



FAQ: NASA SBIR Technology Infusion and Post Phase II Opportunities

Updated June 2017

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Overview

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Introduction

- This is an FAQ-type overview of NASA SBIR technology infusion (transition from Phase II into applications) and some options/strategies that are available for pursuing post Phase II funding.
- **Blue headers: Introductory material on infusion.** Particularly useful if you're new to SBIR. If you're an SBIR veteran, you may still want to scan it for updates.
- **Green headers: Specific material** if you're familiar with SBIR. You are encouraged to also share this information with your small business contacts.
- **Orange headers: Commercialization materials and references**
 - Of primary interest to companies – You are encouraged to share this information with your small business contacts.

Introduction to SBIR Technology Infusion

How does NASA define infusion success?

- SBIR infusion success is measured in several ways.
 - **Technology directly picked up by a flight project, mission or instrument** – This is the ultimate prize, with the highest visibility, but not the only one.
 - **Technology targeted for further specific development**, under an advanced technology program which a flight project, mission or instrument supports.
 - **Technology significantly benefits direction** of overall portfolio.
 - Small business either (a) sells their technology to a larger company, or (b) is bought out by a larger company, which in turn **incorporates the technology into one of their product lines and/or uses it on a flight program.**

What are typical technology infusion mechanisms?

- **Funded Infusion Mechanisms**

- Direct funding of SBIR company via Phase III contract with a NASA Project.
- Direct funding from NASA to SBIR company that happens not to be via a Phase III Contract (i.e. could be the result of an additional competition, or a unit purchase order, or some other means of funding).
- Subcontract or similar indirect NASA funding to SBIR company through a third party (e. g. a prime contractor) working for a NASA project.

- **Unfunded Infusion Mechanisms**

- Technology Use (e. g. an instrument or software is used by a project or lab).
- Use of the concept technology in trade study or proposal.

Success Story Example: NASA SBIR Contributions to the Mars Science Laboratory



Grammatech - Software for eliminating defects in mission-critical and embedded software applications directing rover operations

Starsys Research - Planetary gearboxes for the articulated robotic arm and the descent braking mechanism for controlling rate of descent to planetary surface

Creare - A space-qualified vacuum pump for the Sample Analysis at Mars (SAM) instrument package



The Mars Science Laboratory Curiosity Begins its Scientific Investigation on Mars Surface

Yardney Technical Products – Lithium ion batteries that enable the power system to meet peak power demands or rover activities

Honeybee Robotics – Dust removal tool used to remove the dust layer from rock surfaces and to clean the rover's observation tray and designed the sample manipulation system for the Sample Analysis at Mars (SAM) instrument package

inXitu– Features of their automated sample handling system are implemented in the Chemistry and Mineralogy experiment (CheMin) instrument

(1/3) What's working in technology infusion?

- Focus on technologies that have clear **economic and/or risk reduction impact**.
 - e. g. Significant savings in design time/effort, mass, volume, power, integration complexity/costs, etc.
- Focus on technologies with **horizontal scope** (more than one potential application, or class of applications) so they do not become obsolete if a specific application is redirected or dries up.
- Emphasize technical areas where **other NASA funding sources are lacking**.
- **Publicize upcoming SBIR solicitation** at relevant technical and programmatic meetings and conferences. Includes engineering staff and project/mission people making their small business contacts aware of the Solicitation.
- **Publicize SBIR successes**, so that program and project managers can see concrete examples of the benefits.

(2/3) What's working in technology infusion?

- Technical Monitors and CORs who:
 - Make the small business aware of NASA technology requirements (and changes to these requirements) and effectively "**champion the technology**" to NASA programs and projects.
 - Communicate consistently with the small business and **help it stay on track towards NASA applications.**
 - Have solid **connections to relevant missions, projects, and/or advanced technology programs.**
 - Have specialized knowledge of **how the relevant technology dovetails with NASA-specific mission needs.**
 - Encourage the small business to take a **proactive role** in finding post Phase II funding and customers (see next page).

(3/3) What's working in technology infusion?

- Company has **realistically assessed prospective NASA applications**, including specific projects, instruments or advanced technology programs - and **confirmed** these interests via direct communication and contacts (not just via reading documents or websites).
- **Company is proactive - has a realistic, clearly defined plan** – preferably a written plan - **and mechanism to proceed beyond Phase II**, either via their internal funding, seeking non-SBIR NASA funds, funds from other government agencies, angel investors, venture capital, teaming with a prime or other larger organization, or a combination.

What are some Phase II strategies to increase the odds of follow-on work?

- **Tech Monitors, CORs, and Subtopic Managers are among our most valuable resources to help company technologies get infused. You provide technical/programmatic credibility and connections with program and project personnel.**
- Center Technology Transition Lead (CTTL) works connections with Center technologists, helps plan and implement infusion strategies, helps identify applications and funding sources, reports successes, keeps prospective users informed of relevant available and developing technologies, keeps SBIR advocates motivated.
- Integrate SBIR technologies with larger NASA technology development programs as much as possible. In Phase II, for a few hr/wk or hr/mo of your time, you receive, in return, several hundred \$K/yr worth of the company's technology development.
- Keep your line and program management aware about your company's SBIR successes and how their work is directly benefiting NASA.
- Focus on companies that are proactive in pursuing NASA applications, post Phase II funding, connections with primes, and commercial (private sector) applications.

