers from academia—in part to address the intellectual property concerns of applicants, who may be reluctant to have their proposals reviewed by potential private-sector competitors. Primarily working with reviewers from academia, however, significantly reduces the pool of potential reviewers and can make it more difficult to assure diversity in the review process. Efforts to address this issue should encompass strategies for mitigating intellectual property concerns to allow for greater private-sector participation in the review process.

OUTREACH

A better ability to identify and connect with diverse small business talent continues to be a need for many federal agencies. The federal government maintains lists of “minority serving institutions” but these lists are often out of date. Agencies may find it more effective to establish internal groups that are specifically focused on improving the diversity of SBIR applicants and reviewers and can work directly with individual agencies’ diversity offices.

In addition, updating the federal list of minority serving institutions (MSIs) to ensure that it is current and comprehensive will help agency outreach efforts.\(^{14}\)

As a starting point NASA’s Minority University Research and Education Project (MUREP), which hosts an MSI list, offers an excellent resource for the SBIR/STTR programs. In addition, NASA’s MSI Exchange is a tool for finding diverse academic partners for teaming opportunities and competitive federal awards (additional diversity resources are provided in the appendix).
VI. Observations from Stakeholder Interviews

STAKEHOLDER INTERVIEWS

To better understand the SBIR/STTR programs, identify best practices, and solicit suggestions for program improvement, BPC interviewed a cross-section of stakeholders and participants, including congressional staff and agency staff as well as incubators, accelerators and small businesses/startups.

Agencies represented in our interviews include DOE, NSF, SBA, and AFWERX, which is a program of the U.S. Air Force. Most of the small businesses we interviewed have had experience with the NSF and/or DOE SBIR/STTR programs (although not exclusively).

Since the interviews were conducted for informational purposes only, we identify organizations rather than individuals in the discussion that follows. In many cases we also aggregate input without attributing particular views to a specific stakeholder or group of stakeholders.

While all agencies use a consistent three-phase program structure, SBIR/STTR organization, administration, and accessibility vary greatly between agencies. For example, some agencies will accept applications on any topic while others will accept applications only from a defined set of topics. Some agencies have a greenlighting/vetting process in which applicants for a Phase 1 award are required to first submit an abstract or whitepaper. The next remainder of this section focuses on the Air Force and NSF SBIR programs, which stakeholders describe as particularly accessible and responsive to entrepreneurial needs.

National Science Foundation — NSF (A – Agency)

Many agencies have procurement goals for their SBIR program, meaning that they aim to invest in technologies that the agency may be interested in procuring in the future. NSF is unique in that it does not have procurement goals—rather its broad goal is to push the frontiers of science and invest in technology innovation.

Accordingly, the NSF website describes its SBIR program as offering “very broad solicitation topics that are intended to encourage as many eligible science- and technology-based small businesses as possible to compete for funding.” The NSF program is also open to proposals that focus on technical and market areas not explicitly noted on the website.
NSF seeks to invest in technologies that can have a catalytic impact but it is also interested in creating human capital and building entrepreneurial skills. Applicants are encouraged to identify societal benefits that would be achieved by their technology.

To optimize the application process, the NSF created a letter of intent (LOI) process in mid-2019. Applicants submit a 2-page “pitch” or LOI; companies that pass this stage are invited to apply.

Several features of the NSF SBIR program are viewed as important to its success:

• **Focus on startups**

  The NSF focuses on funding new companies (typically less than three years old) that have had limited SBIR funding. This is to help ensure that SBIR investments (1) have a catalytic impact and (2) are used to commercialize new technologies rather than being used to grow and sustain company operations.

  The NSF’s evaluation process recognizes that startups often look less appealing on paper and attempts to ensure that applicants are fairly assessed based on their potential to meet NSF goals. More than half of NSF SBIR program managers are new to government and were previously entrepreneurs, founders, investors, or in other positions that gave them first-hand experience with entrepreneurs. NSF believes this experience gives program managers the insight to relate to the needs and perspectives of entrepreneurs and to understand the complexities of startups.

  a. **Flexibility and freedom**

    Recognizing that a company’s vision may change for a variety of reasons, the NSF SBIR program allows award recipients to pivot as needed and update SBIR program managers accordingly. The NSF application process also offers significant freedom to propose technologies that do not fit within posted topics.

  b. **Centralized program structure**

    Perhaps the most significant and unique feature of the NSF’s SBIR program is that the entire program is centralized within a single office that has dedicated program managers. In other agencies, the program may be spread across multiple offices, which means that supporting SBIR may be only a small portion of any individual manager’s responsibilities.
c. Outreach and support to startups

The NSF invites potential applicants to speak with NSF program managers as early as possible and seeks to provide excellent customer service.

