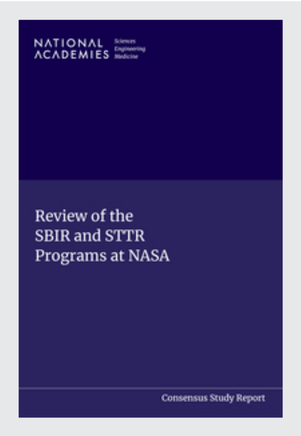

Review of the SBIR and STTR Programs at NASA (2026)

DETAILS

170 pages | 6 x 9 | PAPERBACK
ISBN 978-0-309-60403-1 | DOI 10.17226/29381

CONTRIBUTORS

Committee on the Review of the Small Business Innovation Research and Small Business Technology Transfer Programs at NASA; Social and Economic Systems; Center for Health, People, and Places; National Academies of Sciences, Engineering, and Medicine

SUGGESTED CITATION

National Academies of Sciences, Engineering, and Medicine. 2026. *Review of the SBIR and STTR Programs at NASA*. Washington, DC: The National Academies Press. https://doi.org/10.17226/29381.

NATIONAL ACADEMIES *Sciences Engineering Medicine*

NATIONAL ACADEMIES PRESS
Washington, DC

Review of the SBIR and STTR Programs at NASA

Committee on the Review of the Small Business Innovation Research and Small Business Technology Transfer Programs at NASA

Social and Economic Systems

Center for Health, People, and Places

Consensus Study Report

NATIONAL ACADEMIES PRESS 500 Fifth Street, NW Washington, DC 20001

This material is based upon work supported by the National Aeronautics and Space Administration (NASA) under contract number 80HQTR22DA003, order number 80HQTR23FA058, and contract number 80HQTR22DA003, order number 80HQTR24FA056. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of NASA.

International Standard Book Number-13: 978-0-309-60403-1
Digital Object Identifier: https://doi.org/10.17226/29381

This publication is available from the National Academies Press, 500 Fifth Street, NW, Keck 360, Washington, DC 20001; (800) 624-6242; https://nap.nationalacademies.org.

The manufacturer's authorized representative in the European Union for product safety is Authorised Rep Compliance Ltd., Ground Floor, 71 Lower Baggot Street, Dublin D02 P593 Ireland; www.arccompliance.com.

Printed in the United States of America.

Suggested citation: National Academies of Sciences, Engineering, and Medicine. 2026. *Review of the SBIR and STTR Programs at NASA*. Washington, DC: National Academies Press. https://doi.org/10.17226/29381.

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This Consensus Study Report was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the National Academies of Sciences, Engineering, and Medicine in making each published report as sound as possible and to ensure that it meets the institutional standards for quality, objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

We thank the following individuals for their review of this report:

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Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations of this report, nor did they see the final draft before its release. The review of this report was overseen by **WESLEY L. HARRIS** (NAE), Massachusetts Institute of Technology, and **ADAM B. JAFFE**, Brandeis University (emeritus). They were responsible for making certain that an independent examination of this report was carried out in accordance with the standards of the National Academies and that all review comments were carefully considered. Responsibility for the final content rests entirely with the authoring committee and the National Academies.

Acknowledgments

The committee would like to express its appreciation for insights, information, experiences, and perspectives provided by invited speakers during the conduct of this study. We recognize the considerable time and effort made by NASA staff, especially those from the Small Business Innovation Research and Small Business Technology Transfer programs, to help the committee understand the complexity associated with NASA's programs. NASA staff were responsive and generous with their time in answering the committee's questions and provided valuable data to aid the committee's analyses. The committee also thanks Evan Johnson, principal consultant, for invaluable contributions of research and technical assistance in the preparation of this report. Finally, we would particularly like to recognize the leadership of Gail Cohen and the contributions of the National Academies staff, especially David Dierksheide, Erin Rooney, and Emily Schmitz.

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Preface

This report is the result of a request by Congress for an assessment of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs at the National Aeronautics and Space Administration (NASA). As part of evaluations across five federal agencies, the National Academies of Sciences, Engineering, and Medicine convened a committee to examine the role of these programs in advancing NASA's mission and contributing to innovation within the United States.

The SBIR/STTR programs are based on the premise that small and young firms are an important source of novel ideas and have specialized capabilities that can contribute to technological innovation. The SBIR/STTR programs are a central mechanism through which federal agencies engage small businesses in research and development (R&D) activities. At NASA, however, the SBIR/STTR programs operate in a distinctive context. Unlike agencies that rely on large-scale procurement or continuous demand for broadly applicable technologies, NASA's innovation system is organized around specific missions, each requiring the integration of multiple advanced technologies under conditions of uncertainty. As a result, the role of the agency's SBIR/STTR programs is closely tied to this mission-driven approach to innovation.

This report provides a detailed examination of the context, operations, and outcomes of the SBIR/STTR programs at NASA. The committee undertook both qualitative and quantitative analyses, including an assessment of program processes and organizational structure, a characterization of the landscape of applicants and awardees, and a set of empirical analyses examining outcomes related to technology advancement, follow-on funding, and external innovation activity. These analyses provide a comprehensive and evidence-based understanding of how the SBIR/STTR programs function within NASA's broader innovation ecosystem.

Several overarching themes emerged from the committee's work. First, the NASA SBIR/STTR programs play a central, mission-aligned role in advancing technologies relevant to NASA. The programs are closely integrated with mission directorates and centers, and they support early- and intermediate-stage technology development that supports the agency's research, development, and operational needs. A subset of SBIR/STTR-supported technologies is ultimately incorporated into mission systems, while many others contribute as components, subsystems, or enabling technologies within larger architectures. The evidence indicates that NASA continues to invest in these firms through follow-on R&D and contracting activities, reflecting the value of their capabilities within the agency.

Second, the programs operate within a context in which demand for innovation is often limited in scale and highly specific to particular missions. NASA missions typically involve small quantities of highly specialized systems, and procurement is frequently one-off or small batch rather than sustained and large in scale. As a result, the primary contribution of the SBIR/STTR programs is best understood in terms of advancing technologies to integration readiness rather than considered through large procurement outcomes. The use of Technology Readiness Levels, supported by NASA's Technology Portfolio Management System (TechPort), provides a distinctive and systematic framework for tracking this progress and assessing technology advancement across the agency.

Third, the committee finds that NASA's SBIR/STTR programs are implemented through a structured and evolving set of processes that have been strengthened by recent organizational changes. The centralization of key program functions, the development of improved data systems, and the introduction of new mechanisms for outreach and topic development have enhanced coordination across mission directorates and centers. While opportunities remain to streamline processes and reduce administrative burden, the overall structure provides a strong foundation for aligning SBIR/STTR activities with NASA's strategic priorities and for tracking program outcomes.

Fourth, while the programs do contribute to broader innovation and commercialization outcomes, these effects differ in important ways from those observed in other agencies. NASA SBIR/STTR firms do attract follow-on funding from other federal agencies and, in some cases, from private capital. The SBIR/STTR programs are only one of several forces—including scale-oriented entrepreneurial activity, private investment, and large-scale government contracts—shaping the rapidly growing commercial space sector. SBIR/STTR plays a critical complementary role in the growth of the commercial sector, supporting the development of technologies and specialized suppliers that contribute to both NASA missions and emerging commercial applications.

Finally, the committee's work highlights the importance of data and measurement in assessing the performance of SBIR/STTR and other government investment programs. NASA's TechPort system represents a distinctive strength, providing a framework for linking technology investments to mission objectives and tracking progress over time. At the same time, limitations in tracking downstream activities—particularly those occurring through subcontracting, supply-chain relationships, or external markets—underscore the need for continued improvement in data integration and accessibility. Strengthening these capabilities would enhance both program management and the ability to assess outcomes in a systematic manner.

Taken together, the evidence in this report supports the conclusion that NASA's SBIR/STTR programs are effective mechanisms for engaging small businesses in mission-oriented innovation and for advancing technologies that contribute to the agency's objectives. At the same time, the distinctive features of NASA's innovation system—its mission-driven structure, the limited scale of procurement, and its integration within a broader federal and commercial ecosystem—shape both the role of the programs and the metrics appropriate for evaluating their performance.

Maryann P. Feldman, *Co-Chair*
Scott Stern, *Co-Chair*
Committee on the Review of the Small Business Innovation Research and Small Business Technology Transfer Programs at NASA
May 2026

Acronyms and Abbreviations

AFRC	Armstrong Flight Research Center
AMA	Ask Me Anything
AMU	Acquisition Management Unit
ARC	Ames Research Center
ARMD	Aeronautics Research Mission Directorate
BAA	broad agency announcement
BIRAC	Biotechnology Industry Research Assistance Council
CCRPP	Civilian Commercial Readiness Pilot Program
CMU	Customer Management Unit
CPI	Consumer Price Index
DOD	U.S. Department of Defense
ESDMD	Exploration Systems Development Mission Directorate
FAST	Federal and State Technology Partnership Organization
FY	fiscal year
GRC	Glenn Research Center
GSFC	Goddard Space Flight Center
HBCU	historically Black college or university

HEOMD	Human Exploration Operations Mission Directorate
HUBZone	historically underutilized business zone
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KOSBIR	Korea Small Business Innovation Research
KSC	Kennedy Space Center
LaRC	Langley Research Center
MIS	Made In Space
MIT	Massachusetts Institute of Technology
MPLAN	Minority Partnership Learning Award Notification
MSD	Mission Support Directorate
MSFC	Marshall Space Flight Center
MSI	minority-serving institution
NASA	National Aeronautics and Space Administration
NIH	National Institutes of Health
Phase II-E	Phase II-Extended
PI	principal investigator
P.L.	Public Law
ProSAMS	Proposal Submissions and Award Management System
PSST	Portfolio Selection Support Tool
R&D	research and development
RI	research institution
SBA	Small Business Administration

SBIR	Small Business Innovation Research
SBIRI	Small Business Innovation Research Initiative
SED	socially and economically disadvantaged
SMD	Science Mission Directorate
SOMD	Space Operations Mission Directorate
STMD	Space Technology Mission Directorate
STTR	Small Business Technology Transfer
TABA	Technical and Business Assistance
TCU	tribal colleges and universities
TechPort	Technology Portfolio Management System
TRL	Technology Readiness Level
UEI	Unique Entity Identifier

Summary

The National Aeronautics and Space Administration (NASA) asked the National Academies of Sciences, Engineering, and Medicine (the National Academies) to conduct a review of NASA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, in accordance with a legislative mandate. The committee convened by the National Academies to conduct this review produced this report on the committee's detailed examination of the operations of and outcomes stemming from these programs.

Drawing on published research and existing data, the committee analyzed (1) the contribution of SBIR/STTR awardees to NASA's research and development (R&D) and other mission needs; (2) broad innovation impacts associated with these programs; (3) collaborations between small businesses and research institutions associated with the STTR program, including any barriers to or opportunities for such collaborations; and (4) the effectiveness of NASA's SBIR/STTR outreach, application, and selection processes.

Although NASA's SBIR/STTR programs represent just 4 percent of total federal SBIR/STTR spending (the majority of which is accounted for by the Department of Defense and National Institutes of Health), the committee found that these programs are effective at supporting early-stage research by small businesses that is further matured through follow-on funding from NASA or other federal agencies, consistent with the programs' goal of using small businesses to meet federal R&D needs. Technologies developed by a subset of these firms are ultimately incorporated into mission-critical systems or subsystems. NASA SBIR/STTR participation is associated with some increase in access to external capital after an initial award; however, this modest increase indicates that access to private financing is not the primary pathway through which NASA SBIR/STTR firms generate value.

The committee found that NASA closely aligns its SBIR and STTR solicitations with the agency's mission and technology needs, and small businesses that participate in the programs have contributed to the success of NASA missions, including the Mars rover. At the same time, the award sizes may limit the programs' impact. Award sizes are well below the statutory maximums allowed under Small Business Administration guidance, and these relatively small award sizes may be reducing the potential pool of applicants. The average initial amount of venture funding for space-oriented start-up companies is much larger than a NASA Phase I award. Still, NASA's SBIR/STTR programs are

implemented in a relatively standardized manner, with similar award sizes and structures across directorates and centers, and in many ways benefit from this standardized approach. Across NASA, SBIR/STTR projects begin at similar early-stage Technology Readiness Levels, progressing to midrange levels by the end of the first phase of SBIR/STTR funding, consistent with the programs' role in supporting early-stage technology development within NASA's broader research and technology portfolio.

The committee's analysis of STTR awards indicated that collaborations between small businesses and research institutions are concentrated among a relatively small set of research-intensive universities, particularly those with established capabilities in aerospace and related engineering fields. New potential partner institutions may find it costly to create and approve the legal agreements required for such partnerships, a hurdle that inhibits collaborations between small businesses and smaller universities that do not usually contract with the federal government.

NASA has recently reorganized its SBIR/STTR programmatic structure to ensure that small businesses can navigate the processes involved, that SBIR/STTR awards generate broader innovation benefits, and that those benefits can be tracked and measured. The restructuring centralizes some of the backend operations of the award processes so as to eliminate redundant roles, centralize support services for NASA-wide personnel, and enable better tracking of awards and outcomes. The new programmatic structure is designed to facilitate communication across NASA directorates and centers, each of which has unique R&D needs.

NASA's outreach capacity has been substantially affected by a number of factors, including impacts of the COVID-19 pandemic and limited funding for outreach and travel. At the same time, NASA has undertaken some process and outreach experimentation, including reduced-paperwork application requirements; presolicitation market-scouting gatherings; and training sessions associated with its experimental Ignite program, which is focused on technologies with strong commercial pull—including commercial markets outside of NASA.

From the 34 findings resulting from its review, the committee developed 16 recommendations, listed in full in Boxes S-1 and S-2, respectively. The remainder of this summary presents an overview of the review and highlights eight findings and six recommendations related to the effectiveness of NASA's overall SBIR/STTR operations, the rapidly growing commercial space sector, and metrics for assessing technology advancement and impact resulting from the programs.

KEY FINDINGS AND RECOMMENDATIONS

The committee's key findings and recommendations can be broadly categorized as addressing the three areas noted above: program effectiveness, the rapid growth of the commercial space sector, and the measurement of technology advancement and impact.

Program Effectiveness

The first four key findings address the programs' effectiveness, including whether they serve as a gateway for small businesses to engage with NASA's broader R&D and contracting activities. While the committee found that NASA's SBIR and STTR programs are an on-ramp for many firms seeking to participate in NASA-related R&D and technology development, they are not the only entry point into the broader NASA R&D ecosystem. At the same time, the committee found that the programs' organizational structure, including the recent reorganization, has been effective at helping small businesses meet NASA's mission-driven technology needs, and that NASA SBIR/STTR awardees tend to attract a substantial amount of additional, non-SBIR/STTR funding from NASA. Additionally, the programs support a heterogeneous population of small businesses, some of which pursue growth-oriented strategies that involve attracting private capital. Firms that receive NASA SBIR/STTR funding are more likely to subsequently attract private capital than those that apply but do not receive the awards, indicating that receipt of an award signals technical merit to other funders.

> Finding 2-3: NASA's SBIR/STTR programs are an important entry mechanism among the multiple pathways by which small businesses engage with the agency.

> Finding 4-1: The organizational structure and related processes of NASA's SBIR/STTR programs facilitate the advancement of NASA's mission and key priorities.

> Finding 6-1: NASA's SBIR/STTR programs have served as an effective and strategic mechanism for developing and advancing technologies that are critical to the agency's missions and priorities.

> Finding 6-4: NASA SBIR/STTR awardees tend to attract significant non-SBIR/STTR funding from NASA, at a ratio of more than 3:1.

Overall, the committee recommends that the new organizational program structure be maintained. At the same time, the committee acknowledges that some of the program processes and procedures could be simplified, and that some of the best practices from NASA's experimental Ignite program could be adopted more widely. The committee also notes that some of the program contracting processes are cumbersome and that additional training and contracting flexibility might help relieve some of that burden. These observations are consistent with requirements in the recent reauthorization that federal agencies establish training activities to help transition SBIR/STTR-funded technologies into Phase III awards and to simplify and standardize procedures and contracts for the SBIR/STTR programs.

Recommendation 4-1: NASA's Small Business Innovation Research and Small Business Technology Transfer program leaders should institutionalize the new organizational structure, complete process cycles without midcourse changes, and leverage the new structure as a foundation for ongoing improvements in program processes, data tracking, and postaward support.

Recommendation 4-2: NASA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer Program Office should apply more generally the best practices from the SBIR Ignite program. These practices include a strong external focus, external input into topic selection and outreach to new applicants, and streamlined application processes.

Recommendation 4-5: NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program Office should develop training modules, including refresher training, for technical monitors, subtopics managers, reviewers, and other SBIR/STTR personnel as needed. In addition, because of the concern that reviewers are overburdened, the NASA administrator should provide clear incentives for participating in the review process—for example, by including this participation as a significant strength during annual performance appraisals or providing a project code to cover time spent refereeing.

Recommendation 4-8: The NASA administrator should establish a pilot program to explore ways of strengthening and/or formalizing the process of transitioning Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) technologies from Phase II to NASA-funded Phase III development of mission-critical components or subsystems, which might include SBIR/STTR-funded firms subcontracting to NASA and Department of Defense prime contractors.

Rapidly Growing Commercial Space Sector

While NASA SBIR/STTR–funded firms have been effective at meeting NASA mission needs, the committee recognizes that the U.S. space sector has undergone a significant transformation, marked by the rapid growth of the commercial space sector. Whereas NASA historically operated at the center of a largely government-directed system of space exploration and technology development, recent years have seen the emergence of a more decentralized and commercially oriented ecosystem in which private firms play an increasingly prominent role in both developing and executing space-based activities. The resulting "New Space" sector includes both established aerospace firms and a growing set of entrepreneurial and venture-backed companies. Firms such as SpaceX and Blue Origin have played a leading role in developing launch capabilities and supporting infrastructure, while a broader ecosystem of firms has emerged to exploit new opportunities associated with space-based data, services, and applications. Venture capital investment in the sector has increased substantially, supporting the entry of hundreds of start-ups. Importantly, this emerging commercial space sector includes many firms in the United States, as well as firms and institutions around the world. That is not to say that NASA has not played a role in New Space—many of the innovations in the space sector arise from inventions created by traditional aerospace companies (rather than start-ups and venture capital–backed firms). In addition, the contributions of SBIR/STTR-funded small businesses to those innovations are often difficult to identify because NASA (and other federal agencies) does not always collect data on subcontracting by SBIR/STTR-funded firms or designate additional support for firms to continue their SBIR/STTR-funded work as Phase IIIs.

These developments reflect a broader shift from a centralized, government-led model of space activity toward a more distributed system in which private firms increasingly shape both the pace and direction of innovation. While some successful companies, such as Made In Space, have started with NASA SBIR/STTR funding, the committee's analysis revealed that relative to other private firms, SBIR/STTR awardees are less well connected to the private venture capital needed to operate at scale in the commercial space sector. The goals of the programs include both using small businesses to meet federal R&D needs and increasing private-sector commercialization of federally funded innovations; these goals may be in conflict, especially given the small size of NASA's SBIR/STTR programs relative to other federal agencies' programs and the capital requirements needed to produce scalable innovations in the commercial space industry. The following findings address the burgeoning commercial space sector and serve as the basis for a recommendation to facilitate these space-sector start-ups through the SBIR/STTR programs.

> Finding 2-4: The rapid expansion of the commercial space sector presents both opportunities and challenges for NASA's SBIR/STTR programs, as new sources of private-sector funding and commercial demand complement—rather than replace—NASA's mission-driven innovation system.

> Finding 6-7: Relative to other private firms, NASA SBIR/STTR awardees tend to be less well connected to private venture capital prior to their engagement with the SBIR/STTR programs, suggesting that these firms may be more interested in serving the agency's mission than in expanding the scale of their sales or operations.

Finding 6-8: NASA SBIR/STTR awardees tend to attract some form of publicly reported private capital (but not a higher level of venture capital) after receiving their first NASA SBIR/STTR award.

Recommendation 6-2: NASA should consider a range of strategies for how best to accelerate and support the emerging set of start-ups and scale-ups in the commercial space sector. The agency's Small Business Innovation Research and Small Business Technology Transfer programs should continue to play a key role in facilitating the advancement of technologies and components important to this emerging sector, while recognizing that the capital and scaling opportunities required for certain technologies require the involvement of other programs and/or private-sector initiatives.

Measurement of Technology Advancement and Impact

The committee's final set of key findings and recommendations concerns how to assess whether a given technology is sufficiently mature for incorporation into a mission, especially in a system characterized by distributed innovation and mission-specific integration needs. NASA addresses this challenge with Technology Readiness Levels (TRLs), a standardized framework for evaluating the maturity of technologies as they progress from basic principles to operational deployment. TRLs provide a common language across mission directorates, centers, and external partners for assessing technological progress and readiness for integration. While not determinative on their own—since ultimate deployment depends on mission timing, system-level integration, and programmatic priorities—TRLs offer a systematic means of gauging whether a component, instrument, or subsystem has reached a threshold consistent with potential mission use. In this way, TRLs play an important coordinating role within NASA's innovation system, enabling the agency to manage technological uncertainty and align distributed development efforts with mission requirements.

NASA's Technology Portfolio Management System (TechPort) aids in understanding the progress and impact of technologies supported by the agency's SBIR/STTR awards by providing information on NASA's technology development through a web-based portal. For outside users, TechPort provides information on NASA-funded projects, including a detailed description of each project; its primary technology area; anticipated benefits to NASA, the commercial space industry, and other government agencies; the responsible mission directorate; the name and location of the lead organization being funded; key partners to the lead organization; project contacts; and the TRL at the start of the project, currently, and as estimated for the end of the project.

Importantly, TechPort provides user-friendly access to information linking NASA's contracts and grants to its technology development and missions. NASA and external users can thereby understand the links between NASA's technology investments and its strategy for filling any technology gaps. This capability is unique among those agencies that offer SBIR/STTR awards. Because TechPort contains data on changes in the technology readiness of projects, it is a useful mechanism for tracking NASA's progress on a variety of technologies. Providing links between SBIR/STTR awards and Phase III awards (which should include subcontracting by SBIR/STTR-funded small businesses to larger companies) would facilitate understanding of how awardees have advanced NASA's technology needs.

> Finding 3-5: NASA's TechPort provides a unique capability for NASA and the wider research community to demonstrate how the agency's technology investments align with its strategy for filling technology gaps. By linking SBIR/STTR awards to mission directorates and tracking changes in projects' TRLs, TechPort establishes a foundation for systematic portfolio-level assessment of technology progression.

> **Recommendation 3-2: NASA should build on the strengths of the Technology Portfolio Management System (TechPort) for use in portfolio management and evaluation. To improve its ability to provide a systematic analysis of progress in technology readiness and transition pathways across mission directorates, TechPort should link firms funded by the Small Business Innovation Research/Small Business Technology Transfer programs to Phase III awards and include all NASA research and development and procurement grants and contracts, not just a subset of its smaller awards.**

FINAL THOUGHTS

NASA's SBIR/STTR programs advance the agency's mission-driven technology needs, and NASA has created an infrastructure for measuring and documenting these advances. At the same time, NASA missions typically involve limited quantities of highly specialized systems, often produced for a single mission or a small number of deployments. As a result, procurement is frequently one-off or small batch in nature and does not involve sustained, large-scale production. The primary value of participation in NASA's innovation system therefore lies less in large procurement contracts and more in contributing critical components, capabilities, or technologies to mission systems. This distinction has important implications for firms—particularly small businesses—whose engagement with NASA is often part of a broader portfolio spanning multiple agencies and commercial markets. NASA's SBIR/STTR programs can expand the set of technological options available to the agency and maintain alignment with mission objectives, with the caveat that these new options are closely related to the capability base of SBIR/STTR firms.

BOX S-1
Complete Set of Findings

Finding 2-1: NASA's SBIR/STTR's topics and subtopics are closely aligned with the agency's mission needs and advance technologies that support its objectives, including the integration of those technologies into mission systems.

Finding 2-2: NASA's SBIR/STTR awards support early-stage, enabling technologies, advancing their technical maturity and broadening the range of options available for mission applications.

Finding 2-3: NASA's SBIR/STTR programs are an important entry mechanism among the multiple pathways by which small businesses engage with the agency.

Finding 2-4: The rapid expansion of the commercial space sector presents both opportunities and challenges for NASA's SBIR/STTR programs, as new sources of private-sector funding and commercial demand complement—rather than replace—NASA's mission-driven innovation system.

Finding 3-1: NASA's SBIR/STTR programs operate in a highly standardized manner across mission directorates, with uniform award sizes that are consistently below statutory maximums and initial and final TRLs that are similar across mission directorates.

Finding 3-2: The steady volume of NASA's SBIR/STTR Phase I applications suggests that the programs remain an attractive source of early-stage financing for small firms wishing to contribute to NASA's mission and work with the federal government. At the same time, a decline in the number of Phase I awards funded has lowered award rates over the past decade.

Finding 3-3: Most NASA SBIR/STTR awardees have won only a single Phase I award, indicating that participation is broadly distributed across firms rather than concentrated among repeat recipients.

Finding 3-4: Generally, state-level analysis reveals a positive association between venture capital investment and NASA's SBIR/STTR funding, but several states with low venture capital activity have relatively high NASA SBIR/STTR support, on a per capita basis.

Finding 3-5: NASA's TechPort provides a unique capability for NASA and the wider research community to demonstrate how the agency's technology investments align with its strategy for filling technology gaps. By linking SBIR/STTR awards to mission directorates and tracking changes in projects' TRLs, TechPort establishes a foundation for systematic portfolio-level assessment of technology progression.

Finding 3-6: NASA SBIR/STTR funding helps reduce geographic disparities in innovation opportunity. Many NASA SBIR/STTR award recipients are located in regional innovation hubs related to aerospace and academia that are distant from NASA centers.

Finding 4-1: The organizational structure and related processes of NASA's SBIR/STTR programs facilitate the advancement of NASA's mission and key priorities.

Finding 4-2: The NASA SBIR/STTR reorganization has enhanced collaboration and communication and has introduced both opportunities and challenges for staff as they adjust to the new structure.

Finding 4-3: NASA's SBIR/STTR Program Office has adopted a number of modernization measures to help streamline topic announcements, proposal submissions, and award management. These measures include moving to a new electronic proposal and award management system and a planned move to offer funding opportunities through a broad agency announcement, which would allow release of subtopics on a rolling basis. Yet despite these modernization efforts, there remains a broad consensus among NASA staff and stakeholders that the processes are too complex and the required documentation is cumbersome for small business applicants.

Finding 4-4: The centralization and partial automation of NASA's due diligence review for SBIR and STTR awards within the Business Intelligence Unit ensures that publicly funded innovations are not compromised by foreign affiliates of concern, reduces the burden of conducting due diligence on subtopic managers, and helps speed up the award process.

Finding 4-5: Responding to the rapid growth of the commercial space sector and the increasing focus on space within the Department of Defense (particularly through Space Command), NASA has undertaken initiatives aimed at more closely connecting its SBIR/STTR programs to this emerging sector. Most notable among these initiatives is the SBIR Ignite program, which offers a small number of awards focused on commercialization of technologies beyond those for which NASA is the ultimate customer. Yet while NASA Ignite serves as a critical experimental platform, it is a relatively small initiative.

Finding 4-6: NASA's SBIR/STTR programs employ a multifaceted outreach strategy that has been diminished by the impacts of the COVID-19 pandemic, organizational changes, and budget constraints. In the face of limited dedicated outreach funding, the programs leverage events hosted by other organizations. However, traditional outreach efforts, such as road tours, have not shown effectiveness in generating competitive proposals, especially from new applicants or from underresourced research institutions or parts of the country.

Finding 4-7: NASA's SBIR/STTR Program Office provides minimal training for SBIR/STTR team members, reviewers, and new applicants. Lacking direct authority and funding for application assistance, NASA's SBIR/STTR programs have limited ability to provide structured preproposal assistance to underresourced applicants. Additional training, especially for technical monitors and reviewers, is needed.

Finding 4-8: There are limited awareness and clarity about how to use the tools and/or access metrics now collected and maintained by NASA's SBIR/STTR Program Office. For example, SBIR/STTR team members varied in their understanding of the ranking system used to determine award selection.

Finding 4-9: Transitioning NASA SBIR/STTR–funded technologies to Phase III awards relies mainly on informal connections among program managers, technical monitors, and other NASA personnel.

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BOX S-1
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Finding 4-10: Individual NASA centers have developed effective local partnerships with state Federal and State Technology Partnership Organizations and other regional entities, but these successful practices are not systematically shared programwide.

Finding 4-11: Experienced firms may have an advantage in the review process because of their greater experience and resources.

Finding 5-1: NASA's STTR research partnerships are concentrated among a relatively small subset of research-intensive universities with established capabilities in aerospace and related engineering fields. A limited number of institutions appear repeatedly across awards, indicating a centralized collaboration network. Information on SBIR collaborations would be necessary to obtain a fuller picture of collaborations with research institutions.

Finding 5-2: Minority-serving institutions participate in a substantial share of NASA STTR collaborations, although partnerships with historically Black colleges and universities are rare.

Finding 5-3: NASA STTR–awarded firms that are owned by socially or economically disadvantaged persons or women are more likely to partner with a minority-serving institution than are the overall set of NASA STTR awardees.

Finding 5-4: Administrative, legal, and contractual requirements associated with STTR cooperative research agreements likely influence collaboration patterns by favoring research institutions with prior experience in federal research contracting and established technology transfer infrastructure.

Finding 6-1: NASA's SBIR/STTR programs have served as an effective and strategic mechanism for developing and advancing technologies that are critical to the agency's missions and priorities.

Finding 6-2: NASA's SBIR/STTR programs have played an important role in contributing to technologies and companies engaged in the growing commercially oriented space sector.

Finding 6-3: Firms that have received both SBIR/STTR and non-SBIR/STTR funding from NASA typically receive their first NASA funding through the SBIR/STTR programs.

Finding 6-4: NASA SBIR/STTR awardees tend to attract significant non-SBIR/STTR funding from NASA, at a ratio of more than 3:1.

Finding 6-5: NASA SBIR/STTR firms attract significant non-SBIR/STTR funding from other federal agencies.

Finding 6-6: Relative to other R&D projects tracked in NASA's TechPort, NASA SBIR/STTR projects report larger average gains in TRLs over the course of their support from NASA and are more likely to report an advance of at least two TRLs. However, NASA projects are no more likely than comparable TechPort-reported projects to achieve a TRL of 7 or above, and they achieve a TRL of 9 only in rare circumstances.

Finding 6-7: Relative to other private firms, NASA SBIR/STTR awardees tend to be less well connected to private venture capital prior to their engagement with the SBIR/STTR programs, suggesting that these firms may be more interested in serving the agency's mission than in expanding the scale of their sales or operations.

Finding 6-8: NASA SBIR/STTR awardees tend to attract some form of publicly reported private capital (but not a higher level of venture capital) after receiving their first NASA SBIR/STTR award.

Finding 6-9: Although many NASA SBIR/STTR awardees do receive formal intellectual property protections (patents), these firms experience no "boost" in the rate of patenting after receiving their first NASA SBIR/STTR award. This observation may reflect a relative lack of reliance on patents in the NASA innovation ecosystem.

BOX S-2
Complete Set of Recommendations

Recommendation 3-1: NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program Office, in coordination with directorate leadership, should periodically assess whether its standardized SBIR and STTR award amounts and structures are optimally aligned with the technical scope and capital intensity of the technologies it solicits. NASA should offer Direct to Phase II awards or larger post–Phase II strategic breakthrough awards as allowed in the 2026 reauthorization of the SBIR/STTR programs.

Recommendation 3-2: NASA should build on the strengths of the Technology Portfolio Management System (TechPort) for use in portfolio management and evaluation. To improve its ability to provide a systematic analysis of progress in technology readiness and transition pathways across mission directorates, TechPort should link firms funded by the Small Business Innovation Research/Small Business Technology Transfer programs to Phase III awards and include all NASA research and development and procurement grants and contracts, not just a subset of its smaller awards.

Recommendation 4-1: NASA's Small Business Innovation Research and Small Business Technology Transfer program leaders should institutionalize the new organizational structure, complete process cycles without midcourse changes, and leverage the new structure as a foundation for ongoing improvements in program processes, data tracking, and postaward support.

Recommendation 4-2: NASA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer Program Office should apply more generally the best practices from the SBIR Ignite program. These practices include a strong external focus,

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BOX S-2
(Continued)

external input into topic selection and outreach to new applicants, and streamlined application processes.

Recommendation 4-3: NASA's contracting office should allow more flexibility in funding Small Business Innovation Research and Small Business Technology Transfer awards—for example, offering purchase orders or procurement for Phase I awards and cooperative agreements for Phase I or II.

Recommendation 4-4: Congress should not mandate that NASA offer open topics. Instead, Congress should allow more flexibility for agencies such as NASA to experiment with approaches that support technology development and infusion to meet various goals. Such an approach is exemplified by SBIR Ignite, which seeks innovative products that can be infused into NASA missions as well as external markets.

Recommendation 4-5: NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program Office should develop training modules, including refresher training, for technical monitors, subtopics managers, reviewers, and other SBIR/STTR personnel as needed. In addition, because of the concern that reviewers are overburdened, the NASA administrator should provide clear incentives for participating in the review process—for example, by including this participation as a significant strength during annual performance appraisals or providing a project code to cover time spent refereeing.

Recommendation 4-6: NASA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer Program Office should standardize and expand successful outreach models from the SBIR Ignite pilot—specifically, Catalyst events and Ask Me Anything sessions—while developing and evaluating new academic partnership models.

Recommendation 4-7: NASA's Small Business Innovation Research and Small Business Technology Transfer Program Office should develop an integrated support system for underresourced and first-time applicants.

Recommendation 4-8: The NASA administrator should establish a pilot program to explore ways of strengthening and/or formalizing the process of transitioning Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) technologies from Phase II to NASA-funded Phase III development of mission-critical components or subsystems, which might include SBIR/STTR-funded firms subcontracting to NASA and Department of Defense prime contractors.

Recommendation 5-1: NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program Office should expand the availability of information on research partnerships for both SBIR and STTR awards by incorporating standardized partnership data into the Technology Portfolio Management System database. Such information should include partner type, institutional characteristics, and indicators of repeat collaborations to support monitoring of participation patterns.

Recommendation 5-2: NASA's Small Business Innovation Research/Small Business Technology Transfer (STTR) Program Office should develop and disseminate standardized resources to reduce administrative and contractual barriers to the formation of STTR partnerships. These resources might include model cooperative research agreement templates and guidance on intellectual property and data sharing provisions to facilitate participation by institutions with limited prior experience.

Recommendation 5-3: NASA's Small Business Innovation Research/Small Business Technology Transfer (STTR) Program Office should take steps to broaden participation in STTR collaborations by facilitating connections between small businesses and underrepresented research institutions, including historically Black colleges and universities, through targeted outreach and partnership development efforts.

Recommendation 6-1: NASA's contracting and procurement workforce should advocate for the maximum practicable use and transition of products, services, and technologies developed under the Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs into NASA missions by means of Phase III awards to small businesses, as Congress required in the 2026 reauthorization of the SBIR/STTR programs.

Recommendation 6-2: NASA should consider a range of strategies for how best to accelerate and support the emerging set of start-ups and scale-ups in the commercial space sector. The agency's Small Business Innovation Research and Small Business Technology Transfer programs should continue to play a key role in facilitating the advancement of technologies and components important to this emerging sector, while recognizing that the capital and scaling opportunities required for certain technologies require the involvement of other programs and/or private-sector initiatives.

Recommendation 6-3: Congress should require agencies to submit scoring information on applicants to the government database so as to facilitate analysis of the impact of NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) funding on applicants. Scoring information could enable the determination of a well-defined funding cutoff, which would help identify any cause-and-effect relationship between NASA's SBIR/STTR funding and outcomes.

1

Introduction[1]

The Small Business Innovation Research (SBIR) program was conceived in the late 1970s and early 1980s to address several related, but distinct, challenges. The focus and purpose of the program, at least as articulated by Congress, have changed over time. The 1982 act creating the program stated that its purposes were to stimulate technological innovation, to use small business to meet federal research and development (R&D) needs, to foster and encourage participation in technological innovation by minority and disadvantaged persons, and to increase private-sector commercialization of innovations derived from federal R&D.[2] The 1992 reauthorization of the program established the complementary Small Business Technology Transfer (STTR) program, which was intended to improve the commercialization of innovations resulting from federal funding by requiring collaborations between research institutions and small businesses. The 1992 legislation also tweaked the purposes of the SBIR program slightly. The stated purposes of the program were changed to emphasize the goals of increasing private-sector commercialization of technology developed through federal R&D; increasing small business participation in federal R&D; and improving the federal government's dissemination of information concerning the program, particularly with regard to program participation by small businesses owned by women and socially and economically disadvantaged groups.[3] The 1992 act stated that the program had created jobs, but it was not until its 2000 reauthorization that legislative language was added to request that the National

[1] Material in this chapter draws from material in Chapter 1 of the National Academies of Sciences, Engineering, and Medicine report *Review of the SBIR and STTR Programs at the Department of Energy* (NASEM, 2020), Chapter 1 of the National Academies report *Assessment of the SBIR and STTR Programs at the National Institutes of Health* (NASEM, 2022), Chapter 1 of the National Academies report *Review of the SBIR and STTR Programs at the National Science Foundation* (NASEM, 2023), and Chapter 1 of the National Academies report *Review of the SBIR and STTR Programs at the Department of Defense* (NASEM, 2026).

[2] U.S. Congress, Small Business Innovation Development Act of 1982, P.L. 97-219, Section 2(b) (July 22, 1982).

[3] U.S. Congress, Small Business Research and Development Enhancement Act, P.L. 102-564, Section 102(b)(2–4) (October 28, 1992).

Academy of Sciences evaluate the economic and noneconomic benefits of the SBIR and STTR programs.[4]

By statute, participation in the SBIR/STTR programs is determined by the size of an agency's extramural R&D budget. Eleven federal agencies currently participate in the SBIR program, and of these, six participate in the STTR program.[5] The principal budgeting mechanism of the SBIR/STTR programs is a set-aside of each participating agency's extramural federal R&D budget. The percentage set aside for each program has increased over time. For fiscal year (FY) 1983, the percentage to be set aside for the SBIR program, based on the original legislation, was no less than 0.2 percent of a participating agency's extramural budget, with this percentage increasing over time to 1.25 percent by FY1986.[6] When the STTR program was established, a set-aside of at least 0.05 percent was required for the program in FY1994, a rate prescribed to increase to 0.15 percent.[7] Subsequent legislation increased these percentages; the FY2011 reauthorization increased the percentage for each program over the ensuing decade, ultimately leading to the most recent minimum rates of 3.2 percent for SBIR and 0.45 percent for STTR.[8] Combined with increasing agency extramural R&D budgets, the result has been a significant expansion of the programs.