Specific Material if You're Familiar with SBIR

How are YOU essential to SBIR Technology Infusion?

- Each of the NASA Centers, including JPL, has an SBIR CTTL. (A few Centers have more than one).
 - The CTTL plans and implements their Center's overall strategy for infusing SBIR-developed technologies. Mostly via NASA SBIRs managed by their Center; but can include applicable SBIR technologies managed by other Centers or developed via other agencies, particularly DoD.
- **The CTTL relies heavily upon a broad network of contacts (YOU) who are active in working SBIR technology infusion.**

Infusion and Commercialization

- NASA SBIR/STTR solicits research and development of interest to NASA's Mission Directorates, with the goal that the selected technologies will become successes by being transitioned, or infused, into a NASA program, or by commercial success outside of NASA and the Federal Government.
- Both are important outputs. Some technologies are inherently a better fit to one or the other. Other technologies are candidates for both.
- If a company is successful in bringing a product or innovation to market (private sector commercialization), the odds of growing a viable business are improved. In other words – a small business is more likely to succeed if NASA is not its only customer. In turn, a successful small business is in a better position to develop technologies of interest to NASA.

How did the 2011 Reauthorization address infusion and commercialization?

- On 12/31/2011, the Federal SBIR Program was reauthorized long-term (through 9/30/2017) as part of the National Defense Authorization Act for FY 2012, H.R.1540; Public Law No. 112-81.
- For full text, go to <https://www.congress.gov/>
 - Drop down menu: Select “All Legislation”
 - Search for H.R.1540 then select version from the 112th Congress (2011-2012). Navigate to it and download the text.
 - Navigate to Division E, SBIR and STTR Reauthorization
- This was superseded by the 2016 Reauthorization (see next page) but its fundamental provisions are still current.

How does the 2016 Reauthorization address infusion and commercialization?

- On 11/30/2016, the Federal SBIR Program was again reauthorized long-term (through 9/30/2022) as part of the National Defense Authorization Act for FY 2017, S.2943.
 - The SBIR/STTR language included in the Act calls for a simple 5-year reauthorization (extension of the existing program) with no allocation increase beyond the current 3.2% or pilot programs. Such ancillary features will be reconsidered by Congress at a later date for FY'18 and beyond. Nevertheless, the 2016 Reauthorization provides long term stability to the base program.
- Full text as passed by the 114th Congress:
<https://www.congress.gov/bill/114th-congress/senate-bill/2943/text>
 - Navigate to Sec. 1834, Extension of SBIR and STTR Programs

Why are the SBIR and STTR Policy Directives important to infusion and commercialization?

- Per the 2011 Reauthorization, Subtitle D: The U. S. Small Business Administration (SBA) had 180 days to implement **amended SBIR and STTR Policy Directives** in accordance with the reauthorization legislation.
- **Federal agencies participating in SBIR/STTR must follow the guidance provided by the Policy Directives.**
- The Reauthorization bill included many program changes and additions.
 - **A number of these are potential new tools for commercialization and infusion.** Some apply only to certain agencies. Some items are mandatory, others are optional. The Policy Directives spell these out.
 - The amended Policy Directives were originally published in the Federal Register on 8/6/2012. Latest versions, dated 2/24/2014 and still currently active, are available at:

<https://www.sbir.gov/about/about-sbir#sbir-policy-directive> (SBIR)

<https://www.sbir.gov/about/about-sttr#sttr-policy-directive> (STTR)

How did the Reauthorization address commercialization readiness?

- **SBIR Civilian Agencies (Sect. 5123) – includes NASA.**
 - Pilot program – New. Up to 3 yr duration (per Sect. 5164).
 - **Agency head may allocate up to 10% of SBIR/STTR budget for awards for technology development, testing, evaluation and commercialization assistance for Phase II technologies; or to support progress of SBIR/STTR R&D and commercialization to Phase III.**
 - For highly promising technologies to substantially enhance Agency’s mission.
 - Individual awards can be up to 3X the amount of Agency’s Phase II individual awards.
- **SBIR DoD Agencies (Sect. 5122)**
 - Per the Small Business Act, Sect. 9(y): The Secretary of Defense and the Secretary of each military department is authorized to create and administer a “Commercialization Pilot Program” to accelerate the transition of technologies, products, and services developed under the SBIR Program to Phase III, including the acquisition process.
 - Reauthorization converted this program from Pilot to Readiness.