The NSF has also targeted two areas of SBIR implementation for improvement:

d. Diversity, Equity and Inclusion

NSF has created marketing campaigns and sponsored programs to target women and under-represented people and states that it is now “exceeding the pipeline” on funding applicant from disadvantaged groups. However, success with these groups continues to be an issue. Among other efforts, the agency is seeking to increase diversity in its program managers.

e. Application process

While the NSF has modified its program to make it friendlier to startups, the application process is still long and cumbersome. Ideas for improvement include allowing startups to use a pitch deck instead of developing a full proposal.

Air Force/AFWERX

AFWERX was established by the Air Force in 2017 to promote a culture of innovation and facilitate connections with industry, academia, and other branches of the military. Its mission is to “solve problems and enhance the effectiveness of the service by enabling thoughtful, deliberate, ground-up innovation.” According to accelerators and incubators who have worked with AFWERX, the Air Force has done a good job re-thinking its SBIR program. They cite several characteristics that have made the program more effective and entrepreneur-friendly:

a. AFWERX and the SBIR/STTR programs work together to reach out to entrepreneurs.

b. Any business that meets SBIR criteria can apply for SBIR funding without being restricted to particular topics. That said, applicants are encouraged to look for alignment with areas of mission focus for the Air Force.

c. SBIR applications can take the form of pitch decks. This is a significant difference from other agencies, although it is also a step the NSF has taken. AFWERX has also introduced the concept of a "pitch day", which, according to the AFWERX website, has "marked a dramatic shift in the Air Force's acquisition strategy, creating a faster, smarter method to get cutting-edge technologies and capabilities into the hands of warfighters. Designed to speed up the investment process, the event has continued to expand its reach and scope."

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Other stakeholder perspectives

Several common suggestions or themes emerged from the stakeholder interviews with regard to optimizing the SBIR/STTR programs to make them more accessible and useful to accelerators and incubators, particularly startups:

a. **Simplify the application process and provided more support for startups.** The current process is resource intensive and, because it is distinct from other programs, requires specific expertise in applying for SBIR/STTR grants.

b. **Increase program flexibility.** Because the current funding process is challenging, companies often have to decide whether they are on the “SBIR track” or not. High-growth companies may decide they would rather have flexible capital and spend valuable time and resources focusing on implementation and company growth, rather than making the effort to seek government funding. Companies with an established grant infrastructure, by contrast, are better positioned to participate in SBIR. Companies that are developing “hard technologies” may find it more attractive to seek funding from ARPA-E, due to that agency’s more flexible program structure.

Separate from SBIR/STTR, DOE has also used technology prizes to encourage and support innovation.

c. **Provide the entrepreneurial network.** Many startups would benefit from help connecting to the broader “entrepreneurial community,” including to other founders who can share resources and lessons learned about commercializing a new technology and building a successful company.

d. **Build in more incentives for commercialization.** Past experience with the SBIR program shows that “SBIR shops” have had little incentive to commercialize. Instead, SBIR funding has more often been used to pay salaries, even as time and resources that could be directed to technology commercialization have been diverted to meeting SBIR/STTR program requirements. Better aligning those requirements with the unique and dynamic needs of successful commercialization was a common suggestion from stakeholders. For example, companies are constantly assessing market needs and updating their technology development process. But small businesses are often held to initial application requirements that do not reflect these changes.

e. **Simplify grant management.** The SBIR/STTR grant process has been criticized as particularly time consuming and complex. Startups need support to manage it, including help with properly identifying and documenting cost-reimbursable work.

f. **Expand the program to extend a lifeline during the current pandemic downturn.** Many startups did not receive Paycheck Protection Program (PPP) loans offered in response to the coronavirus crisis. For these small businesses, SBIR will be even more of a lifeline until the economy recovers.
g. **Allow a wider array of companies to have access to SBIR resources.**

Some startups have not been able to access the program due to limits on the amount of venture capital funding participants are allowed to have.

h. **Expedite funding.** SBIR application, award, and disbursement processes take time. Awarding funding up front or earlier would significantly benefit startups.

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**Funding Levels**

A consistent comment from stakeholders, especially small businesses and startups, was that Phase I SBIR/STTR funding levels are too low. SBA adjusts the maximum dollar amount available to recipients every year for inflation. The adjusted cap is effective for all awards issued on or after the date of the adjustment. As of November 2019, agencies could issue Phase I awards up to $256,580 and Phase II awards up to $1,710,531 without seeking SBA approval. Awards above these amounts required a waiver.