The SBIR program is one of the most emulated government R&D programs in the world (Link, 2024). Countries as diverse as India, New Zealand, South Korea, Taiwan, and Turkey have adopted similar programs to engage small businesses in their national economies more effectively (BIRAC, n.d.a; Link, 2024). In 1998, for example, South Korea established the Korea Small Business Innovation Research (KOSBIR) program, basing it on the U.S. SBIR program (de Souza Lima Júnior et al., 2024). India's Small Business Innovation Research Initiative (SBIRI), established in 2005, provides support for small- and medium-sized enterprises carrying out high-risk R&D in the biotech sector (BIRAC, n.d.b). In an earlier example, Turkey set up the Small and Medium-sized Industry Development Organization (KOSGEB) in 1990, an enterprise similar to SBIR in some respects (Unsal, 2024).

The legislation authorizing the programs has, from its outset, contained sunset provisions. The programs were most recently authorized through

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[4] U.S. Congress, Small Business Reauthorization Act of 2000, H.R. 5667, P.L. 106-554, Appendix I (December 21, 2000).

[5] At the outset, the legislation governing the SBIR program called for participation by any federal agency with extramural research or an R&D budget in excess of $100 million (U.S. Congress, Small Business Innovation Development Act of 1982, P.L. 97-219, Section 4[f][1] [July 22, 1982]). The STTR program has set a higher threshold, requiring participation by any agency with a research or R&D budget in excess of $1 billion (U.S. Congress, Small Business Research and Development Enhancement Act, P.L. 102-564, Section 202[c][n][1] [October 28, 1992]). As agency budgets increase, new participants may be, and have been, drawn into the programs.

[6] U.S. Congress, Small Business Innovation Development Act of 1982, P.L. 97-219, Section 4(f)(1) (July 22, 1982).

[7] U.S. Congress, Small Business Research and Development Enhancement Act, P.L. 102-564, Section 202(c)(n)(1) (October 28, 1992).

[8] 15 U.S.C., Section 638(f)(1), and 15 U.S.C., Section 638(n)(1)(B).

September 2025; after a 5-month lapse in the programs, Congress passed a reauthorization on March 17, 2026. This legislation reauthorizes the programs through September 30, 2031.[9]

THE NATIONAL ACADEMIES STUDY MANDATE

Congress first requested that the National Academies of Sciences, Engineering, and Medicine (the National Academies) undertake a study of the SBIR program as part of the Small Business Reauthorization Act of 2000.[10] This study mandate was expanded in the National Defense Authorization Act for Fiscal Year 2012,[11] wherein Congress directed agencies with SBIR program budgets of more than $50 million to engage with the National Academies to conduct a quadrennial assessment of their SBIR and STTR programs.[12]

The congressional mandate calls for assessments to study "how the SBIR program has stimulated technological innovation and used small businesses to meet federal research and development needs."[13] These assessments are to encompass several specific analyses and evaluations, including the value and quality of the R&D conducted under the programs and the programs' economic and noneconomic benefits. The mandate also includes an analysis of whether federal agencies are making sufficient effort to utilize funded firms to fulfill procurement needs. Since 2011, the legislative mandate has also called for a study of how the STTR program has "stimulated technological innovation and technology transfer."[14]

This report is the product of a National Academies study focused on the SBIR and STTR programs at the National Aeronautics and Space Administration (NASA). The stated purpose of the study was to examine the economic and noneconomic benefits of NASA's SBIR and STTR programs and the

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[9] U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026).

[10] U.S. Congress, Small Business Reauthorization Act of 2000, H.R. 5667, P.L. 106-554, Appendix I (December 21, 2000).

[11] U.S. Congress, National Defense Authorization Act for 2012, P.L. 112-81, Section 5137 (December 31, 2011).

[12] The National Academies has conducted previous sets of studies in response to the legislative mandate. The first, completed in 2009, included a review of the SBIR programs at NASA, the National Institutes of Health (NIH), the Department of Energy (DOE), the Department of Defense (DOD), and the National Science Foundation (NSF). The second, completed by a separate committee in 2016, included reviews of both the SBIR and STTR programs at those same agencies. More recent National Academies studies have had a standalone committee for each participating agency. In 2020, a National Academies committee completed a review of the SBIR and STTR programs at DOE (NASEM, 2020); in 2022, a committee completed a review of the SBIR and STTR programs at NIH (NASEM, 2022); in 2023, a committee completed a review of the SBIR and STTR programs at NSF (NASEM, 2023); and most recently, in 2026, a committee completed a review of the SBIR and STTR programs at DOD (NASEM, 2026).

[13] U.S. Congress, Small Business Reauthorization Act of 2000, H.R. 5667, P.L. 106-554, Appendix I, Section 108(a)(1) (December 21, 2000).

[14] U.S. Congress, National Defense Authorization Act for 2012, P.L. 112-81, Section 5137(e)(1)(B) (December 31, 2011).

effectiveness of its program processes. To carry out the study, the National Academies assembled a committee of experts, including academic scholars specializing in innovation and entrepreneurship; former SBIR/STTR awardees; former executive branch and space experts; and experts in research, engineering, development, and finance.[15] The committee's formal statement of task was established at the outset of the project, which began in July 2023, and is presented in Box 1-1.

BOX 1-1
Statement of Task

In response to a Congressional mandate, an expert committee will assemble and analyze evidence about the economic and noneconomic benefits of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs and the effectiveness of program management practices at the National Aeronautics and Space Administration (NASA). Drawing on published research plus available data, the committee will examine:

- The contribution of SBIR/STTR awardees in NASA's research and development and other mission needs;
- Broad innovation impacts associated with these programs, including contributions to the commercial aerospace industry;
- Collaborations created between small businesses and research institutions that are associated with the SBIR and STTR programs, including barriers to and opportunities for collaborations, especially with academic institutions that serve minority populations; and
- The effectiveness of NASA's SBIR/STTR outreach, application and selection processes, and commercialization assistance programs, including exploring barriers to NASA's ability to increase the number of applications and awards from small businesses that are (1) new to the programs, (2) from under-represented states, (3) woman-owned, or (4) minority-owned.

As part of its review, the committee will examine recent initiatives at NASA to improve the broader impacts of the programs, create more equitable access to the program, and support awardees. The committee will consider the uniqueness of the space and aeronautics innovation ecosystem and suggest appropriate metrics and strategies to track the long-term impact of program awards.

A series of committee meetings will be convened to assist the committee to produce a consensus report with findings and recommendations.

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[15] Brief biographies of committee members can be found in Appendix B.

PROGRAM OPERATIONS

SBIR and STTR program operations are decentralized to agencies and subagencies throughout the federal government, with the Small Business Administration (SBA) playing a broad oversight role. Although specific features of the programs vary significantly across and within agencies, and agencies have engaged in adaptation and experimentation in their programs, the broad structure of the two programs is similar across agencies.

Three Program Phases

SBIR and STTR awards are made on a competitive basis, with each participating agency issuing solicitations—also referred to as funding opportunity announcements—at least once per year. By design in the original Small Business Act, the program funding proceeds in three phases[16]:

- **Phase I:** This is a feasibility demonstration phase to "determine the scientific and technical merit and feasibility of [a] proposed effort and the quality of performance of the [small business] with a relatively small agency investment before consideration of further Federal support in Phase II" (SBA, 2023, p. 18). Although the SBA Policy Directive allows Phase I awards to exceed $300,000 (SBA, 2023), NASA plans to limit its Phase I awards to $225,000 in 2026.[17] Award durations at NASA are 6 months for SBIR and 13 months for STTR.
- **Phase II:** This phase is intended to support Phase I projects that have shown positive results and continue to demonstrate scientific and technical merit, along with commercial potential. Although SBA guidelines allow Phase II awards of over $2 million, NASA plans to provide up to $1.275 million per Phase II award with a 24-month duration. Prior to the terms of the 2026 reauthorization of the programs, a firm had to receive a Phase I award from NASA to be eligible to receive a Phase II award from the agency.
- **Phase III:** This phase receives no funding from the SBIR/STTR programs. Instead, it entails follow-on funding for "work that derives from, extends, or completes an effort made under prior SBIR/STTR Funding Agreements" (SBA, 2023, p. 25), which may include direct purchase of the product by some SBIR/STTR-participating agencies. Congress's original intent was for this phase to be where "non-federal capital pursues commercial applications of the research or research and

[16] The SBIR and STTR programs consist of the same phases and dollar amounts, but small businesses receiving STTR awards are required to collaborate formally with a research institution (e.g., university, federal laboratory) in Phases I and II.

[17] Until 2026, NASA offered Phase I awards up to $150,000 and Phase II awards up to $850,000; the analysis in this report reflects the pre-2026 award amounts.

development."[18] It includes commercial applications that are financed privately or cases where non-SBIR/STTR federal follow-on funds support additional R&D or "SBIR/STTR-derived products or services intended for use by the Federal Government" (SBA, 2023, p. 25).

Agencies can exceed award amounts for Phase I and Phase II by up to 50 percent of the statutory maximum without a waiver, and agencies can request and receive approval from SBA to further exceed this larger amount (SBA, 2023). Funds are also available to Phase I and Phase II awardees for commercialization assistance, now known as Technical and Business Assistance (TABA), including $6,500 per Phase I award and up to $50,000 per Phase II award. This assistance can be used for business or commercialization assistance, such as intellectual property protection, market research and validation, and the development of regulatory and manufacturing plans. At civilian agencies, this assistance is supplemented by the Commercialization Readiness Pilot Program, which provides support to selected prior Phase II awardees for technical assistance not normally covered under Phase II.

Furthermore, in addition to standard Phase I and Phase II awards, some agencies provide funding either prior to a Phase I or following a Phase II award. NASA provides three post–Phase II award opportunities, two of which require matching funds.

Recent Legislative Changes to the SBIR and STTR Programs

The SBIR and STTR programs have experienced changes over time, principally when reauthorized. For instance, in addition to calling for program assessments by the National Academies, the 2000 reauthorization included language around commercialization and specifically mentioned that commercial potential should be used as a criterion for awards. A number of legislative changes have accompanied the programs' reauthorizations, including in the April 2026 recent reauthorization.[19]

The August 2018 program reauthorization expanded the scope and level of assistance to awardees, raising the levels of commercialization assistance (TABA) to $6,500 per Phase I award and up to $50,000 per Phase II award, each of these raised from the previous limit of $5,000 per awarded project. The reauthorization also extended pilot programs such as the Commercialization Readiness Pilot Program; authorization for the National Institutes of Health, Department of Education, and Department of Defense to give Phase II awards to

[18] U.S. Congress, Small Business Innovation Development Act of 1982, P.L. 97-219, Section 4(e)(4)C) (July 22, 1982).

[19] U.S. Congress, National Defense Authorization Act for 2012, P.L. 112-81 (December 31, 2011); U.S. Congress, John S. McCain National Defense Authorization Act for Fiscal Year 2019, P.L. 115–232 (August 13, 2018); U.S. Congress, SBIR and STTR Extension Act of 2022, P.L. 117-183 (September 30, 2022); U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026).

companies that did not receive a Phase I award; and a 2011 pilot allowing agencies to use 3 percent of their SBIR funds to help cover SBIR/STTR oversight and contract-processing costs.

The SBIR and STTR Extension Act of 2022, which reauthorized the programs through September 2025, introduced measures designed to address national security concerns.[20] It required awarding agencies to perform a security risk assessment for all applicants as part of their review of applications. Under these provisions, applications must disclose any ties with foreign countries—for example, affiliations, participation in talent recruitment programs, contractual or financial obligations, relationships with venture funds, technology licensing arrangements, or any intellectual property sale involving a foreign country.

Performance metrics introduced in the December 2011 reauthorization of the programs were applied to multiple-award recipients with award counts above certain thresholds over set periods of time.[21] The reauthorization required the establishment and administration of standards concerning both a company's track record in progressing from Phase I to Phase II and the extent to which a company has progressed past Phase II projects toward commercialization. The resulting Transition Rate Benchmark currently applies to companies that have received 21 or more Phase I awards during the past 5 fiscal years, excluding the most recently completed fiscal year, and requires that a company have achieved an average ratio of Phase II's to Phase I's of 0.25.[22] Additionally, the legislation calls for a Commercialization Rate Benchmark that applies to any company having received 16 or more Phase II awards during the past 10 fiscal years, excluding the 2 most recently completed fiscal years. It requires that a company have achieved an average of $100,000 in sales/investments per Phase II award received during that 10-year period, or have received a number of patents equaling or exceeding 15 percent of the number of Phase II awards received over that period.[23] Both provisions went into effect in 2013. Each year, SBA identifies those companies failing to meet the standards, which then become ineligible to apply for a Phase I or Direct to Phase II award for 1 year. The 2022 reauthorization tightened restrictions on multiple-award recipients by establishing increased performance standards for more experienced firms, both for their transition rate and for commercialization progress.[24] Any experienced firm, as determined under the provisions of the 2022 reauthorization, that fails to meet either the required

[20] U.S. Congress, SBIR and STTR Extension Act of 2022, P.L. 117-183 (September 30, 2022).
[21] U.S. Congress, National Defense Authorization Act for 2012, P.L. 112-81 (December 31, 2011).
[22] The current standards are published by SBA on its website. See SBA, "Performance Benchmark Requirements," https://www.sbir.gov/performance-benchmarks.When calculating the Phase II/Phase I Transition Rate for a company, the measurement period for Phase II's begins and ends 1 year after those years used to calculate the number of Phase I's received by a firm.
[23] Firms report commercialization data via the Company Commercialization Report on the SBA website. Awardees are required to update their report at the end of any Phase II and then annually for at least 5 years. Phase II applicants must update their company's report whenever applying for a new Phase II award.
[24] The current benchmark standards are published by SBA on its website. See SBA, "Performance Benchmark Requirements," https://www.sbir.gov/performance-benchmarks.

transition or commercialization rate cannot receive more than 20 total Phase I and Direct to Phase II awards from each federal agency for a period of 1 year. In addition to these commercialization and transition requirements, the 2026 reauthorization requires agencies to set limits on the number of Phase I and Phase II proposals that a small business can submit.[25]

STUDY METHODOLOGY AND LIMITATIONS

The committee based its review on a wide range of evidence, including descriptive and qualitative evidence on outcomes; quantitative data on patterns in the landscape of awards, firms, and related geographic characteristics; and qualitative evidence concerning the administration of the programs from the perspective of NASA and its personnel. The committee also used descriptive evidence regarding program impacts with respect to collaborations, firm structure/orientation, and other system-level outcomes that cannot easily be determined using standard econometric techniques. Finally, the committee considered causal evidence of direct and indirect effects of the programs on innovation and commercialization and agency transition.

The committee gathered quantitative data from (1) SBA's SBIR/STTR Company and Award Listing, (2) NASA (application data) from the government database maintained by SBA for purposes of program evaluation, (3) SBA Dynamic Small Business Search, (4) the U.S. General Services Administration's System for Award Management, (5) USAspending.gov, (6) the U.S. Economic Development Administration's Cluster Map, (7) the Federal Procurement Data System, (8) publication data in Web of Science, (9) patent data in PatentsView, (10) venture capital funding and initial public offering/acquisition outcome data in PitchBook and Crunchbase, and (11) firm-level data in the National Establishment Time-Series database. Data from these sources were compiled, matched, and verified to provide the empirical basis for this study.

Sources of qualitative data include presentations by NASA SBIR/STTR personnel; archival data available from the NASA SBIR/STTR website, such as webinars, publicly available documents, and solicitations; and presentations from NASA SBIR/STTR awardees.

ORGANIZATION OF THIS REPORT

The remainder of this report contains detailed information on the SBIR/STTR programs, describes the study methodology and results, and presents the committee's findings and recommendations.

Chapter 2 provides a framework for understanding the role of SBIR and STTR within the ecosystem that drives innovation in support of the NASA mission, while Chapter 3 provides an overview of NASA's SBIR/STTR

[25] U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026).

applicants and awardees. A description of the organization and administration of the NASA SBIR/STTR programs, including processes for outreach, review of applicants, and selection of and commercialization support for awardees, follows in Chapter 4. Chapter 5 provides an analysis of collaboration patterns and considers obstacles to forming collaborations. Finally, Chapter 6 reports on observable outcomes associated with participation in the NASA SBIR/STTR programs with the objective of assessing how these programs contribute to NASA's mission-oriented R&D and acquisition goals.

The body of the report is followed by a list of references, agendas for meetings of the committee, brief biographies of committee members, and chapter annexes.

2

The NASA SBIR/STTR Programs and the NASA and Space Ecosystem

Innovation is central to NASA's mission, enabling advances in science, exploration, aeronautics, and the technologies required to support complex space and Earth-based activities. Innovation in support of this mission is not generated by a single organization but emerges from a broader ecosystem—including multiple parts of government, private firms, universities, research institutions, and international partners. This ecosystem is supported by a range of programs, including NASA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) initiatives, which facilitate the participation of small firms in technology development. Many technologies initially developed to meet mission-specific needs have subsequently contributed to broader economic and societal applications, including satellite communications, Earth observation, and navigation systems. Since its founding, NASA has maintained an extensive and evolving set of partnerships with external organizations, including small businesses, recognizing their role in advancing specialized and emerging technologies. Within this system, the SBIR/STTR programs serve as targeted mechanisms for supporting early-stage technology advancement and enabling small firms to engage with NASA's mission-oriented innovation activities.

This chapter provides a framework for understanding the role of the SBIR/STTR programs within the broader ecosystem. It outlines the structure and evolution of NASA's innovation system; examines the interaction between the agency's SBIR/STTR programs and the processes of technology development and procurement; and situates these programs within the changing landscape of the U.S. space sector, including the emergence of a rapidly expanding commercial space industry.

THE NASA INNOVATION SYSTEM

In the wake of the launch of Sputnik by the Soviet Union in 1957, NASA was established through the National Aeronautics and Space Act of 1958 "to provide for research into problems of flight within and outside the Earth's atmosphere."[1] Over the next decade, NASA led a series of landmark achievements during the Space Race—including the Apollo Moon landings—establishing U.S. leadership in space and generating enduring advances in sciences and technology. While the agency's relative budgetary scale and centrality within federal priorities declined in subsequent decades, NASA continues to play a critical role in advancing scientific discovery, technological innovation, and the broader aerospace ecosystem. Although it maintains many aspects of its original mission, NASA has refined and evolved its mandate over time. Notably, its most recent 2022 Strategic Plan articulates this mission clearly: to discover by expanding human knowledge through scientific advances; to explore by extending human presence to the Moon and toward Mars; to innovate by catalyzing economic growth and addressing national challenges; and to advance by strengthening the capabilities and operations required for sustained mission success (NASA, 2022). These objectives underscore that NASA's mission is not limited to scientific discovery or exploration but encompasses a broader role in technological advancement and national innovation. Achieving these goals requires the development and execution of complex, high-risk space and aeronautics programs that depend on the integration of multiple advanced technologies under conditions of uncertainty.

NASA has sought to meet this challenge through a combination of in-house technical capabilities and reliance on external partners, including large aerospace firms, small businesses, universities, international partners, and other research institutions. This hybrid model of combining internal expertise with a distributed network of contributors continues to define how NASA identifies technology needs, organizes development efforts, and transitions new capabilities into operational use (NASEM, 2024).

The 1960s NASA Space Race era was predominantly top-down in its definition of mission objectives, with priorities set at the highest levels of the federal government and translated into specific programs and technical priorities set by NASA leadership (Launius, 1994; McCurdy, 1994). Early human spaceflight programs—Mercury, Gemini, and Apollo—were characterized by clear national objectives, aggressive schedules, and substantial federal investment. Reflecting this legacy, NASA continues to organize its innovation activities around clearly defined missions and programs. These missions, ranging from human spaceflight and planetary exploration to Earth science and aeronautics, establish the technical requirements that guide technology development across the agency. In contrast to agencies that primarily support investigator-driven research (e.g., National Science Foundation, National Institutes of Health), NASA's technology investments are largely driven by anticipated mission needs, with priorities established through mission directorates and associated planning processes (NASEM, 2024).

[1] U.S. Congress, National Aeronautics and Space Act of 1958, P.L. 85-568, Section 102, 72 Stat. 426 (1958).

Within this structure, programs are translated into projects and missions, each of which requires the coordinated development and integration of multiple subsystems, components, and enabling technologies. Innovation within NASA is a means of achieving defined technical and operational goals. This mission-driven approach continues to characterize initiatives such as the Artemis program[2] and major science missions (Launius, 1994; NASEM, 2024). In other words, building on a long history as a mission-oriented agency, NASA continues to conceptualize its innovation objectives in relation to missions rather than around generalized support for innovation. Table 2-1 provides a high-level chronology of NASA's major initiatives and priority areas.

Across these eras, NASA has consistently undertaken high-risk, long-horizon scientific and technological challenges that exceed the incentives of private markets alone. At the same time, its methods of execution—particularly

TABLE 2-1 Selected Major NASA Initiatives and Their Institutional Significance

Period	Initiative	Significance for Innovation System
1958–1972	Mercury, Gemini, Apollo	Strong mission focus, rapid scaling of contractor-based development, expansion of NASA center capabilities
1970s–2011	Space Shuttle	Shift toward reusable systems, sustained operations, and long-term integration among centers and contractors
1990s–present	Major space science missions (e.g., Hubble, Mars Rover and successors)	Greater reliance on science-driven priority-setting and specialized instrumentation networks
2000s–present	International Space Station and international collaboration	Increased coordination across international partners, long-horizon operations
2010s–present	Commercial Cargo and Commercial Crew	Expanded use of milestone-based partnerships and greater reliance on private operators
2017–present	Artemis program	Integrates long-term exploration strategy, combining prime contractors, commercial firms, and international partners

SOURCE: Committee generated based on NASA, n.d.k.

[2] https://www.nasa.gov/humans-in-space/artemis.

in procurement, partnerships, and technology development—have evolved in response to changing technological and economic conditions (Launius, 1994; NASEM, 2024). Two features of NASA's approach—the relationship between mission directorates and geographically distributed NASA centers, and its reliance on a multilayered supply chain—are particularly important for understanding how technologies are developed, advanced, and ultimately incorporated into mission systems, and for situating the role of the SBIR/STTR programs within this broader structure.

NASA's Mission Directorates and Centers

A defining feature of NASA's innovation system is the relationship between mission direction at headquarters and execution through a geographically distributed set of field centers. NASA's mission directorates establish strategic priorities, define programmatic objectives, and allocate resources across broad areas such as science, exploration, aeronautics, space operations, and technology development (see Table 2-2). The centers, in turn, provide the engineering, testing, program management, and operational capabilities required to translate those priorities into missions, projects, and technology development activities. In this way, NASA's innovation system is both mission driven and organizationally distributed (Szajnfarber and Weigel, 2013; Vertesi, 2020).

This relationship is important for understanding how NASA identifies and advances technologies. Mission directorates provide the high-level framework within which needs are defined and priorities are set, but implementation typically occurs through programs and projects in which one or more centers assume lead responsibility, often in coordination with other centers and with external partners. The result is neither a purely centralized nor a purely decentralized system. Rather, it is a structure in which priorities are set at the agency level, while technical problem-solving, testing, and integration are distributed across specialized organizational units.

As this structure suggests, technology development at NASA is not confined to a single mission directorate or organizational unit. Rather, it occurs across multiple mission areas, often in ways that reflect both mission-specific requirements and broader, cross-cutting technical needs. That said, the Space Technology Mission Directorate plays a distinctive role in advancing enabling technologies and supporting mechanisms for technology transfer and small business engagement (NASEM, 2024).

NASA's geographically distributed field centers reinforce the distributed nature of this system. Since the early decades of the agency, NASA has relied on centers across the United States with distinct technical capabilities, facilities, and areas of specialization. These centers serve not simply as research sites, but as focal points for engineering, testing, program management, mission support, and engagement with external partners (see Table 2-3 and Figure 2-1). The geographic

TABLE 2-2 Primary Responsibilities of the NASA Mission Directorates

Mission Directorate	Primary Areas of Responsibility
Science Mission Directorate (SMD)	Planetary science, astrophysics, heliophysics, Earth science
Exploration Systems Development Mission Directorate (ESDMD)	Moon-to-Mars architecture, deep-space human exploration systems, Orion, Space Launch System, Gateway
Space Operations Mission Directorate (SOMD)	International Space Station, commercial crew and cargo, space communications, launch and flight support
Space Technology Mission Directorate (STMD)	Cross-cutting and enabling technologies, technology maturation, technology transfer, support for small business innovation
Aeronautics Research Mission Directorate (ARMD)	Aeronautics research, advanced air vehicles, sustainable aviation, air traffic management
Mission Support Directorate (MSD)	Agency capabilities, mission support functions, workforce and institutional support

SOURCE: NASA, n.d.e.

diversity of NASA SBIR/STTR awardees is explored in Chapter 3, and that of the research partner collaborators is discussed in Chapter 5.

The centers do more than provide technical capability. In many cases, they also help define technical needs, formulate research topics, evaluate proposals, and manage the progression of technologies toward mission use. This role is particularly visible in programs such as SBIR and STTR, where center-based technical staff help identify subtopics, assess technical merit, and guide projects toward potential infusion. The centers function not only as implementers of mission priorities but also as important intermediaries linking mission requirements, technical opportunities, and external performers.

These centers differ not only in formal technical focus but also in institutional culture, engineering practices, and relationships with external partners. The Jet Propulsion Lab (JPL), for example, operates as a federally funded research and development center with a distinctive mission-oriented laboratory culture. Other centers are more directly embedded within NASA's civil service structure. These differences shape how projects are defined, how firms are engaged, and how technologies are advanced toward mission use (Vertesi, 2020). As a result, the NASA innovation system is best understood not as a single uniform structure, but as a set of interconnected organizational units with differentiated capabilities and roles.

Together, the mission directorates and centers provide the organizational framework through which NASA translates high-level strategic objectives into specific technology development and mission activities. That framework also shapes the channels through which external organizations—including large contractors, universities, and small businesses—engage with NASA, leading to the second distinctive feature of the NASA innovation system: its multilayered supply chain.

TABLE 2-3 Locations and Primary Focus Areas of NASA Centers

Center	Location	Primary Focus Areas
Johnson Space Center (JSC)	Houston, Texas	Human spaceflight, astronaut operations, mission operations
Marshall Space Flight Center (MSFC)	Huntsville, Alabama	Propulsion, launch systems, exploration hardware
Jet Propulsion Laboratory (JPL)	Pasadena, California	Robotic exploration, planetary missions, deep-space systems
Goddard Space Flight Center (GSFC)	Greenbelt, Maryland	Earth science, astrophysics, satellite systems
Kennedy Space Center (KSC)	Merritt Island, Florida	Launch operations, integration, infrastructure
Langley Research Center (LaRC)	Hampton, Virginia	Aeronautics, atmospheric science, structures
Glenn Research Center (GRC)	Cleveland, Ohio	Power systems, propulsion, materials
Ames Research Center (ARC)	Moffett Field, California	Computing, autonomy, simulation
Armstrong Flight Research Center (AFRC)	Edwards, California	Atmospheric flight research
Stennis Space Center (SSC)	Hancock County, Mississippi	Propulsion, launch systems

NOTE: Unlike the other NASA centers, JPL is a federally funded research and development center managed by the California Institute of Technology. In addition to these main field centers, NASA has a number of other communication and telescope facilities and manufacturing, test, and research facilities.
SOURCE: NASA, n.d.c.

FIGURE 2-1 Mapped locations of NASA space centers.

The NASA Supply Chain

A defining feature of NASA's approach to innovation is its long-standing reliance on an external industrial base. From the early years of the space program, NASA made a strategic decision to contract out a substantial portion of research, development, and production activities to private firms. This approach reflected both the need to rapidly scale technical capacity and an explicit effort to mobilize a national industrial base in support of space exploration (Kantor and Whalley, 2025). During the Apollo era (see Table 2-1), most personnel supporting NASA missions were employed by contractors rather than by the agency itself, and this contractor-based model, though evolving in its details, continues to characterize NASA's approach to technology development.

One immediate consequence of NASA's mission-driven structure is that demand for new technologies is often limited in scale and highly specific to mission or programmatic needs. Unlike broader research and development systems in which demand for innovation may be continuous and generalized (or result in large, multiyear procurements), NASA's requirements tend to arise in connection with discrete missions, each with its own technical constraints, timelines, and performance requirements. As a result, demand for specific capabilities may be episodic and uneven across technical areas, and not all areas of strategic interest will attract a corresponding level of activity at any given time. Demand for any single procured item may be very low (e.g., 1–3 items). This pattern reinforces the importance of understanding the SBIR/STTR programs as part of a system in which both the demand for and supply of innovation are shaped by mission-specific considerations.

NASA has addressed this need by developing a layered supply chain structure that links mission requirements to technology development and, ultimately, to procurement and system integration. Unlike a simple buyer–supplier relationship, this structure involves multiple tiers of actors, each of which plays a distinct role in shaping how technologies are generated, evaluated, and incorporated into mission systems.

NASA's Space Centers Within the Supply Chain

NASA centers occupy a central position within this supply structure, acting as technical intermediaries between mission directorates and external performers. In addition to executing programs and missions, centers help define technical requirements, identify capability gaps, formulate research topics, and evaluate emerging technologies. They also oversee testing, validation, and integration processes that determine whether a technology is sufficiently mature for mission use. In programs such as SBIR and STTR, center-based technical staff play a direct role in identifying subtopics, assessing proposals, and guiding projects toward potential infusion. As a result, centers are not only implementers of mission priorities but also key actors in shaping the direction of technological search and selection.

Prime Contractors as System Integrators

Large aerospace firms serve as system integrators within the NASA innovation system, providing systems engineering, manufacturing, certification, and program management capabilities required for complex space and aeronautics systems. These firms are responsible for assembling mission architectures and ensuring that components meet stringent performance and reliability requirements. Because primes ultimately determine how subsystems are incorporated into larger platforms, their procurement practices and risk tolerance play a critical role in shaping which technologies—particularly those developed by smaller firms—are adopted. In this sense, primes act as gatekeepers in the transition from technological capability to operational system.

Subprime Contractors and Specialized Engineering Firms

Below the level of system integration is a set of subprime contractors and specialized engineering firms that contribute subsystems and technical modules. These organizations often develop or produce instruments, propulsion components, avionics, or software systems and are frequently involved in later-stage development and refinement. Their role is particularly important in bridging the gap between early-stage innovation and system-level integration, as they translate component-level advances into forms that can be incorporated into mission architectures.

Small Businesses and Entrepreneurial Firms

At the lower tiers of the supply chain, small businesses and entrepreneurial firms contribute highly specialized capabilities, including sensors, materials, electronics, software, and control systems. These firms are often the source of novel technical approaches and are disproportionately active in early-stage development. Programs such as SBIR and STTR provide important entry points for these firms into the NASA ecosystem. However, their ability to transition technologies depends on alignment with center priorities, acceptance by integrators, and compatibility with mission requirements. As a result, small firms rarely serve as system integrators themselves; instead, their technologies are typically incorporated into larger systems through collaboration with prime and subprime contractors.

Universities and Research Institutions

Universities and nonprofit research institutions play a complementary role by generating foundational scientific knowledge, developing and even designing instruments and experiments, and training the technical workforce. Through collaborations with NASA centers and industry, including through STTR, these institutions contribute to both early-stage research and applied technology development. They also serve as an important source of new ideas and talent, linking advances in basic science to mission-driven technological challenges.

International Partners

International cooperation further extends NASA's innovation system, with foreign space agencies and research institutions contributing mission elements, scientific instruments, and operational capabilities. Programs such as the International Space Station and Artemis illustrate the extent to which NASA's missions are embedded in a global network of technical collaboration. These partnerships expand the available knowledge base and distribute both the risks and costs of complex missions, while also introducing additional coordination and integration challenges.

Implications for the NASA Innovation System

Taken together, this layered supply structure supports a distinctive model of technology development. NASA combines top-down, mission-driven requirements with a distributed process of technological exploration across multiple organizational levels. Early-stage technologies are often developed through relatively small-scale projects—frequently involving small businesses or university partners—and subsequently refined, validated, and incorporated into mission systems through interactions with centers and system integrators. This process reflects both directed technological change, guided by mission needs, and decentralized experimentation across a diverse set of actors (Mazzucato and Robinson, 2016).

At the same time, the procurement implications of this system differ in important ways from those of larger mission agencies such as the Department of Defense (DOD). NASA missions typically involve limited quantities of highly specialized systems, often produced for a single mission or a small number of deployments. As a result, procurement is frequently one-off or small batch in nature, rather than involving sustained, large-scale production. The primary value of participating in NASA's innovation system therefore lies less in large procurement contracts and more in contributing critical components, capabilities, or technologies to mission systems. This distinction has important implications for firms—particularly small businesses—whose engagement with NASA is often part of a broader portfolio spanning multiple agencies and commercial markets.

A central challenge in a system characterized by distributed innovation and mission-specific integration is how to assess whether a given technology is sufficiently mature for incorporation into a mission. NASA addresses this challenge using Technology Readiness Levels (TRLs), a standardized framework for evaluating the maturity of technologies as they progress from basic principles to operational deployment. TRLs provide a common language across mission directorates, centers, and external partners for assessing technological progress and readiness for integration. The framework spans a sequence from early-stage conceptual work (TRL 1–2), through laboratory validation and prototype development (TRL 3–5), to demonstration in relevant and operational environments (TRL 6–9), with progression along this scale often requiring successive rounds of testing, validation, and system-level refinement (see Box 2-1 and Table 2-4). While not determinative on their own—since ultimate deployment depends on mission timing, system-level integration, and programmatic priorities—TRLs offer a systematic means of gauging whether a component, instrument, or subsystem has reached a threshold consistent with potential mission use. In this way, TRLs play an important coordinating role within NASA's innovation system, enabling the agency to manage technological uncertainty and align distributed development efforts with mission requirements (NASEM, 2026).

TRLs are also particularly relevant for understanding the role of the SBIR/STTR programs within this system. Many SBIR/STTR projects are explicitly oriented toward advancing technologies across intermediate stages of development—often from early proof of concept toward demonstration in relevant environments—making the TRL framework a useful tool for tracking progress and assessing potential for transition. At the same time, progression along the TRL scale is not purely mechanical and often reflects iterative interactions between NASA centers and external performers, including feedback from testing, evolving mission requirements, and system-level considerations. As a result, the effectiveness of SBIR/STTR investments can be understood, in part, through their contribution to moving technologies along the TRL spectrum, even in cases where eventual mission integration depends on broader programmatic factors.

Furthermore, while this structure is suited to the development of complex, high-risk systems that require integration across multiple technological domains, it introduces challenges related to coordination, risk management, and technology advancement. The successful incorporation of new technologies depends not only on technical performance but also on alignment across centers, integrators, and mission programs. Understanding this layered system is therefore essential for assessing how NASA develops and deploys new technologies and for situating the role of the SBIR/STTR programs within the broader innovation ecosystem.

BOX 2-1
Technology Readiness Levels in the NASA Innovation System

Technology Readiness Levels (TRLs) provide a widely used framework for assessing the maturity of a technology, ranging from early-stage conceptual research to proven operational systems. Originally developed within NASA and subsequently adopted by other federal agencies that conduct research and development, TRLs offer a standardized approach for evaluating whether a technology is ready to advance toward integration into larger systems.

The TRL scale ranges from 1 (basic principles observed) to 9 (system proven in operational use). Intermediate levels capture key stages of development, including laboratory validation, testing in relevant environments, and demonstration in operational contexts. In practice, technologies typically must reach approximately TRL 6—demonstration in a relevant environment—before they can be considered for integration into mission systems (NASEM, 2026).

TRLs serve several functions within NASA. First, they provide a consistent metric for evaluating technological progress across diverse domains, including propulsion, instrumentation, materials, and software. Second, they facilitate coordination between mission directorates, centers, and external partners by establishing shared expectations regarding technological maturity. Third, they support decision-making about resource allocation, helping to determine when a technology is sufficiently developed to justify further investment or integration into a mission.

At the same time, TRLs are an imperfect measure of readiness. Advancement along the TRL scale can require substantial time and resources, particularly at later stages of development, and does not guarantee eventual deployment. A technology may reach a high level of maturity but still not be incorporated into a mission because of changes in mission priorities, integration challenges, or budget constraints. Conversely, some technologies may be incorporated at lower TRLs when mission timelines or strategic priorities warrant.

As a result, TRLs are best understood not as a deterministic measure of success, but as a coordinating tool within a broader innovation system. They enable NASA to track and compare technological progress in a complex, distributed environment, while recognizing that ultimate mission integration depends on factors beyond technological maturity alone.

TABLE 2-4 Technology Readiness Level Definitions

Level	Definition
1	Basic principles observed and reported
2	Technology concept and/or application formulated
3	Analytical and experimental critical function and/or characteristic proof-of-concept
4	Component and/or breadboard validation in laboratory environment
5	Component and/or breadboard validation in relevant environment
6	System/subsystem model or prototype demonstration in a relevant environment (ground or space)
7	System prototype demonstration in a space environment
8	Actual system completed and “flight qualified” through test and demonstration (ground or space)
9	Actual system “flight proven” through successful mission operations

SOURCE: Drawn from NASA, 2023.

Finally, the geography of NASA’s innovation system follows directly from these institutional features. Because NASA operates through multiple centers and relies on a distributed industrial base, its innovation activities are geographically dispersed across the United States. This pattern emerged early in the agency’s history, as contracting decisions were tied to existing technical capabilities and industrial specialization rather than to a single centralized location (Kantor and Whalley, 2025). As a result, NASA-related innovation is organized across a set of interconnected regional clusters that are linked to particular centers, contractors, and areas of technical expertise, rather than concentrated in a single location. Contractor activity has historically been concentrated in sectors such as aerospace, electronics, computing, and scientific instrumentation, and in regions with established capabilities in these domains. At the same time, the distributed nature of NASA’s procurement system has enabled participation by firms located outside traditional aerospace hubs, particularly in areas involving enabling technologies such as software, sensing, and advanced materials.