Implementation choice and details were up to each Agency.
In FY14 NASA initiated its Civilian Commercialization Readiness Pilot Program (CCRPP)

NASA SBIR Phase II-E and II-X Initiatives (through 2015 Phase II)

- **Phase II-Enhancement (II-E) Option**
 - Objective is to further encourage the advancement of innovations developed under Phase II via an option of R/R&D efforts underway on current Phase II contracts. Eligible firms shall secure an external investor to partner with and invest in enhancing their technology for further research, infusion, and/or commercialization. Under this option, NASA will match external investor funds with SBIR/STTR funds to extend an existing Phase II project for a minimum of 4 months to perform additional R/R&D.
- **Phase II-Expanded (II-X) Option**
 - Objective is to establish a strong and direct partnership between the NASA SBIR/STTR Program and other NASA projects undertaking the development of new technologies of innovations for future use. Under this option, innovations developed in Phase II are to be advanced via an extension of R/R&D efforts to the current Phase II contract.
- Detailed guidelines are available at
<https://sbir.nasa.gov/content/post-phase-ii-initiatives#Phase-II-E>
<https://sbir.nasa.gov/content/post-phase-ii-initiatives#Phase-II-x>

NASA SBIR CCRPP (formerly CRP)

- The Civilian Commercialization Readiness Pilot Program (CCRPP) was created as part of the SBIR and STTR Reauthorization Act of 2012 (P. L. 112-81, Section 5001) with the purpose of **accelerating the transition of SBIR and STTR funded technologies to commercialization.**
- Goal of the CCRPP is to advance SBIR/STTR-developed technology through a combination of further SBIR/STTR program investment and non-SBIR/STTR program investor funds.
- **Primary objective is an infusion or commercialization, not an incremental improvement in technology maturation alone.** Technology maturation without infusion or commercialization is not acceptable for CCRPP.
- Detailed guidelines are available at <https://sbir.nasa.gov/content/post-phase-ii-initiatives#CCRPP>

Post Phase II Initiatives (Starting 2016 Phase II)

- **Phase II-Extended (II-E) Option**

- Objective is to further encourage the transition of SBIR/STTR technologies into NASA programs and missions; NASA acquisition programs, other Agency's programs, as well as the private sector.
- **Phase II-Extended is a combination of the older II-Enhancement and II-Expanded Initiatives.**
- Eligible firms shall secure a non-SBIR/STTR investor to contribute funding towards further enhancing the research to qualify for this option. Investor may be a non-SBIR/STTR NASA or NASA program; or may be an investor external to NASA, from another government agency or the private sector, depending on strategy being pursued for enhancing the technology for further research, infusion, and/or commercialization.
- The NASA SBIR/STTR Program will match the investment funds with SBIR/STTR funds, on a 1-for-1 basis, to extend an existing Phase II project for a minimum of 4 months to perform additional R/R&D.
- Detailed guidelines are available at

<https://sbir.nasa.gov/content/post-phase-ii-initiatives#Phase-II-E-2016-2>

How does NASA post Phase II funding differ from that of other agencies?

- NASA's SBIR Program provides funds for Phase I (proof of concept), Phase II (demonstration/reduction to practice), the Phase II-E and II-X options (extension of Phase II that increases infusion or commercialization probability) and the CCRPP (prospective direct path to a defined infusion or commercialization)
- **Anything beyond that ---- needs to get its funds from elsewhere. Post Phase II funds can be NASA or non-NASA, but cannot be provided by SBIR/STTR.**
- Several other SBIR agencies, particularly DoD, NSF and NIH; and especially the Navy, maintain a number of formal, funded post Phase II commercialization, business development, and infusion programs to which SBIR companies can apply.
- NASA has no direct analog of these large “umbrella” programs, so infusion into NASA programs and projects is more individualized.
 - Some of these strategies have been adopted by NASA, as has been done with Phase II-E, Phase II-X and the CCRPP. The Reauthorization will accelerate this. However, **most NASA infusion will continue to be on a case-by-case basis.**

How does NASA make Phase III awards?

- **NASA may award Phase III contracts for products or services with non-SBIR/STTR funds. An agency that wishes to fund a Phase III project is not required to conduct another competition. (This is an advantage over other types of post Phase II funding).**
- A Federal agency may enter into a Phase III agreement at any time with a Phase I or Phase II awardee.
- Phase III is the commercialization of innovative technologies, products, and services resulting from either a Phase I or Phase II contract. This includes further development of technologies for transition into NASA programs, other Government agencies, or the private sector.
- There is no limit on the number, duration, type, or dollar value of Phase III awards made to a business concern.
- There is no limit on the time that may elapse between a Phase I or Phase II and a Phase III award.
- For more information and to download the Phase III Contracting Handbook, see <https://sbir.nasa.gov/content/post-phase-ii-initiatives#Phase-III>
- **If you have a prospective NASA Phase III funding source, contact our SBIR Program Office for information on how to get it implemented.**

How does the NASA SBIR Program interface with NASA's Office of the Chief Technologist (OCT) and Space Technology Mission Directorate (STMD)?

(And why is this important?)

External Drivers in Creation of NASA's Space Technology Program

- NASA Authorization Act of 2008
<http://thomas.loc.gov/cgi-bin/query/z?c110:H.R.6063:>
- NRC report, “A Constrained Space Exploration Technology Program: A Review of NASA’s ETDP” (2008)
http://www.nap.edu/catalog.php?record_id=12471
- NRC report, “America’s Future in Space: Aligning the Civil Space Program with National Needs” (2009)
http://www.nap.edu/catalog.php?record_id=12701
- NRC report, “Fostering Visions for the Future: A Review of the NASA Institute for Advanced Concepts (2009)
http://www.nap.edu/catalog.php?record_id=12702
- Augustine Committee – Review of U. S. Human Space Flight Plans (2009)
http://www.nasa.gov/offices/hsf/meetings/10_22_pressconference.html
- NRC report, “Capabilities for the Future: An Assessment of NASA Laboratories for Basic Research” (2010)
http://books.nap.edu/catalog.php?record_id=12903

New NASA Technology framework, as of April 2013



With successful formulation and implementation of Space Technology program, NASA officially separates Office of the Chief Technologist (OCT) into two organizations: OCT and Space Technology Mission Directorate (STMD).