The current funding levels that trigger a waiver requirement were set in 1992. (Agencies can, of course, issue awards for lesser amounts at their discretion.) In a 2018 report to Congress, the Section 809 Panel, which was charged with developing recommendations to improve DoD capabilities, recommends increasing the cap on SBIR/STTR Phase I funding to $500,000 and Phase II funding to $1,500,000, with adjustments for inflation. This recommendation was developed for DoD but similar changes to funding caps should be assessed for other agencies.

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**VII. Conclusion**

SBIR and STTR are high-value programs that have generated significant innovation benefits and new business opportunities. An important benefit to award recipients is that the review process helps to validate their R&D efforts and the potential commercial value of the technology they are developing. Information about award recipients can be found in the SBIR database and on agency SBIR/STTR websites; additional success stories are highlighted in the SBIR showcase and on agency websites.

Our stakeholder interviews point to broad support for these programs within the small business community and to opportunities for further program improvement through greater flexibility, outreach, and applicant support, together with the development and use of well-designed performance metrics. Implementing the ideas described in this paper would make these excellent programs even better, and further empower diverse small business entrepreneurs to drive American innovation and competitiveness forward.
APPENDIX: Related Papers & Resources

GOVERNING DOCUMENTS

- S.881 — Small Business Innovation Development Act of 1982
- Executive Order No. 13329 (Encouraging Innovation in Manufacturing);
- Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program Policy Directive
- Small Business Act

SBIR/STTR RELATED REPORTS AND PAPERS

- SBIR Annual Reports
- Review of the SBIR and STTR Programs at the Department of Energy, National Academies Press (2020)
- Becoming America’s Seed Fund: Why NSF’s SBIR Program Should Be a Model for the Rest of Government, ITIF
- Report on women’s participation in the SBIR/STTR, National Women’s Business Council
- Federal Research and Development (R&D) Funding: FY2021
- Innovation, Diversity, and the SBIR/STTR Programs: Summary of a Workshop (2015), National Academy Press

TECHNOLOGY STATUS & INVESTING REPORTS

- Mind the Gap: A Design for a New Energy Technology Commercialization Foundation, ITIF
- Advancing the Landscape of Clean Energy Innovation, IHS Energy Futures Initiative Report,
- DeepTech Investing Report 2020, Different Funds
DIVERSITY RESOURCES

- **Society of Women Engineers** (has diversity and entrepreneur groups)
- **Department of Education Offices** that support diversity
- **Professional Organizations That Support People of Color in STEM**
- **National Association of Multicultural Engineering Program Advocates (NAMEPA)**
- **NSBE list of Engineering Organizations**
- Minority Serving Institutions (MSI) Program
  - “White House Initiative on Hispanic Serving Institutions”
  - “Asian American/Pacific Islander Serving Institutions”
  - **White House Initiative on Historically Black Colleges and Universities**
  - **White House Initiative on American Indian and Alaska Native Education**
  - **Asian American and Native American Pacific Islander-Serving Institutions Program**

- Black **Founders**

RESOURCES FOR START UPS

- Agency Capital, **A Startup’s Guide To SBIR**
- SBIR, **Guide to SBIR/STTR Program Eligibility**
Endnotes

2. SBIR Tutorial: Course 1 PROGRAM BASICS — THE HISTORY OF THE SBIR AND STTR PROGRAMS
3. https://www.sbir.gov/about
4. https://www.sbir.gov/about
5. https://www.sbir.gov/about
6. “Extramural” in this context means funding for activities that are not undertaken by government employees or through government-owned or operated facilities. See also footnote 14.
7. SBIR Program Basics, https://www.sbir.gov/tutorials/program-basics/tutorial-1
9. https://www.sbir.gov/about
10. “Extramural budget” is defined as “the sum of the total obligations [for R/R&D] minus amounts obligated for such activities by employees of the agency in or through Government-owned, Government-operated facilities.” For the Department of Energy the “extramural budget” excludes amounts obligated for atomic energy defense programs (i.e., nuclear weapons activities or naval reactor programs). For the Agency for International Development it excludes amounts obligated solely for general institutional support of international research centers or for grants to foreign countries.
11. Additionally, participating agencies must report their total fiscal year extramural R/R&D obligations to the NSF’s National Center for Science and Engineering Statistics (NCSES) “Survey of Federal Funds for Research and Development” (NCSES Survey). Where these amounts have sometimes differed from the amounts reported to the SBA, the SBA has requested explanations.
12. CFR 124.103 — Who is socially disadvantaged? (a) General. Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias within American society because of their identities as members of groups and without regard to their individual qualities. The social disadvantage must stem from circumstances beyond their control.
14. https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html
15. https://www.afsbirsttr.af.mil/Events/Pitch-Days/
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