This distributed structure has important implications for firm participation in the NASA innovation system. For small and innovative firms in particular, engagement requires not only technical capability but also the ability to connect to the relevant organizational and geographic nodes of the system. Programs such as SBIR and STTR provide one mechanism for establishing these connections, allowing firms to engage with NASA centers and align their technologies with mission-relevant needs. However, longer-term participation typically depends on the ability to navigate a more complex set of relationships involving centers, system integrators, and other partners. In this sense, the challenge for firms is not only to develop viable technologies, but also to effectively “plug into” a distributed and multilayered system in which opportunities for development, testing, and integration are shaped by both organizational structure and geography.

THE ROLE OF THE SBIR/STTR PROGRAMS IN THE NASA INNOVATION SYSTEM

The SBIR/STTR programs at NASA are best understood not as standalone small business initiatives, but as embedded mechanisms within the broader mission-driven innovation system described above. The programs function not only as sources of early-stage funding but also as a gateway through which small firms enter, learn to navigate, and potentially become embedded within NASA's broader innovation and supply ecosystem.

NASA's implementation of its SBIR/STTR programs, as discussed in more detail in Chapter 4, reflects this broader structure. Historically, while there was a coordinating function attached to the central SBIR/STTR office within NASA headquarters, the large share of administering the programs was carried out within the centers. More recently, under a program reorganization put in place early in 2024, the role of the central office has increased, particularly in its ability to manage some of the administrative activities. One thing not changed is that program topics are derived from technology needs identified by mission directorates and centers, and awards are evaluated in part on their relevance to these needs. This "mission pull" distinguishes NASA's programs from more investigator-driven approaches and helps ensure that supported projects are connected to areas of agency demand (NASEM, 2016, 2024). In other words, the programs provide a mechanism for exploring a range of potential approaches to those needs, often involving firms or technologies that would not otherwise be incorporated into NASA's existing supplier base. Of course, the realized portfolio of SBIR/STTR awards reflects not only NASA's stated priorities but also the distribution of capabilities within the applicant pool. As a result, while solicitations are strategically defined, the specific projects funded depend in part on the alignment between mission needs and the technologies proposed by participating firms (Boroff and Vertesi, 2026). In this sense, the NASA SBIR and STTR programs have the ability to expand the set of technological options available to the agency and maintain alignment with mission objectives, with the caveat that these new options must be closely related to the capability base of SBIR and STTR firms.

NASA SBIR/STTR projects are typically oriented toward advancing technologies across early and intermediate stages of development—from proof of concept and laboratory validation toward demonstration in relevant environments (i.e., advancing along the TRL scale). In doing so, these programs contribute to iterative processes of testing, refinement, and evaluation, often involving sustained interaction between external performers and NASA centers. Advancement along the TRL scale is therefore not purely linear, but reflects feedback from technical review, evolving mission requirements, and system-level considerations (Mazzucato and Robinson, 2018; NASEM, 2024).

At the same time, advancing technology to a higher level of maturity does not, on its own, ensure its incorporation into a mission. NASA's innovation system is structured around a layered supply chain in which centers, system integrators, and other actors jointly determine how technologies are incorporated into mission architectures. SBIR/STTR-supported technologies are therefore subject to the same constraints as other innovations: they must align with mission timelines, meet system-level requirements, and be accepted by integrators responsible for assembling complex systems. In this respect, the SBIR/STTR programs can be best understood as contributing to the advancement of technological capabilities within the system, rather than determining their ultimate use. Therefore, the impact of these programs is more likely to be realized through technology incorporation, follow-on development, or integration into larger systems than through standalone procurement contracts.

To be clear, a subset of SBIR/STTR-supported projects do progress to direct use in NASA missions. In these cases, technologies initially developed through early-stage SBIR/STTR awards are further matured—often through follow-on funding and integration with system contractors—and ultimately incorporated into flight systems, instruments, or mission-critical subsystems. While such outcomes represent only a portion of SBIR/STTR activity, they illustrate an important pathway through which small-firm innovations contribute directly to NASA's mission objectives. For example, analyses at JPL identified at least eight distinct instruments and subsystems on the Mars 2020 Perseverance Rover that incorporate technologies developed through the SBIR/STTR pipeline (see Box 2-2).[3] An examination of earlier rovers reveals the incorporation of SBIR/STTR technologies. For example, lenses developed by Optimax Systems and funded by NASA and DOD SBIR contracts were used on the 2011 Curiosity Rover and the 2005 Spirit & Opportunity Rover (Nelson et al., 2015; Optimax, n.d.).

However, this type of direct connection to the mission represents but one pathway—rather than the sole gateway—through which SBIR/STTR participants engage and contribute to the NASA mission. Firms may also participate in NASA's innovation system through subcontracting relationships, ongoing work with other federal agencies, or activities in commercial space markets. The result is a system in which participation is multidirectional and cumulative, rather than sequential or exclusive.

One element to note along these lines is that, as illustrated in subsequent chapters, many firms participating in NASA's SBIR/STTR programs operate across multiple federal agencies and funding streams, and often develop capabilities in parallel with work supported by other agencies or markets. In this context, SBIR/STTR participation at NASA can be understood as a point at which

[3] Presentation to the committee by Mark Davidson, NASA Jet Propulsion Laboratory, July 30, 2024, Irvine, California.

these broader capabilities are aligned with specific NASA mission priorities and mission strategies. Rather than representing a closed system of innovation, the program frequently draws on technologies and expertise that are being developed more generally and adapts them to mission-specific needs.

This structure and the experience of these firms within this system may also shape outcomes. Evidence from other mission-oriented agencies suggests that firms often require repeated engagement to effectively navigate complex technical, contracting, and organizational environments and to align their capabilities with agency needs. In the NASA context, this confirms that

BOX 2-2
The SBIR/STTR Programs and the Mars 2020 Perseverance Rover

NASA's Mars 2020 Perseverance Rover incorporates multiple components and subsystems that trace back to firms and technologies supported by the Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) programs. According to NASA Jet Propulsion Laboratory program materials, at least eight distinct elements of the rover—including components related to sensing, electronics, and instrumentation—were developed through the SBIR/STTR pipeline and subsequently integrated into the mission (see Figure 2-2). These contributions highlight how SBIR/STTR-supported technologies, when successfully advanced and aligned with mission needs, can be incorporated into flight systems operating in demanding environments.

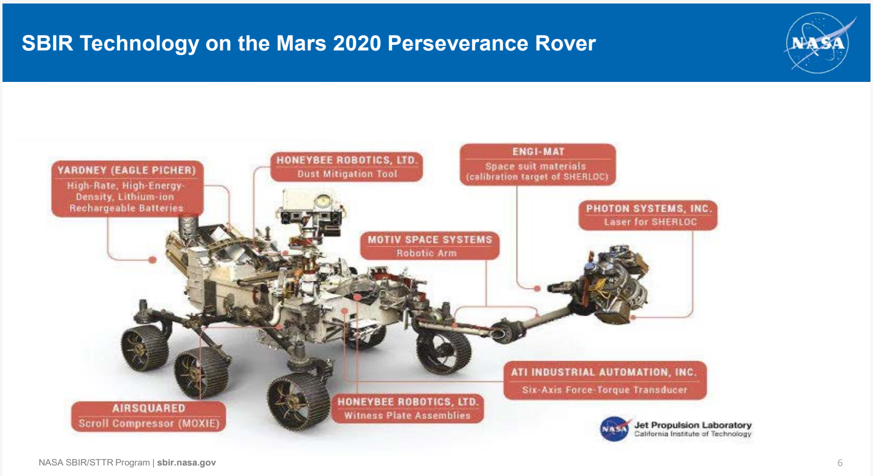

FIGURE 2-2 SBIR technology on the Mars 2020 Perseverance Rover.
SOURCE: Presentation to the committee by Mark Davidson, NASA Jet Propulsion Laboratory, July 30, 2024, Irvine, California.

participation in the SBIR/STTR programs often extends beyond individual projects, as participation builds familiarity with mission requirements, relationships with centers and integrators, and the capacity to engage in subsequent opportunities. The benefits of SBIR/STTR participation may therefore be cumulative rather than confined to a single award.

This characterization also helps frame the types of outcomes that may be expected from SBIR/STTR activities. Within NASA's innovation system, impacts are likely to be reflected in multiple, complementary dimensions. One dimension involves the extent to which SBIR/STTR-supported firms can access additional NASA resources or participate in follow-on activities, reflecting the degree to which initial awards are leveraged within the broader system. A second dimension involves the advancement of technologies along the TRL spectrum, providing a measure of progress in reducing technical uncertainty and increasing readiness for potential use. A third dimension involves outcomes external to NASA, including the ability of participating firms to attract private investment, form partnerships, or generate intellectual property. These pathways are not mutually exclusive, and their relative importance may vary across technologies and firms. At the same time, these pathways are often indirect and not fully observable. Technologies developed through NASA's SBIR/STTR programs may be incorporated into mission systems through subcontracting relationships, integration by prime contractors, or acquisition of small firms, and these channels are not always captured in available data. As a result, any assessment based on observable outcomes will necessarily provide a partial view of the programs' broader contribution to NASA's innovation system.

Finally, it is important to recognize that these outcomes depend not only on the design and execution of the SBIR/STTR programs themselves, but also on the broader ecosystem in which they operate. As NASA's approach to partnerships, commercialization, and engagement with the private sector continues to evolve—including recent efforts to streamline and centralize aspects of program management—the role of the SBIR/STTR programs will be shaped by how effectively they are integrated into the agency's overall approach to technology development.

THE EMERGING COMMERCIAL SPACE SECTOR AND THE NASA SBIR/STTR PROGRAMS

Over the past decade, and at an increasing rate in the last 5 years, the U.S. space sector has undergone a significant transformation, marked by the rapid growth of a commercial space sector. Whereas NASA historically operated at the center of a largely government-directed system of space exploration and technology development, a more decentralized and commercially oriented ecosystem has emerged in recent years in which private firms play an increasingly prominent role in both developing and executing space-based activities (Weinzierl and Rosseau, 2025).

Several factors have contributed to this shift. Most notably, the cost to access space has declined dramatically, driven by advances in launch technologies, miniaturization of satellite systems, and new operational approaches adopted by private firms (Bouzoukis et al., 2025). Launch costs have fallen by orders of magnitude over the past several decades, while the number of active satellites has increased substantially, reflecting the growing economic viability of space-based activities (Jones, 2018). These developments have enabled the expansion of commercial activity across a wide range of domains, including telecommunications, Earth observation, and data analytics; going forward, these developments may include the scaling of in-space manufacturing, resource utilization, and space tourism. At the same time, the proliferation of commercial satellites and space-based infrastructure has introduced new challenges, including congestion in orbital space, debris management, and the governance of shared resources.

The resulting "New Space" sector includes both established aerospace firms and a growing set of entrepreneurial and venture-backed companies. Firms such as SpaceX and Blue Origin have played a leading role in developing launch capabilities and supporting infrastructure, while a broader ecosystem of firms has emerged to exploit new opportunities associated with space-based data, services, and applications. Venture capital investment in the sector has increased substantially, supporting the entry of hundreds of start-ups and the development of new business models that extend beyond traditional government procurement (Weinzierl and Rosseau, 2025; see Figure 2-3). These developments reflect a

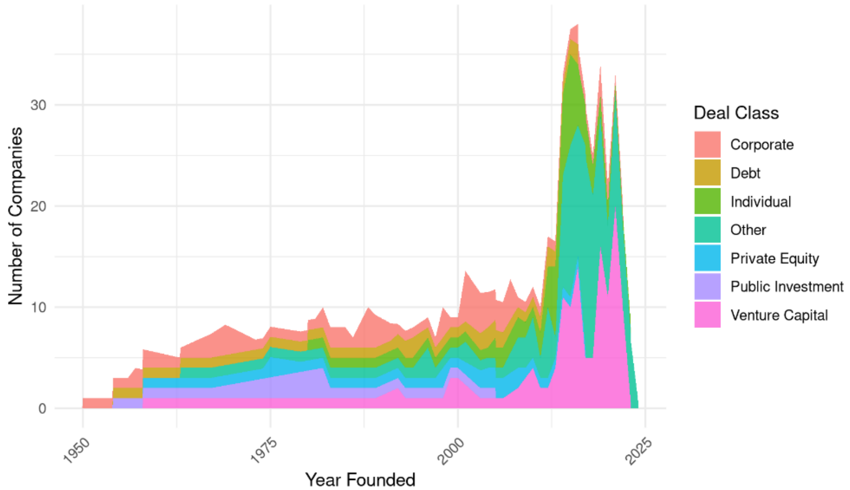

FIGURE 2-3 First financial deal class over time of PitchBook-reported space technology companies.
SOURCE: Committee generated based on data from PitchBook.

broader shift from a centralized, government-led model of space activity toward a more distributed system in which private firms increasingly shape both the pace and direction of innovation. At the same time, recent research suggests that established aerospace companies have played a more important role in driving changes in space innovation than have start-ups and venture capital–backed firms (Gaetani and Whalley, 2026).

These changes have important implications for the role of the NASA innovation system and the NASA SBIR/STTR programs. NASA continues to play a central role in defining and pursuing mission-driven objectives in areas such as exploration, science, and aeronautics, particularly where technological challenges are high risk, long horizon, or unlikely to be addressed by private markets alone. At the same time, NASA's engagement with the commercial sector has evolved, with increasing reliance on partnership- and service-based models that leverage private-sector capabilities. Programs such as the Commercial Orbital Transportation Services initiative and its successors illustrate a shift toward models in which NASA acts as a customer and partner, rather than as the sole developer and operator of space systems (Weinzierl and Rosseau, 2025).

Within this evolving ecosystem, the role of the SBIR/STTR programs remains distinct but increasingly relevant. These programs are designed to support early- and intermediate-stage technology advancement aligned with NASA mission needs, often at the level of components, subsystems, and enabling technologies. While the leading firms in the commercial space sector typically operate at the level of system integration, platform development, or service provision—and rely on a broad mix of funding sources, including private capital and large-scale contracts—SBIR/STTR-supported firms frequently contribute to these systems as specialized suppliers. SBIR-funded technologies in areas such as sensing, materials, propulsion components, electronics, software, and autonomy may serve as critical inputs into both government and commercial space architectures.

This supplier-oriented role is closely linked to the dual-use nature of many SBIR/STTR-supported technologies. Technologies developed to meet NASA mission requirements—such as those related to environmental sensing, communications, navigation, or advanced materials—often have applications in commercial markets, including telecommunications, agriculture, climate monitoring, and data analytics. NASA has increasingly recognized the importance of these dual-use pathways, including through targeted initiatives such as the SBIR Ignite program, which seeks to facilitate connections between NASA-supported technologies and broader commercial applications.[4] While such efforts remain relatively modest in scale, they reflect a broader recognition that technologies developed within NASA's mission-oriented system may contribute to a wider set of economic activities beyond traditional federal missions.

It is useful to highlight both the complementarity and distinction between the role of NASA's SBIR/STTR programs and the drivers of growth in the

[4] https://www.nasa.gov/sbir_sttr/sbir-ignite.

commercial space sector. The emergence of large-scale commercial space enterprises has been shaped by a combination of factors, including substantial private investment, entrepreneurial initiative, and large government contracts beyond SBIR/STTR awards. While some SBIR and STTR firms have done work that now underpins and sets the stage for the New Space economy, the SBIR/STTR programs are not the primary mechanisms through which these firms have developed (see Box 2-3).

This section has demonstrated that boundaries between NASA's mission-driven innovation system and the commercial space ecosystem are increasingly porous. Firms often operate across multiple domains, combining SBIR/STTR funding with other federal awards, commercial contracts, and private investment. As a result, technologies and capabilities developed within NASA's ecosystem may find application in commercial contexts, while developments in the commercial sector may, in turn, shape NASA's technology needs and procurement strategies. Understanding SBIR/STTR within this broader and evolving context is essential for assessing its role not only in supporting NASA missions, but also in contributing—directly and indirectly—to the development of the wider space economy.

BOX 2-3
Made In Space (MIS) and the NASA SBIR/STTR Program

The trajectory of Made In Space (MIS) illustrates how sustained engagement with NASA's Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) programs can help develop capabilities that ultimately support both NASA's mission needs and emerging needs in the commercial space sector. Founded in 2010, MIS focused on developing in-space manufacturing technologies, including additive manufacturing systems designed to operate in microgravity. Over time, the company received multiple NASA SBIR Phase I and II awards, supporting early-stage technology development and advancing its core technology through several Technology Readiness Levels. These SBIR-supported efforts were complemented by follow-on NASA programs, including the Tipping Point initiative, which was designed to accelerate the advancement of technologies with both mission relevance and broader application potential. By the mid-2010s, MIS developed and demonstrated technologies that were ultimately deployed on the International Space Station, providing a proof of concept for in-space manufacturing capabilities. Importantly, these successes within the NASA ecosystem facilitated the acquisition of MIS by Redwire in 2020, enabling technologies initially developed through mission-oriented programs to be incorporated into a larger commercial space strategy. While SBIR/STTR funding represented only one component of this broader process (and one cannot draw out a causal impact of the NASA program on MIS in isolation), MIS demonstrates the role that NASA SBIR/STTR program participants are playing in the emerging commercial space industry.

SOURCE: Weinzierl and Rosseau, 2025.

SUMMARY

This chapter has provided a framework for understanding the role of the SBIR/STTR programs within the ecosystem that drives innovation in support of the NASA mission. NASA's supply chain, including inputs to innovation for technologies required to support complex space- and Earth-based activities, emerges from a broad set of players that includes NASA mission directorates and centers, prime contractors and system integrators, subprime contractors and specialized engineering firms, small businesses and entrepreneurial firms, universities and research institutions, and international partners. Because NASA missions typically involve limited quantities of highly specialized systems, these players cannot rely on NASA for large procurement contracts. While SBIR/STTR funding plays an important role for innovative small businesses operating in the space industry, emergence of large-scale commercial space companies has been driven by substantial private investment and large government contracts (both from NASA as well as DOD) rather than by SBIR/STTR contracts.

FINDINGS

> Finding 2-1: NASA's SBIR/STTR's topics and subtopics are closely aligned with the agency's mission needs and advance technologies that support its objectives, including the integration of those technologies into mission systems.

> Finding 2-2: NASA's SBIR/STTR awards support early-stage, enabling technologies, advancing their technical maturity and broadening the range of options available for mission applications.

> Finding 2-3: NASA's SBIR/STTR programs are an important entry mechanism among the multiple pathways by which small businesses engage with the agency.

> Finding 2-4: The rapid expansion of the commercial space sector presents both opportunities and challenges for NASA's SBIR/STTR programs, as new sources of private-sector funding and commercial demand complement—rather than replace—NASA's mission-driven innovation system.

3

The Landscape of NASA SBIR/STTR Applicants and Awardees

This chapter focuses on the landscape of NASA's Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) applicants and awardees. The objective is to provide descriptive data with which to understand basic questions about the characteristics and geographic locations of firms receiving NASA SBIR/STTR awards. This analysis covers the fiscal years (FY) 2015–2024 using application data from the government database maintained by the U.S. Small Business Administration (SBA). The chapter reviews the distribution of applications and awards across NASA's directorates and the geographic distribution of applicants and awards across states, drawing comparisons with private-sector funding.

The committee finds that NASA links its SBIR/STTR offerings closely to its technology needs and that firms that receive its SBIR/STTR awards successfully advance the requested technologies. The programs are run in a homogeneous fashion with projects adapted to relatively small award sizes compared with the maximum permitted levels.[1]

METHODOLOGY AND SAMPLING

The principal data source for this chapter is the government database of applicants maintained by SBA, as required in 15 U.S.C., Section 638(k)(2).[2] This database includes information on all Phase I and Phase II applications submitted to NASA starting in FY2015. The database does not include information on the amount of an award or amount requested in an application, research partners that rejected STTR applications, research partners for any SBIR applications, or any information on the ranking or scores of the applications. These data were supplemented with award information amounts from SBA's SBIR/STTR Awards database, which contains information on SBIR/STTR award amounts, including

[1] 15 U.S.C., Section 638(j)(2)(D), and 15 U.S.C., Section 638(p)(2)(B)(ix). Maximum award amounts are reviewed annually by SBA and posted on its website (SBIR.gov). Agencies may exceed these guidelines by up to 50 percent (SBA, 2023, p. 48-49).
[2] The awards data from the government database on applicants were verified using SBA's SBIR/STTR Awards database (SBIR.gov).

awards from all federal agencies[3]; other non-SBIR/STTR federal funding from USAspending.gov; and private-sector funding data from PitchBook. In addition, the committee used NASA's Technology Portfolio Management System (TechPort) to determine SBIR/STTR recipients' initial and final Technology Readiness Level (TRL) and links between NASA's SBIR/STTR awards and its overall technology development activities (see Box 3-1).

BOX 3-1
NASA'S TechPort

NASA's Technology Portfolio Management System (TechPort) provides information on NASA's technology development through a web-based portal. Currently, TechPort contains 20,037 projects, of which 19,272 are completed and 693 are active. The bulk of these are Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) projects: 12,303 are SBIR/STTR projects, of which 12,164 are completed and 139 are active.

For outside users, TechPort provides information on NASA-funded projects, including a detailed description of the project; the primary technology area; anticipated benefits to NASA, the commercial space industry, and other government agencies; the responsible mission directorate; the name and location of the lead organization being funded; key partners to the lead organization; project contacts; and Technology Readiness Levels (TRLs) at the start of the project, current TRL levels, and the estimated TRL for the end of the project.

Importantly, TechPort provides user-friendly access linking its contracts and grants to its technology development and missions. This allows NASA and outsiders to understand the links between NASA's technology investments and its strategy for filling any technology gaps. This capability is unique among those agencies that offer SBIR/STTR awards. Because it contains changes in the technology readiness of projects, it is a useful mechanism for tracking NASA's progress on a variety of technologies. The only similar tool among SBIR/STTR-awarding agencies is the National Institutes of Health's (NIH's) RePORTER, which contains information on each institute's and center's awards, but does not link those awards to NIH's strategies and missions or track the technology progress of its awards.

Providing links between SBIR/STTR awards and Phase III awards, as well as identifying the mission directorate associated with SBIR/STTR awards, would facilitate understanding of how these firms have advanced NASA's technology needs. Additionally, TechPort's database does not contain all contracts and grants offered across NASA. Including all of NASA's procurement and research and development contracts and grants would allow entrepreneurs to understand how their innovations may fit into NASA's mission needs. Finally, integrating other outcome measures, such as patents or private capital funding, could help capture the downstream economic effects of these awards.

SOURCE: NASA's Technology Portfolio Management System, https://techport.nasa.gov.

[3] SBA's SBIR/STTR Awards database is updated over time and, as of January 2026, may not have included all awards. In addition, award amounts and identifying information (such as the NASA mission directorate) are sometimes missing from this database.

PROGRAM STRUCTURE AND PARTICIPATION

NASA made a total of 5,158 SBIR/STTR awards to 1,265 small businesses in FY2015–2024 (Table 3-1). The total amount awarded during this time frame was a little over $2 billion in inflation-adjusted 2024 dollars. NASA's programs are designed to provide "funding and non-monetary support to build, mature, and commercialize their [small businesses'] technologies, advancing NASA missions and helping solve important problems facing our country" (NASA, n.d.j, para. 1).[4] In addition to Phase I and Phase II awards, NASA offers Phase II-Extended (II-E) awards, Phase II Sequential awards, and Civilian Commercialization Readiness Pilot Program (CCRPP) awards. These post–Phase II awards, described in more detail below, are also included in SBA's SBIR/STTR database but are difficult to distinguish from regular Phase II awards.

In FY2024, NASA's spending on SBIR/STTR was $174.4 million—only 4 percent of the total SBIR/STTR spending by federal agencies (Table 3-2). The Department of Defense (DOD) dominates the federal SBIR/STTR landscape, accounting for 63.3 percent of all award funding ($2.73 billion), followed by the Department of Health and Human Services (of which the bulk of awards are from the National Institutes of Health [NIH]) at 18.3% ($789.2 million).

TABLE 3-1 NASA SBIR/STTR Awards (Phases I and II): Counts and Funding Amounts (Fiscal Years 2015–2024)

	Number of Phase I and II Awards		Total NASA SBIR/STTR Award Funding	
Fiscal Year	SBIR	STTR	Millions of Nominal Dollars	Millions of 2024 Dollars*
2015	463	70	176	233
2016	478	75	169	221
2017	470	83	166	212
2018	446	68	170	213
2019	454	70	166	204
2020	492	81	188	228
2021	455	79	199	230
2022	409	73	190	204
2023	385	70	182	188
2024	365	72	174	174
Total	4,417	741	N/A	2,107

* Inflation adjusted using the Consumer Price Index with 2024 as the base year.
NOTE: N/A = not applicable.
SOURCES: Committee calculations based on the Small Business Administration's (SBA's) SBIR/STTR Awards database (SBIR.gov) as of January 2026 and the government database on applicants maintained by SBA.

[4] Chapter 4 provides details on the programs' processes and procedures for announcing topics and selecting awardees.

The percentage of NASA's extramural research and development (R&D) budget that is set aside for SBIR increased from 2.9 percent in FY2015 to 3.2 percent in FY2017, and the set-aide for STTR increased from 0.40 percent to 0.45 percent in that same time period (Table 3-3). While the set-aside percentages have remained the same since 2017, NASA's extramural research budget has declined in real terms during the past decade, which along with a slight increase in the size of awards in FY2022 led to a decline in the number of SBIR awards from 463 in FY2015 to 365 in FY2024 (Table 3-1).

NASA's Phase I awards provide funding for idea generation. Unlike other federal agencies, NASA has different timelines for its SBIR and STTR Phase I awards. NASA's SBIR Phase I awards are for 6 months, while its STTR Phase I awards are for 13 months to facilitate the required collaboration between the small business and a research institution. Phase II awards are for prototype development and are 24 months in duration.

In FY2022, NASA introduced SBIR Ignite, an initiative designed to focus a portion of NASA SBIR funding on more commercialization-oriented technologies. The program targets technologies more mature than those funded by traditional SBIR awards and is intended to encourage participation from

TABLE 3-2 Federal SBIR/STTR Award Funding, by Agency (Fiscal Year 2024)

Agency	Number of Awards	Total Award Amount (Dollars)	Percentage of Total
Department of Defense	3,422	2,731,408,692	63.3
Department of Health and Human Services	1,226	789,172,812	18.3
Department of Energy	554	309,703,773	7.2
National Science Foundation	419	197,931,859	4.6
NASA	437	174,432,457	4.0
All others	328	113,330,839	2.6
Total	6,386	4,315,980,432	100.0

SOURCE: Committee calculations based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) as of January 2026.

TABLE 3-3 Required Minimum SBIR/STTR Expenditures for Participating Agencies as a Percentage of Agency Extramural Budgets for Research or Research and Development (Fiscal Years 2015–2024)

	Fiscal Year		
	2015	2016	2017–2024
SBIR	2.9	3.0	3.2
STTR	0.40	0.45	0.45

NOTE: Minimum expenditures for subsequent years remain at fiscal year 2017 levels.
SOURCES: 15 U.S.C., Sections 638(f)(1) and 638(n)(1)(B).

companies that are not looking to sell their product to NASA as their primary customer. Its structure is designed to accelerate the timeline between phases. Each year since the initiative launched, about ten Ignite Phase I awards have been made, and most Phase I recipients have gone on to receive an Ignite Phase II award. By the end of Phase II, technologies funded under SBIR Ignite are expected to reach TRL 5 or 6 (NASA, n.d.f).

NASA offers three post–Phase II SBIR opportunities, two of which require matching funds. NASA's Phase II Sequential awards go to a small number of Phase II awardees who need additional funding to continue the work of the initial Phase II award. Phase II awardees are eligible to apply for a single Phase II Sequential award. NASA issued six Phase II Sequential awards in FY2023, two in FY2024, and six in FY2025. NASA also offers a Phase II-Extended (II-E) award up to $375,000 that matches outside investments (from another company, venture capital firm, individual investor, or another government agency [outside of SBIR/STTR]). Finally, NASA provides matching funds from $500,000 to $2.5 million through its CCRPP to facilitate accelerated pathways for technologies to either move into NASA missions or other commercial markets. These funds and pathways are especially important in technical domains that are critical for long-term NASA projects such as space exploration where there may be limited incentives for private-sector investment from sources such as venture capital.

The final phase of NASA's SBIR/STTR programs is Phase III, or the commercialization phase. Phase III contracts are products or services that derive, extend, or complete efforts from Phase I and II awards. They receive further federal R&D support and/or transition to NASA or another federal agency. Phase III activities do not receive SBIR/STTR funds. An SBIR/STTR awardee has certain rights, such as the ability to transition its technology without competition and data rights that other federal contractors do not have (NASEM, 2026). This aspect of the overall structure of the SBIR/STTR programs allows for the possibility that projects initially funded by one agency may ultimately benefit multiple agencies across the federal government as well as the private sector.

Previous National Academies reports have found that transitions to Phase III are difficult to track because of the multiple pathways in which technologies may transition and because subsequent federal R&D or procurement contracts for SBIR/STTR-funded research are not carefully measured (NASEM, 2026). Concerns about transitions to Phase III contracts were noted in the most recent reauthorization of the programs, which includes several provisions for measuring and maximizing Phase III transitions for SBIR/STTR-funded products, services, and technologies.[5]

NUMBER OF PHASE I APPLICATIONS AND APPLICANTS

Despite the decline in NASA's budget and the number of Phase I awards it has made, there was not a substantial decline in the number of SBIR Phase I

[5] U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026).

applications from FY2015 to FY2024 (Figure 3-1). The steady number of applications combined with a decline in the number of awards led to a significant decline in the success rate for Phase I SBIR applications, which fell from 28 percent in FY2015 to 18 percent in FY2024 (Figure 3-2). The number of STTR Phase I applications, on the other hand, showed a great deal of variability during this period, rising from 103 applications in FY2015 to a peak of 266 applications in FY2020, declining to 128 in FY2023, and increasing to 210 in FY2024 (Figure 3-3). The success rates for STTR Phase I applications were generally higher than those for SBIR and followed an inverse pattern with the number of applications. NASA allows Phase II applicants only from awardees who received their Phase I awards in the period immediately preceding the Phase II application period (and was not authorized to offer Direct to Phase II awards until the passage of the most recent SBIR/STTR reauthorization).[6] The success rate of Phase II SBIR applications remained in the 40- to 50-percent range during this period, while the STTR Phase II success rate was more volatile (Figure 3-4). The variability in success rates for STTR Phase II applications is likely due to the variation in application numbers and the small numbers of applications and awards for STTR relative to the SBIR program.

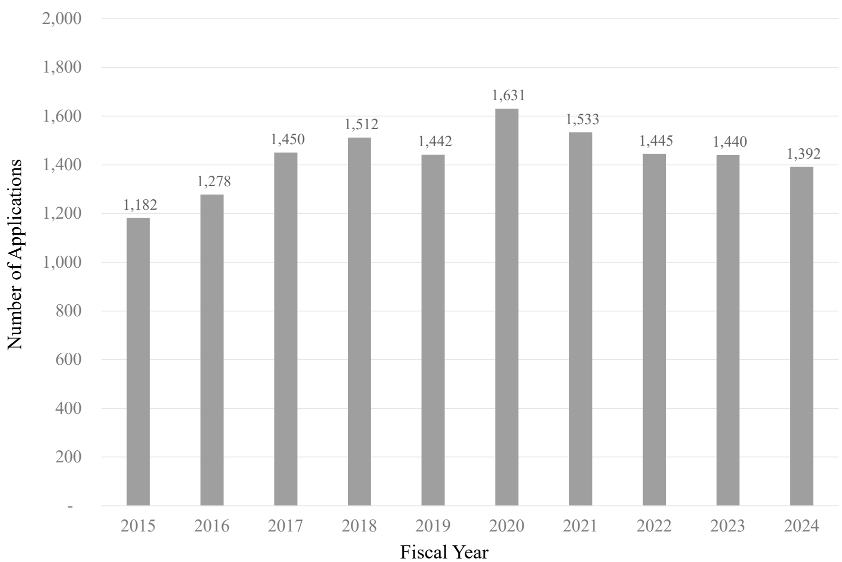

FIGURE 3-1 Number of Phase I applications to NASA's SBIR program, by year (fiscal years 2015–2024).
SOURCE: Committee calculations based on the government database maintained by the Small Business Administration.

[6] U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026), Section 10(a).

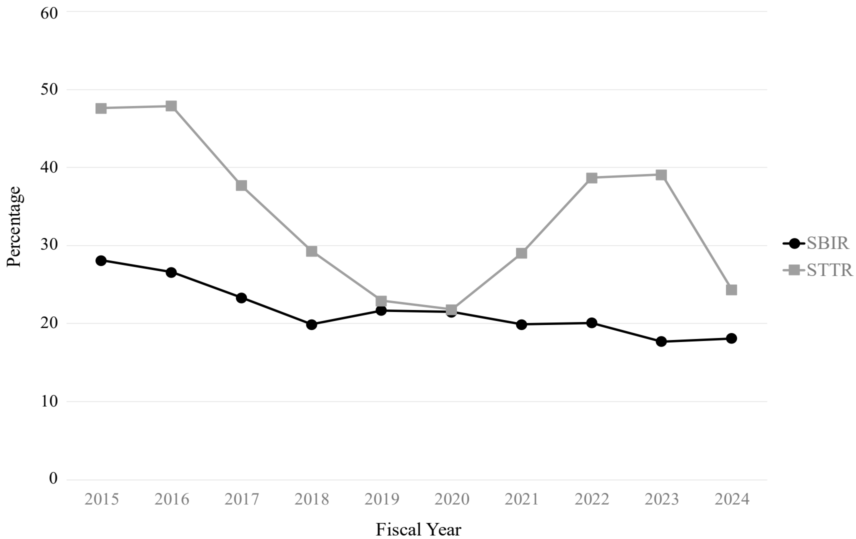

FIGURE 3-2 NASA's SBIR/STTR Phase I success rates (fiscal years 2015–2024).
SOURCE: Committee calculations based on the government database maintained by the Small Business Administration.

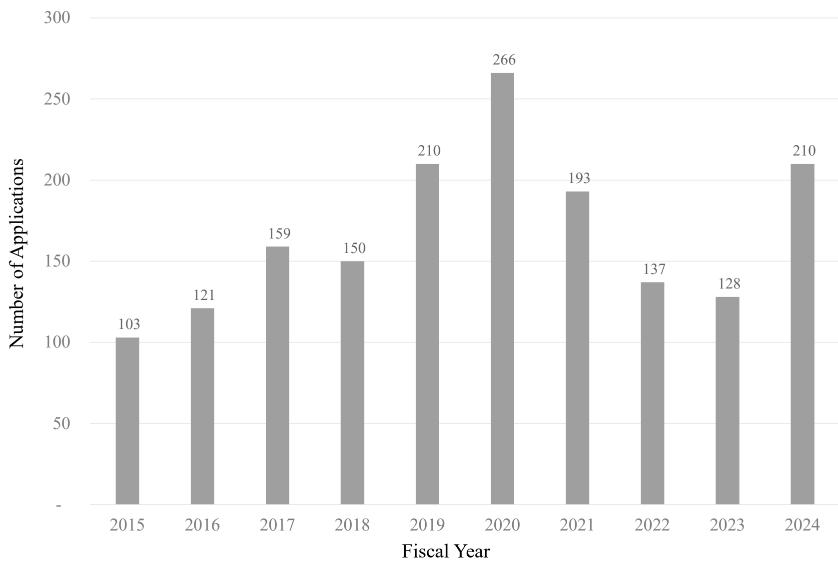

FIGURE 3-3 Number of NASA's STTR Phase I applications, by year (fiscal years 2015–2024).
SOURCE: Committee calculations based on the government database maintained by the Small Business Administration.

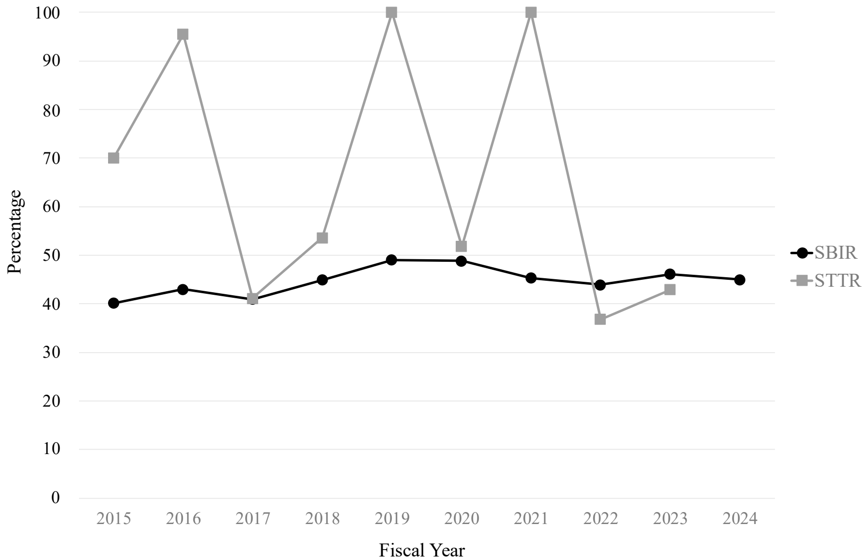

FIGURE 3-4 NASA'S SBIR/STTR Phase II success rates (fiscal years 2015–2024).
SOURCE: Committee calculations based on the government database maintained by the Small Business Administration.

NASA's Phase I success rate is quite competitive, comparable to or lower than many of the most prestigious and competitive research programs in the federal government, such as R01 grants from NIH and the National Science Foundation's programs. Although the success rate for firms seeking funding from venture capitalists is generally much lower, the pool of applicants for SBIR/STTR funding is narrower than that for venture capital funding. Firms applying for SBIR/STTR awards must satisfy statutory eligibility criteria and must be able to respond to a specific NASA solicitation. What is more, venture deals for space companies have averaged in the tens of millions of dollars, much larger than NASA SBIR/STTR awards (Bryce Tech, 2022). Venture funding also generally requires concise documents, such as pitch decks, whereas government funding requires rigid detailed proposals with technical reports, system registration, due diligence documentation, and strict budget narratives to ensure compliance and alignment with agency goals and federal laws. These factors combine to create a narrower field of potential applicants for NASA's SBIR/STTR awards than for venture capital investments.