Space Technology Mission Directorate

- Has direct management and budget authority of the Space Technology programs, which are performed by all 10 NASA Centers;
- Focuses on project execution and technology infusion into the Agency's exploration and science mission needs;
- Takes a customer driven approach, proving capabilities needed for future NASA missions and the national aerospace community; and
- Develops the Nation's innovation economy.

Office of the Chief Technologist

- Continues to serve as the Administrator's principal advisor and advocate on matters concerning Agency-wide technology policy and programs;
- Continues to lead NASA's technology transfer and commercialization efforts;
- Integrates, tracks, and coordinates all of NASA's technology investments; and
- Documents and communicates the societal impacts of the Agency's technology efforts.

Realignment will not affect the mission, content or budget authority of the Space Technology Programs.

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How SBIR/STTR Fits Into STMD

- **SBIR/STTR is a relatively large and high visibility program within the Space Technology Mission Directorate (STMD).**
 - <https://www.nasa.gov/directorates/spacetech/programs>
- **STMD is responsible for developing crosscutting and pioneering new technologies and capabilities which NASA needs for current and future missions.**
 - NASA infusion opportunities that are crosscutting would be typically funded by higher TRL STMD programs, such as Game Changing Development (GCD), Small Spacecraft Technology, and Technology Demonstration Missions (TDM).
 - NASA infusion opportunities that are specific to a particular mission directorate (MD) would be typically funded by that MD.
- STMD uses merit-based competition to generate a technology portfolio which covers a range of discipline areas and technology readiness levels.

https://www.nasa.gov/directorates/spacetech/about_us/index.html

STMD Low TRL Programs

- **SBIR/STTR:** Opportunity for small, high tech companies and research institutions to participate in Government sponsored research and development (R&D) in key technology areas.
- **NASA Innovative Advanced Concepts (NIAC):** Nurtures visionary ideas that could transform future NASA missions with creation of breakthroughs—radically better or entirely new aerospace architectures, systems, or missions—engaging innovators and entrepreneurs as partners. NIAC projects study early, innovative, technically credible, advanced concepts. Intended scope is for TRL 1-2 or early 3.
- **Center Innovation Fund:** Stimulates and encourages creativity and innovation within the NASA Centers in addressing technology needs of NASA and the nation.
- **Space Technology Research Grants:** Accelerates development of “push” technologies to support future space science and exploration needs of NASA, other government agencies and commercial space sector. Innovative efforts with high risk and high payoff are encouraged. Composed of two competitively awarded components: Fellowships and Grants.
- **Centennial Challenges:** Initiated in 2005 to directly engage public in process of advanced technology development. Offers incentive prizes to generate revolutionary solutions to problems of interest to NASA and the nation. Seeks innovations from diverse and non-traditional sources. Competitors are not supported by government funding; awards are made to successful teams when the challenges are met.

<https://www.nasa.gov/directorates/spacetech/programs>

STMD Mid TRL Programs: Game Changing Development (GCD)

- **Seeks to identify and rapidly mature innovative/high impact capabilities and technologies, and to investigate novel ideas and approaches that have the potential to revolutionize future space missions.**
- Advances space technologies that may lead to entirely new approaches for the Agency's future space missions and provide solutions to significant national needs.
- **Focuses efforts in mid TRL range (from 3 to 5/6)**, generally taking technologies from proof of concept through component or breadboard testing in a relevant environment. Balanced approach of guided technology development efforts and competitively selected efforts from academia, industry, NASA, and other government agencies.
- The most promising ideas will be advanced through significant ground-based testing and or laboratory experimentation, typically by multiple performing teams using varied approaches. These teams are held accountable for ensuring that discoveries move rapidly from the laboratory to application.
- Portfolio will produce both subsystem and system level multidisciplinary innovations and component and discipline innovations. **Primary objective is to mature transformational innovations for system-level flight demonstration.**

https://www.nasa.gov/directorates/spacetech/game_changing_development/about/index.html

STMD Mid/High TRL Programs: Small Spacecraft Technology

- Development of new subsystem technologies to enhance or expand capabilities of small spacecraft. Seeks to develop subsystem technologies that are new and revolutionary, rather than incremental improvements of existing subsystems. Goal is to advance subsystem technologies from TRL 3 to TRL 5.
- **Supports flight demonstrations of new technologies, capabilities and applications for small spacecraft.** Seeks to demonstrate technologies that are new, and capabilities not previously demonstrated in space. Goal is to advance technologies and capabilities from TRL 5 to TRL 7+ .
- **Uses small spacecraft as platforms for testing and demonstrating technologies and capabilities that might have more general applications in larger-scale spacecraft and systems.** Seeks to contribute where demonstrations with small spacecraft can reduce cost, risk, complexity or time required to advance state-of-the-art.