NASA strictly limits the size of its Phase I and Phase II awards, as shown in Figures 3-5 and 3-6. NASA Phase I award amounts remained tightly clustered around $125,000 from FY2015 to FY2021, then increased to approximately $150,000 in FY2022–2024. NASA Phase II award amounts remained fixed around $750,000 from FY2015 to FY2021, with a modest increase to $850,000–

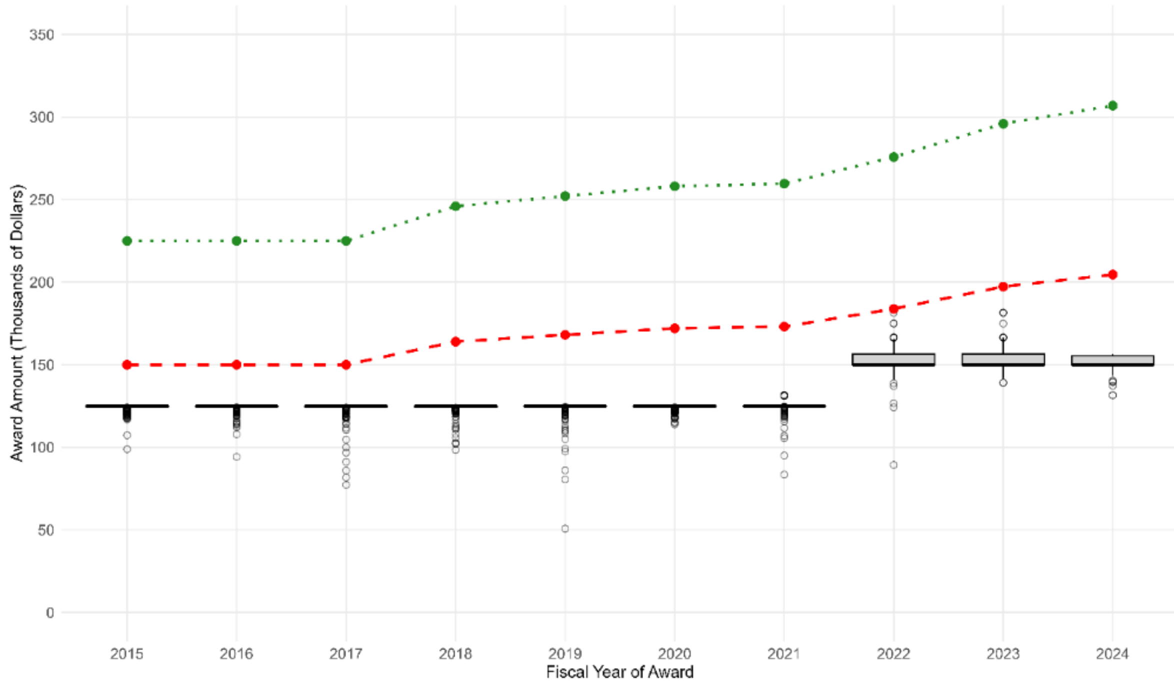

FIGURE 3-5 NASA's SBIR/STTR Phase I award amounts, by year (fiscal years 2015–2024).
NOTES: Box = 25th–75th percentile; line = median; whiskers = 1.5 × interquartile range. Red dashed line = maximum award size per the Small Business Administration's (SBA's) Policy Directive; green dotted line = maximum award size without a waiver from SBA; award amounts are in nominal dollars.
SOURCE: Committee calculations based on SBA's SBIR/STTR Awards database (SBIR.gov) as of January 2026.

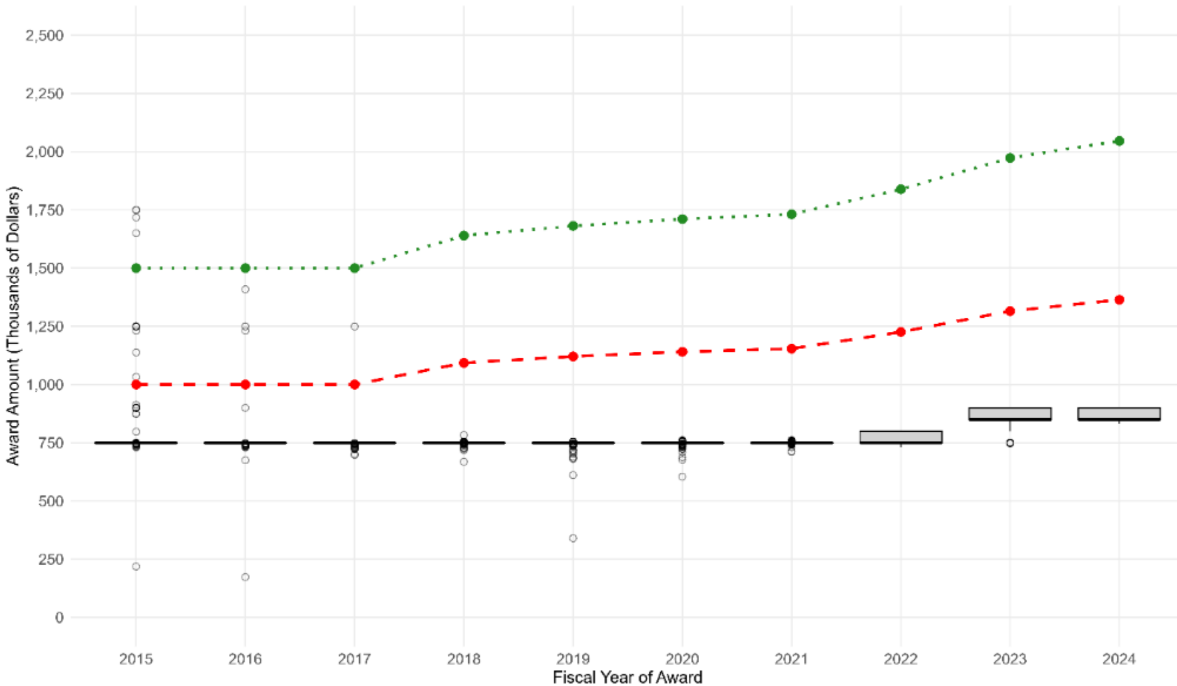

FIGURE 3-6 NASA's SBIR/STTR Phase II award amounts, by year (fiscal years 2015–2024).
NOTES: Box = 25th–75th percentile; line = median; whiskers = 1.5× interquartile range. Red dashed line = maximum award size from the Small Business Administration's (SBA's) Policy Directive; green dotted line = maximum award size without a waiver from SBA; award amounts are in nominal dollars.
SOURCE: Committee calculations based on SBA's SBIR/STTR Awards database (SBIR.gov) as of January 2026.

$900,000 in FY2022–2024. As part of their applications, firms can also request additional funding for Technical and Business Assistance, as required in the FY2019 National Defense Authorization Act—$6,500 for a Phase I award and $50,000 for a Phase II award, which is included in the total award amount.[7]

NASA's award amounts for both Phases I and II are well below the statutory caps, which are inflation adjusted annually by SBA in accordance with the provisions of the SBIR/STTR Policy Directive (SBA, 2023). (These adjusted caps are represented in the figures by the red dashed lines.) Furthermore, as the policy directive indicates, agencies can exceed these adjusted caps by up to 50 percent without requesting a waiver from SBA (represented in the figures by the green dotted lines) and can request a waiver from SBA to offer even larger awards. Overall, award amounts consistently fall below the SBA inflation-adjusted maximums, indicating that NASA adheres to conservative Phase I and Phase II award sizes compared with the allowable amounts.

NASA's practice of making smaller awards provides the agency more flexibility to fund post–Phase II awards. However, pursuing technologies for space exploration is costly for firms, and the documentation requirements for SBIR/STTR applications are extensive. Phase II Sequential and CCRPP awards also require matching funds from other investors, which may be limited for long-term projects such as space exploration. In practice, only a small share of Phase II awardees receive post–Phase II (Phase II-E, Phase II Sequential, or CCRPP) awards.

DISTRIBUTION OF SBIR/STTR AWARDS ACROSS DIRECTORATES

The committee next analyzed differences among SBIR awards across the mission directorates at NASA that currently offer SBIR awards (directorate information for STTR awards is not available). From most of the committee's period of analysis, four directorates offered SBIR awards: Space Technology Mission Directorate (STMD), Science Mission Directorate (SMD), Aeronautics Research Mission Directorate (ARMD), and the Human Exploration Operations Mission Directorate (HEOMD). In September 2021, HEOMD was split into the Space Operations Mission Directorate and the Exploration Systems Development Mission Directorate (ESDMD). Over the period FY2015–2024, NASA received more than 17,300 SBIR applications and made over 4,400 SBIR awards. Each directorate has a different mission and technology focus, but the TRLs of the projects and sizes of awards are similar across the directorates.

Table 3-4 presents NASA SBIR awards in FY2024 by directorate and describes each directorate's mission. The differences in these missions can be illustrated by the differences in technology categories (Box 3-2) among the SBIR Phase I awards across the directorates (Figure 3-7). While many of these taxonomy categories are covered by SBIR awards from all the directorates, TX15

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[7] U.S. Congress, John S. McCain National Defense Authorization Act for Fiscal Year 2019, P.L. 115–232, Section 854 (August 13, 2018).

TABLE 3-4 NASA Mission Directorate Descriptions and SBIR Award Data for Fiscal Year 2024

Directorate	Mission	Number of SBIR Phase I Awards	Number of SBIR Phase II and Post–Phase II Awards	Total SBIR Funding
Science Mission Directorate (SMD)	Seeks to discover the secrets of the universe, search for life elsewhere, and protect and improve life on Earth and in space	92	41	$52,618,986
Space Technology Mission Directorate (STMD)	Develops, demonstrates, and transfers new space technologies that benefit NASA, commercial, and other government agencies' missions	74	34	$48,155,428
Aeronautics Research Mission Directorate (ARMD)	Manages efforts to safely and sustainably transform aviation for the 21st century	45	17	$21,786,122
Exploration Systems Development Mission Directorate (ESDMD)	Defines and manages human exploration system development for lunar orbital, lunar surface, and Mars exploration	38	18	$24,536,115
Space Operations Mission Directorate (SOMD)	Maintains a continuous human presence in space for the benefit of people on Earth through the International Space Station	5	1	$1,653,536

NOTES: The Mission Operations Directorate does not offer SBIR or STTR awards. In fiscal year 2022, the Human Exploration Operations Mission Directorate was divided into ESDMD and SOMD.
SOURCES: Committee calculations based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) as of January 2026. Directorate descriptions drawn from NASA, n.d.e.

(flight vehicle systems) and TX16 (air traffic management and range tracking systems) are almost exclusive to awards from ARMD. SMD, which has the largest R&D budget, has a broad portfolio including planetary science, Earth science, astrophysics, heliophysics, and biological and physical sciences. While SMD offers awards across many of the taxonomy categories, the bulk of its Phase I SBIR contracts are in TX08 (sensors and instruments). Recent studies indicate that commercial space sensors are increasingly utilized in NASA missions for a range of essential applications (Popkin, 2017).

While NASA's SBIR program funds technologies broadly relevant to the agency's mission, recent research (Boroff and Vertesi, 2026) suggests that its SBIR projects do not comprehensively address the full set of strategic technology gaps the agency has identified. In particular, some mission-critical areas appear to receive limited attention from SBIR participants relative to their importance to NASA. Understanding the alignment between SBIR/STTR topic selection and evolving mission priorities represents an important area for further analysis and potential program refinement.

BOX 3-2
NASA's Technology Taxonomy

"NASA engages in a variety of technology development activities" and uses a technology taxonomy to "identif[y], organize, and communicate technology areas relevant to advancing the agency's mission" into 17 distinct areas (NASA, n.d.l, para. 1):

- TX01: propulsion systems;
- TX02: flight computing and avionics;
- TX03: aerospace power and energy storage;
- TX04: robotic systems;
- TX05: communications, navigation, and orbital debris tracking and characterization systems;
- TX06: human health, life support, and habitation systems;
- TX07: exploration destination systems;
- TX08: sensors and instruments;
- TX09: entry, descent, and landing;
- TX10: autonomous systems;
- TX11: software, modeling, simulation, and information processing;
- TX12: materials, structures, mechanical systems, and manufacturing;
- TX13: ground, test, and surface systems;
- TX14: thermal management systems;
- TX15: flight vehicle systems;
- TX16: air traffic management and range tracking systems; and
- TX17: guidance, navigation, and control technologies.

SOURCE: Taxonomy areas drawn from NASA, n.d.l.

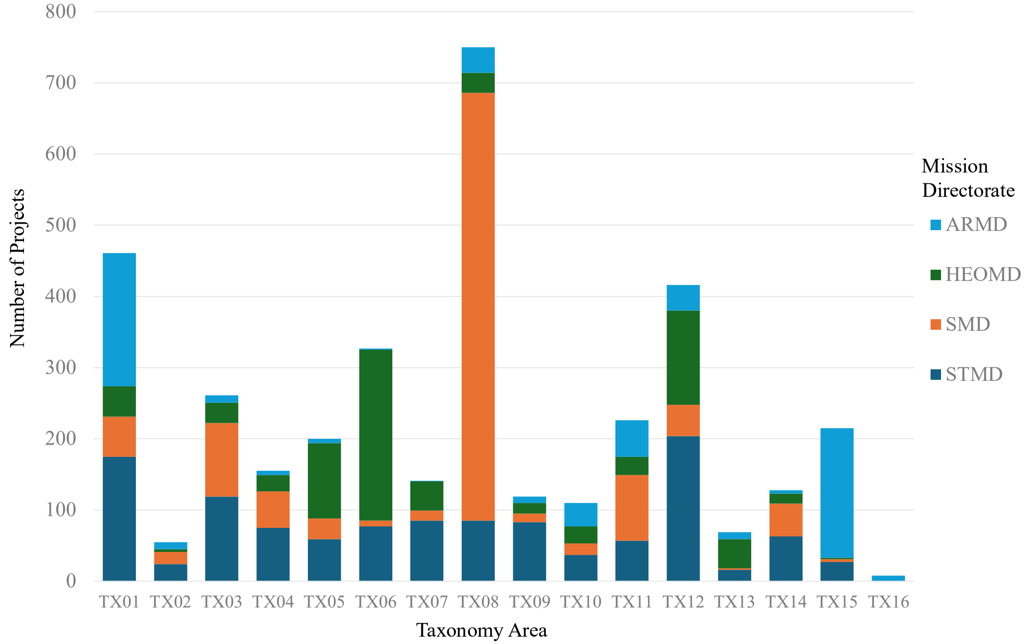

FIGURE 3-7 NASA SBIR Phase I projects, by primary taxonomy area and mission directorate (fiscal years 2015–2022).
NOTES: Taxonomy category details are provided in Box 3-2. ARMD = Aeronautics Research Mission Directorate; HEOMD = Human Exploration Operations Mission Directorate; SMD = Science Mission Directorate; STMD = Space Technology Mission Directorate.
SOURCES: Committee calculations based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) as of January 2026 and from NASA's Technology Portfolio Management System (https://techport.nasa.gov).

During FY2015–2024, SMD received the most Phase I applications, followed by STMD, which saw a dramatic increase from 91 applications in FY2015 to over 400 annually starting in FY2017 (Figure 3-8). Among the human exploration directorates, HEOMD saw a decline from 494 applications in FY2016 to 299 in FY2021; its successor ESDMD has continued that downward trend, dropping from 214 in FY2022 to 194 in FY2024.

All the directorates declined in their SBIR Phase I success rate during FY2015–2024 (Figure 3-9). The directorate offering the most SBIR awards during this period, SMD, did not face a substantial decrease in the number of applications, although the number of awards it gave out annually has declined over the 10-year study period (Figure 3-10).

The committee also investigated the TRLs of the Phase I projects that were awarded during this period to see whether there were differences across the directorates. As described in Chapter 2, NASA uses a scale from 1 to 9; in TRL 1, basic principles are observed and reported, and in TRL 9, a technology is successfully demonstrated on missions to fly (Table 3-5). Prior research indicates that when calibrated across directorates, NASA TRLs provide an appropriate benchmark and reasonable proxy for technology development risks and costs at each stage of progress in the project life cycle (Terrile et al., 2015). Table 3-6 shows the TRL levels of an average Phase I recipient at the time of award and end of award. There is little variation in the TRL beginning and ending levels across the directorates. The average starting TRL is just under 3 and the average ending TRL is 4.5.

NEW ENTRANTS TO THE NASA SBIR/STTR PROGRAMS

As discussed in previous National Academies studies of the SBIR/STTR programs, new entrants to the programs play an important role and help provide novel approaches to government-funded innovation efforts (NASEM, 2026). The committee analyzed whether the share of NASA SBIR/STTR awards going to new entrants has increased in recent years. The committee evaluated both the share of awardees that were new to SBIR/STTR from any agency, over time, and the share of awardees that were new to NASA's SBIR/STTR programs. (See Table 3-7.) The committee found that nearly one-third of NASA awardees over the study period were new to NASA's programs; however, a substantial number of NASA awardees were not new to the SBIR/STTR program. NASA's SBIR/STTR budget is dwarfed by the combined budgets of the Air Force and Space Force, which makes it likely that these agencies can attract more applicants than NASA. Moreover, given the larger budgets available within DOD for outreach, leveraging Air Force and Space Force awardees to fulfill NASA-specific technological needs may be a cost-effective way for NASA to achieve its goals.

Concerns about the unevenness in award distribution led to legislative requirements on SBIR/STTR awardees. The 2011 reauthorization of the SBIR/STTR programs introduced Phase I–II transition rate and

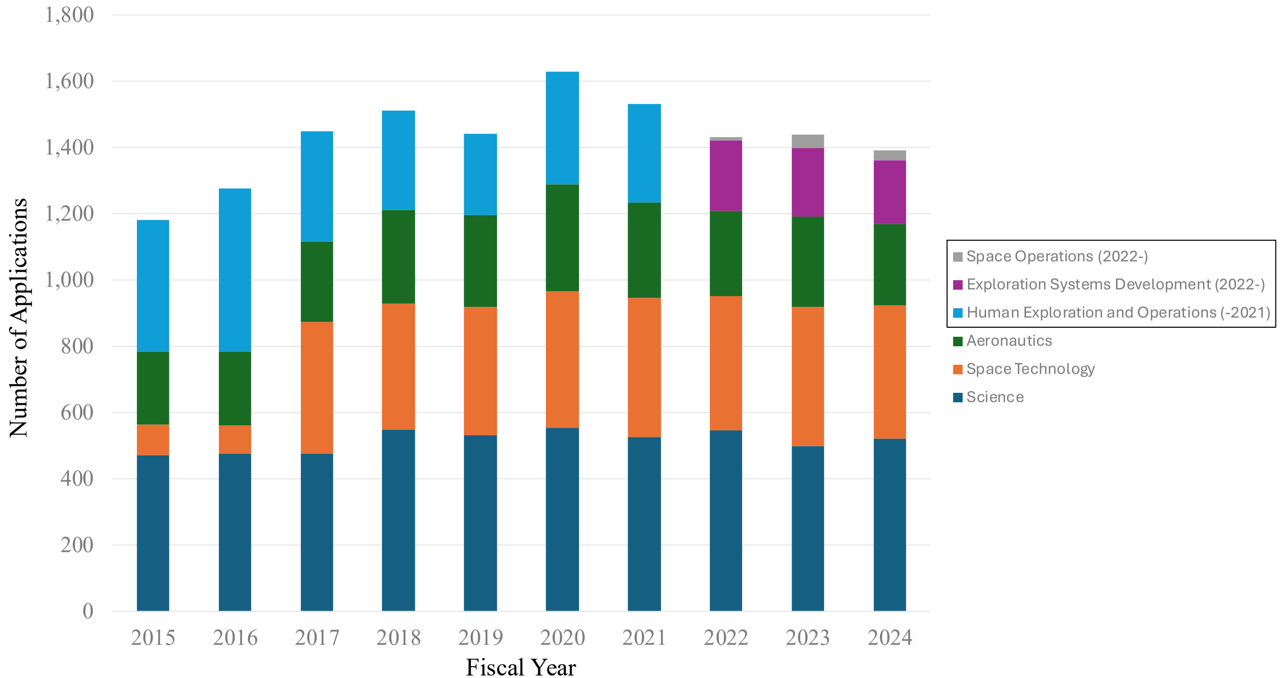

FIGURE 3-8 Number of Phase I applications to NASA's SBIR program, by mission directorate (fiscal years 2015–2024).
SOURCES: Committee calculations based on the Small Business Administration's (SBA's) SBIR/STTR Awards database (SBIR.gov) as of January 2026 and the government database maintained by SBA.

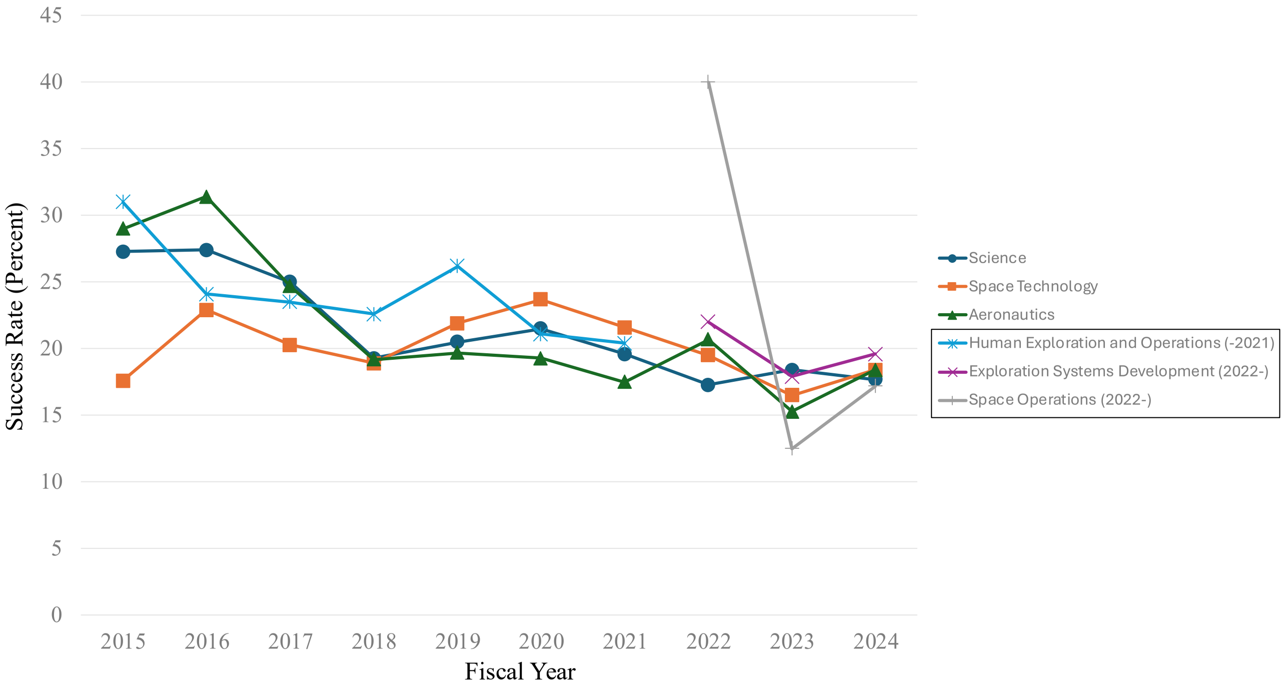

FIGURE 3-9 Success rate for Phase I applications to NASA's SBIR program, by mission directorate (fiscal years 2015–2024).
SOURCES: Committee calculations based on the Small Business Administration's (SBA's) SBIR/STTR Awards database (SBIR.gov) as of January 2026 and the government database maintained by SBA.

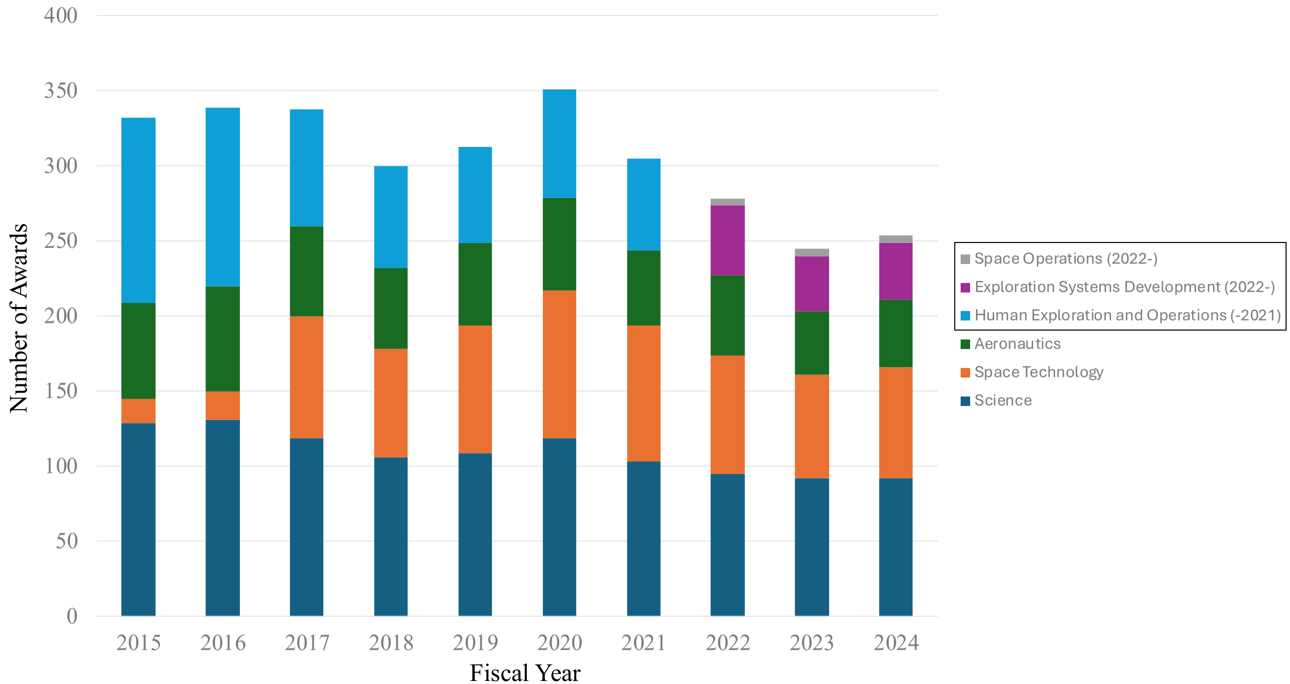

FIGURE 3-10 Number of NASA SBIR Phase I awards, by mission directorate (fiscal years 2015–2024).
SOURCES: Committee calculations based on the Small Business Administration's (SBA's) SBIR/STTR Awards database (SBIR.gov) as of January 2026 and the government database maintained by SBA.

TABLE 3-5 Technology Readiness Level Definitions

Level	Definition
1	Basic principles observed and reported
2	Technology concept and/or application formulated
3	Analytical and experimental critical function and/or characteristic proof-of-concept
4	Component and/or breadboard validation in laboratory environment
5	Component and/or breadboard validation in relevant environment
6	System/subsystem model or prototype demonstration in a relevant environment (ground or space)
7	System prototype demonstration in a space environment
8	Actual system completed and "flight qualified" through test and demonstration (ground or space)
9	Actual system "flight proven" through successful mission operations

SOURCE: Drawn from NASA, 2023.

TABLE 3-6 Average Technology Readiness Level (TRL), by Mission Directorate (Fiscal Years 2015–2022)

Mission Directorate	Average Starting TRL	Average Ending TRL
Space Technology Mission Directorate (STMD)	2.76	4.48
Science Mission Directorate (SMD)	2.73	4.43
Human Exploration Operations Mission Directorate (HEOMD)/Exploration Systems Development Mission Directorate (ESDMD)/Space Operations Mission Directorate (SOMD)	2.76	4.47
Aeronautics Research Mission Directorate (ARMD)	2.64	4.48

NOTES: Projects started after fiscal year 2022 are not included because they are not completed (and therefore do not have ending TRL levels). In September 2021, HEOMD was split into ESDMD and SOMD.
SOURCES: Committee calculations based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) as of January 2026 and from NASA's Technology Portfolio Management System (https://techport.nasa.gov).

TABLE 3-7 Award History of NASA SBIR/STTR Awardees (Fiscal Years 2015–2024)

Fiscal Year	Total Number of Awardees	Number of Awardees with No Previous NASA SBIR/STTR Awards	Number of Awardees with No Previous SBIR/STTR Awards from Any Agency	Percentage of Awardees with No Previous NASA SBIR/STTR Awards	Percentage of Awardees with No Previous SBIR/STTR Awards from Any Agency
2015	318	69	38	21.7	11.9
2016	320	69	35	21.6	10.9
2017	329	71	41	21.6	12.5
2018	332	85	55	25.6	16.6
2019	348	94	52	27.0	14.9
2020	402	105	64	26.1	15.9
2021	360	88	43	24.4	11.9
2022	329	85	50	25.8	15.2
2023	322	86	41	26.7	12.7
2024	293	89	41	30.4	14.0

NOTES: Prior award history was determined by matching awardee unique entity identifiers (UEIs) against NASA awards in the SBIR.gov database across all available years. Cases with missing UEI (<1 percent of awarded proposals) were excluded.
SOURCES: Committee calculations based on the Small Business Administration's (SBA's) SBIR/STTR Awards database (SBIR.gov) as of January 2026 and the government database maintained by SBA.

commercialization performance metrics that, if not met, would impact eligibility to participate in the programs.[8] The SBIR and STTR Extension Act of 2022 created more stringent transition and commercialization performance requirements for what it defines as *experienced firms*—those receiving more than 50 Phase I or Phase II awards over defined periods.[9] In addition to these commercialization and transition requirements, the 2026 reauthorization requires each agency to establish limits on the number of Phase I and Phase II proposals that a small business can submit.[10]

As shown in Figure 3-11, however, most NASA SBIR/STTR awardees won only a single Phase I award during FY2015–2024, and nearly three-quarters won only one or two Phase I awards. Only 16 firms received over 20 awards in the 10-year study period. Figure 3-12 shows that, even among the top-25 Phase I award recipients, each received fewer than 50 awards during the study period. As

[8] U.S. Congress, National Defense Authorization Act for Fiscal Year 2012, P.L. 112–81, Section 5165 (December 31, 2011).
[9] U.S. Congress, SBIR and STTR Extension Act of 2022, P.L. 117–183, Section 8 (September 30, 2022).
[10] U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026).

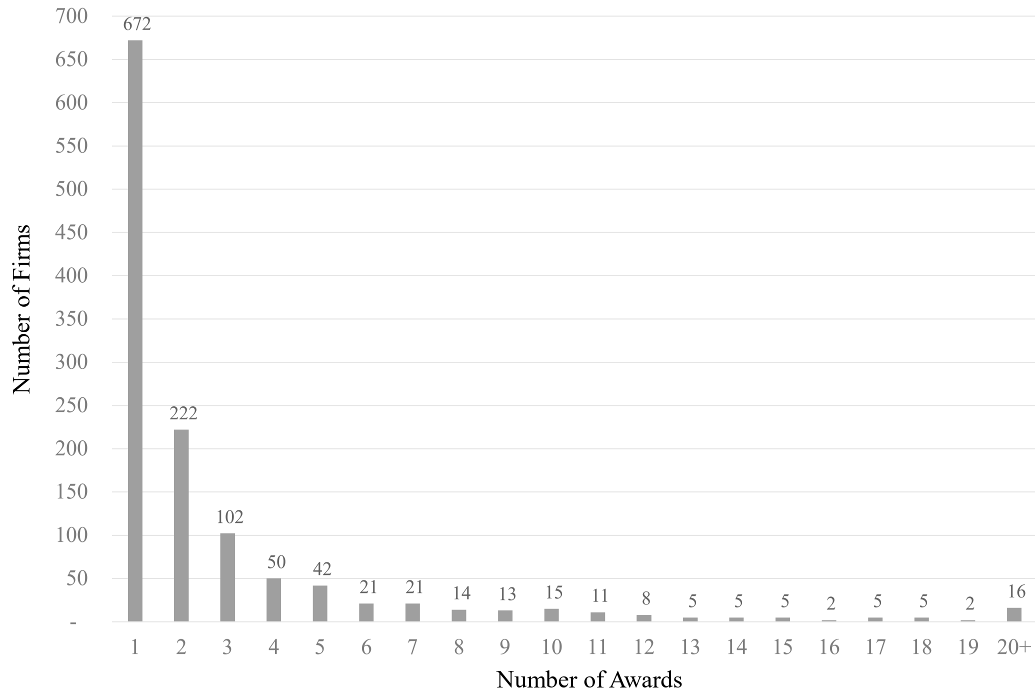

FIGURE 3-11 Distribution of firms, by total number of NASA's SBIR/STTR Phase I awards received (fiscal years 2015–2024).
NOTE: Indicates the number of unique firms that received each award count over the period.
SOURCE: Committee calculations based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov).

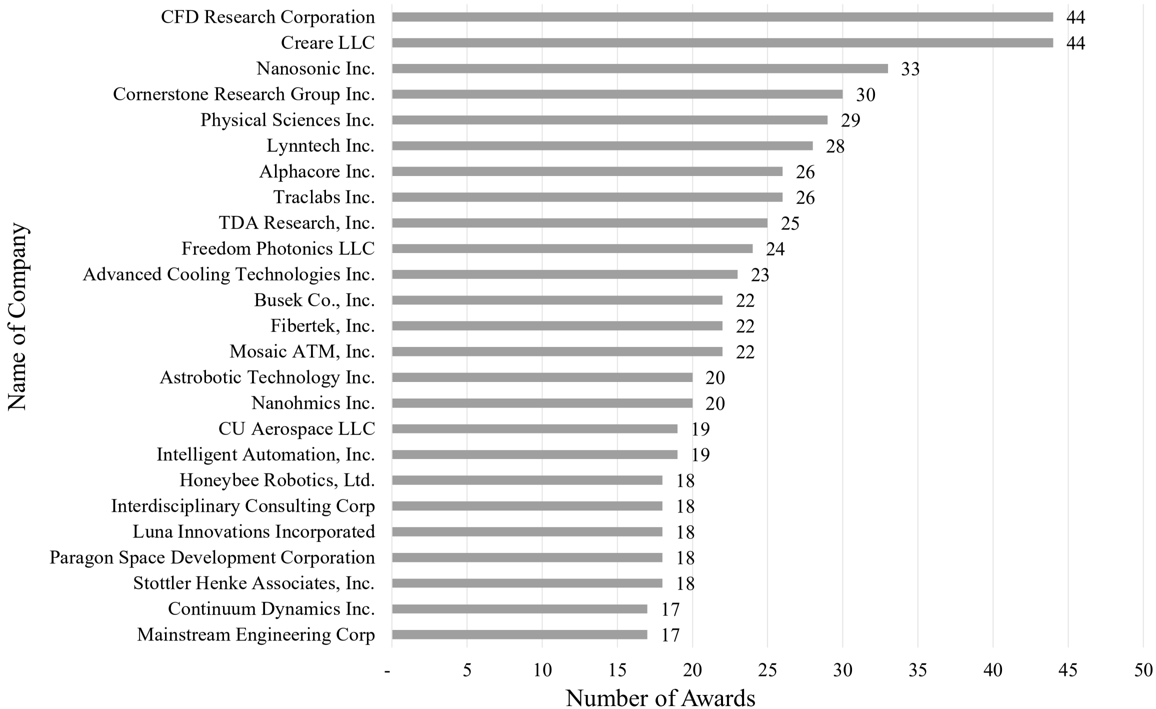

FIGURE 3-12 Top 25 NASA SBIR/STTR Phase I award recipients (fiscal years 2015–2024).
SOURCE: Committee calculations based on the Small Business Administration’s SBIR/STTR Awards database (SBIR.gov) as of January 2026.

NASA's experiences with its Mars rovers have indicated, SBIR/STTR-funded firms that provided instrumentation for early iterations of the rover were well positioned to provide instruments for succeeding versions. As discussed in Chapter 2, Optimax Systems provided instruments for three different Mars rovers.

Previous National Academies reports have noted that many of these multiple award–winning firms engage new technical experts as principal investigators as they obtain additional SBIR/STTR awards, and these individuals can bring fresh technical perspectives to the government (NASEM, 2026). In addition, previous National Academies reports have found that firms that receive multiple awards are substantially more likely to generate inventions, secure follow-on government or private funding, and contribute meaningfully to national security (NASEM, 2026).

GEOGRAPHIC DISTRIBUTION OF AWARDEES

Analyzing the geographic distribution of NASA SBIR/STTR spending is important because it provides insight into whether the programs are broadening access to federal innovation funding—either beyond the NASA center locations or traditional innovation hubs. The SBA Policy Directive web page indicates that one of the statutory purposes of the SBIR program is to "foster and encourage participation by emerging and undercapitalized SBCs [small business concerns] in technological innovation" (SBA, n.d., "Purpose," para. c). Several bills introduced during the 199th Congress (2025–2026) focused on outreach and assistance to small businesses located in rural areas or states that have been historically underrepresented in these programs.[11]

NASA SBIR/STTR participation is geographically concentrated in states with established aerospace or defense ecosystems (Table 3-8). However, many NASA SBIR/STTR awards go to firms located in the Midwest and Rocky Mountain areas (Figure 3-13). These firms are far away from NASA centers or from coastal urban areas, where firms that are funded by venture capital tend to be established, indicating that NASA's SBIR/STTR programs are helping reduce geographic disparities in innovation opportunity.

The application data show similar trends with the largest number of applications coming from California (nearly 4,000 Phase I applications and over 700 Phase II applications over the 10-year study period), far exceeding the applications from any other state. Colorado, Texas, Virginia, and Massachusetts also represent major centers of participation, each submitting several hundred applications across both phases. These states combine strong research university systems, mature aerospace supply chains, federal laboratory presence, and a high density of small advanced-technology firms; these factors collectively drive sustained proposal volume.

[11] See, for example, the Rural Innovation and Small Business Support Act (H.R. 1590) and SBIR/STTR Application Assistance Act (H.R. 4520).

Most states, however, had firms submitting fewer than 300 Phase I applications over the 10-year period, and many fell well below 100. The distribution reflects the broader geography of the U.S. aerospace and space technology industrial base: participation is not evenly distributed nationwide but instead is clustered in regions with deep technical infrastructure and historical NASA or DOD engagement. This concentration in application volume also drives concentration in absolute award counts (Table 3-8).

At the same time, many of the states with lower participation rates have high success rates when they do apply. As Table 3-9 shows, states such as New Hampshire, Montana, Wyoming, and Rhode Island all have Phase I success rates over 30 percent, well above NASA's overall average for the period, and above California and Texas, which have success rates of 22 percent.

Figure 3-14 compares average NASA SBIR/STTR funding per capita and average venture capital funding per capita across U.S. states for FY2015–2024. Because California; Massachusetts; New York; Washington, DC; and

TABLE 3-8 NASA SBIR/STTR Phase I and Phase II Awards, by State (Fiscal Years 2015–2024)

State	Number of Phase I Awards	Number of Phase II Awards	State	Number of Phase I Awards	Number of Phase II Awards
CA	759	341	DE	29	10
CO	326	145	GA	25	10
VA	253	105	MO	24	11
MA	226	100	TN	24	12
TX	221	78	UT	23	10
OH	151	67	DC	17	5
MD	145	56	KS	16	9
PA	133	75	AR	15	4
AZ	123	55	LA	14	3
FL	120	53	HI	12	5
NY	105	39	OK	12	4
AL	104	46	VT	11	4
IL	90	39	WV	9	4
WA	74	33	WI	8	2
NH	67	38	WY	7	2
OR	63	28	KY	6	1
MI	59	20	RI	6	2
CT	57	36	ID	5	0
NM	53	23	NV	5	2
NJ	50	23	MS	4	3
NC	34	12	SC	4	2
IN	33	12	IA	3	2
MN	32	12	ME	3	1
MT	32	20	SD	2	0

SOURCE: Committee calculations based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) as of January 2026.

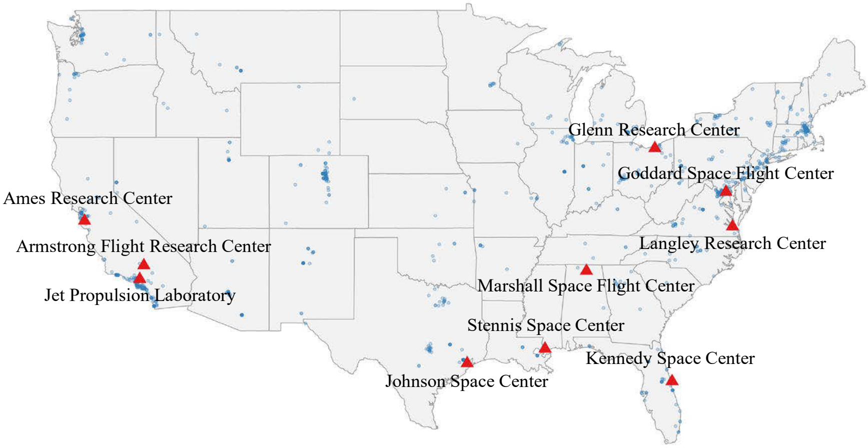

FIGURE 3-13 Locations of NASA space centers and SBIR/STTR awards (fiscal years 2015–2024).
NOTES: Continental United States only. Blue dots signify awards, with the size of the dot indicating the relative award sizes. Red triangles identify the locations of NASA centers.
SOURCE: Committee calculations based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) as of January 2026.

TABLE 3-9 NASA's SBIR/STTR Programs: Top States, by Phase I Success Rate

State	Number of Applications	Number of Applicants	Number of Awards	Number of Awardees	Success Rate (Awards as a Percentage of Applications)
NH	166	20	66	12	39.8
MT	89	23	33	11	37.1
WY	25	13	9	5	36.0
RI	19	12	6	3	31.6
AR	50	9	15	6	30.0
WV	30	6	9	4	30.0
KS	58	12	17	6	29.3
OR	224	39	64	13	28.6
DE	159	60	42	22	26.4
AL	429	88	112	35	26.1

SOURCES: Committee calculations based on the Small Business Administration's (SBA's) SBIR/STTR Awards database (SBIR.gov) as of January 2026 and the government database maintained by SBA.

Delaware had either high levels of venture capital funding or received many NASA SBIR/STTR awards, they are omitted from the chart to show detailed information for the remaining states. The diagonal line serves as a reference indicating the trend relationship between venture capital and NASA SBIR/STTR funding. This line reveals a general correlation: states with higher venture capital funding per capita also tend to receive more NASA SBIR/STTR funding per capita. Similar to a trend observed in the National Academies report on the SBIR/STTR programs at DOD (NASEM, 2026), this correlation suggests that SBIR/STTR programs are complementary to rather than substitutes for venture capital or other funding. It is likely that underlying conditions that make a state able to succeed in attracting public funding for R&D, such as having a strong science and engineering workforce or high-quality research institutions, are likely to make the state attractive to private-sector innovation funding as well. While

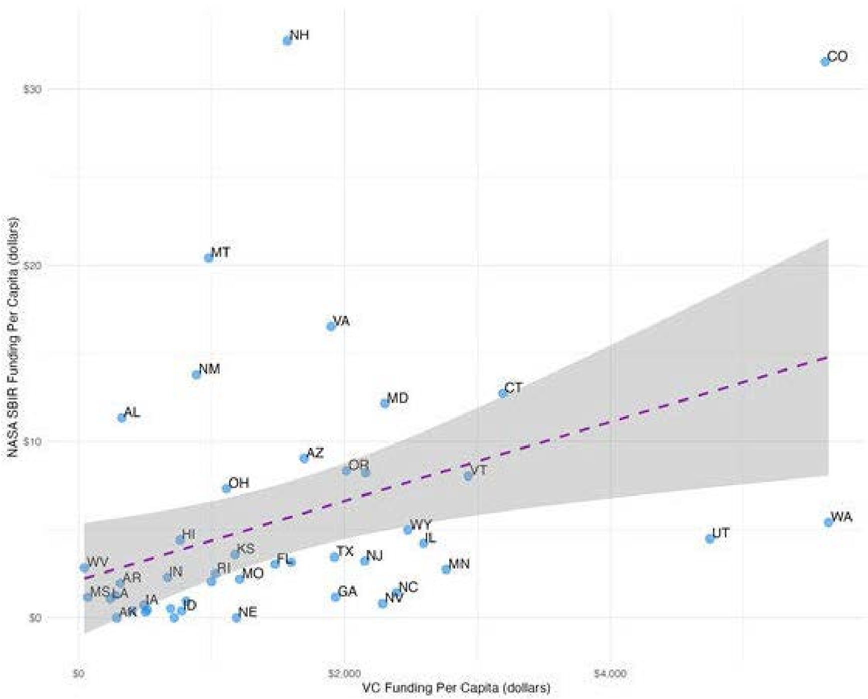

FIGURE 3-14 NASA SBIR/STTR vs. venture capital (VC) funding levels per capita, by state (fiscal years 2015–2024).
NOTES: California, Massachusetts, the District of Columbia, New York, and Delaware are not included. Inflation-adjusted using the Consumer Price Index with 2024 as the base year.
SOURCES: Committee calculations based on the Small Business Administration's (SBA's) SBIR/STTR Awards database (SBIR.gov) as of January 2026, the government database maintained by SBA, and PitchBook data.

this analysis points out only the positive relationship between public and private innovation funding, previous research has shown that public funding can create large innovation spillovers that lead to new firm formation and growth; this, in turn, can attract follow-on private-sector investments (Gross and Sampat, 2023).

This upward trend is not uniform, however; firms in states such as New Hampshire, Montana, New Mexico, Alabama, and Virginia receive high levels of NASA SBIR/STTR funding despite modest venture capital investment, suggesting that federal programs may play a more significant role in supporting innovation in those states. Conversely, states such as Washington and Utah exhibit relatively high venture capital funding but low NASA SBIR/STTR participation. Notably, Colorado stands out with relatively high levels of both per capita venture capital and NASA SBIR/STTR funding, reflecting its high density of aerospace contractors. Overall, the figure underscores the complementary yet uneven roles of public and private capital in regional innovation systems.

To build on this picture, the committee also looked at success rates for NASA SBIR/STTR Phase I and II applications submitted by firms located within historically underutilized business zones (HUBZones) and compared these success rates with those for firms overall, broken down by certain demographic characteristics (Figure 3-15). For firms located in HUBZones, 21 percent of

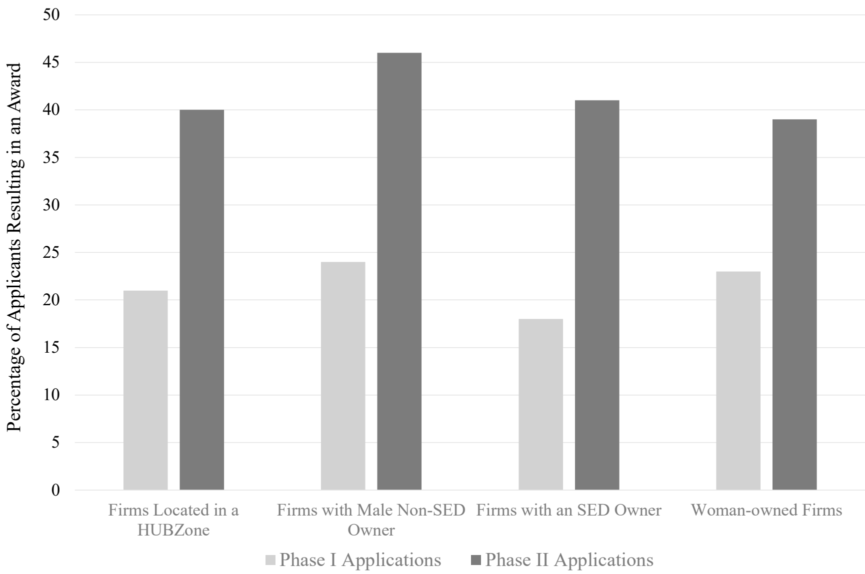

FIGURE 3-15 NASA SBIR/STTR Phase I and Phase II award rates, by demographic characteristics of business owners (fiscal years 2015–2024).
NOTES: HUBZone = historically underutilized business zone; SED = socially and economically disadvantaged.
SOURCE: Committee calculations based on the government database maintained by the Small Business Administration.

Phase I applications and 40 percent of Phase II applications resulted in an award during the study period (FY2015–2024). In comparison, Phase I applications from woman-owned firms and from firms owned by members of socially and economically disadvantaged groups resulted in Phase I awards at a lower rate; the same was true for Phase II applications from woman-owned firms. However, because there were fewer than 400 Phase I applications and fewer than 100 Phase II applications during FY2015–2024 from firms located in HUBZones, these differences in success rates may not be statistically significant.

SUMMARY

The evidence presented in this chapter shows that NASA closely aligns its SBIR and STTR solicitations with the agency's mission and technology needs. Across mission directorates, projects begin at similar early-stage TRLs and progress to midrange levels by the end of Phase I, consistent with the programs' role in supporting early-stage technology development within NASA's broader research and technology portfolio. NASA's SBIR/STTR programs are implemented in a relatively standardized manner, with similar award sizes and structures across directorates and award levels generally below the statutory maximums allowed under SBA guidance.

NASA's SBIR/STTR programs operate within a broader federal innovation ecosystem in which DOD and NIH account for the majority of federal SBIR/STTR spending. NASA accounts for approximately 4 percent of total federal SBIR/STTR spending. Within this context, NASA's programs both leverage and contribute to the federal small business innovation base. A substantial share of NASA awardees have prior SBIR/STTR experience with other federal agencies.

Over the past decade, the number of Phase I applications has remained relatively stable, indicating sustained interest among small firms in participating in NASA's SBIR/STTR programs. However, the number of Phase I awards has declined during this period, resulting in a lower success rate for applicants. Most firms that received NASA SBIR/STTR awards during the 10-year study period received only one award, suggesting that participation is broadly distributed across firms rather than concentrated among repeat recipients. At the same time, the small award amounts offered through NASA's SBIR/STTR program and the administrative burden of applying may limit the pool of potential applicants. More flexibility in award sizes, perhaps by offering Direct to Phase II awards for technologies that are further developed, could attract a larger applicant pool.[12]

[12] The 2026 Reauthorization of the SBIR/STTR programs included a provision to allow NASA to offer Direct to Phase II awards. U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026), Section 10(a)(2). Previously, only NIH, DOD, and the Department of Education could offer Direct to Phase II awards. In addition, the 2026 reauthorization allows an agency to offer a larger post–Phase II award (strategic breakthrough award) that matches either new private capital or non-SBIR/STTR funding from a government agency.

Geographically, NASA's SBIR/STTR awards are concentrated in states with established aerospace and advanced R&D ecosystems, reflecting the national distribution of technical capabilities and industrial infrastructure. Participation also extends well beyond states hosting NASA centers and beyond major venture capital hubs. While states that receive the most venture funding tend to receive the most NASA SBIR/STTR awards on a per capita basis, many states that receive modest venture capital funding are quite successful in receiving NASA SBIR/STTR awards.

Finally, NASA's TechPort provides a distinctive capability for linking SBIR/STTR awards to NASA's broader technology development activities. By tracking technology readiness progression and connecting projects to mission directorates and technology areas, TechPort is a valuable tool for understanding how NASA's small business innovation investments contribute to the agency's technology portfolio and long-term mission needs.

FINDINGS

Finding 3-1: NASA's SBIR/STTR programs operate in a highly standardized manner across mission directorates, with uniform award sizes that are consistently below statutory maximums and initial and final TRLs that are similar across mission directorates.

Finding 3-2: The steady volume of NASA's SBIR/STTR Phase I applications suggests that the programs remain an attractive source of early-stage financing for small firms wishing to contribute to NASA's mission and work with the federal government. At the same time, a decline in the number of Phase I awards funded has lowered award rates over the past decade.

Finding 3-3: Most NASA SBIR/STTR awardees have won only a single Phase I award, indicating that participation is broadly distributed across firms rather than concentrated among repeat recipients.

Finding 3-4: Generally, state-level analysis reveals a positive association between venture capital investment and NASA's SBIR/STTR funding, but several states with low venture capital activity have relatively high NASA SBIR/STTR support, on a per capita basis.

Finding 3-5: NASA's TechPort provides a unique capability for NASA and the wider research community to demonstrate how the agency's technology investments align with its strategy for filling technology gaps. By linking SBIR/STTR awards to mission directorates and tracking changes in projects' TRLs, TechPort establishes a foundation for systematic portfolio-level assessment of technology progression.

Finding 3-6: NASA SBIR/STTR funding helps reduce geographic disparities in innovation opportunity. Many NASA SBIR/STTR award recipients are located in regional innovation hubs related to aerospace and academia that are distant from NASA centers.

RECOMMENDATIONS

Recommendation 3-1: NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program Office, in coordination with directorate leadership, should periodically assess whether its standardized SBIR and STTR award amounts and structures are optimally aligned with the technical scope and capital intensity of the technologies it solicits. NASA should offer Direct to Phase II awards or larger post–Phase II strategic breakthrough awards as allowed in the 2026 reauthorization of the SBIR/STTR programs.

Recommendation 3-2: NASA should build on the strengths of the Technology Portfolio Management System (TechPort) for use in portfolio management and evaluation. To improve its ability to provide a systematic analysis of progress in technology readiness and transition pathways across mission directorates, TechPort should link firms funded by the Small Business Innovation Research/Small Business Technology Transfer programs to Phase III awards and include all NASA research and development and procurement grants and contracts, not just a subset of its smaller awards.

4

NASA's SBIR/STTR Processes

This chapter reviews NASA's processes for executing the Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs, including such activities as topic and subtopic selection, outreach to applicants, and selection of and support for awardees. The chapter provides a detailed assessment of the application and award processes. It also describes some key domains in which opportunities for change might be helpful, especially with regard to improved training opportunities for contracting and procurement personnel, reviewers, technical experts, and potential applicants.

The principal sources of data for this chapter were nearly 20 in-depth discussions between committee members and SBIR/STTR program managers and staff from NASA mission directorates and centers and the NASA SBIR/STTR Program Office, conducted throughout 2024 and 2025 (see Appendix C). The program managers oversee the processes and procedures in the programs and rely on technical experts in the centers to determine specific research topics and monitor the small businesses' performance. Targeted conversations with SBIR/STTR unit leads and the SBIR/STTR program executive highlighted the implications of a recent NASA SBIR/STTR program reorganization and explored evolving roles and relationships within the organization. These discussions were supplemented by systematic searches of the NASA SBIR website and related sources, ensuring a comprehensive view of relevant processes and policies. Insights from committee members and presentations by SBIR/STTR, entrepreneurship, and space innovation experts at committee meetings further informed the committee's analysis.

A list of interviewees and their duty stations is provided in Appendix C of this report. Each discussion followed a similar protocol (also found in Appendix C) and lasted approximately 60–90 minutes. These discussions provided a foundation for understanding current practices and organizational dynamics within the SBIR/STTR programs at NASA. The discussion protocol focused on eliciting detailed information about program operations, decision-making, and organizational structure. However, as noted, the programs were undergoing reorganization at the time, and changes in personnel rules in the executive branch in 2025 (including a return-to-office mandate, deferred resignation program, and 20-percent reduction in the overall NASA workforce) also led to changes in NASA's workforce composition. On top of this, the legislative authorization for the SBIR/STTR programs expired at the end of September 2025, and Congress did not reauthorize the programs until March 2026.[1] These factors inhibited the committee's ability to evaluate the effectiveness of the programs' processes and procedures, especially with regard to the efficacy of the organizational changes.

PROGRAM STRUCTURE, MANAGEMENT, AND REORGANIZATION EVOLUTIONS

The reorganization of the NASA SBIR/STTR program structure was implemented early in 2024. The program changed from a decentralized model operated across ten NASA centers to a unified program that brings together staff from the mission directorates and centers into four units.

The reorganization was motivated by three factors: (1) SBIR/STTR modernization efforts from 2015 to 2109 that centralized the review process (Gustetic et al., 2019); (2) new leadership put into place in 2021; and (3) NASA's SBIR/STTR strategic planning in 2022, which identified three program goals: create and measure societal benefits, ensure equitable access and diverse representation, and provide exemplary service for awardees. After the strategic plan was finalized, an internal assessment determined that a reorganization was needed to execute the strategy, noting gaps in core operations that needed to be addressed; the possibility to become a more efficient, collaborative, and learning organization; and opportunities to improve capacity and accountability.

The new structure moved the SBIR/STTR programs at NASA from a center-based operations-and-management model to a centralized, matrix, enterprise approach organized around core functions and stages in the SBIR/STTR administration process. The reorganization was designed to encourage collaboration across NASA, breaking down barriers across centers and enabling staff to understand the full life cycle of the programs in a unified way. The SBIR/STTR Program Office envisions rotating team assignments intended to develop deeper expertise and broader perspectives across the organization; however, these rotations have not yet begun.

The reorganization established four distinct units: Acquisition Management, Customer Management, Systems Management, and Business Intelligence. The new model aimed to eliminate redundant roles, such as multiple independent acquisition management teams, and it centralized support services with the goal of better meeting the needs of all centers. For instance, contracting is now done through the NASA Shared Service Center, located at Stennis Space Center. The newly created Business Intelligence Unit enables the SBIR/STTR programs to prioritize and advance analytical work; provides insights, goals for

[1] U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026).

operations, and success stories; and centralizes and automates the congressionally mandated due diligence process.

The Acquisition Management Unit (AMU) and Customer Management Unit (CMU) are linked by three cross-cutting teams that align with the awardee administration cycle: Solicitation and Requirements Development, Proposal Review and Selection, and Post-Selection Support and Analysis. These teams are structured around the front, middle, and back processes. The *front process* handles inquiries from firms and stakeholders and manages external communications, such as newsletters and success stories. The *middle process*, or acquisition management, focuses on the internal execution of program initiatives, including the creation of solicitation content and the selection of proposals. The *back process* manages award-tracking and post–Phase II opportunities, overseeing acquisitions such as support contracts and collaborating with external partners to gather market insights. This structure ensures that both internal needs and external market demands are addressed throughout the program life cycle. Each team has a lead as well as support from center and mission directorate staff, who serve as liaisons between the SBIR/STTR programs and their directorate or center.

AMU and CMU (and their three cross-cutting teams) are responsible for internal and external outreach, serving both innovative small businesses seeking funding and the broader NASA community that creates subtopics and reviews proposals. External outreach is conducted by attending events such as TechConnect and the use of email lists and newsletters released in cadence with Phase I and II opportunities and deadlines. The Help Desk, part of CMU, collaborates closely with the Systems Management Unit to implement system changes that are identified through the work of the Help Desk and from the input of team members and others throughout NASA.

The Business Intelligence Unit is responsible for preparing reports, when requested, such as tracking the development of specific NASA technologies over time and highlighting the SBIR/STTR programs' contributions to its progress. The unit also conducts foreign-affiliation due diligence required by law and, in collaboration with the Systems Management Unit, facilitates the transition from the programs' previous interface (the Electronic Handbook) to the new system, which is known as ProSAMS (Proposal Submissions and Award Management System).

As is suggested by the above, the Systems Management Unit is responsible for the SBIR/STTR internal and external systems, including system security. This team ensures that changes are implemented whenever policies shift or when internal or external customers encounter issues using the system. All changes, including minor ones, are tracked through a change management process.

As discussed, in addition to having dedicated SBIR/STTR staff, unit teams also include center liaisons and mission directorate liaisons and other center and mission directorate staff. Each of NASA's ten centers has unique research and development (R&D) needs, while the five mission directorates that offer SBIR/STTR awards also have strategic road maps that guide their projects and initiatives. The interplay between these roles and responsibilities is fundamental to achieving NASA's overarching goals. The center and mission directorate liaison positions are important for connecting the agency's priorities. Center liaisons are responsible for representing their center and assisting various stakeholders with their needs, ranging from guidance to support in incorporating topics into solicitations, while mission directorate liaisons highlight and ensure that their directorate's mission, goals, and annual strategy are reflected in the SBIR/STTR programs. Discussions with NASA SBIR/STTR staff indicated that team members who juggle both team and liaison roles often find themselves stretched thin, which can compromise their effectiveness.

Contractors are also an integral part of these teams and appear to work seamlessly with the unit teams. For example, they support communication and outreach and lead the change process. They conduct regular check-ins, present goals, solicit feedback, and ensure team alignment with proposed directions.

The matrix model of the new structure facilitates more horizontal communication and collaboration across units. Regular meetings among unit and team leads have fostered the sharing of knowledge and best practices. This shift has improved the programs' ability to make changes, such as enhancing solicitation development and increasing mission directorate engagement. Within units, proactive check-ins during weekly meetings encourage team members, including the Help Desk team, to share any issues or concerns. At these meetings, unit leads and other team members discuss challenges and resolve issues. These meetings also help to maintain and improve working relationships. This feedback loop is the primary method for understanding internal and external customer challenges and gathering insights. Each unit also meets weekly to plan and discuss progress on its activities and identify challenges.

SBIR/STTR program leadership holds regular meetings to provide policy updates, discuss progress on implementing new approaches and tools, and listen to SBIR/STTR staff. For instance, information concerning the SBIR/STTR reauthorization has been discussed at these meetings, even when the potential program changes were unclear. This information-sharing helps team members who are not in leadership meetings understand matters concerning upcoming workloads and priorities.

Overall, NASA team members described the communication in the new structure as transparent and open, with no barriers to leadership. This multidirectional flow of communication, occurring vertically (up and down) and horizontally across teams, indicates that NASA's SBIR/STTR team culture values collaboration and supporting one another.

NASA'S SBIR/STTR APPLICATION AND AWARD PROCESSES

As described above, NASA's SBIR/STTR programs have a strong leadership infrastructure, and their cross-cutting teams allow cohesive operation. The SBIR/STTR Program Office, consisting principally of the program executive and deputy, reside institutionally at NASA headquarters. Day-to-day program management is delegated to Ames Research Center in Silicon Valley, California, led by a program manager and deputy program manager. Other SBIR/STTR staff are located at mission directorates and centers across NASA and work together through the four enterprise units described above. This section continues by describing the major steps in administering the SBIR/STTR programs.

Development of Topics and Subtopics

AMU and CMU are responsible for managing NASA's SBIR/STTR topic development. They ensure that topics and subtopics remain relevant to small businesses by collaborating closely with NASA's technical community, which is primarily composed of civil service staff in the centers and project personnel working in the mission directorates. Topic areas are broadly defined categories, such as propulsion, air, space, and safety, that guide the development of specific subtopics for inclusion in program solicitations. About 90 percent of solicitation topics remain consistent from year to year. Once topic areas are identified, the NASA technical community is invited to submit subtopic proposals that address high-tech and high-need gaps, specifically those that small firms can address. According to NASA, the new ProSAMS system facilitates the creation of SBIR/STTR topics and subtopics for inclusion in the agency's program solicitations more quickly than was possible with the Electronic Handbook system.

The SBIR/STTR programs have recently announced plans to begin offering funding opportunities through a broad agency announcement (BAA) instead of offering a single solicitation per year. The goal of moving to a BAA is to be more responsive to the agency's evolving priorities, particularly with a focus on the Artemis program,[2] enabling stakeholders to submit topics year-round rather than being confined to a single time frame.

Development of subtopics for the STTR program emphasizes grassroots involvement, with the NASA chief technologist playing a key role in identifying critical technology needs that may not be linked directly to mission directorates. Overall, this collaborative process is designed to foster innovation and project development while ensuring that the resulting technologies remain accessible to small businesses and universities.

While other agencies offer open topics for their SBIR/STTR programs, thereby allowing small businesses to define and propose solutions to problems, NASA does not. Because of NASA's smaller and more limited budgets and NASA's focus on mission-specific technology development, the agency's SBIR/STTR staff are concerned that they could not absorb the large number of proposals that open topic solicitations tend to generate.

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[2] https://www.nasa.gov/feature/artemis.

Overview of Program Phases

The SBIR/STTR programs have three phases, with only the first two phases including financial support from the SBIR/STTR programs (see Figure 4-1).

Phase I

During Phase I, the "idea generation" phase, small business awardees (in cooperation with their research institution partners in the case of STTR awardees) "establish the scientific, technical, commercial merit and feasibility of the proposed innovation" (NASA, n.d.h, para. 1). For fiscal year (FY) 2026, the maximum award size is $225,000, an increase from the previous maximum of $150,000 but still under the statutory maximum allowed of over $300,000. Under Phase I, SBIR awardees have 6 months to study the scientific, technical, and commercial feasibility of their SBIR award, and STTR awardees have 13 months, a timeline that accommodates the academic calendar. SBIR and STTR awardees must submit their Phase II proposals by the end of the Phase I period of performance.

FIGURE 4-1 Overview of NASA's SBIR/STTR programs, by phases and opportunities.
NOTES: CCRPP = Civilian Commercial Readiness Pilot Program; Phase II-E = Phase II-Extended; TABA = Technical and Business Assistance.
SOURCE: NASA, n.d.j.

Phase II

Phase II focuses on the "development, demonstration, and delivery of a technology innovation" (NASA, n.d.i, para. 1). Phase II awards are made to small businesses (working in cooperation with their research institution partners in the case of STTR) who "successfully demonstrated the feasibility of their technology idea during Phase I" (NASA, n.d.i, para. 1). Until the FY2026 reauthorization, only small businesses that were awarded a Phase I were eligible to apply for Phase II and only immediately after or near the end of their corresponding Phase I award.[3] Phase II awardees have 24 months to develop, demonstrate, and deliver their innovation. Phase II contracts in FY2026 will have a maximum funding of $1.275 million, an increase from previous levels but well below the statutory maximum of over $2 million.

Post–Phase II Funding Opportunities

NASA offers additional funding opportunities to some of its Phase II awardees to further develop the results developed under Phase II.

Phase II-Extended (II-E) Awards[4]

Small businesses with a current Phase II award can apply to participate in this program, which extends their Phase II award for up to an additional 6–12 months with NASA SBIR/STTR funds matched by an outside investor(s) or non-SBIR/STTR funds. Phase II-E funding is used to further R&D efforts and the commercialization of innovations developed during Phase II. Although it has a smaller overall funding amount than the other post–Phase II opportunities, Phase II-E support provides up to $375,000 in matching funds for a total of $750,000 for eligible Phase II projects.

Although Phase II-E applicants do not have to compete for this support as long as the technology shows promise and matching funds are verified, there is no guarantee of receiving these additional funds from NASA. What is more, matching funds cannot come from other SBIR/STTR awards from any agency.

Phase II Sequential Awards[5]

The Small Business Administration's (SBA's) approval of a waiver request from NASA to allow larger-than-normal Phase II awards has enabled the agency to provide what it calls Phase II Sequential awards. Phase II Sequential funding focuses on high-priority technology sectors or technical need areas. It is set aside by NASA to ensure sufficient available SBIR/STTR funding to support significant advancements with a higher chance of transitioning into practical applications and is available to Phase II awardees that are focused on agency-

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[3] U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026), Section 10(a)(2).

[4] https://www.nasa.gov/sbir_sttr/phase-ii-e/#phaseiiextendedguidelines.

[5] https://www.nasa.gov/sbir_sttr/phase-ii-sequential.

specified topics. A Phase II awardee may receive only one Phase II Sequential award on top of its original Phase II support.

Civilian Commercialization Readiness Pilot Program (CCRPP)[6]

CCRPP is designed to accelerate a technology's transition to NASA missions as well as commercial markets after the completion of a Phase II award. Under CCRPP, the NASA SBIR/STTR programs will match between a minimum of $500,000 and a maximum of $2.5 million of the external investment (which may include non-SBIR/STTR funding from NASA) during a period of performance of 24 months, typically. According to NASA, CCRPPs are "not designed for the incremental changes of earlier phases of development"; rather, these technologies need to be on an "accelerated path into transitioning to NASA missions and applications as well as commercial markets" (NASA, n.d.b, para. 1). Box 4-1 highlights a success story of a CCRPP awardee.

SBIR Ignite

To operate alongside its traditional Phase I and Phase II programs, NASA introduced the SBIR Ignite program. SBIR Ignite is a small pilot program that

BOX 4-1
Success Story: Civilian Commercialization Readiness Pilot Program

Mango Materials, a woman-owned small business in San Francisco, California, received NASA Small Business Technology Transfer (STTR) funding to create biodegradable plastic alternatives from waste methane gas from landfills and wastewater treatment facilities. The idea stemmed from the company founders' research at Stanford University and from a vision to reduce environmental harm caused by traditional plastics. Mango Materials applied for and received a Phase I STTR award, in collaboration with the Colorado School of Mines. This funding propelled the development of a system that converts methane into a plastic substitute.

Following early success, the team secured Phase II and subsequently Phase II-Extended Small Business Innovation Research/STTR funding, allowing it to refine the technology for commercial markets and space, including concepts to support human missions to Mars through in situ resource utilization. After completing these research phases, Mango Materials applied to the STTR Civilian Commercialization Readiness Pilot Program and obtained $6 million in combined funding from the program and private investors, including the fashion industry. The fashion industry is interested in these fibers as a greener alternative to polyester, addressing a major source of plastic pollution. This infusion of capital accelerated the optimization and scaling of Mango Materials' biopolymer products.

SOURCE: NASA, n.d.d.

[6] https://www.nasa.gov/sbir_sttr/ccrpp.

offers Phase I and Phase II awards that are similar in size to those of the traditional programs but are designed to promote innovation by identifying technologies with strong commercial potential that can address market needs and support NASA applications. SBIR Ignite offers a streamlined application process, requiring only a 15-page technical proposal. The review process used to begin with an assessment of abstracts and commercialization scores, after which finalists are selected for pitches, but now Ignite proposals are reviewed for commercial potential and technical merit. Additionally, Phase I Ignite awardees must submit their Phase II proposal by the end of the fourth month of their award. This requirement is designed to minimize the wait time between the completion of Phase I and the start of Phase II.

Some Ignite processes, such as Ask Me Anything sessions, have already been incorporated into the regular SBIR/STTR processes. Other practices, such as Reverse Pitch Days and a topic/subtopic selection process that includes evaluation by external reviewers, represent potential future improvements. By staggering its solicitation release date later in the year, SBIR Ignite allows companies to respond to multiple calls, creating a more equitable process. One of the three annual solicitations under the BAA, planned to start in 2026, will be for SBIR Ignite.

Phase III

Although not funded by the SBIR/STTR programs, Phase III is the next stage for a small business to either transition its technology into a NASA mission or another federal agency or commercialize its technology in the private sector. It includes companies receiving funds from NASA; another government agency; or the private sector, such as venture capital funding (perhaps a mix of these), to continue work toward commercialization or the use of their innovations. SBIR/STTR-funded firms can be awarded Phase III contracts from the government without competition, and the firms retain their data rights under such contracts. (For more information on data rights, see NASEM, 2026.)

Review and Approval Process

Subtopic managers choose reviewers for both the main SBIR/STTR and Ignite programs. NASA reviewers are primarily NASA center civil servants, with occasional use of contractors. External personnel, such as Air Force and Space Force members, are sometimes asked to participate as reviewers because of their expertise and overlapping interests. However, access to NASA's electronic system for proposal submission and review is restricted, and individuals outside of NASA must go through a permission process, which can complicate their participation. As a result, NASA primarily uses reviewers who already have access to internal systems.

As part of the review process for traditional SBIR/STTR Phase II and SBIR Ignite Phase I and II applications, outside experts are assembled into a team by a NASA contractor to assess commercial potential during both Phase I and Phase II. Phase II requires a formal commercialization plan (accounting for 5 percent of the weight for scoring the proposal). Phase I emphasizes technical feasibility, while reviewers also consider prospects for future commercialization; Phase II emphasizes strategies for transitioning the technology to market.

Proposals undergo an initial review to ensure compliance with solicitation requirements, including completed forms and adherence to page limits. Subtopic managers evaluate proposals for relevance to the current subtopic and assess whether firms are attempting to fit outdated proposals into new categories. They are responsible for identifying and assigning qualified reviewers from their technical community. Reviews are conducted independently by reviewers without panels.

Subtopic managers conduct a quality check by reviewing all evaluations and determining whether a third reviewer is needed based on any discrepancies that arise. Subtopic managers prioritize meritorious proposals from a technical perspective. Topic managers further prioritize proposals by aligning them with higher-level agency objectives and strategic priorities. In addition, at the time that the committee spoke to NASA staff, a convex optimization software tool developed by REI Systems (2023), referred to internally as the Portfolio Selection Support Tool, is used in Phase I to prioritize other factors such as underserved locations and first-time applicants. The algorithm enables the program to weight certain factors to align with that cycle's priorities. While this tool may help speed up the selection process, at the time that the committee undertook this study, some NASA SBIR personnel mentioned that they did not understand the algorithm used to weight the applications.

The commercialization score is weighted more heavily in Phase II than in Phase I: Phase I uses a 0–100 scale for technical review, while Phase II uses 0–95 for the technical review + 5 points for commercial potential. Phase II has a separate commercial review and additional board meetings with mission directorate leadership for strategic investment considerations.

Mission directorate leadership has more input at Phase II because of the higher funding levels. Once the proposals are ranked, the source selection official makes final decisions about which proposals to award. For Phase I, a technical monitor manages the award, and for Phase II, a contracting officer representative interacts with the principal investigator about the SBIR/STTR award.

OUTREACH TO APPLICANTS AND STAKEHOLDERS

NASA's SBIR/STTR programs depend on attracting high-quality applicants. An explicit objective of the SBIR/STTR programs is to foster and encourage participation in technological innovation by woman-owned and socially and economically disadvantaged small businesses. The program employs a centralized, multifaceted outreach strategy that includes webinars, conferences, and collaborations with state organizations.

NASA's SBIR/STTR program outreach occurs externally and internally (see Box 4-2). External outreach efforts focus on seeking new applicants, such as small, innovative companies that may not be aware of the SBIR/STTR programs. These external outreach efforts aim to educate potential future applicants about opportunities at NASA. Internally, outreach is directed at identifying mission directorates and centers that can champion topics and facilitate the transition of Phase II awards into follow-on contracts or procurements. This internal effort demands persistence, strong networking, and in-depth knowledge of the programs and NASA mission requirements.

The extent of outreach activity varies with the program's budget and staffing capabilities. Outreach is centralized under the NASA SBIR/STTR Program Office's CMU and remains collaborative, often involving staff from AMU with expertise in outreach engagements. Personnel attend both traditional and nontraditional events to connect with potential applicants. Examples of connecting events include SBA Road Tours, conferences for professional organizations (e.g., Society for Advancement of Chicanos/Hispanics and Native Americans in Science, National Society of Black Engineers), and specialized gatherings.

Outreach and administration of the programs are currently funded in part by a pilot program originally authorized in the SBIR/STTR Reauthorization Act of 2011,[7] which allows agencies to allocate 3 percent of their SBIR/STTR budgets to administer the programs. This funding addresses a chronic issue within the programs' original authorized structure, under which no funds allocated for the programs could be used for their administration. Within NASA's SBIR/STTR programs, these funds are used broadly for administrative costs associated with running the programs, though a limited budget requires the programs to leverage events hosted by other organizations rather than mount independent national campaigns.

The programs' outreach capacity has been substantially affected by COVID-19 impacts, organizational changes, and budget constraints. The loss of major outreach events and reduced travel funding have affected program visibility.

Some stakeholders, including leadership, have questioned the value of traditional outreach efforts because of a lack of metrics demonstrating their success in generating competitive proposals from targeted populations. The lack of robust metrics to evaluate outreach effectiveness is a persistent challenge. Without clear evidence linking specific outreach activities to measurable outcomes—such as increases in applications from targeted populations or regions, or improvements in proposal quality—it is difficult to justify resource allocation to particular activities or to refine outreach strategies based on demonstrated effectiveness. Staff perceptions of the effectiveness of their outreach efforts vary

[7] U.S. Congress, National Defense Authorization Act for Fiscal Year 2012, P.L. 112–81, Section 5141 (December 31, 2011) and subsequent legislation, which extended the provision.

BOX 4-2
Examples of SBIR/STTR Outreach Strategies and Activities

SBIR IGNITE

The SBIR Ignite program serves as a critical "sandbox" for process experimentation within NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) operations. SBIR Ignite serves as a testbed for piloting new outreach methods before they are considered for adoption into the main program. Among the innovations developed through Ignite are Catalyst events—presolicitation market-scouting gatherings that gauge industry interest in potential research topics and engage new firms before formal solicitations are released. These events use dedicated contractors to host sessions that help the program office understand market capabilities while simultaneously introducing potential applicants to NASA's SBIR/STTR opportunities.

First-time applicants have identified training sessions and Ask Me Anything (AMA) sessions as highly valued resources. These interactive formats provide opportunities for potential applicants to receive direct guidance on program requirements, proposal preparation, and the review process. Successful pilots from Ignite, including the Catalyst events, are being considered for adoption into the mainline SBIR/STTR programs, which have already adopted AMA sessions.[a]

ACADEMIC PARTNERSHIPS AND MSI ENGAGEMENT

The NASA SBIR/STTR programs maintain specific focus on engaging minority-serving institutions (MSIs), including historically Black colleges and universities (HBCUs). The STTR component, which requires a small business to partner with a research institution, presents particular opportunities for university engagement. While STTR collaborations with MSIs account for 24 percent of NASA STTR awards (fiscal years 2015–2024), HBCU partnerships represent only 1.3 percent of awards during the same period. Despite well-resourced HBCUs with strong master's and PhD engineering programs—including North Carolina A&T State University, Florida A&M University, Howard University, and Morgan State University—HBCU participation in STTR collaborations remains limited.