https://www.nasa.gov/directorates/spacetech/small_spacecraft/smallsat_overview.html

STMD High TRL Programs: Technology Demonstration Missions

- **Bridges gap between scientific and engineering challenges and the technological innovations needed to overcome them, between laboratory development and demonstration in space.**
- Focuses on crosscutting technologies with strong customer interest that meet needs of NASA and industry by enabling new missions or greatly enhancing existing ones. Chosen technologies will be thoroughly ground- and flight-tested in relevant operating environments.
- TDM Project Portfolio (as of September 2016):
 - Deep Space Atomic Clock
 - Evolvable Cryogenics (eCryo)
 - Green Propellant Infusion Mission
 - Laser Communications Relay Demonstration
 - Restore-L (demonstration of satellite servicing technologies)
 - Solar Electric Propulsion (SEP)

https://www.nasa.gov/mission_pages/tdm/main/overview.html

STMD – High TRL Programs: Flight Opportunities

- Advances innovative space technologies of interest to NASA, while also stimulating the growth and use of the U.S. commercial spaceflight industry, as well as supporting capability development in the suborbital and orbital small satellite launch vehicle market.
- **Provides access to space-relevant environments through the use of commercial reusable suborbital launch vehicles, rocket powered vertical takeoff, vertical landing platforms, high-altitude balloons and parabolic aircraft flights.**
- These platforms bridge the critical gap between laboratory or ground-based testing and demonstration of technical readiness in a mission-relevant, operational environment.

<https://www.nasa.gov/directorates/spacetech/flightopportunities/about>

Crosscutting Space Technology Development – Potential Post Phase II Funding Sources

- Candidate technologies should be applicable to:
 - More than one NASA Mission Directorate (MD), or
 - A NASA MD and an external Federal agency, or
 - A NASA MD and a commercial application.
- Technologies applicable exclusively to one NASA MD will probably not be considered unless truly revolutionary.
 - Instead seek follow-on funding from MD-specific sources (more on that later).
- Advancement from Early Stage Innovation programs into higher TRL programs is not automatic. **One good option is for your company to get onto an appropriate team that is proposing to Game Changing Development, Small Spacecraft Technology, Technology Demonstration Missions or Flight Opportunities.**
 - Company should use its NASA points of contact, both SBIR and non-SBIR; and learn as much as possible about STMD and its specific initiatives.

STMD Funding Opportunities

- **Proposals to STMD funding calls must align with major drivers in NASA OCT's Space Technology Roadmaps.**
- Recent STMD Solicitations are posted at <http://www.nasa.gov/directorates/spacetech/solicitations>
- STMD Solicitations are also posted on NSPIRES (NASA Solicitation and Proposal Integrated Review and Evaluation System). Home page:
 - <http://nspires.nasaprs.com/external/>
- Register with NSPIRES – See “Getting Started” on the NSPIRES home page – to get on mailing lists for NASA research announcements and to submit proposals.
 - Individuals can register any time.
 - Organizations must have a valid registration with the System for Award Management. See NSPIRES home page for process.

NASA OCT Technology Roadmaps

- In 2010, NASA developed a set of 14 Technology Roadmaps, published in 2012, to guide the development of space technologies.
- The 2015 NASA Technology Roadmaps (now a set of 15) expand and update the original 2012 roadmaps, providing extensive detail about **anticipated NASA mission capabilities and associated technology development needs**.
- The Roadmaps feed into OCT's Strategic Technology Investment Plan (STIP).
 - STIP provides strategy for developing technologies essential to the NASA mission and to National goals. **It prioritizes the technology candidates within the roadmaps, and provides guidelines for technology investment.**
 - The recommendations provided by the National Research Council (NRC) heavily influence NASA's technology prioritization.

<https://www.nasa.gov/offices/oct/home/roadmaps/index.html>

<https://www.nasa.gov/offices/oct/home/sstip.html>

NASA OCT Technology Roadmaps – 2015 (Most Recent)



<http://www.nasa.gov/offices/oct/home/roadmaps/index.html>

NASA Strategic Technology Investment Plan (STIP)

- Formerly the Strategic Space Technology Investment Plan (SSTIP).
- Created by NASA after development of the draft TA Roadmaps.
- **Prioritizes space technologies essential to the NASA mission and achievement of national goals.**
- **Focused approach to guide NASA's space technology investment over next 4 years**, within context of 20-year horizon.
 - 70% Core Investments - must begin development ASAP.
 - 20% Adjacent Investments - important but not indispensable.
 - 10% Complementary Investments - limited immediate relevance.
- Publicly available at <https://www.nasa.gov/offices/oct/home/sstip.html>

**What if a technology or application is
mission-directorate specific
(not crosscutting)?**

What are some potential NASA Science Mission Directorate (SMD) post Phase II funding sources?

- **Research Opportunities in Space and Earth Sciences (ROSES) NRA**
 - Covers a range of post Phase II TRL levels.
 - Can also pursue ROSES in parallel with an ongoing Phase I or II.
 - See next two pages for detailed opportunities.
- **NASA Pre-project and Project funding**
 - Case-by-case basis. Tech Monitors' project and program office connections are especially important here.

How is the ROSES NRA relevant?