This low participation rate persists even for institutions with geographic proximity to NASA centers, such as Howard University and Morgan State University, both near Goddard Space Flight Center, indicating that barriers extend beyond technical capacity to include network access, value proposition concerns, and administrative burden. A notable exception is Alabama A&M University, which has been a research partner for five awards and is in close geographic proximity to the Marshall Space Flight Center.

Some universities may not find that a potential $30,000 share (30 percent of a Phase I award) is worth the substantial administrative effort required to establish intellectual property agreements and submit a competitive 19-page proposal, particularly when larger federal funding opportunities are available.

NASA previously operated the Minority Partnership Learning Award Notification (MPLAN), which was designed to provide enhanced support for participation by underresourced institutions. However, this program was discontinued after well-resourced R1 research universities with MSI designations—such as Virginia Polytechnic

Institute (i.e., Virginia Tech) (ranking #1 as the research partner for 30 awards), Arizona State University (#4, for 22 awards), University of Central Florida (#7, for 19 awards), and The University of Texas at San Antonio (#18, for 9 awards)—were participating in MPLAN while serving as major STTR partners. This ran contrary to the program's intent to support underresourced institutions. Despite these challenges, MPLAN produced HBCU successes such as Oakwood University, which received both Phase I and Phase II awards (NASA, 2024).

Following its experience with MPLAN, NASA SBIR/STTR leadership has been exploring new engagement models. A notable example is a formal entrepreneurship course at Howard University designed to create a direct pipeline to the SBIR/STTR program. This approach represents a shift from award-based support to curriculum-integrated preparation, potentially reaching students and faculty before they consider SBIR/STTR participation. This effort represents better opportunities for measuring outcomes compared with traditional outreach efforts such as periodic visits introducing SBIR/STTR to faculty and students.

CENTER-LEVEL PARTNERSHIPS

Individual NASA centers have developed effective local partnerships, including collaborations with state Federal and State Technology Partnership organizations that provide valuable connections to regional innovation ecosystems. However, successful practices developed at individual centers are not shared across the program systematically, representing a missed opportunity to leverage successful engagement models program wide.

POSTAWARD SUPPORT

The Post-Selection Support and Analysis team (formerly Awardee Support and Tracking) manages programs such as welcome webinars for new awardees and sessions focused on post–Phase II opportunities. These activities are designed to help awardees maximize the value of their awards and successfully navigate the transition from research funding to commercialization.

[a] https://www.nasa.gov/sbir_sttr/2025-phase-1-subtopic-amas.

considerably. The program lacks direct authority or a dedicated budget for "Phase Zero" support—the kind of preproposal assistance that could help underresourced or new applicants prepare competitive submissions before entering the formal solicitation process. This constraint necessitates reliance on "soft" outreach methods and informal guidance. For some institutions, the SBIR/STTR award size may not be worth the substantial effort required to apply, considering larger opportunities from other sources. Weighting factors are built into award selection tools to help balance the portfolio across various dimensions, but the effectiveness of these mechanisms depends on the accuracy of underlying data and the transparency of parameter settings.

In response to these concerns, the programs have initiated a data-driven approach to identifying underserved regions with untapped aerospace capability.

Through contracted analysis with an outside contractor, Public Spend Forum, NASA is assessing states with significant Department of Defense (DOD), Department of Energy, or other federal aerospace investments but with limited NASA SBIR/STTR participation. This approach targets regions with existing technical infrastructure and university capacity rather than areas requiring fundamental institutional development, enabling more efficient allocation of outreach resources.

Beyond outreach to potential applicants, program stakeholders have identified a critical need for broader public communication about the SBIR/STTR programs' value. This limited awareness poses a long-term risk to program authorization. It was suggested that highlighting accessible examples—such as technologies that help filter water for consumers or support agricultural productivity—may help the public understand how their tax dollars strengthen U.S. competitiveness and address everyday challenges.

To address challenges and support the NASA SBIR/STTR programs' data-driven approach, there is a need for an integrated support system for underresourced and first-time applicants that includes: (1) a centralized resource portal with clear guidance and navigational pathways tailored for institutions without prior federal contracting experience; (2) remote engagement capabilities to reach geographically underserved regions; and (3) advocacy during times of SBIR/STTR reauthorization for explicit Phase Zero authority or a dedicated budget to enable structured preproposal assistance. The current NASA SBIR/STTR website provides comprehensive program information but lacks a clear entry point for first-time applicants, with navigation that assumes familiarity with SBIR/STTR terminology and processes.

Partially addressing these suggestions, NASA's SBIR/STTR programs recently joined the SBIR Partnering Platform.[8] According to NASA, this platform is a way for awardees and commercialization partners, whether they are research institutes, industry stakeholders, or investors, to discover each other.

TECHNOLOGY TRANSITION AND COMMERCIALIZATION ASSISTANCE MECHANISMS

Technology transition within the NASA SBIR/STTR program is a complex, multifaceted process designed to move innovative concepts from early-stage development toward practical application, both within the agency and in the broader commercial sector. NASA's SBIR/STTR technology transition helps advance innovative technologies from concept to commercialization. These initiatives provide support through funding, mentorship, and networking, ensuring that promising technologies can successfully transition from the laboratory to real-world applications. Key components include targeted programs for start-ups; investment matching opportunities such as the CCRPP, which provides matching funds to accelerate technology transition; specialized training

[8] https://www.sbirpartnering.org/nasa.

(e.g., Technical and Business Assistance) provided to awardees; and opportunities to participate in I-Corps (see Box 4-3). By encouraging participation from underserved regions and encouraging new entrants, NASA expands the diversity and impact of its innovation pipeline.

Transition Pathways

The transition of NASA SBIR/STTR–supported technologies occurs primarily through two pathways (see Box 4-4). The first is commercialization via adoption by large systems integrators or other companies, enabling integration into multiple programs and broader markets. A notable example is the Autonomous Technologies Corporation, which developed autonomous rendezvous and docking technology under NASA and DOD SBIR awards—this technology ultimately contributed to the development of LASIK surgery (see Box 4-5). The second pathway focuses on transition or infusion within NASA, where technologies are developed for specific organizational centers or missions. Even if production is limited, these innovations often address critical agency needs and are incorporated into major NASA systems or missions. Success in this pathway is measured by the leverage of SBIR/STTR-supported technologies within the agency, their acquisition for mission-specific applications, and their role in advancing NASA's objectives.

BOX 4-3
NASA's Technology Transition Programs: Two Examples

NASA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs offer Technical and Business Assistance (TABA)[a] as part of Phase I and Phase II awards (up to $6,500 in support for Phase I awardees and $50,000 for Phase II awardees). This supplemental funding can be used to contract with vendors to help shape a commercialization road map. TABA is not offered as part of post–Phase II opportunities, which are already focused on transitioning the technology towards infusion within NASA or commercialization in the marketplace.

Although I-Corps is not explicitly an SBIR/STTR program, NASA has linked the programs.[b] As the NASA SBIR/STTR program website notes, the goals of the two programs "overlap by encouraging the innovation and entrepreneurship of small businesses and enabling those businesses to commercialize their innovations" (NASA, n.d.a, para. 2). The I-Corps program trains participants by "developing their business model hypotheses" and "testing those hypotheses through the Customer Development Interview process" (NASA, n.d.a, para. 3). NASA offers I-Corps to Phase I awardees and those who have received a Phase II-Extended or Civilian Commercialization Readiness Pilot Program award.[c]

[a] https://www.nasa.gov/sbir_sttr/taba.
[b] https://www.nasa.gov/sbir_sttr/icorps.
[c] https://www.nasa.gov/sbir_sttr/post-phase-ii.

A company's financial success may be achieved through product sales to large system integrators, corporate buyouts, or growth into major NASA suppliers; rarely, some innovations reach mass markets as spin-off products. Internal NASA success, however, offers a unique path that reduces risks somewhat and builds lasting relationships through ongoing sales of specialized products, trusted supplier status, and integration into NASA's long-term ecosystem.

BOX 4-4
Pathways to Transitioning NASA SBIR/STTR–Supported Technologies

The transition of technologies supported by NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs occurs primarily through two pathways.

COMMERCIALIZATION

- Focuses on transitioning technology from concept to commercial market adoption.
- Begins with crafting a commercialization plan, identifying markets, and developing entry strategies.
- Emphasizes outreach to funders and partners, with NASA facilitating networking in early phases.
- In later phases, involves securing NASA and commercial funding, engaging directly with investors, and participating in formal technology transfer programs.
- Involves detailed market studies, refining sales strategies, and launching full-scale commercial sales.
- Customers may include NASA prime contractors, technology companies, and potentially mass-market consumers.

INFUSION INTO NASA TECHNOLOGIES AND PROCESSES

- Specifically designed for SBIR/STTR-funded technologies, targeting integration into NASA projects.
- Starts with a notional commercialization plan, formalized in Phase II, with direct engagement with NASA personnel, technical monitors, and contracting officer representatives.
- NASA program support is more direct, especially in later phases, with funding extensions and integration into NASA engineering and design processes.
- The end goal is deployment in NASA spacecraft or facilities, with application-specific engineering and limited production before full deployment.
- Focuses on success within NASA's ecosystem, building relationships for ongoing sales and supplier status, with some opportunities for commercial spin-offs.

BOX 4-5
Spin-Off Technology from NASA' s SBIR Awardees: Laser Vision Correction Surgery

Laser vision correction surgery, especially LASIK, has allowed many people to move beyond glasses and contacts by reshaping the cornea with an excimer laser. A major innovation in this area is Alcon's LADARVision® 4000 system, which uses a highly precise laser radar (LADAR) eye-tracking device.

This technology comes from Small Business Innovation Research (SBIR) contracts awarded by NASA's Johnson Space Center and the Department of Defense. In the 1980s, the Autonomous Technologies Corporation developed LADAR technology through SBIR contracts, originally intended for autonomous spacecraft docking and military target tracking. This pioneering work eventually led to the eye-tracking device used in vision correction.

Autonomous Technologies adapted its LADAR expertise to create the LADARVision excimer laser system for refractive surgery, receiving approval from the Food and Drug Administration (FDA) in 1998. After Autonomous Technologies merged with Summit Technology to form Summit Autonomous, the technology was acquired by Alcon in 2000. Alcon refined the system, introducing a small-spot laser beam for extremely precise corneal shaping.

The LADARVision 4000 has since become a leading system used in LASIK surgery, earning the first FDA approval for wavefront-guided procedures in 2002. This enabled more customized vision correction for patients. The story of LADARVision exemplifies how SBIR-funded aerospace technology can be transformed into groundbreaking advances in medical treatment.

SOURCE: NASA, 2003.

Important Factors in Transition Success

NASA's budgetary considerations play a central role in technology transition, as financial resources are essential for advancing innovation. Active participation from NASA's mission directorates in funding solicitations ensures alignment with agency priorities and maximizes the likelihood of successful transition. Strategic planning, ongoing feedback, and collaboration among stakeholders are crucial for guiding investments and accelerating the adoption of breakthrough technologies.

The transition process balances innovation with technical rigor, designing topics that meet agency needs while remaining broad enough to foster creative solutions from small businesses. Technology transition efforts begin with targeted mentoring, guidance, and opportunities for engagement. Active involvement from program staff helps small businesses navigate the technical and organizational complexities of mission-driven development.

To promote commercialization of SBIR/STTR-supported technologies, the program office highlights success stories through agency publications[9] and showcases, providing visibility for SBIR/STTR-derived technologies through TechPort.[10] This recognition serves as an endorsement to attract further investment and market opportunities. Strong communication practices ensure that eligible firms are informed of new opportunities, both within the program and through related initiatives. Efforts are also underway to create centralized resources and portals that would connect firms with relevant contacts and opportunities after initial funding phases, reducing reliance on individual support staff and enhancing overall program effectiveness. Key personnel often volunteer additional time to guide projects, reinforcing the collaborative culture of the transition process. To further support commercialization, the programs provide technology showcases, endorsements, and networking events that help firms gain visibility, attract investment, and access broader markets.

Challenges to Transitioning Technologies

A need remains to further define strategies for sustained engagement and support after initial awards, ensuring that companies continue to progress toward successful technology adoption. Formalized guidance and expanded support structures may strengthen connections and improve transition outcomes. However, consistent engagement by technical monitors and contracting officer representatives is not always achieved, hindering the seamless progression of some projects. Additionally, postsolicitation support for applicants can be limited, and successful transition frequently hinges on the engagement of specific individuals, making outcomes highly dependent on personal involvement. Rigorous testing requirements and extended project timelines further challenge sustained engagement, especially in the space sector. The recent reauthorization of the programs notes that transitions to Phase III awards could be improved, and agency heads are now required to establish training activities for contracting officers and other agency acquisition personnel in order to improve transitions to Phase III awards. Moreover, the recent legislation notes the challenges associated with federal contracting for small businesses and requires agencies to develop model contracts for Phase I, Phase II, and Phase III SBIR awards.[11] As discussed in Chapter 5, many underresourced small businesses and potential research partners may have trouble complying with reporting requirements associated with federal contracts. More simplified contracting, such as fixed-price contracts or cooperative agreements, may lessen the administrative burden of federal contracting, as recommended in a previous National Academies report (NASEM, 2026).

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[9] https://spinoff.nasa.gov.
[10] https://techport.nasa.gov.
[11] U.S. Congress, Small Business Innovation and Economic Security Act, P. L. 119–83 (April 13, 2026).

Measuring these transitions can be challenging. As discussed in Chapter 6 and noted in a previous National Academies report (NASEM, 2026), Phase III awards are not reported uniformly, and subcontracting or other technology transfers to more established firms (e.g., through licensing or acquisitions) is not always transparent (NASEM, 2026). The recent reauthorization requires updates to reporting that will help make transitions to Phase III, including through subcontracting, more transparent.[12]

Overcoming Challenges to Transition

Despite these hurdles, the programs have demonstrated success in enabling breakthroughs and supporting innovative concepts that might otherwise lack funding. Even when commercial adoption is not immediate, the expertise and exposure gained are valuable for the companies and for the agency. The Reimagine initiative seeks to address some of the programs' challenges by reevaluating and improving SBIR program processes; for example, it seeks to strengthen the Post Selection Support and Analysis processes to better support technology transition.

SUMMARY

NASA's SBIR and STTR programs have been recently reorganized in order to facilitate collaboration across NASA and to reduce the administrative burden of the programs on both NASA personnel as well as small businesses in the space innovation sector. The reorganization has modernized a number of processes and procedures, and the recently introduced SBIR Ignite program has adopted initiatives that might improve efficiency in the implementation of the traditional SBIR/STTR programs.

The reorganization has, however, faced challenges. Since its implementation, the programs have completed only one full cycle of the SBIR/STTR process. During this time, there have been many changes, including an initial matrix restructuring, the Reimagine initiative, and a pause in the programs while waiting for congressional reauthorization.

By fully committing to the newly established reorganization, NASA SBIR/STTR program leaders can provide stability and clarity for staff and stakeholders, reduce disruptions caused by midcycle process or tool changes, and create a solid platform for further process improvements. Institutionalizing the structure will enable the program to proactively track data; enhance awardee support; and foster stronger connections between awardees, technical monitors, and NASA programs. Additionally, formal guidance and training for technical roles, together with a clear strategy for postaward engagement, will ensure that the program continues to evolve to meet the needs of both NASA and its awardees.

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[12] U.S. Congress, Small Business Innovation and Economic Security Act, P. L. 119–83 (April 13, 2026).

FINDINGS

Finding 4-1: The organizational structure and related processes of NASA's SBIR/STTR programs facilitate the advancement of NASA's mission and key priorities.

Finding 4-2: The NASA SBIR/STTR reorganization has enhanced collaboration and communication and has introduced both opportunities and challenges for staff as they adjust to the new structure.

Finding 4-3: NASA's SBIR/STTR Program Office has adopted a number of modernization measures to help streamline topic announcements, proposal submissions, and award management. These measures include moving to a new electronic proposal and award management system and a planned move to offer funding opportunities through a broad agency announcement, which would allow release of subtopics on a rolling basis. Yet despite these modernization efforts, there remains a broad consensus among NASA staff and stakeholders that the processes are too complex and the required documentation is cumbersome for small business applicants.

Finding 4-4: The centralization and partial automation of NASA's due diligence review for SBIR and STTR awards within the Business Intelligence Unit ensures that publicly funded innovations are not compromised by foreign affiliates of concern, reduces the burden of conducting due diligence on subtopic managers, and helps speed up the award process.

Finding 4-5: Responding to the rapid growth of the commercial space sector and the increasing focus on space within the Department of Defense (particularly through Space Command), NASA has undertaken initiatives aimed at more closely connecting its SBIR/STTR programs to this emerging sector. Most notable among these initiatives is the SBIR Ignite program, which offers a small number of awards focused on commercialization of technologies beyond those for which NASA is the ultimate customer. Yet while NASA Ignite serves as a critical experimental platform, it is a relatively small initiative.

Finding 4-6: NASA's SBIR/STTR programs employ a multifaceted outreach strategy that has been diminished by the impacts of the COVID-19 pandemic, organizational changes, and budget constraints. In the face of limited dedicated outreach funding, the programs leverage events hosted by other organizations. However, traditional outreach efforts, such as road tours, have not shown effectiveness in generating competitive proposals, especially from new applicants or from underresourced research institutions or parts of the country.

Finding 4-7: NASA's SBIR/STTR Program Office provides minimal training for SBIR/STTR team members, reviewers, and new applicants. Lacking direct authority and funding for application assistance, NASA's SBIR/STTR programs have limited ability to provide structured preproposal assistance to underresourced applicants. Additional training, especially for technical monitors and reviewers, is needed.

Finding 4-8: There are limited awareness and clarity about how to use the tools and/or access metrics now collected and maintained by NASA's SBIR/STTR Program Office. For example, SBIR/STTR team members varied in their understanding of the ranking system used to determine award selection.

Finding 4-9: Transitioning NASA SBIR/STTR–funded technologies to Phase III awards relies mainly on informal connections among program managers, technical monitors, and other NASA personnel.

Finding 4-10: Individual NASA centers have developed effective local partnerships with state Federal and State Technology Partnership Organizations and other regional entities, but these successful practices are not systematically shared programwide.

Finding 4-11: Experienced firms may have an advantage in the review process because of their greater experience and resources.

RECOMMENDATIONS

Recommendation 4-1: NASA's Small Business Innovation Research and Small Business Technology Transfer program leaders should institutionalize the new organizational structure, complete process cycles without midcourse changes, and leverage the new structure as a foundation for ongoing improvements in program processes, data tracking, and postaward support.

Recommendation 4-2: NASA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer Program Office should apply more generally the best practices from the SBIR Ignite program. These practices include a strong external focus, external input into topic selection and outreach to new applicants, and streamlined application processes.

Recommendation 4-3: NASA's contracting office should allow more flexibility in funding Small Business Innovation Research and Small Business Technology Transfer awards—for example, offering purchase orders or procurement for Phase I awards and cooperative agreements for Phase I or II.

Recommendation 4-4: Congress should not mandate that NASA offer open topics. Instead, Congress should allow more flexibility for agencies such as NASA to experiment with approaches that support technology development and infusion to meet various goals. Such an approach is exemplified by SBIR Ignite, which seeks innovative products that can be infused into NASA missions as well as external markets.

Recommendation 4-5: NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program Office should develop training modules, including refresher training, for technical monitors, subtopics managers, reviewers, and other SBIR/STTR personnel as needed. In addition, because of the concern that reviewers are overburdened, the NASA administrator should provide clear incentives for participating in the review process—for example, by including this participation as a significant strength during annual performance appraisals or providing a project code to cover time spent refereeing.

Recommendation 4-6: NASA's Small Business Innovation Research (SBIR) and Small Business Technology Transfer Program Office should standardize and expand successful outreach models from the SBIR Ignite pilot—specifically, Catalyst events and Ask Me Anything sessions—while developing and evaluating new academic partnership models.

Recommendation 4-7: NASA's Small Business Innovation Research and Small Business Technology Transfer Program Office should develop an integrated support system for underresourced and first-time applicants.

Recommendation 4-8: The NASA administrator should establish a pilot program to explore ways of strengthening and/or formalizing the process of transitioning Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) technologies from Phase II to NASA-funded Phase III development of mission-critical components or subsystems, which might include SBIR/STTR-funded firms subcontracting to NASA and Department of Defense prime contractors.

5

STTR Collaborations with Research Institutions

Congress established the Small Business Technology Transfer (STTR) program in 1992 to foster innovation by facilitating collaboration between small businesses and research institutions. By leveraging the agility of small enterprises and the capabilities of nonprofit research institutions such as universities and federal laboratories, the STTR program aims to achieve NASA's missions through technological advances. Collaboration is a statutory requirement rather than a discretionary component.

This chapter explores the unique characteristics of NASA's STTR program, examining its funding landscape and potential obstacles to forming collaborations, and concludes by synthesizing some findings and recommendations. It examines collaboration patterns across all 741 NASA Phase I and Phase II STTR awards made between fiscal years (FY) 2015 and 2024, using research institution information reported by the Small Business Administration (SBA) in its Small Business Innovation Research (SBIR)/STTR Awards database accessible via SBIR.gov. The chapter also describes the structure of NASA STTR collaborations, highlighting the concentration of partnerships among a limited set of research institutions, differences in participation across firm types, and the structural factors that influence collaboration patterns.

Unlike the SBIR program, the STTR program requires small business awardees to formally partner with a nonprofit research institution; the funding agency reports that collaboration in SBA's SBIR/STTR Awards database.[1] Research institution partners of STTR awardees must carry out a minimum of 30 percent and a maximum of 60 percent of the work (SBA, 2023, p. 33).[2] In forming such a collaboration, the small business and the research institution must establish

[1] While there is no requirement under the SBIR program for a small business awardee to partner with a research institution, partnerships with research institutions are permitted as long as at least two-thirds of the Phase I work and at least one-half of the Phase II work is undertaken by the small business (SBA, 2023, p. 33). There is, however, no requirement for agencies to publicly document the research institution partners for SBIR-funded firms.

[2] SBA's 2023 SBIR/STTR Policy Directive indicates that "an agency can measure this research or analytical effort using the total award dollars or labor hours, and must explain to the small business in the solicitation how it will be measured" (SBA, 2023, p. 34).

a cooperative research agreement in advance that includes details on the allocation of intellectual property rights; data sharing, data use, and data transfer agreements; the rights to carry out follow-on research and development; and commercialization rights.

The tables in this chapter represent all 741 Phase I and II STTR awards made by NASA over the study period (FY2015–2024). Almost all identify a research institution partner. The tables examine the composition of these partners by institution type, with historically Black colleges and universities (HBCUs) and other minority-serving institutions (MSIs) as subcategories of academic partners; differences in HBCU/MSI partnership rates between socially and economically disadvantaged (SED)–owned and non-SED-owned firms; the specific research institutions partnering with woman-owned and SED-owned awardees; and the top 20 most frequently appearing research institution partners overall. Partner-type classification uses pattern-matching on institution names from SBA's SBIR/STTR Awards database, supplemented by a confirmed override list for institutions with nonstandard naming conventions. HBCU status is based on the federal designation list for specific institutions that were established before 1964 with a primary mission to educate Black Americans (DoEd, n.d.). MSI status covers broader, federally designated categories which include Hispanic-serving institutions, tribal colleges and universities, and Alaska Native and Native Hawaiian–serving institutions, identified through a named institution list based on current enrollment thresholds (NASA, n.d.m). HBCUs are treated as a separate category per their distinct federal designation and are not included in the MSI figures. Ownership flags (SED-owned, woman-owned) are drawn directly from the SBA SBIR/STTR Awards database.

DISTRIBUTION OF RESEARCH INSTITUTION PARTNER TYPES

Across the 741 awards in the study period (FY2015–2024), the vast majority of STTR partners are academic institutions. The predominance of academic partners reflects the technical profile of NASA's STTR topics, which frequently involve aerospace systems, propulsion technologies, advanced materials, robotics, autonomy, and computational engineering. These areas align closely with the research capacity of engineering-intensive universities and reflect the program intent to connect small businesses with university research capability. Nonprofit research institutions—including national laboratories such as Lawrence Berkeley National Laboratory and Lawrence Livermore National Laboratory—constitute a secondary category of partners.

Universities account for 696 awards (94.4 percent) (see Table 5-1). Other nonprofit research institutions account for 41 awards (5.6 percent). No research partner was listed for 4 awards. Among those partners from academia, the committee also looked at how many research institutions held HBCU or MSI designations. Almost one-quarter of awards involved collaborations with MSIs but only a small number indicated collaboration with an HBCU.

TABLE 5-1 NASA STTR Partnership Counts, by Partner Type (Fiscal Years 2015–2024): Phases I and II

Partner Type	Number of Awards	Percentage Share of Awards
Academia	696	94.4
of which: HBCU	10	1.4
of which: MSI (non-HBCU)	178	24.2
Nonprofit Research Institution	41	5.6
No research institution listed	4	—

NOTES: HBCU = historically Black college or university; MSI = minority-serving institution; STTR = Small Business Technology Transfer.
SOURCE: Committee generated based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov).

Table 5-2 presents data on research partnership patterns for SED-owned and non-SED-owned firms. Among the 107 STTR awards made to SED-owned firms with identified research institution partners, 4.7 percent (5 awards) involved an HBCU partner. In contrast, among non-SED-owned firms, HBCU partnerships accounted for 0.8 percent (5 awards). While the absolute number of HBCU partnerships is small in both groups, the proportional difference is substantial.

Differences are more pronounced with respect to non-HBCU MSIs. SED-owned firms in the dataset partner with MSIs at a rate of 41.1 percent, compared with 21.3 percent for non-SED-owned firms. When HBCU and MSI partnership counts are combined, 45.8 percent of SED-owned firm awards involve such a partnership, compared with 21.4 percent for non-SED-owned firms.

The creation of a dedicated nonprofit organization to manage SBIR/STTR infrastructure at Alabama A&M University appears to be a notable model for connecting firms with an HBCU and for promoting university research that achieves NASA's missions. This nonprofit entity provides essential intellectual property management, grant support services, and coordination between faculty and university administration, addressing the administrative barriers that often prevent underresourced institutions from participating in the STTR program. This infrastructure enabled Alabama A&M to be the research partner for five NASA STTR awards, three of which were granted to an SED-owned small business. This case provides an example of how the barriers to successful research collaborations in underresourced research institutions could be overcome successfully.

Taken together, these results indicate that SED-owned firms with NASA STTR Phase I and II awards are more likely than non-SED-owned firms to collaborate with MSIs, and neither group is frequently collaborating with an HBCU. This lack of partnering with HBCUs may indicate missed collaboration opportunities. A number of HBCUs, including North Carolina A&T State University, Florida A&M University, Howard University, and Morgan State University offer strong master's and PhD engineering programs. Moreover, Howard and Morgan State are located in the Baltimore–Washington, DC area,

TABLE 5-2 Partnership Rates Between HBCUs/MSIs and SED-Owned vs. Non-SED-Owned Small Businesses in NASA's STTR Program (Fiscal Years 2015–2024): Phases I and II

	Awards with an HBCU Partner		Awards with an MSI (non-HBCU) Partner		Awards with Either an HBCU or MSI Partner		
SED-Owned	Number of Awards	Percentage of Total	Number of Awards	Percentage of Total	Number of Awards	Percentage of Total	Total Awards
Yes	5	4.7	44	41.1	49	45.8	107
No	5	0.8	134	21.3	139	22.1	630

NOTES: HBCU = historically Black college or university; MSI = minority-serving institution; SED = socially and economically disadvantaged.
SOURCE: Committee generated based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov).

which is also home to the Goddard Space Flight Center and the Department of Defense's Naval Research Laboratory. Because HBCUs and MSIs serve a disproportionate number of low-income students and those who are the first in their families to attend college, facilitating collaborations between these universities and small businesses may help broaden the set of researchers working on space topics, while enhancing the capacities of these institutions and contributing to NASA's missions.

The NASA STTR program functions as a highly specialized university–small business integration mechanism embedded within established aerospace research ecosystems. While this structure supports mission-aligned technical rigor, collaboration patterns remain concentrated and exhibit limited engagement with certain institution types.

Table 5-3 ranks the 20 research institution partners that appear most frequently across all 741 NASA STTR awards made between FY2015 and FY2024. The ranking illustrates a pronounced concentration of partnerships among a limited set of research-intensive universities with top aerospace engineering programs. Virginia Polytechnic Institute and State University (Virginia Tech) appears most frequently, with 30 awards, followed by the University of Colorado (24), Purdue University (23), and Arizona State University and the Massachusetts Institute of Technology (MIT) (22 each). The remaining institutions in the top 20 include other large public and private R1 universities (i.e., universities with doctoral programs and very high levels of research activity) with established strengths in aerospace engineering, materials science, propulsion systems, robotics, and advanced computational modeling.

All institutions in the top 20 are classified as academic institutions. None holds an HBCU designation, but six—including Virginia Tech and Arizona State University—hold MSI status. The absence of HBCUs among the most frequent partners underscores the degree to which NASA STTR collaborations are concentrated within a small set of established engineering research universities.

The dominance of large public research universities reflects the technical orientation of NASA STTR solicitations. Many topic areas require specialized laboratory infrastructure; advanced testing capabilities; and faculty expertise in aerospace, propulsion, materials science, and computational systems—capabilities that are disproportionately located within major engineering schools. When STTR awardees partner with these institutions, it is typically with the aim of leveraging the cumulative research and development (R&D) investment and depth of technical expertise available to accelerate their commercialization activities. Historically, the involvement and support of the respective institutions' technology transfer office in licensing complementary technologies often plays a key role in advancing commercialization efforts of STTR awardees (Olivari et al., 2021). These institutions also tend to participate extensively in federally funded research, suggesting that prior experience with federal R&D contracting and intellectual property management may facilitate repeated STTR engagement.

Mississippi State University's appearance at rank 13, with 14 awards, is notable. Although smaller in overall research expenditure than many other institutions in the top 20, Mississippi State maintains a strong aerospace and engineering profile, including established relationships within NASA-related

TABLE 5-3 Top 20 Research Institution Partners for NASA STTR Phase I and II Awardees (Fiscal Years 2015–2024)

Rank	Research Institution	Partner Type	HBCU	MSI	Number of Awards
1	Virginia Polytechnic Institute and State University (Virginia Tech)	Academia	—	Yes	30
2	University of Colorado	Academia	—	—	24
3	Purdue University	Academia	—	—	23
4	Arizona State University	Academia	—	Yes	22
5	Massachusetts Institute of Technology	Academia	—	—	22
6	The Pennsylvania State University	Academia	—	—	20
7	University of Central Florida	Academia	—	Yes	19
8	Georgia Institute of Technology	Academia	—	—	18
9	University of Illinois	Academia	—	—	17
10	Carnegie Mellon University	Academia	—	—	16
11	University of Alabama	Academia	—	—	16
12	University of Tennessee	Academia	—	—	15
13	Mississippi State University	Academia	—	—	14
14	University of Delaware	Academia	—	—	12
15	University of Maryland	Academia	—	—	12
16	Stanford University	Academia	—	—	11
17	University of Washington	Academia	—	Yes	11
18	The University of Texas at San Antonio	Academia	—	Yes	9
19	Case Western Reserve University	Academia	—	—	8
20	University of Connecticut	Academia	—	Yes	8

NOTES: "—" = no; HBCU = historically Black college or university; MSI = minority-serving institution.
SOURCE: Committee generated based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov).

research networks (Mississippi Space Grant Consortium, n.d.; U.S. News, 2026).[3] Its presence in the ranking illustrates that while overall concentration favors large R1 universities, institutional specialization in NASA-relevant fields can elevate participation irrespective of absolute institutional size.

Taken together, the ranking reveals a collaboration structure characterized by institutional centralization and repeated partnerships. Relatively few universities serve as recurrent nodes in the NASA STTR network, suggesting that collaboration patterns may be shaped not only by technical capability but also by established institutional relationships, geographic clustering within aerospace regions, and accumulated experience with STTR administrative requirements.

Table 5-4 presents all research institutions that partnered with woman-owned small businesses receiving NASA STTR Phase I and II awards between FY2015 and FY2024. During the study period, 63 STTR awards with identified research institution partners went to woman-owned firms, and these partnerships were distributed across 26 unique institutions.

Several patterns emerge. First, partnerships are concentrated among a small subset of universities. Virginia Tech accounts for 15 of these awards—nearly one-quarter of all partnerships with a woman-owned firm during the study period. The University of Tennessee follows as partners for 6 awards, while Arizona State University and Colorado State University each were partners for 4 awards. The remaining institutions appear with lower frequency, typically listed as the partner for between 1 and 3 awards each.

Second, all research partners in this group are classified as academic institutions. No other nonprofit research institutions or industry research entities appear in the partnership profile of woman-owned STTR awardees. This pattern mirrors the overall program distribution but suggests particularly strong reliance on university-based collaboration among woman-owned firms.

Third, like SED-owned firms, woman-owned small firms are more likely than the overall set of STTR-awarded firms to collaborate with MSIs: 44.4 percent of woman-owned small business awardees collaborate with MSIs. No HBCU partners are listed for woman-owned STTR awards during the study period.

The absence of HBCU participation in this subset contrasts with the modest HBCU engagement observed among SED-owned firms. Although the total number of awards involving woman-owned firms is relatively small (63 awards), the absence of HBCU partnerships suggests that the collaboration networks of woman-owned firms may be shaped differently than those of SED-owned firms.

Finally, the institutional profile of partners for woman-owned firms aligns closely with major engineering research universities. Many partners—such as MIT, Georgia Institute of Technology, Johns Hopkins University, Stanford University, and the University of Michigan—are nationally recognized for

[3] See also Mississippi State University, n.d.

TABLE 5-4 Research Institution Partners for Woman-Owned NASA STTR Phase I and II Awardees (Fiscal Years 2015–2024)

Research Institution	Partner Type	HBCU	MSI	Number of Awards
Virginia Polytechnic Institute and State University (Virginia Tech)	Academia	—	Yes	15
University of Tennessee	Academia	—	—	6
Arizona State University	Academia	—	Yes	4
Colorado State University	Academia	—	—	4
Colorado School of Mines	Academia	—	—	3
Temple University	Academia	—	—	3
George Mason University	Academia	—	Yes	2
Louisiana Tech University	Academia	—	—	2
Navajo Technical University	Academia	—	Yes	2
Northwestern University	Academia	—	—	2
Rensselaer Polytechnic Institute	Academia	—	—	2
University of Central Florida	Academia	—	Yes	2
University of Connecticut	Academia	—	Yes	2
University of Maryland	Academia	—	—	2
Cornell University	Academia	—	—	1
Florida Institute of Technology	Academia	—	—	1
Georgia Institute of Technology	Academia	—	—	1
Johns Hopkins University	Academia	—	—	1
Massachusetts Institute of Technology	Academia	—	—	1
Mississippi State University	Academia	—	—	1
New Mexico State University-Dona Ana	Academia	—	Yes	1
North Carolina State University at Raleigh	Academia	—	—	1
Stanford University	Academia	—	—	1
University of Colorado	Academia	—	—	1
University of Michigan	Academia	—	—	1
Vanderbilt University	Academia	—	—	1

NOTES: "—" = no; HBCU = historically Black college or university; MSI = minority-serving institution.
SOURCE: Committee generated based on the Small Business Administration's SBIR/STTR Awards database (SBIR.gov).

aerospace, materials science, propulsion, robotics, or computational engineering programs. This alignment suggests that woman-owned firms participating in the NASA STTR program are embedded within technically rigorous research ecosystems, similar to the broader awardee population.

Considered altogether, the table suggests that woman-owned STTR awardees collaborate primarily with established research-intensive universities, with strong engagement with MSIs but no observed engagement with HBCUs during the study period. The concentration of partnerships among a few institutions—particularly Virginia Tech—also indicates the potential importance of recurring institutional relationships within the NASA STTR collaboration network.

SUMMARY

The NASA STTR program provides a mechanism for linking small businesses with research institutions to advance mission-relevant technologies. While this structure supports mission-aligned technical rigor, collaboration patterns remain concentrated and exhibit limited engagement with certain institution types, which tend to be the top aerospace engineering universities. STTR collaborations require formal intellectual property agreements that detail the allocation of intellectual property rights; data sharing, data use, and data transfer agreements; the rights to carry out follow-on R&D; and commercialization rights; thus, it is not surprising that the bulk of the research institution partners are large universities, which are likely to have already created templates for such agreements. Analysis of awards from FY2015 to FY2024 indicates that these collaborations are concentrated among a relatively small set of research-intensive universities, particularly those with established capabilities in aerospace and related engineering fields. New partner research institutions may find it costly to create and approve these agreements, and those costs may inhibit collaborations between small businesses and smaller universities that do not usually contract with the federal government.

NASA could facilitate new collaborations by providing support for the necessary contracting agreements between research partners and the small business awardees. For example, recent research indicates that NASA's Technology Transfer Program, "which facilitates the licensing of NASA inventions to third parties," stimulates the development of vital follow-on innovations across a range of technical domains (Giebel and Rösner, 2025, abstract). Because a large share of NASA STTR–funded firms collaborate with an MSI, there may be lessons to be learned from those collaborations that could help facilitate partnerships between innovative small businesses and research institutions that possess the necessary research expertise but have not previously engaged with NASA.

Participation varies across institution types. MSIs account for a substantial share of collaborations, particularly with SED- and woman-owned firms, whereas partnerships with HBCUs are infrequent. These patterns indicate uneven participation across segments of the research ecosystem. The concentration of partnerships appears to be shaped not only by technical capacity but also by structural factors associated with participation in the STTR program. The requirement to establish cooperative research agreements, including provisions governing intellectual property, data rights, and commercialization, may advantage institutions with prior experience in federal research contracting and established administrative infrastructure. These conditions may create barriers to entry for institutions with less experience, reinforcing reliance on a limited set of partners.

Overall, the STTR program effectively connects small businesses with high-capability research institutions, but its collaboration network remains relatively centralized, which may limit broader institutional participation.

FINDINGS

Finding 5-1: NASA's STTR research partnerships are concentrated among a relatively small subset of research-intensive universities with established capabilities in aerospace and related engineering fields. A limited number of institutions appear repeatedly across awards, indicating a centralized collaboration network. Information on SBIR collaborations would be necessary to obtain a fuller picture of collaborations with research institutions.