- This annual umbrella NASA Research Announcement (NRA) solicits basic and applied research in support of NASA SMD.
- Covers all aspects of basic and applied supporting research and technology in space and Earth sciences. Includes many individual program elements.
- **Awards range from <\$100K/yr for focused, limited efforts (e.g., data analysis) to >\$1M/yr for extensive activities (e. g. development of specialized science experimental hardware). Typical period of performance is 3 yrs.**
- A program element may select anywhere from less than one to several dozen proposals in a given year.
- Organizations of every type: Government and private, for profit and not-for-profit, may submit proposals without restriction on teaming arrangements.
- **2017 ROSES NRA, Solicitation NNH17ZDA001N, is available via NSPIRES.**
<http://nspires.nasaprs.com/external/>
 - Proposals due (depending on specific element) through 5/3/2018.

What ROSES NRA elements are particularly applicable (in years in which they're competed)?

In rough order of increasing TRL:

- Astrophysics Research and Analysis (APRA)
- Advanced Component Technology (ACT)
- Advanced Information Systems Technology (AIST)
- Planetary Instrument Concepts for the Advancement of Solar System Observations (PICASSO)
- Maturation of Instruments for Solar System Exploration (MatISSE)
- Strategic Astrophysics Technology (SAT)
- Instrument Incubator Program (IIP)
- Planetary Science and Technology Through Analog Research (PSTAR)
- Airborne Instrument Technology Transition (AITT)
- Heliophysics Technology and Instrument Development for Science
- In-Space Validation of Earth Science Technologies (InVEST)

What are some potential NASA Human Exploration and Operations Mission Directorate (HEOMD) post Phase II funding sources?

- HEOMD includes three major Research and Technology elements.
 - **Advanced Exploration Systems (AES)** pioneers new approaches for rapidly developing prototype systems, demonstrating key capabilities, and validating operational concepts for future human missions beyond Earth orbit. AES activities are uniquely related to crew safety and mission operations in deep space, and strongly coupled to future vehicle development.
 - **Space Life and Physical Sciences Research and Applications (SLPSRA)** oversees basic and mission driven scientific research in support of human space flight and crew health and safety, oversees basic and applied scientific research in life and physical sciences, and serves as Agency liaison with the International Space Station (ISS) National Laboratory management organization.
 - **Human Research Program** is dedicated to discovering the best methods and technologies to support safe, productive human space travel.

<https://www.nasa.gov/directorates/heo/programs.html>

HEOMD – AES Opportunities

- AES pioneers innovative approaches and public-private partnerships to rapidly develop prototype systems, advance key capabilities, and validate operational concepts for future human missions beyond Earth orbit.
- **AES activities are related to crew mobility, habitation, vehicle systems, robotic precursors, and foundational systems for deep space.** These activities are strongly coupled with future vehicle development while advancing critical competencies at the NASA Centers. AES infuses new technologies developed by STMD, and partners with SMD to address Strategic Knowledge Gaps for multiple destinations.
- AES activities reduce risk and improve affordability of deep-space mission elements.
- By engaging in strategic partnerships with commercial space industry and government agencies, AES is able to rapidly advance new technologies, reduce risk, and reduce cost for all partners
- Prototype systems developed in AES are demonstrated in ground-based test beds, field tests, underwater tests, flight experiments on the International Space Station (ISS), and deep-space missions.

<https://www.nasa.gov/content/aes-overview>

HEOMD – SLPSRA Opportunities

- SLPSRA Mission: **(1) Enable human spaceflight exploration to expand the frontiers of knowledge, capability, and opportunity in space. (2) Pioneer scientific discovery in and beyond low Earth orbit to drive advances in science, technology, and space exploration.** Execution of this mission requires both scientific research and technology development.
- SLPSRA administers NASA's:
 - [Human Research Program \(HRP\)](#) - investigates and mitigates highest risks to human health and performance in order to enable safe, reliable, and productive human space exploration.
 - [Space Biology Program](#) - solicits and conducts research to understand how biological systems accommodate to spaceflight environments.
 - [Physical Sciences Program](#) - solicits and conducts research to understand how physical systems respond to spaceflight environments, particularly weightlessness.
- SLPSRA partners with the research community and a wide range of organizations to accomplish its mission. Grants to academic, commercial, and government laboratories are the core of SLPSRA's research and technology development efforts. All SLPSRA solicitations are issued through NSPIRES.

<https://www.nasa.gov/content/slpsra-overview>

What are some potential NASA Aeronautics Research Mission Directorate (ARMD) post Phase II funding sources?

- ARMD uses NASA Research Announcements (NRAs) to solicit proposals for foundational research to enhance core capabilities.
- Current umbrella solicitation for ARMD Research Opportunities is **ROA-2016 (Solicitation NNH16ZEA001N on NSPIRES website)**. Amendments will be posted to the NSPIRES page and announced at <https://www.nasa.gov/aeroresearch/solicitations> as they occur.
- All NRA technical work is defined and managed at NASA Centers by project teams within each of the four program areas: Advanced Air Vehicles Program (AAVP), Airspace Operations and Safety Program (AOSP), Integrated Aviation Systems Program (IASP) and Transformative Aeronautics Concepts Program (TACP). NRA awards originate from the Centers.
- Participation is open to all categories of organizations, including educational institutions, industry and nonprofit organizations.