Finding 5-2: Minority-serving institutions participate in a substantial share of NASA STTR collaborations, although partnerships with historically Black colleges and universities are rare.

Finding 5-3: NASA STTR–awarded firms that are owned by socially or economically disadvantaged persons or women are more likely to partner with a minority-serving institution than are the overall set of NASA STTR awardees.

Finding 5-4: Administrative, legal, and contractual requirements associated with STTR cooperative research agreements likely influence collaboration patterns by favoring research institutions with prior experience in federal research contracting and established technology transfer infrastructure.

RECOMMENDATIONS

Recommendation 5-1: NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program Office should expand the availability of information on research partnerships for both SBIR and STTR awards by incorporating standardized partnership data into the Technology

Portfolio Management System database. Such information should include partner type, institutional characteristics, and indicators of repeat collaborations to support monitoring of participation patterns.

Recommendation 5-2: NASA's Small Business Innovation Research/Small Business Technology Transfer (STTR) Program Office should develop and disseminate standardized resources to reduce administrative and contractual barriers to the formation of STTR partnerships. These resources might include model cooperative research agreement templates and guidance on intellectual property and data sharing provisions to facilitate participation by institutions with limited prior experience.

Recommendation 5-3: NASA's Small Business Innovation Research/Small Business Technology Transfer (STTR) Program Office should take steps to broaden participation in STTR collaborations by facilitating connections between small businesses and underrepresented research institutions, including historically Black colleges and universities, through targeted outreach and partnership development efforts.

6

Outcomes of the NASA SBIR/STTR Programs

The Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs are designed to fulfill multiple congressionally mandated objectives, including meeting federal research and development (R&D) needs through small businesses and promoting technological innovation and commercialization in the private sector. Evaluating program impact requires consideration of both internal, mission-oriented outcomes and external indicators of innovation performance. This chapter examines the observable outcomes associated with participation in NASA's SBIR/STTR programs, with the aim of assessing how these programs contribute to the agency's mission-oriented R&D and acquisition objectives. The analysis employs a set of complementary metrics to capture the role of participating firms both within NASA's innovation ecosystem and in the broader technology and commercial landscape.

NASA's dual objectives are shaped by the agency's distinctive, mission-driven approach to innovation. NASA organizes technology development around mission requirements, with innovation occurring through a distributed network of centers, system integrators, specialized suppliers, and research institutions. Within this innovation ecosystem, SBIR and STTR awards typically support early- and intermediate-stage technology advancement, contributing to the development of components, subsystems, and enabling technologies that may ultimately be incorporated into mission architectures.

SBIR/STTR-supported firms also generate impacts beyond NASA. Prior research across federal agencies links SBIR funding to follow-on federal funding, private investment, patenting, and firm growth (Howell, 2017; Lanahan and Armanios, 2018; Lerner, 1999; Myers and Lanahan, 2022). However, the relevance and magnitude of these outcomes depend on institutional context. In NASA's case, the mission-driven nature of technology development, the structure of the space innovation ecosystem, and the limited scale of procurement imply that commercialization outcomes may differ from those observed in other agencies.

The analysis adopts a multidimensional approach. It examines whether SBIR/STTR serves as an entry point into NASA's innovation ecosystem and the extent of subsequent engagement through follow-on funding. It then assesses technology advancement using Technology Readiness Levels (TRLs) and evaluates external indicators of innovation, including private financing and patenting, recognizing that these measures capture only part of the program's broader impact.

MEASURING THE OUTCOMES OF NASA'S SBIR/STTR PROGRAMS

Evaluating the NASA SBIR/STTR program impact presents several challenges. The pathways through which SBIR/STTR-supported technologies contribute to missions are multistage and nonlinear, often involving follow-on funding, integration into subsystems, or incorporation through supply-chain relationships that are not consistently captured in available data. Commercialization outcomes also emerge over long time horizons and through varied channels. As a result, empirical analysis based on observable data provides only a partial view of program impact.

A central challenge in the NASA context is that no single, consistently tracked mechanism captures the downstream incorporation of SBIR/STTR-supported technologies into mission systems. NASA maintains detailed information on technology development through the Technology Portfolio Management System (TechPort), which includes measures of TRLs and the pathways through which technologies are ultimately integrated into complex supply chains and NASA missions. These pathways include incorporation into subsystems by prime contractors, use in follow-on projects outside the original award scope, and deployment through subcontracting arrangements that are not consistently observable in administrative data. As a result, measuring outcomes requires combining multiple indicators that reflect different aspects of participation and technological progress.

A larger challenge is identifying causal effects associated with NASA investment. Firms receiving SBIR/STTR awards may differ systematically from nonrecipients in ways that also affect outcomes. Although the committee explored applicant-level comparisons, the limited number of years for which these data are available and the absence of a clear funding cutoff preclude strong causal inference. Accordingly, the results are best interpreted as descriptive patterns rather than causal estimates. However, the results are informative when considered alongside qualitative evidence and institutional context.

To assess the outcomes associated with participation in NASA's SBIR/STTR programs, it is necessary to construct measures that capture how technologies and firms supported through the programs are subsequently connected to activities within NASA and, more broadly, to the NASA innovation ecosystem. The committee considered a range of potential approaches, drawing on both the academic and policy literature on SBIR/STTR and related innovation programs (Howell, 2017; Lanahan and Armanios, 2018; Myers and Lanahan, 2022).

First, the committee examined follow-on NASA funding received by SBIR/STTR firms, capturing the extent to which these firms continue to engage with NASA through R&D and contracting activities beyond the initial award. This measure, while not specific to technologies or projects, provides an indicator of continued demand within NASA for engaging the capabilities of participating firms.

Second, the committee evaluated technology advancement using Technology Readiness Levels (TRLs), a standardized framework widely used within NASA to assess technological maturity. Drawing on TechPort data, which include both initial and final TRL levels for a large set of projects, the committee constructed measures of change in TRL and indicators of whether projects advanced by two or more levels. These measures provide a consistent basis for assessing whether SBIR/STTR-supported activities are associated with meaningful progress in technological maturity, while recognizing that reaching higher TRLs does not guarantee eventual mission integration.

Third, the committee considered traditional indicators of innovation outcomes, including patenting and the receipt of private financing. These measures provide information on the extent to which SBIR/STTR-supported firms participate in broader innovation and commercialization activities beyond NASA. However, their interpretation requires care, as technologies developed for mission-specific applications may be embedded within larger systems or deployed through noncommercial channels.

Taken together, this multidimensional approach provides a structured way to assess outcomes across internal and external dimensions. While each measure has limitations, their combined use allows the committee to characterize how SBIR/STTR participation is associated with continued engagement within NASA, progress in technological capability, and broader innovation activity.

NASA'S SBIR/STTR PROGRAMS AS A GATEWAY TO R&D AND FOLLOW-ON CONTRACTING

A central question in assessing the outcomes of NASA's SBIR/STTR programs is whether they serve as a gateway for small businesses to engage with NASA's broader R&D and contracting activities. To address this question, the committee linked firms receiving NASA SBIR/STTR awards to subsequent NASA funding observed in administrative data. Rather than focusing solely on whether firms receive follow-on funding, the analysis examines the sequencing of engagement—specifically, whether firms that participate in both SBIR/STTR and non-SBIR/STTR activities tend to first engage with NASA through the SBIR/STTR programs. Figure 6-1 shows that a clear majority of these firms—roughly two-thirds to three-quarters—receive their first NASA funding through the SBIR/STTR programs, while a smaller share first engage through other mechanisms.[1]

[1] Figure 6-1 is best interpreted as conditional on firms that receive both types of funding and does not capture the full population of participants. Nonetheless, it provides evidence that SBIR/STTR plays a meaningful gateway role within a broader set of entry pathways.

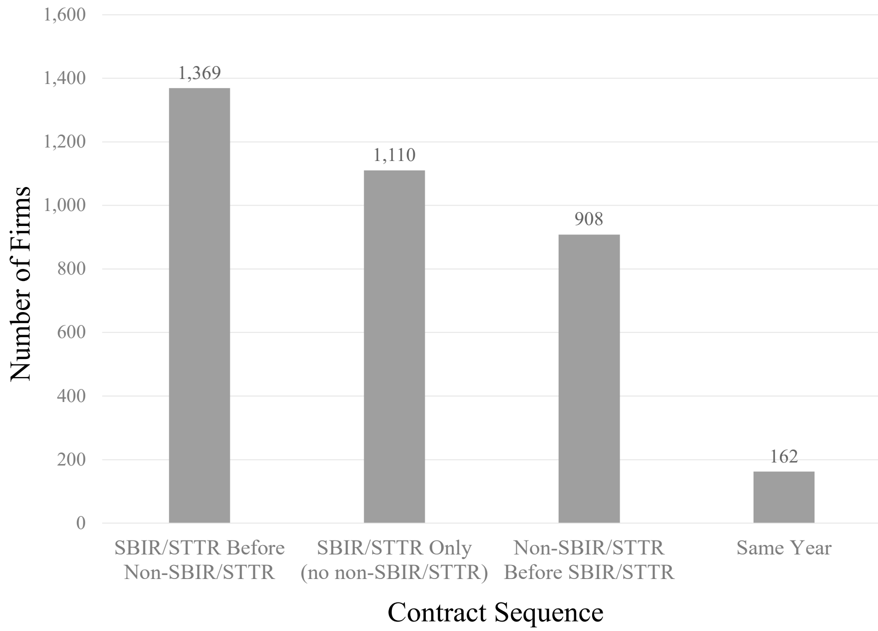

FIGURE 6-1 Sequencing of NASA engagement: Relative timing of receipt of NASA SBIR/STTR and non-SBIR/STTR funding (fiscal years 2015–2024).
SOURCES: Committee calculations based on data from the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) and USAspending.gov.

This pattern indicates that the SBIR/STTR programs often serve as an entry point into NASA's innovation ecosystem, enabling firms to establish relationships and demonstrate technical capabilities that support subsequent engagement. At the same time, the presence of firms that enter through other pathways underscores that the SBIR/STTR programs are important, but not exclusive, mechanisms for participation.

The gateway role of the SBIR/STTR programs at NASA appears less exclusive than in some other agencies, particularly the Department of Defense. Firms enter NASA's innovation ecosystem through multiple pathways, including prior work with other federal agencies, subcontracting relationships, and participation in the commercial space sector. In some cases, firms establish capabilities through work with other agencies and subsequently engage with NASA. As a result, the SBIR/STTR programs operate within a more distributed pattern of entry, providing an important mechanism for introducing small, often early-stage firms—especially those aligned with mission needs—while subsequent engagement frequently reflects a broader set of relationships and prior experience. By lowering barriers to entry and supporting early-stage development, the program expands participation, while operating alongside other federal and commercial pathways into the space innovation ecosystem.

SBIR/STTR AND NON-SBIR/STTR CONTRACTING AT NASA: THE LEVERAGE RATIO

Another central question is whether NASA's SBIR/STTR programs contribute to the agency's mission needs. One way to assess this is by examining the extent to which firms receiving SBIR/STTR awards obtain additional, non-SBIR/STTR funding from NASA. Such follow-on funding provides an observable indicator that the agency values the capabilities, technologies, and services of these firms beyond the initial award. Although this measure does not establish that a specific SBIR/STTR-supported technology was incorporated into a mission, it indicates that other parts of NASA allocated R&D and contracting resources to these firms.

To construct this measure, the committee linked NASA SBIR/STTR awardees to non-SBIR/STTR NASA funding using data from the Small Business Administration (SBA) and USAspending.gov. This broader category includes both R&D funding and other NASA contracting obligations, capturing continued engagement regardless of whether it occurs through R&D, mission support, or other activities. While incomplete—particularly where downstream contributions occur through subcontracting or are not fully observable in administrative data—this measure provides a useful and systematic indicator of sustained NASA demand for the capabilities of SBIR/STTR firms.

The committee finds that NASA SBIR/STTR firms receive substantial follow-on funding from NASA outside the SBIR/STTR program. The total amount of non-SBIR/STTR NASA funding received by these firms exceeded total SBIR/STTR funding by more than a factor of three over the period examined (see Figure 6-2). Put differently, for every dollar NASA invested through SBIR/STTR, firms that received those awards subsequently obtained more than three dollars in additional non-SBIR/STTR NASA funding. This pattern suggests that NASA components beyond the SBIR/STTR program frequently choose to continue working with these firms after the initial award period.

It is not appropriate to interpret this ratio as a conventional return on investment. The additional funding reflects subsequent NASA expenditures directed to the same firms, not revenue returned to the agency. Instead, the leverage ratio is best understood as an indicator of continued internal demand for the capabilities of SBIR/STTR-performing firms. It reflects the willingness of NASA program managers, centers, and contracting entities to allocate additional resources to firms initially supported through the SBIR/STTR programs, consistent with the view that these firms provide technologies, engineering capabilities, and specialized services valued for mission needs.

Many SBIR/STTR firms are small, technically specialized organizations that contribute not only discrete products but also R&D, testing, engineering support, and mission-relevant services. This aligns with the structure of NASA missions, which depend on the integration of highly specialized components and subsystems and rely on diverse contributors rather than large-scale production alone.

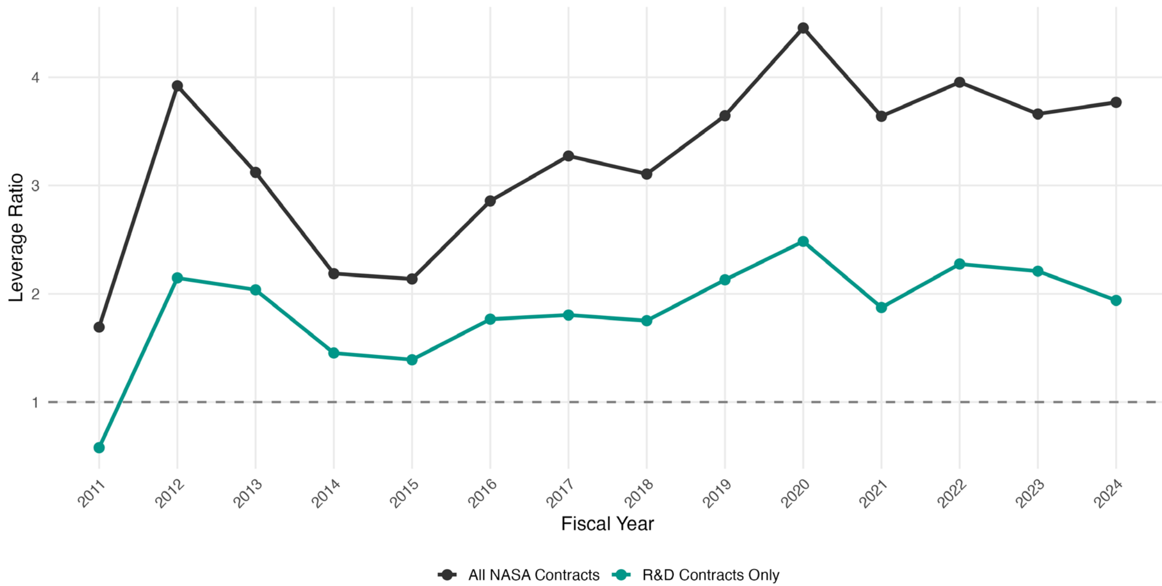

FIGURE 6-2 Ratio of non-SBIR/STTR NASA funding to NASA SBIR/STTR funding for participating firms (fiscal years 2011–2024).
NOTES: R&D = research and development. Inflation adjusted using the Consumer Price Index with 2024 as the base year. Phase III included. Fiscal Year 2020 spike likely reflects COVID-era supplemental NASA procurement.
SOURCES: Committee calculations based on data from the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) and USAspending.gov.

The time pattern of the leverage ratio is also informative. The ratio increased in the early 2010s and has remained elevated over the past decade, suggesting a strengthening and subsequent stabilization of the relationship between SBIR/STTR and broader NASA funding activities. While not interpreted causally, this pattern is consistent with NASA increasingly using the SBIR/STTR programs to identify and engage firms with mission-relevant capabilities.

These findings indicate that SBIR/STTR plays an important role not only in early-stage technology development but also in connecting capable firms to follow-on opportunities within NASA. The substantial level of continued funding suggests that the program helps identify firms whose capabilities are valued across the agency. At the same time, this measure captures only one dimension of program outcomes. Firms may contribute through follow-on R&D, service contracts, or less visible supply-chain roles, and some impacts extend beyond NASA into other federal or commercial markets. Even with these limitations, the leverage analysis provides evidence that SBIR/STTR firms often remain engaged with NASA after their initial awards.

NASA SBIR/STTR AND NON-NASA FEDERAL CONTRACTING

The committee examined the extent to which NASA SBIR/STTR firms receive funding from other federal agencies. This provides an indicator that other agencies value the capabilities, technologies, and services of NASA's SBIR/STTR firms by allocating R&D and contracting resources to these firms.

To construct this measure, the committee linked NASA SBIR/STTR awardees to non-SBIR/STTR federal funding using data from SBA and USAspending.gov. This category includes both R&D funding and other procurement obligations, capturing continued engagement across agencies through R&D and contracting activities. As with NASA-based measures, this approach is incomplete, particularly where downstream contributions occur through subcontracting or are not fully observable in administrative data. Figure 6-3 shows that NASA SBIR/STTR–funded firms received a substantial amount of money from other federal agencies, demonstrating that those agencies value the knowledge created from NASA's SBIR/STTR firms.

Phase III awards, especially those resulting from subcontracting and direct commercial investment, are not easily tracked using current government data sources and reporting systems (NASEM, 2026). Problems tracking Phase III awards were addressed in the recent reauthorization of the programs, which requires Phase III awards, including Phase II subcontracting awards, to be included in both the SBA database as well as the federal procurement data system, including a requirement for government contracting officer to "reference an SBIR or STTR contract identification number for relevant prior SBIR or STTR work" in order to facilitate better tracking of this follow-on funding.[2]

[2] U.S. Congress, Small Business Innovation and Economic Security Act, P.L. 119–83 (April 13, 2026), Section 8(b).

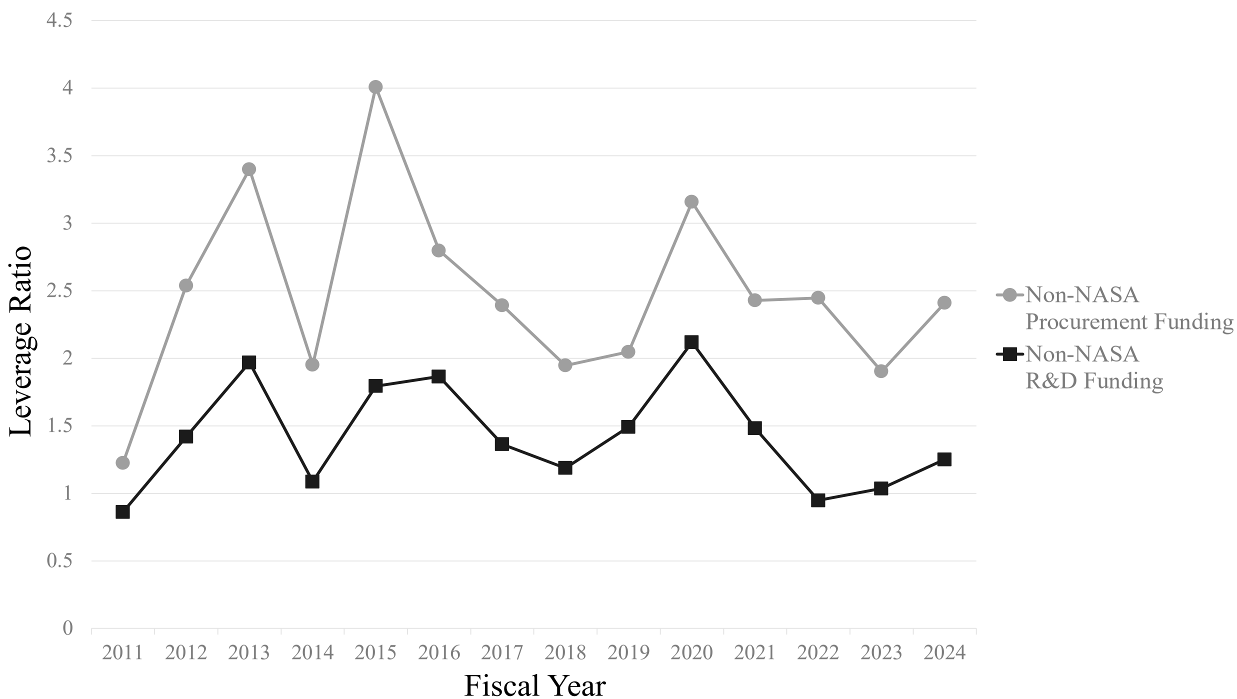

FIGURE 6-3 Total and R&D federal procurement spending on NASA SBIR/STTR recipients over time (fiscal years 2011–2024).
NOTE: R&D = research and development.
SOURCES: Committee calculations based on data from the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) and USAspending.gov.

TECHNOLOGY ADVANCEMENT AND TECHNOLOGY READINESS LEVELS

To further assess the outcomes associated with NASA's SBIR/STTR programs, the committee examined whether SBIR/STTR-supported projects are associated with measurable advances in technological maturity. One of the central purposes of the NASA SBIR/STTR program is to help advance promising technologies toward levels at which they may become relevant for mission use, with TRLs as a standardized framework for tracking the maturity of technologies (see Chapter 2 for more detail). While TRL assessments involve subjective judgment, they provide a common metric within NASA for evaluating progress in technology development.

The committee's analysis draws on project-level data from NASA's TechPort system. A particular advantage of the NASA context is that TechPort includes both initial and final TRL assessments for a large set of projects, making it possible to examine technology advancement more directly than is feasible in many other federal settings. The analysis compares SBIR/STTR-supported projects with other externally performed technology development projects recorded in TechPort, including university collaborations, other private-sector contracts, and cooperative projects involving a NASA center and an external research team. These projects are broadly comparable in that they are mission-oriented technology advancement efforts for which NASA tracks progress. In addition, the projects in both the SBIR/STTR group and the comparison group are similar in scale, in the range of approximately $100,000 to $1 million.

To assess whether SBIR/STTR-supported projects exhibit different patterns of technology advancement, the committee estimated a set of ordinary least squares regressions using three dependent variables. The first is the change in TRL over the course of the project. The second is an indicator for whether a project advances by two or more TRL levels, a threshold intended to capture meaningful progress beyond incremental movement or variation in assessment. The third is an indicator for whether a project reaches TRL 7 or higher, representing later-stage readiness consistent with potential mission insertion (see Table 6-1).

For each outcome, the committee reports two specifications. The first is the raw association between SBIR/STTR status and the TRL outcome. The second adds controls for project start year, initial TRL level, technology division, and target destination (e.g., Earth, Moon, Mars), accounting for observable differences that may independently affect technology progression. Projects that begin at different TRLs or operate in different technical or mission areas may face distinct opportunities for advancement.

Across specifications, SBIR/STTR-supported projects are associated with somewhat greater technology advancement than other external projects recorded in TechPort. In the raw results, these projects exhibit larger average

TABLE 6-1 Technology Advancement Outcomes: Association Between SBIR/STTR Status and Changes in Technology Readiness Levels

Dependent Variable	Change in TRL		TRL Increased by 2 or More		Project Reaches Mission Readiness (TRL 7 or Larger)	
	(1)	(2)	(3)	(4)	(5)	(6)
Grant SBIR/STTR	0.175***	0.101***	0.145***	0.093***	0.016***	0.008
	(0.020)	(0.028)	(0.011)	(0.015)	(0.006)	(0.007)
Fixed Effects						
Grant Start Year	No	Yes	No	Yes	No	Yes
Grant Start TRL	No	Yes	No	Yes	No	Yes
Technology Division	No	Yes	No	Yes	No	Yes
Target Destination	No	Yes	No	Yes	No	Yes
Observations	8,337	7,093	8,337	7,093	8,337	7,093
R-squared	0.009	0.088	0.021	0.084	0.001	0.380

*** Indicates statistical significance of $p < 0.01$.

NOTES: Ordinary least squares regression. Sample is all projects publicly available in NASA's Technology Portfolio Management System (TechPort). Independent variable is equal to 1 if the award is an SBIR/STTR award and 0 otherwise. Target Destination refers to the assigned destination of the technology for NASA (e.g., Earth, Moon, Outside Solar System). TRL = Technology Readiness Level.

SOURCE: Committee calculations based on data from TechPort (https://techport.nasa.gov).

increases in TRL and are more likely to advance by two or more levels. These relationships remain statistically significant after introducing controls, although the magnitudes are reduced. The results are best interpreted as descriptive rather than causal, reflecting both potential selection into the program and the effects of participation. Overall, they indicate that SBIR/STTR projects are associated with slightly greater progress in moving technologies forward along the readiness spectrum relative to comparable NASA-supported activities.

In contrast, the evidence is weaker for later-stage advancement. While SBIR/STTR status is positively associated with reaching TRL 7 or higher in the raw specification, this relationship becomes small and statistically insignificant once controls are included. This pattern is consistent with the program's role within NASA's innovation system, which is oriented toward advancing emerging technologies rather than carrying them through to full mission readiness. Achieving higher TRLs typically requires additional development, integration, and testing beyond the scope of a single SBIR/STTR award.

When interpreting these findings, it is also important to consider the limitations of TRL-based measures. TRL assessments provide a standardized but imperfect indicator of technological maturity, and progression along the scale does not guarantee eventual mission use. Even at higher TRLs, incorporation into a mission depends on factors such as system integration, mission timing, budget constraints, and programmatic priorities. Nevertheless, the availability of systematic TRL data in TechPort provides a valuable basis for assessing whether SBIR/STTR contributes to measurable progress in technology development.

The results indicate that NASA SBIR/STTR is associated with meaningful advancement in early and intermediate stages of technology development. The greater likelihood of multilevel TRL advancement is consistent with the program's role in maturing promising technologies. At the same time, the limited association with late-stage readiness reinforces the conclusion that SBIR/STTR supports primarily upstream technology development rather than serving as the final step toward mission deployment.

EXTERNAL INNOVATION AND COMMERCIALIZATION OUTCOMES

The committee considered whether participation in the SBIR/STTR programs is associated with broader indicators of innovation and commercialization. These external outcomes include the ability of firms to attract private financing and to generate formal intellectual property. While these metrics provide useful information, their interpretation in the NASA context requires care, as the structure of the space innovation ecosystem and the mission-oriented nature of technology development differ from those of more commercially oriented sectors.

The committee first examined patterns of private financing using data drawn from PitchBook, with a robustness check using data from Crunchbase. The analysis compares firms that receive SBIR/STTR awards with those that apply but do not receive an award, focusing on the timing of financing activity relative to the first SBIR/STTR application. The evidence indicates that firms receiving NASA SBIR/STTR awards are, on average, less likely to have prior venture capital financing than firms that apply but do not receive an award. This pattern suggests that SBIR/STTR awardees may be less oriented toward venture-backed growth strategies at the time of application and instead may be more focused on developing specialized technologies aligned with NASA mission needs.

At the same time, firms that receive NASA SBIR/STTR awards show a modest increase in private financing following their initial award. Awardees are more likely than nonawardees to experience financing events after their first award (see Figure 6-4). However, this increase is relatively modest compared with

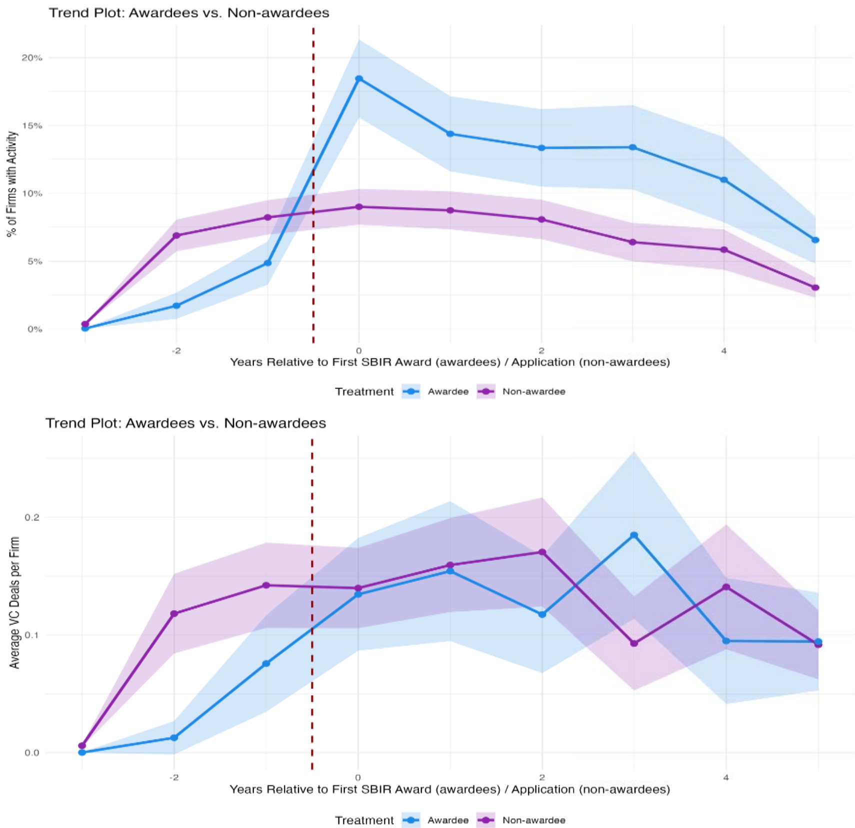

FIGURE 6-4 Comparison of postaward private financing activity for NASA SBIR/STTR awardees and nonawardees.
NOTE: VC = venture capital.
SOURCES: Committee calculations based on data from the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) and PitchBook.

patterns observed in some other agencies. These results suggest that while SBIR/STTR participation is associated with some increase in access to external capital, it is not the primary pathway through which NASA SBIR/STTR firms generate value.

The committee also examined patenting behavior among NASA SBIR/STTR applicants. The analysis indicates that many firms participating in the program exhibit significant patenting activity prior to their initial SBIR/STTR application (Figure 6-5). This finding reinforces the interpretation that the program attracts firms that are already engaged in innovative activity and possess established technical capabilities. When examining patenting trajectories over time, the committee finds no evidence of a substantial increase in patenting following receipt of an SBIR/STTR award. While patenting continues for many firms, the rate of patenting does not appear to change markedly relative to preaward levels.

Taken together, these results suggest that external commercialization outcomes associated with NASA SBIR/STTR participation are present but differ in important ways from those observed in more market-oriented settings. Participation in the program is associated with some increase in access to private financing, but not with a pronounced shift toward venture-backed scaling.

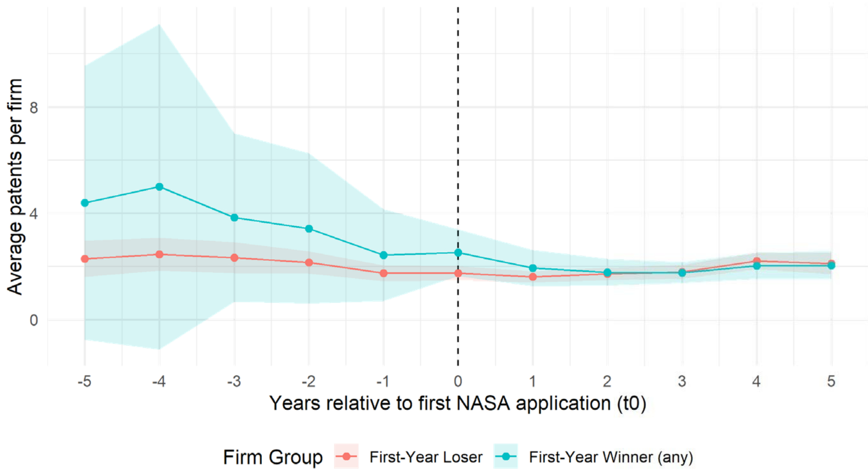

FIGURE 6-5 Average annual patent counts per firm before and after the year of first NASA SBIR/STTR application.
NOTE: Compares first-year funded and unfunded applicants, with 95% confidence intervals.
SOURCES: Committee calculations based on data from the Small Business Administration's SBIR/STTR Awards database (SBIR.gov) and the United States Patent and Trademark Office.

Similarly, while many participating firms generate intellectual property, SBIR/STTR participation does not appear to lead to a discrete increase in patenting activity. These patterns are consistent with the broader role of SBIR/STTR within the NASA innovation ecosystem.

SUMMARY

The NASA SBIR/STTR programs are best understood as a mission-oriented innovation and procurement pipeline, not as general-purpose commercialization or venture-development programs. Their strongest impacts occur where program design aligns closely with NASA's institutional role—namely, early-stage technology development, certification of technical capability, and integration into federal R&D and acquisition networks. Outcomes that depend on external private markets, such as venture capital investment or patenting, appear to be secondary and highly heterogeneous.

Within NASA, SBIR/STTR projects report a higher average increase in their TRLs over the course of the R&D support from NASA, and are, in particular, more likely to report an advance of at least two TRLs. However, NASA projects are no more likely than comparable TechPort-reported projects to achieve a TRL of 7 or above, which is reached when a prototype is demonstrated in space, and they achieve a TRL level of 9, where the system is proven through successful mission operations, only in rare circumstances.

The strongest and most consistent outcome associated with NASA SBIR/STTR participation is increased engagement in federal contracting, both within NASA and from other federal agencies. NASA SBIR/STTR awardees receive substantial follow-on funding from both NASA and other federal agencies. Firms that have participated in NASA's SBIR/STTR programs receive a disproportionately large share of NASA's non-SBIR/STTR contract dollars to small businesses relative to their share of SBIR/STTR funding. Taken together, these patterns suggest that the SBIR/STTR programs function as a certification and onboarding mechanism within the federal innovation ecosystem.

In contrast to conventional narratives that frame the SBIR/STTR programs as a certification for private investors, the evidence provides limited support for a generalized venture capital catalysis effect. Firms that ultimately receive NASA SBIR/STTR awards are less likely to have venture capital backing prior to application than unsuccessful applicants, and postaward venture activity does not increase in a sustained or systematic manner relative to nonawardees. Where postaward capital activity does occur, it is more often associated with private equity or other non–venture capital transactions and is driven by a small number of large outliers rather than broad-based increases across firms. These results suggest that venture capital is not the dominant or intended commercialization pathway for many of NASA's SBIR/STTR-funded technologies, and that reliance on venture capital–based metrics may mischaracterize program performance.

Measures of innovative output, particularly patenting activity, further reinforce the importance of selection effects. Firms that receive NASA SBIR/STTR awards tend to be more patent active prior to applying than firms that are not funded, indicating that the program selects firms with existing innovative capacity. However, event-study analyses show no clear increase in patenting following award receipt. This absence of a postaward patent increase does not imply an absence of innovation impact. Rather, it suggests that SBIR funding may redirect effort toward applied development, system integration, and mission-specific problem-solving, activities that are not well captured by patent counts. These findings highlight the limitations of patent-based indicators for evaluating mission-oriented R&D programs such as NASA SBIR/STTR.

As discussed in earlier chapters, the programs support a heterogeneous population of firms. Some participants pursue growth-oriented strategies that involve attracting private capital and expanding into commercial markets, including emerging segments of the space sector. However, a substantial share of SBIR/STTR participants appear to be small, technically specialized firms that develop capabilities and technologies aligned with NASA mission needs. For these firms, value creation may occur through continued engagement with NASA, participation in supply-chain relationships, or contributions to mission-specific systems, rather than through traditional commercialization pathways such as venture-backed growth or patent-driven licensing.

Accordingly, the committee interprets the external commercialization evidence as complementary to the internal outcomes documented earlier in this chapter. While SBIR/STTR participation may contribute to broader innovation activity for some firms, the primary role of the program in the NASA context appears to lie in supporting the development of mission-relevant technologies and in enabling the participation of specialized firms within NASA's innovation system. External metrics such as private financing and patenting provide useful, but partial, indicators of these broader outcomes.

FINDINGS

> Finding 6-1: NASA's SBIR/STTR programs have served as an effective and strategic mechanism for developing and advancing technologies that are critical to the agency's missions and priorities.

> Finding 6-2: NASA's SBIR/STTR programs have played an important role in contributing to technologies and companies engaged in the growing commercially oriented space sector.

> Finding 6-3: Firms that have received both SBIR/STTR and non-SBIR/STTR funding from NASA typically receive their first NASA funding through the SBIR/STTR programs.

Finding 6-4: NASA SBIR/STTR awardees tend to attract significant non-SBIR/STTR funding from NASA, at a ratio of more than 3:1.

Finding 6-5: NASA SBIR/STTR firms attract significant non-SBIR/STTR funding from other federal agencies.

Finding 6-6: Relative to other R&D projects tracked in NASA's TechPort, NASA SBIR/STTR projects report larger average gains in TRLs over the course of their support from NASA and are more likely to report an advance of at least two TRLs. However, NASA projects are no more likely than comparable TechPort-reported projects to achieve a TRL of 7 or above, and they achieve a TRL of 9 only in rare circumstances.

Finding 6-7: Relative to other private firms, NASA SBIR/STTR awardees tend to be less well connected to private venture capital prior to their engagement with the SBIR/STTR programs, suggesting that these firms may be more interested in serving the agency's mission than in expanding the scale of their sales or operations.

Finding 6-8: NASA SBIR/STTR awardees tend to attract some form of publicly reported private capital (but not a higher level of venture capital) after receiving their first NASA SBIR/STTR award.

Finding 6-9: Although many NASA SBIR/STTR awardees do receive formal intellectual property protections (patents), these firms experience no "boost" in the rate of patenting after receiving their first NASA SBIR/STTR award. This observation may reflect a relative lack of reliance on patents in the NASA innovation ecosystem.

RECOMMENDATIONS

Recommendation 6-1: NASA's contracting and procurement workforce should advocate for the maximum practicable use and transition of products, services, and technologies developed under the Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs into NASA missions by means of Phase III awards to small businesses, as Congress required in the 2026 reauthorization of the SBIR/STTR programs.

Recommendation 6-2: NASA should consider a range of strategies for how best to accelerate and support the emerging set of start-ups and scale-ups in the commercial space sector. The agency's Small Business Innovation Research and Small Business Technology Transfer programs should continue to play a key role in facilitating

the advancement of technologies and components important to this emerging sector, while recognizing that the capital and scaling opportunities required for certain technologies require the involvement of other programs and/or private-sector initiatives.

Recommendation 6-3: Congress should require agencies to submit scoring information on applicants to the government database so as to facilitate analysis of the impact of NASA's Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) funding on applicants. Scoring information could enable the determination of a well-defined funding cutoff, which would help identify any cause-and-effect relationship between NASA's SBIR/STTR funding and outcomes.