<https://www.nasa.gov/aeroresearch/solicitations>

What if I need details on specific SBIR companies and technologies that might fit my program or project's needs?

- Search the NASA SBIR Abstract Archives or Award Search
https://sbir.nasa.gov/abstract_archives
https://sbir.nasa.gov/advanced_search
- Search the NASA TechSource SBIR database
<https://ehb8.gsfc.nasa.gov/sbir/public/technologySearch/searchAction.do?requestFrom=NASASBIRHome>
- Search the Small Business Administration (SBA)'s SBIR/STTR Award database
<https://www.sbir.gov/sbirsearch/award/all>
- Search the SBA Tech-Net database
<http://web.sba.gov/tech-net/docrootpages/index2.cfm>

These are all user friendly and publicly accessible. You can either search on your own, or we can easily do a search for you (free!)

Can we leverage other agencies' resources?

- Yes - We can leverage other agencies' tech infusion resources by:
 - **Picking up connections at conferences where accomplishments of SBIR companies (particularly hand-picked ones) are highlighted:** e.g. SBIR National and regional conferences, and the Navy Opportunity Forum.
 - NASA SBIR personnel usually attend these, and we can then distribute the latest technology and programmatic news to interested researchers and managers.
 - **Staying aware of relevant SBIR technologies developed by other agencies (particularly DoD) that are also potentially applicable to NASA.**
 - Involvement with other agencies' SBIR solicitations.
 - NASA personnel have the opportunity to see technologies which small companies are developing for these agencies. If they are also relevant to NASA applications and technology needs, we can then encourage these companies to respond to NASA's SBIR proposal solicitation, and can provide information on these capabilities to our personnel for follow-up.

Commercialization Materials and References

Additional NASA Mission Directorate Resources: Roadmaps, Program Plans, Working Groups, Missions, Decadal Surveys...

- Science (SMD) <https://science.nasa.gov>
 - Earth Science <https://science.nasa.gov/earth-science>
 - Planetary Science <https://science.nasa.gov/solar-system>
 - Astrophysics <https://science.nasa.gov/astrophysics/>
 - Heliophysics <https://science.nasa.gov/heliophysics/>
- Human Exploration and Operations (HEOMD)
<http://www.nasa.gov/directorates/heo/home/>
- Space Technology (STMD)
<http://www.nasa.gov/directorates/spacetech/home>
- Aeronautics Research (ARMD)
 - <https://www.nasa.gov/topics/aeronautics/index.html>

Companies: Use these resources as a starting point – Always follow up with technical and/or programmatic points of contact.

(1/3) NASA I-Corps Pilot Program (FY17)

- The National Science Foundation (NSF) created the NSF Innovation Corps (I-Corps) Program in FY 2011. NSF's I-Corps training is designed to lower the market risk inherent in bringing a product or innovation to market.
- **The goals of SBIR/STTR and I-Corps overlap by encouraging the innovation and entrepreneurship of small businesses, and enabling those businesses to commercialize their innovations.**
- NASA is working with NSF to implement pilot I-Corps programs in 2017 as part of the NASA SBIR/STTR Proposal Solicitation. The NASA I-Corps program should enable small businesses to increase the odds of accelerating the process of developing their SBIR/STTR technologies into a repeatable and scalable business model.
 - The intended result is to provide firms with a better understanding of their customers' needs, give firms a better understanding of their company's value proposition as it relates to those customer needs, and provide firms with an outline of a business plan for moving forward.
- **NASA's approach to I-Corps is intended to facilitate the commercialization of NASA SBIR/STTR-funded research, particularly to non-NASA markets.**

(2/3) NASA I-Corps Pilot Program (FY17)

- The program will accomplish this by putting the firms through a version of the Lean Launchpad – I-Corps process which includes:
 - **Developing their business model hypotheses using the Business Model Canvas.**
 - **Testing those hypotheses through the Customer Development Interview process.**
- Participation in the I-Corps Pilot is currently limited to offerors selected for negotiations for a Phase I contract and involves a two-step process.
 - First step - Opt-In Form. Phase I SBIR/STTR offerors interested in participating in I-Corps completed a short I-Corps Opt-In Form as part of their Phase I proposal submission.
 - Second step - I-Corps Proposal. To be qualified to submit an I-Corps Proposal: 1) Offerors must have Opted-in to I-Corps as part of their Phase I proposals; 2) Offerors must be qualified to participate in I-Corps, and 3) Offerors must be selected for a Phase I award. This was completed in May 2017.
 - Successful firms proceed to the I-Corps assessment and selection process.

(3/3) NASA I-Corps Pilot Program (FY17)

- NASA anticipates up to approximately 20 SBIR/STTR firms will be selected for participation in the I-Corps Pilot.
 - **STTR teams will participate in a complete "canonical" version of I-Corps lasting 7 weeks.**
 - **SBIR teams will participate in a modified, less intensive "bootcamp" version of I-Corps occurring in a 12 week period.**
- NASA will fund up to \$35,000 for each SBIR team participation, and up to \$50,000 for each STTR team participation.
- Participation in NASA I-Corps will be via a research and development (R&D) training grant issued in parallel with the Phase I contract. I-Corps training will be concurrent with the performance of the Phase I proposal work and must be completed by the conclusion of the Phase I contract.