References

BIRAC (Biotechnology Industry Research Assistance Council). n.d.a. *About Us*. https://birac.nic.in/desc_new.php?id=89.

BIRAC. n.d.b. *Small Business Innovation Research Initiative (SBIRI).* https://www.birac.nic.in/desc_new.php?id=217.

Boroff, A., and J. Vertesi. 2026. *The Risk Transfer Paradox: NASA SBIR'S Innovation Characteristics.* Working Paper.

Bouzoukis, K-P., G. Moraitis, V. Kostopoulos, and V. Lappas. 2025. "An Overview of CubeSat Missions and Applications." *Aerospace* 12(6): 550. https://doi.org/10.3390/aerospace12060550.

Bryce Tech. 2022. *Start-Up Space: Update on Investment in Commercial Space Ventures*. https://brycetech.com/reports/report-documents/Bryce_Start_Up_Space_2022.pdf.

de Souza Lima Júnior, I., S. J. Sohn, and N. S. Vonortas. 2024. "Korea Small Business Innovation Research (KOSBIR)." *Annals of Science and Technology Policy* 8(1–2): 64–78.

DoEd (U.S. Department of Education). n.d. *White House Initiative on Historically Black Colleges and Universities: 2025 HBCU Carnegie Classifications.* https://sites.ed.gov/whhbcu/2025-hbcu-carnegie-classifications.

Gaetani, R., and A. T. Whalley. 2026. "Old Space, New Space: A Commercial Revolution in Innovation?" Chapter 4 in *Entrepreneurship and Innovation Policy and the Economy*, *Volume 6* (B. Jones and J. Lerner, Eds.). University of Chicago Press.

Giebel, M., and A. Rösner. 2025. "Reaching for the Society: The Commercialization Effects of NASA Technology Licensing." *Research Policy* 54(10): 105337. https://doi.org/10.1016/j.respol.2025.105337.

Gross, D. P., and B. N. Sampat. 2023. "America Jump-Started: World War II R&D and the Takeoff of the US Innovation System." *American Economic Review* 113(12): 3323–3356.

Gustetic, J. L., D. Askey, Z. Burkland, A. Cordrey, M. Feinberg, K. Kvaternik, S. Mantravadi, B. McClave, L. Mederos, A. Mutter, I. Ranaviraja, G. Steele, C. Torrez, and M. Yancey. (2019). "Making NASA More Business Friendly: A Small Business Innovation Research and Small Business Technology Transfer Case Study." *New Space* 7(3): 151–178. https://doi.org/10.1089/space.2019.0005.

Howell, S. T. 2017. ”Financing Innovation: Evidence from R&D Grants.” *American Economic Review* 107(4): 1136–1164. https://doi.org/10.1257/aer.20150808.

Jones, H. 2018. *The Recent Large Reduction in Space Launch Cost*. International Conference on Environmental Systems. ICES-2018-81.

Kantor, S., and A. Whalley. 2025. “Moonshot: Public R&D and Growth.” *American Economic Review* 115(9): 2891–2925. https://doi.org/10.1257/aer.20220540.

Lanahan, L., and D. Armanios. 2018. “Does More Certification Always Benefit a Venture?” *Organization Science* 29(5): 931–947. https://doi.org/10.1287/orsc.2018.1211.

Launius, R. D. 1994. *NASA: A History of the U.S. Civil Space Program.* Krieger Publishing.

Lerner, J. 1999. “The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program.” *The Journal of Business 72*(3): 285–318. https://doi.org/10.1086/209616.

Link, A. N. (Ed.). 2024. “The Globalization of the U.S. Small Business Innovation Research (SBIR) program.” *Annals of Science and Technology Policy* 8(1–2).

Mazzucato, M., and D. K. Robinson, 2016. “Lost in Space? NASA and the Changing Public-Private Eco-System in Space.” SPRU Working Paper Series 2016-20. Science Policy Research Unit, University of Sussex Business School.

Mazzucato, M., and D. K. Robinson. 2018. “Co-Creating and Directing Innovation Ecosystems? NASA’s Changing Approach to Public–Private Partnerships in Low-Earth Orbit.” *Technological Forecasting and Social Change* 136: 166–177. https://doi.org/10.1016/j.techfore.2017.03.034.

McCurdy, H. E. 1994. *Inside NASA: High Technology and Organizational Change in the U.S. Space Program*. Johns Hopkins University Press.

Mississippi Space Grant Consortium. n.d. *Affiliates*. https://msspacegrant.org.

Mississippi State University. n.d. *MSU Space Cowboys Rocketry Team Wins Challenge at 2025 International Rocket Engineering Competition*. https://www.msstate.edu/newsroom/article/2025/07/msu-space-cowboys-rocketry-team-wins-challenge-2025-international-rocket.

Myers, K. R., and L. Lanahan. 2022. “Estimating Spillovers from Publicly Funded R&D: Evidence from the US Department of Energy.” *American Economic Review* 112(7): 2393–2423. https://doi.org/10.1257/aer.20210678.

NASA (National Aeronautics and Space Administration). n.d.a. *About I-Corps*. https://www.nasa.gov/sbir_sttr/icorps/#about-icorps.

NASA. n.d.b. *CCRPP*. https://www.nasa.gov/sbir_sttr/ccrpp.

NASA. n.d.c. *Centers and Facilities*. https://www.nasa.gov/centers-and-facilities.

NASA. n.d.d. *Mango Materials & Colorado School of Mines*. https://www.nasa.gov/nasa-sbir-sttr-success-stories/#mango-materials.

NASA. n.d.e. *NASA Directorates*. https://www.nasa.gov/directorates.

NASA. n.d.f. *NASA SBIR Ignite: General Overview AMA FAQ: Frequently Asked Questions & Applicant Guidance*. https://www.nasa.gov/sbir_sttr/sbir-ignite.

NASA. n.d.g. *Phase II-Extended (II-E)*. https://www.nasa.gov/sbir_sttr/phase-ii-e/#phaseiiextendedguidelines.

NASA. n.d.h. *SBIR/STTR Phase I*. https://www.nasa.gov/sbir_sttr/phase-i.

NASA. n.d.i. *SBIR/STTR Phase II*. https://www.nasa.gov/sbir_sttr/phase-ii.

NASA. n.d.j. *SBIR/STTR Program*. https://www.nasa.gov/sbir _sttr.

NASA. n.d.k. *67 Years of Aerospace Exploration*. https://www.nasa.gov/history.

NASA. n.d.l. *TechPort: NASA Technology Taxonomy*. https://techport.nasa.gov/taxonomy.

NASA. n.d.m. *2023-2024 List of Minority Serving Institutions*. https://msiexchange.nasa.gov/pdf/2023-2024%20MSI%20List.pdf.

NASA. 2003. "The Right Track for Vision Correction." *NASA Spinoff*. https://spinoff.nasa.gov/spinoff2003/hm_1.html.

NASA. 2022. *NASA Strategic Plan 2022*. March 28. https://www.nasa.gov/wp-content/uploads/2018/01/2022_nasa_strategic_plan_0.pdf.

NASA. 2023. *Technology Readiness Levels*. https://www.nasa.gov/wpcontent/uploads/2023/09/trl.png.

NASA. 2024. *Partnerships That Prepare for Success: Oakwood University Became a First-Time Small Business Technology Transfer (M-STTR)*. https://www.nasa.gov/directorates/stmd/sbir-sttr/oakwood-university.

NASEM (National Academies of Sciences, Engineering, and Medicine). 2016. *SBIR at the National Aeronautics and Space Administration.* National Academies Press. https://doi.org/10.17226/21797.

NASEM. 2020. *Review of the SBIR and STTR Programs at the Department of Energy.* National Academies Press. https://doi.org/10.17226/25674.

NASEM. 2022. *Assessment of the SBIR and STTR Programs at the National Institutes of Health.* National Academies Press. https://doi.org/10.17226/26376.

NASEM. 2023. *Review of the SBIR and STTR Programs at the National Science Foundation.* National Academies Press. https://doi.org/10.17226/26884.

NASEM. 2024. *NASA at a Crossroads: Maintaining Workforce, Infrastructure, and Technology Preeminence in the Coming Decades.* National Academies Press. https://doi.org/10.17226/27519.

NASEM. 2026. *Review of the SBIR and STTR programs at the Department of Defense.* National Academies Press. https://doi.org/10.17226/29329.

National Research Council, Division on Engineering and Physical Sciences, and Committee on NASA's Strategic Direction. 2013. *NASA's Strategic Direction and the Need for a National Consensus.* National Academies Press.

Nelson, J. D., K. Medicus, T. Blalock, B. Myer, M. Brunelle, T. Lynch, M. Walters, G. Frisch and M. Mandina. 2015. *Optimax SBIR Commercialization: Enabling Customer Satisfaction, Revenue Growth and Job Creation Utilizing SBIR Developed Technologies*. November 10.

Olivari, M., C. Jolly, and M. Undseth. 2021. "Space Technology Transfers and Their Commercialisation." *OECD Science, Technology and Industry Policy Papers*. No. 116. Paris: OECD Publishing. https://doi.org/10.1787/0e78ff9f-en.

Optimax. n.d. *Mars Rover Curiosity*. https://www.optimaxsi.com/optimax-in-space/mars-rover-curiosity.

Popkin, G. 2017. "Commercial Space Sensors Go High-Tech." *Nature* 545(May 25): 397–398.

REI Systems. 2023. "Convex Optimization Tool Enables Rapid and Accurate Portfolio Management at NASA with Global Optimal Solutions." *Insights.* https://www.reisystems.com/convex-optimization-tool-enables-rapid-and-accurate-portfolio-management-at-nasa-with-global-optimal-solutions.

SBA (U.S. Small Business Administration). n.d. *Policy Directives: Purpose*. https://www.sbir.gov/about/policies.

SBA. 2023. *Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program: Policy Directive*. https://www.sbir.gov/sites/default/files/documents/SBA%20SBIR_STTR_POLICY_DIRECTIVE_May2023.pdf.

Szajnfarber, Z., and A. L. Weigel. 2013. "A Process Model of Technology Innovation in Governmental Agencies: Insights from NASA's Science Directorate." *Acta Astronautica* 84(2013): 56–68. https://doi.org/10.1016/j.actaastro.2012.10.039.

Terrile, R. J., F. G. Doumani, G. Y. Ho, and B. L. Jackson. 2015. "Calibrating the Technology Readiness Level (TRL) Scale Using NASA Mission Data." *2015 IEEE Aerospace Conference*. March 7–14, 2015. https://doi.org/10.1109/AERO.2015.7119313.

Unsal, N. 2024. "Public Support of SMEs in the Republic of Turkey." *Annals of Science and Technology Policy* 8(1–2): 9–28. https://doi.org/10.1561/110.00000028-2.

U.S. News (U.S. News & World Report). 2026. *Best Aerospace Engineering Programs.* March 11. https://www.usnews.com/best-graduate-schools/top-engineering-schools/aerospace-rankings.

Van Nimmen, J., and L. C. Bruno. 1976. *NASA Historical Data Book, 1958–1968.* NASA.

Vertesi, J. 2020. *Shaping Science: Organizations, Decisions, and Culture on NASA's Teams*. University of Chicago Press.

Weinzierl, M., and B. Rosseau. 2025. *Space to Grow: Unlocking the Final Economic Frontier*. Harvard Business Review Press.

Appendix A

Meeting Agendas

FIRST MEETING: NOVEMBER 13, 2023
VIA ZOOM
All Times U.S. Eastern

MONDAY, NOVEMBER 13, 2023 (CLOSED SESSION: 13:00–14:45)

MONDAY, NOVEMBER 13, 2023 (OPEN SESSION: 15:00–16:00)

15:00–15:05 **Welcome**
Scott Stern and Maryann Feldman, co-chairs

15:05–16:00 **Sponsor Perspectives**
Jason Kessler, National Aeronautics and Space Administration (NASA)

SECOND MEETING: FEBRUARY 15–16, 2024
Keck Center of the National Academies
500 Fifth Street, NW
Washington, DC 20001
All Times U.S. Eastern

THURSDAY, FEBRUARY 15, 2024 (CLOSED SESSION: 09:30–10:00)

THURSDAY, FEBRUARY 15, 2024 (OPEN SESSION: 10:00–11:30)

10:00–10:05 **Welcome**
Scott Stern and Maryann Feldman, co-chairs

10:05–11:30 **Sponsor Perspectives**
Jason Kessler, NASA

THURSDAY, FEBRUARY 15, 2024 (CLOSED SESSION: 11:45–20:00)

FRIDAY, FEBRUARY 16, 2024 (CLOSED SESSION: 09:00–9:25)

FRIDAY, FEBRUARY 16, 2024 (OPEN SESSION: 09:25–11:00)

09:25–09:30 **Welcome and Introduction**
Maryann Feldman and Scott Stern

09:30–11:00 **Panel: NASA SBIR/STTR Awardees (virtual)**
Moderator: Alexandra Graddy-Reed

Bradley Cheetham, Advanced Space
Jack Goodwin, Astrobotic
Dimi Apostolopoulos, ProtoInnovations

FRIDAY, FEBRUARY 16, 2024 (CLOSED SESSION: 11:00–14:00)

THIRD MEETING: APRIL 25–26, 2024
Keck Center of the National Academies
500 Fifth Street, NW
Washington, DC 20001
All Times U.S. Eastern

THURSDAY, APRIL 25, 2024 (CLOSED SESSION: 09:30–13:00)

THURSDAY, APRIL 25, 2024 (OPEN SESSION: 13:00–14:00)

13:00–13:05 **Welcome**
Scott Stern and Maryann Feldman, co-chairs

13:05–14:00 **Perspectives from Small Businesses**
Solange Massa, Ecoatoms (virtual)
Jackie Jester, Relativity Space

THURSDAY, APRIL 25, 2024 (CLOSED SESSION: 14:00–20:00)

FRIDAY, APRIL 26, 2024 (CLOSED SESSION: 09:00–09:25)

FRIDAY, APRIL 26, 2024 (OPEN SESSION: 09:30–10:30)

09:30–09:35 **Welcome and Introduction**
Maryann Feldman and Scott Stern, co-chairs

09:35–10:30 **NASA and the Commercial Space Ecosystem**
Moderator: Janet Vertesi, Princeton University

Presenter: Matthew Weinzierl, Harvard Business School (virtual)

FRIDAY, APRIL 26, 2024 (CLOSED SESSION: 10:45–14:00)

FOURTH MEETING: JULY 29–31, 2024
Beckman Center of the National Academies
100 Academy Way
Irvine, CA 92617
All Times U.S. Pacific

MONDAY, JULY 29, 2024 (CLOSED SESSION: 12:30–20:00)

TUESDAY, JULY 30, 2024 (CLOSED SESSION: 09:00–12:00)

TUESDAY, JULY 30, 2024 (OPEN SESSION: 12:50–14:15)

12:50–12:55 **Welcome**
Maryann Feldman and Scott Stern, co-chairs

12:55–13:35 Leon Alkalai, Mandala Space Ventures, LLC

13:35–14:15 Mark Davidson, Jet Propulsion Laboratory

TUESDAY, JULY 30, 2024 (CLOSED SESSION: 14:45–17:00)

WEDNESDAY, JULY 31, 2024 (CLOSED SESSION: 09:00–11:30)

FIFTH MEETING: JULY 7, 2025
VIA ZOOM
All Times U.S. Eastern

THURSDAY, JULY 7, 2025 (CLOSED SESSION: 14:00–15:30)

SIXTH MEETING: JANUARY 22, 2026
VIA ZOOM
All Times U.S. Eastern

THUSDAY, JANUARY 22, 2026 (CLOSED SESSION: 16:00–17:00)

SEVENTH MEETING: FEBRUARY 5, 2026
VIA ZOOM
All Times U.S. Eastern

THUSDAY, FEBRUARY 5, 2026 (CLOSED SESSION: 16:00–17:30)

EIGHTH MEETING: FEBRUARY 9, 2026
VIA ZOOM
All Times U.S. Eastern

MONDAY, FEBRUARY 9, 2026 (OPEN SESSION: 13:30–14:30)

13:30–13:35 **Welcome**
Maryann Feldman and Scott Stern, co-chairs

13:35–14:30 **Committee Discussion with Sponsor Representative**
Jason Kessler, NASA

NINTH MEETING: FEBRUARY 19, 2026
VIA ZOOM
All Times U.S. Eastern

THURSDAY, FEBRUARY 19, 2026 (CLOSED SESSION: 16:00–17:00)

TENTH MEETING: MARCH 5, 2026
VIA ZOOM
All Times U.S. Eastern

THURSDAY, MARCH 5, 2026 (CLOSED SESSION: 16:00–17:30)

ELEVENTH MEETING: MARCH 19, 2026
VIA ZOOM
All Times U.S. Eastern

THURSDAY, MARCH 19, 2026 (CLOSED SESSION: 16:00–17:30)

Appendix B

Biographies of Committee Members

Maryann P. Feldman (*Co-Chair*) is Watts professor in the Department of Public Policy at Arizona State University. Feldman won the Global Award for Entrepreneurship Research for her contributions to the study of the geography of innovation and the role of entrepreneurial activity in the formation of regional industry clusters. Her most recent work explores the emergence of regional entrepreneurial ecosystems. Feldman served as co-chair of the congressionally mandated National Academies of Sciences, Engineering, and Medicine studies of the Small Business Innovation Research and Small Business Technology Transfer programs at the Department of Energy (2018–2020), National Institutes of Health, National Science Foundation, and Department of Defense.

Scott Stern (*Co-Chair*) is David Sarnoff professor of management at the Massachusetts Institute of Technology (MIT) Sloan School of Management. Stern explores how innovation and entrepreneurship differ from more traditional economic activities and the consequences of these differences for strategy and policy. His research in the economics of innovation and entrepreneurship focuses on entrepreneurial strategy, innovation-driven entrepreneurial ecosystems, and innovation policy and management. Recent studies include the impact of university research on both the quantity and quality of entrepreneurship, the drivers and consequences of entrepreneurial strategy, the impact of regional clusters, and the role of institutions in shaping the rate and direction of innovation. Stern is a research associate at the National Bureau of Economic Research (NBER) and was cofounder and director of the NBER Innovation Policy Working Group. He previously served as a professor at the Kellogg School of Management and nonresident senior fellow at the Brookings Institution. In 2005, Stern was awarded the Kauffman Prize Medal for Distinguished Research in Entrepreneurship. He has served and contributed to a number of National Academies committees and boards, including the Board on Science, Technology, and Economic Policy; The Future of Supercomputing (2004); Copyright in the Digital Era (2013); and An Assessment of ARPA-E (2017). Along with Maryann

Feldman, he has also served as co-chair of four consensus committees examining the Small Business Innovation Research and Small Business Technology Transfer programs at Department of Energy (2018–2020), National Institutes of Health, National Science Foundation, and Department of Defense. Stern holds a B.A. in economics from New York University and a Ph.D. in economics from Stanford University.

Gregory W. Autry is associate provost for space commercialization and strategy at the University of Central Florida. Previously he was director of space leadership, policy, and business in the Thunderbird School of Global Management and Affiliate Professor with the Interplanetary Initiative at Arizona State University. He is also a visiting professor in the Institute for Security Science and Technology at Imperial College London. Autry's research is focused on the role of government in the emergence of new industries. He has taught technology entrepreneurship at the University of California, Irvine and the University of Southern California. Autry authored the textbook *A New Entrepreneurial Dynamic*. He served on the 2016 Agency Review Team and as White House liaison at NASA and was nominated to serve as NASA's chief financial officer in 2020. He also served as chair of the Safety Working Group on the Commercial Space Transportation Advisory Committee at the Federal Aviation Administration. Autry is vice president for space development at the National Space Society and a member of the Academy of Management and the American Institute of Aeronautics and Astronautics. Autry holds an MBA and Ph.D. from the University of California, Irvine.

Dianne Chong was vice president in The Boeing Company's Engineering, Operations & Technology organization, where she led materials and manufacturing research and development and production program integration for the entire enterprise. She supported production support and research and development for all program areas—military, commercial, and space. Chong was elected to the National Academy of Engineering (NAE) and Washington State Academy of Science in 2017. She serves on the NAE Council and the National Research Council Governing Board. She has co-chaired EngineerGirl and served on the Pathways to Engineering steering team. She has served on several National Academies boards and committees and led the effort to assess the portfolio for Practices for Engineering Education and Research (PEER) Program and is leading the PEER Implementation Advisory Group. Among many other service and leadership positions, Chong served on the National Science Foundation Directorate for Engineering Advisory Committee. She received an award for alumna achievement from the University of Illinois in 2019 and has received numerous technical and diversity awards. Chong was inducted into the first class of the Women in Manufacturing Hall of Fame. She received bachelor's degrees in biology and psychology, and master's degrees in physiology and metallurgical engineering. Chong received her doctorate in metallurgical engineering from the

University of Illinois. She has an Executive Master of Manufacturing Management degree from Washington University and a green belt in Six Sigma.

Jeannette Colyvas holds a Ph.D. from Stanford University and is a professor at Northwestern University's School of Education and Social Policy, the Institute for Complex Systems, and (by courtesy) the Kellogg School of Management, the Department of Sociology, and the Institute for Policy Research. Her research interests include innovation in science policy and practice; comparing public, private, and nonprofit forms of organizing; performance metrics; and institutional change. Her publications appear in diverse journals such as *Management Science*, *Research Policy*, *Minerva*, *Organization Science*, *Research in Organizational Behavior*, *Sociological Theory*, *Academy of Management Review*, and the *American Journal of Education*. Support for her research has come from competitive grants from government, university, and foundation sources. Colyvas currently teaches courses related to leadership, innovation, and organizational change at the undergraduate, MBA, doctoral, and executive levels. She previously served on the National Academies committee assessing the Small Business Innovation Research and Small Business Technology Transfer programs at the Department of Energy (2018–2020).

Alexandra E. Graddy-Reed is associate professor of public policy at the University of Southern California in the Price School of Public Policy. She is also research director for the National Science Foundation I-Corps Hub West Region. Her research is focused on the financing of innovation, specifically examining the impacts of federal and philanthropic grantmaking on research and development (R&D), small business and entrepreneurship, and scientific career paths. She also studies how bias exists and is mitigated in R&D funding and innovation. Graddy-Reed has previously studied the NASA Small Business Innovation Research program with respect to its impact across firm size, issues around gender bias in the peer review process, and the role of geography in award selection. She received her Ph.D. from The University of North Carolina at Chapel Hill and a bachelor's degree from Hendrix College.

Jorge Guzman is Gantcher associate professor of business at Columbia University and a faculty research fellow in the Innovation Program at the National Bureau of Economic Research (NBER), where he codirects the Entrepreneurship Research Boot Camp. Guzman's research focuses on the measurement of entrepreneurship and the role of entrepreneurship in the economy, including the evolution of economic clusters and their role in enabling startups, entrepreneurial motivations, and entrepreneurial strategy. He was also a leader of the National Science Foundation Regional Innovation Engines study group. Guzman was previously the entrepreneurship postdoc at NBER. He has a Ph.D. and MBA from the Massachusetts Institute of Technology and a B.S. in computer engineering from Tec de Monterrey.

Amol M. Joshi is founder and CEO of Scalable Sciences, Inc., an innovation analytics software firm helping research and development organizations, investors, entrepreneurs, and governments evaluate and commercialize new and emerging technologies in the health care, computing, materials, and aerospace/defense sectors. He is an entrepreneur-in-residence at the Center for Healthcare Innovation at the Wake Forest University School of Medicine, where he advises health system leaders on developing and scaling AI-based solutions deployed in clinical settings and hospital operations. He also mentors physician-inventors and medical researchers on the best pathways for patenting, protecting, and licensing their intellectual property. Joshi is adjunct associate professor of innovation and commercialization at the Wake Forest Institute for Regenerative Medicine (WFIRM), where he serves as course director for innovation management in the M.S. in translational biotechnology program. His ongoing joint research with WFIRM analyzes the adoption of AI technologies by health systems for the early detection and diagnosis of chronic diseases. He previously served on National Academies committees examining the Small Business Innovation Research and Small Business Technology Transfer programs at the Department of Energy (2018–2020), National Institutes of Health, and National Science Foundation. Joshi received his Ph.D. in business administration from the Kenan-Flagler Business School at The University of North Carolina at Chapel Hill, his MBA and M.S. in engineering sciences from Dartmouth College, and his B.S. in electrical engineering (with highest honor) from the Georgia Institute of Technology.

Shawn Kantor is L. Charles Hilton Jr. distinguished professor of economics and director of the Hilton Center for the Study of Economic Prosperity and Individual Opportunity at Florida State University. He is also a research associate of the National Bureau of Economic Research. His current research examines the economic effects of public research and development on regional growth, including work on knowledge spillovers from research universities and the economic impact of expenditures by NASA during the Space Race. His earlier research has examined property rights in the postbellum South, the origins of workers' compensation in the United States, and the economic effects of New Deal spending during the Great Depression. His research has received extensive support from the National Science Foundation. Kantor earned his Ph.D. and M.S. in social science from the California Institute of Technology and his B.A. in economics and history from the University of Rochester.

Robert A. Lieberman is president of Lumoptix LLC, and a member of the National Academy of Engineering. He worked for 10 years at AT&T Bell Labs in the Semiconductor Development, Physics Research, and Materials Research laboratories. Lieberman became vice president of research and development at Physical Optics Corporation (POC) in 1991, and in 1998 spun off his division of POC to found Intelligent Optical Systems (IOS). In addition to serving as president and chief technology officer, Lieberman maintained an active research career as principal investigator for the National Science Foundation, National Institutes of Health, Department of Energy, NASA, Defense Advanced Research Projects Agency, and other U.S. agencies until his retirement from IOS in 2015. He continues to work on scientific and engineering research and policy through his consulting firm, Lumoptix. Lieberman holds 34 U.S. patents on biological, physical, and chemical sensors and systems, and has organized and chaired more than 30 conferences on optical sensors. He is a life member of IEEE and a fellow of the Society for Optics and Photonics (SPIE), and he was SPIE's 2016 president. He was a founding member of the National Photonics Initiative and currently serves as director and/or advisory board member of several for- and nonprofit organizations. Lieberman received his Ph.D. in physics from the University of Michigan.

David W. Miller is chief technology officer (CTO) for astronomy and fundamental physics at the Jet Propulsion Lab; he is also Jerome C Hunsaker professor post tenure of aeronautics and astronautics at the Massachusetts Institute of Technology (MIT). Miller has served previously as CTO for The Aerospace Corporation and NASA. His experience in technology guidance experience includes his role as vice chair and science and technology (S&T) chair of the Air Force Scientific Advisory Board, where he led the annual review of the Air Force Research Laboratory, the management of The Aerospace Corporation's independent research and development program, technology investment prioritization and interagency S&T partnerships at NASA headquarters, and numerous research collaborations with small businesses with Small Business Innovation Research and Small Business Technology Transfer awards while at MIT. He developed three major technology research laboratories that flew on Shuttle, Mir, and the International Space Station (ISS), including the first crew-interactive experiment on ISS. Miller is a member of the National Academy of Engineering and a fellow of the American Institute of Aeronautics and Astronautics. He earned several NASA spaceflight Group Achievement awards and an Air Force Exceptional Public Service award. Miller received his B.S., M.S., and Sc.D. in the Department of Aeronautics and Astronautics at MIT.

Bhaven Sampat is professor in the School of Government and Policy at Johns Hopkins University. He is also a research associate at the National Bureau of Economic Research (NBER) in the Productivity, Innovation, and Entrepreneurship Program. An economist by training, Sampat's work focuses on the economics, law, history, and political economy of science and technology. Among other topics, he has studied U.S. and global patent policy, the politics and economics of publicly funded science, the roles of the government in pharmaceutical innovation, the economic history of the U.S. innovation system, patent-based measures of innovation, and university–industry technology transfer. He previously served as a member of the National Academies committee evaluating the Small Business Innovation Research and Small Business Technology Transfer programs at the National Institutes of Health.

Craig J. Scott is professor and interim associate chair in the Department of Electrical and Computer Engineering at Morgan State University, where he has been a faculty member since 1992. Prior to his academic career, he served as an electronics engineer at the Naval Research Laboratory and as a microelectronics process engineer at Westinghouse Electric Corporation. Scott has served as interim dean of the Clarence M. Mitchell Jr. School of Engineering and chaired the Department of Electrical and Computer Engineering. He has also served as an Office of Advanced Manufacturing associate at the National Institute of Standards and Technology. Scott is actively involved in the U.S. Department of Transportation SMARTER Center's autonomous vehicle research initiatives. He is a member of the IEEE, American Society of Mechanical Engineers (ASME), American Society for Engineering Education, Association for Computing Machinery, and the Tau Beta Pi Engineering Honor Society. Scott received the ASME Foundation Swanson Fellowship and the Electrical and Computer Engineering Department Heads Association Diversity Award. He has served on numerous national panels and boards, including those for the National Academy of Sciences and the University Consortium for Applied Hypersonics, and has served as president of the Inclusive Engineering Consortium. His primary focus is on advancing engagement with and workforce development at historically Black colleges and universities. He received a B.S. in electrical engineering from Howard University in 1979, an M.S. in electrical engineering from Cornell University in 1981, and a Ph.D. in electrical engineering from Howard University in 1991.

Stephanie S. Shipp is research professor at Iowa State University (ISU). At the ISU Center for Survey Statistics and Methodology, she is introducing federal household and business statistics to enrich survey analyses. Until recently, she was acting director and professor in the Social and Decision Analytics Division of the Biocomplexity Institute at the University of Virginia. As a member of the U.S. Senior Executive Service, Shipp led the Economic Assessment Office for the Advanced Technology Program at the National Institute of Standards and Technology, enhancing economic evaluation by collaborating with academic researchers to explore innovative companies conducting high-risk research. Beginning her career at the Federal Reserve Board, she has also directed programs at the Census Bureau and the Bureau of Labor Statistics, fostering partnerships across federal agencies. Her research at the Institute of Defense Analyses Science and Technology Policy Institute contributed to analyses for the White House on advanced manufacturing trends. Shipp also led projects examining innovation and technology transfer with the departments of Energy and Defense. She earned a Ph.D. in economics from The George Washington University.

Eric Stallmer is executive vice president for government affairs and public policy for Voyager Technologies. He is responsible for representing the interests of Voyager to key government institutions, including Congress, the White House, and the many federal agencies that impact the company's success. Prior to joining

Voyager, Stallmer was president of the Commercial Spaceflight Federation, the most recognized and largest trade organization dedicated to promoting policies and best practices that foster the development of the commercial spaceflight industry. He has served on several federal advisory boards, including the Defense Innovation Board and the Federal Aviation Administration's Commercial Space Transportation Advisory Committee. Stallmer was appointed to the National Space Council Users' Advisory Group, where he sat on the Executive Committee and served as co-chair of the Economic Development and Industrial Base Subcommittee. He has testified numerous times to the U.S. Congress and state legislatures. Stallmer served as an officer in the U.S. Army and Army Reserves. His final assignment as a reservist was at the Pentagon in the Office of the Deputy Chief of Staff of the Army. He received his MPA from George Mason University.

Janet Vertesi is associate professor of sociology at Princeton University and has spent nearly 20 years studying NASA's robotic spacecraft teams as an ethnographer and social scientist. She is solo author of the award-winning books *Seeing Like a Rover: How Robots, Teams and Images Craft Knowledge of Mars* and *Shaping Science: Organizations, Decisions, and Culture on NASA's Teams* (both University of Chicago Press) and co-editor of the *MIT Press Infrastructures Series.* Vertesi also publishes in top-ranked venues in the sociology of science and technology and human–computer interaction. Her research on NASA has been funded by numerous grants from the National Science Foundation, and her current work at CERN is funded by the Alfred P. Sloan Foundation. She has served on NASA independent review boards for two missions and is a faculty affiliate of the Center for Information Technology Policy at Princeton and former advisory board member of the Data and Society Institute. Vertesi received her Ph.D. in science and technology studies from Cornell University in 2009.

Angelino C. G. Viceisza is full professor of economics and research director of the Center for Black Entrepreneurship at Spelman College, research associate of the National Bureau of Economic Research, affiliate of the Abdul Latif Jameel Poverty Action Lab at the Massachusetts Institute of Technology (MIT), and associate editor at the *Journal of Economic Behavior and Organization*. In 2023, he was president of the National Economic Association. Viceisza has also held visiting positions at the Federal Reserve Bank of Boston, Duke University, the Hoover Institution at Stanford University, and the Sloan School of Management at MIT. His primary expertise is in behavioral and experimental economics, with applications in development, household finance, and entrepreneurship. His research has been published in peer-reviewed journals such as *Journal of Economic Perspectives*, *Journal of Development Economics*, *Economic Inquiry*, *Journal of Economic Behavior and Organization*, *Experimental Economics*, *Small Business Economics*, *Agricultural Economics*, and *Review of Black Political Economy*. This work has been supported by entities such as the Kauffman Foundation, the National Science Foundation, the Social Security Administration, the U.S. Agency for International Development, and the World

Bank. Viceisza holds a Ph.D. in economics from Georgia State University, an M.A. in economics from Georgia State University, an M.A. in economics from Boston University, an MBA in international business from Temple University, and a B.S. in accounting from University of Curaçao.

Appendix C

Annex to Chapter 4

ANNEX 4-1
NASA Program Manager Interviews: Attendees and Dates

NASA Office	Interview Date	NASA Attendee(s)	NASA Attendee Title(s) at Time of Interview
NASA Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Office	5/8/2024	Kathryn Kvaternik	Acquisitions Unit Lead
Exploration Systems Development Mission Directorate—Space Operations Mission Directorate (ESDMD-SOMD)	8/22/2024	Carla Cohen	Office Portfolio Manager Review & Selection Process | Team Lead Mission Directorate Liaison
Aeronautics Research Mission Directorate (ARMD)	8/22/2024	Bruce Cogan	Mission Directorate Liaison
Science Mission Directorate (SMD)	8/23/2024	Eric Ting	Review and Selection | Team Support Acquisition Management | Unit Support Mission Directorate Liaison

Space Technology Mission Directorate (STMD)	8/23/2024	Keith Woodman	Awardee Support and Tracking | Team Lead Mission Directorate Liaison
Langley Research Center (LaRC)	8/30/2024	Eileen Nelson	Review and Selection | Team Support Customer Management | Unit Support Center Lead
Goddard Space Flight Center (GSFC)	9/19/2024	Quenton Bonds	Review and Selection | Team Support Acquisition Management | Unit Support Center Lead
NASA SBIR/STTR Office	10/4/2024	Howard Conyers	Awardee Support & Tracking | Team Support Customer Management | Unit Support STTR “Mission Directorate Liaison”
Marshall Space Flight Center (MSFC)	10/4/2024	Haley Doude	Solicitation & Requirements Development | Team Lead
Johnson Space Center (JSC)	10/18/2024	Shobhana Gupta	Review and Selection | Team Support Acquisition Management
NASA SBIR/STTR Office	11/1/2024	Jason Kessler	Program Executive
Glenn Research Center (GRC)	5/30/2025	Brandon White	Awardee Support & Tracking | Team Support Acquisition Management | Unit Support Center Lead
Kennedy Space Center (KSC)	5/30/2025	Michael Vinje	Awardee Support & Tracking | Team Support Customer Management | Unit Support Center Lead

Stennis Space Center (SSC)	6/13/2025	Marc Shoemaker	Solicitation & Requirements Dev | Team Support Acquisition Management | Unit Support Center Lead
Ames Research Center (ARC)	7/11/2025	Ryszard Pisarski	Solicitation & Requirements Dev | Team Support Acquisition Management | Unit Support Center Lead
NASA SBIR/STTR Office	9/19/2025	Dina Salazar	Acquisition Management | Unit Lead
NASA SBIR/STTR Office	12/5/2025	Chase Decker	Business Intelligence | Unit Lead (Acting)
NASA SBIR/STTR Office	12/5/2025	Tony Damian	Systems Management | Unit Lead
NASA SBIR/STTR Office	12/12/2025	Abby Tabor Vanessa Jordon	Customer Management | Unit Lead; Customer Management | Unit Support

NOTES: Participant titles were accurate at the time of the discussion. All NASA centers and directorates were invited to meet with the committee (with the exception of the Mission Support Directorate, which does not offer SBIR/STTR awards), but the committee was unable to meet with a representative of the Armstrong Flight Research Center. A representative from the Jet Propulsion Laboratory met with the committee at its July 29–31, 2024, meeting in Irvine, California (see Appendix A).

ANNEX 4-2
NASA Program Manager Interviews: Discussion Questions

1. **Process Overview**
   - Please tell us about the SBIR/STTR (Small Business Innovation Research/Small Business Technology Transfer) process (topic selection, reviewer section and role, and differences between Phase I, Phase II, and Ignite programs)
     - How are topics developed, including whether input is sought from firms, industry associations, or university researchers?

    - How are reviewers selected?
    - How are processes different between Phase I and Phase II awards?
    - Differences between SBIR and STTR?
    - How are processes different for Post Phase II awards (Phase II-E and Phase II Sequential)?
    - What is the SBIR Ignite program?
    - How does the PSST tool work (Portfolio SBIR/STTR Support Tool) for ranking applications?
    - What is the approval process for selecting awards?
  - How are initial and expected TRLs (Technology Readiness Levels) determined?
  - What is the Phase I contract process? Are there differences for Phase II?

2. Outreach

  - How do you educate potential applicants about the SBIR/STTR programs?
  - Do you reach out to potential applicants? How do you decide which communities to conduct outreach with?
  - Describe applicant assistance—webinars, etc.
  - Have there been major shifts in outreach that have occurred in the last 10 years?
  - What is the role, if any, of MPLAN (MUREP Partnership Learning Award Notification) in SBIR outreach?

3. Commercialization Programs

  - What resources are available to awardees? Please describe how you use TABA (Technical and Business Assistance), I-Corps, and CCRPP (Civilian Commercialization Readiness Pilot Program)

4. Technology Transitions

  - Can you tell us how NASA helps companies turn SBIR/STTR projects into products that meet NASA mission needs?
  - How are Phase III awards determined? How do program managers help this happen?

5. Success Stories

  - Describe the most impactful award you made. Why was this impactful?
  - How would you describe a successful project? Are there different types of success?

6. Multiple Award Winners

- What are the situations where you continue to fund the same company?
- Are multiple awardees subject to more scrutiny?

7. Insights for Improvements

- If you could change one anything about the SBIR/STTR programs, what would that be?

8. Other

- Is the anything else you think we should ask about or need to know?
- Is the anyone else we should speak with?