Additional detail on the NASA I-Corps Pilot is available at <https://sbir.nasa.gov/content/I-Corps>

Regional Economic Development (RED)

- RED, managed by NASA's Space Technology Mission Directorate (STMD), seeks to encourage economic growth by creating, contributing to, catalyzing, and supporting economic and innovation ecosystems throughout the United States.
- **RED brings together stakeholders from NASA and from private industry.**
- RED gives NASA researchers the ability to work directly with businesses toward tangible real-world outcomes. This kind of collaboration grounds NASA researchers and engineers in the competitive business environments in which NASA's technologies are developed and implemented. In turn, healthy businesses develop high-technology products that NASA needs.

https://www.nasa.gov/directorates/spacetech/regional_economic_development

(1/2) RED Opportunities – 2017

- February 21: NASA Kennedy Opportunities Workshop (KNOW), Space Coast EDC Office, Rockledge, FL (KSC)
- February 23: Erie Aqua Hack technical challenge statements issued and competition begins, OH
- March 8: Florida Space Day, Florida State Capitol, Tallahassee, FL
- March 20: Aerospace Day at the Capitol, Denver, CO
- March 22: NASA SBIR/STTR Workshop, Shreveport, LA
- March 23: Michigan Black Chamber of Commerce/NASA RED panel at TechTown Detroit, MI
- March 29-30: Advanced Design & Manufacturing, Cleveland, OH
- March 30: OFCC Symposium, Lorain, OH
- April 20-21: Technology Days and the Hampton Roads Unmanned Systems Opportunity Exchange, Hampton, VA
- April 25-27: Ceramics Expo, Cleveland, OH

<https://www.nasa.gov/feature/red/upcoming-events>

(2/2) RED Opportunities – 2017

- May 1: Philadelphia Tech Week — NASA Goddard Space Flight Center and the U.S. Small Business Administration Networking Event
- May 2-3: Lake Erie Hack 2017 (data and engineering competition)
- May 16-18: Internet of Things Conference — NASA RED Water Initiative Panel with Cleveland Water Alliance, Santa Clara, CA
- June 27-29: One Water Summit / U.S. Water Alliance – Stauber (GRC)
- July 10-14: ESRI User Conference in San Diego, CA - (GRC)
- August: Oceans In Action Conference, Stennis Space Center - MS (SSC)
- September: Small Business Summit/Stennis Business Consortium Quarterly Meeting - Stennis Space Center, MS (SSC)
- September TBD: Technology Docking Event in Hampton Roads - (LaRC)
- October 6: Center for Automotive Research, External Advisory Board Meeting - (GRC)

<https://www.nasa.gov/feature/red/upcoming-events>

How about some other commercialization and business development resources?

- **National SBIR Conferences and Regional SBIR Conferences**
 - Resources for small companies include:
 - One-on-one meetings with SBIR agencies and prime contractors
 - Array of presentations on methods, strategies, resources and contacts for maximizing SBIR technical, business development, commercialization, infusion, and funding success
 - Informational poster sessions
 - Many networking opportunities
 - Pre-conference short courses
 - Encourage your small business contacts to attend and participate.
 - Presentations from previous Conferences are openly posted on their websites, but not indefinitely. If you're interested, we can e-mail you copies if we have them.

SBIR 2017 Road Tour - Overview



A national outreach effort to convey the non-dilutive technology funding opportunity provided through SBIR and STTR. The SBIR/STTR programs annually provide \$2.5 billion in funding to small advanced technology firms. Together they represent America's Largest Seed Fund.

Local innovation supporters in communities who have historically underutilized the opportunities provided through the SBIR/STTR programs have invited representatives of America's Largest Seed Fund to engage the small advanced technology community, including women and minority-owned research and development businesses. Every Road Tour stop represents an opportunity to meet directly with Federal and State Program Managers who seed a wide spectrum of innovative ideas, while learning about state-sponsored innovation support infrastructure.

Presented by the Small Business Administration (SBA) with participation by all the Federal SBIR/STTR Agencies, including NASA.

<http://www.sbirroadtour.com/sbir.php>

National SBIR/STTR Portal

- Home page: <http://www.sbir.gov> This resource includes:
 - Extensive database of awards and solicitations, searchable across all the SBIR/STTR participating Agencies.
 - SBIR/STTR program news
 - Calendar of events
 - Frequently asked questions
 - Success stories
 - Information resources

Who can I contact for more information?

NASA SBIR/STTR Program Contacts:

- NASA HQ Program Executive and Deputy Program Executive (Level 1)
- Program Management Office (Level 2)
- Center Level Contacts (Level 3)
 - Mission Directorate Liaisons
 - Center Technology Transition Leads (CTTLs)
- Program Support Office - REI Systems

Full list of these personnel and their contact info is available at

<https://sbir.nasa.gov/content/nasa-sbirsttr-program-contacts>

Who at JPL has more information?

- Mark Davidson – Program Administration and Analysis
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- Indrani Graczyk – Commercial Program/ SBIR Program Manager
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U. S. Government sponsorship acknowledged.



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