



NASA's SBIR Technology Infusion in a New Environment

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Jet Propulsion Laboratory**

**Mirror Technology SBIR/STTR Workshop
June 21-23, 2011
Greenbelt, MD**



Overview

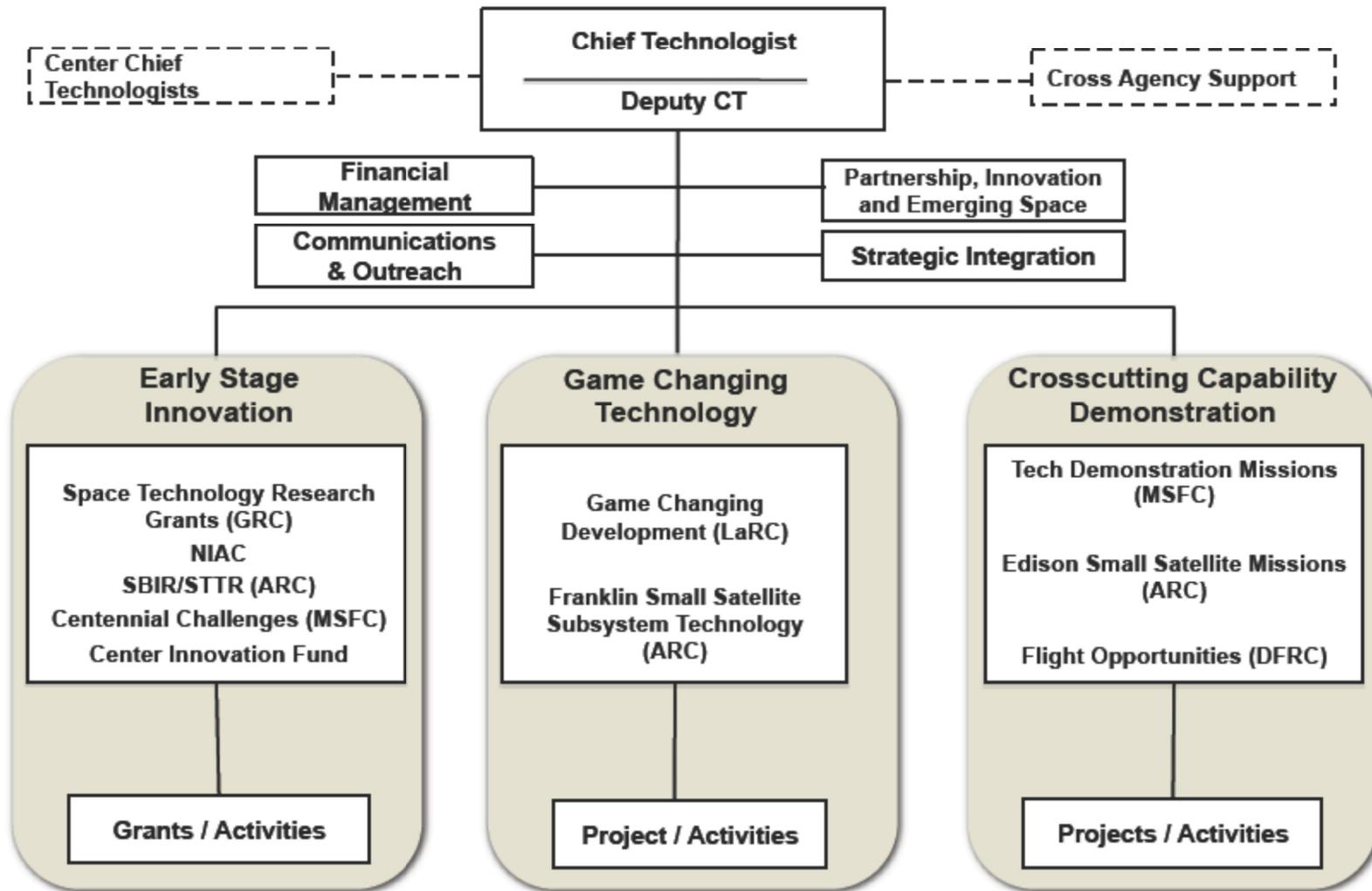
- **NASA's Space Technology Program and Office of the Chief Technologist (OCT)**
 - NASA SBIR as part of Early Stage Innovation Division
 - Mid TRL Divisions
 - Proposed FY'12 Space Technology Program Budget and SBIR Budget
 - Crosscutting Post Phase 2 Opportunities via OCT's Mid-TRL Divisions
 - OCT Drivers: Space Technology Roadmaps and Grand Challenges
- **NASA SBIR - Post Phase 2**
 - NASA Phase 2-E and Phase 3
 - SBIR 2.0 Initiative
 - Mission-Directorate-Specific Post Phase 2 Opportunities
 - Leveraging Other Agencies' Resources
- Commercial and Business Development Resources
- NASA SBIR Solicitation Development 2011
- Points of Contact



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:](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/hfs/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

Office of the Chief Technologist Organization





NASA's Office of the Chief Technologist (OCT)

- NASA Headquarters - OCT Home Page
<http://www.nasa.gov/offices/oct/home/index.html>
 - Detailed overviews of OCT and its Divisions
 - Space Technology Program Solicitations
 - Space Technology Roadmaps
 - Policy documents
 - News releases, upcoming events, program updates
 - NASA partnership tools
 - Outreach materials
 - Social media links
 - Publications...and more
- **NASA SBIR now resides within NASA's OCT; specifically, within Early Stage Innovation.**



OCT Early Stage Innovation Division

- Sponsors a wide range of advanced space system concepts and low TRL technology development by academia, industry and NASA Centers.
 - **SBIR/STTR: Technology development and technology infusion into NASA missions.**
 - **Space Technology Research Grants:** Innovative research in advanced space technology; includes grants and graduate fellowships for student research.
 - **NASA Innovative Advanced Concepts (NIAC):** Innovative aeronautics and space system concepts for future NASA missions.
 - **Center Innovation Fund:** Creative research and technical innovation at NASA Centers.
 - **Centennial Challenges:** Prizes to address key technology needs with new innovation sources outside traditional aerospace community.
- All technical work funded by this Division will be competed.



OCT Game Changing Technology Division

- Matures advanced space technologies that may lead to fundamentally new approaches for future space missions and solutions to significant national needs.
 - **Game Changing Development Program:** Innovative ideas that either enable new capabilities or radically change current approaches to space systems.
 - **Franklin Small Satellite Subsystem Technology Program:** Enables small satellites to provide game-changing capabilities.
- Includes ground-based testing and laboratory experiments/demos.
- **Mid-TRL development;** prepares technologies for potential system level flight demos.
- A high percentage of this work (>70%) will be competed.



OCT Crosscutting Capability Demonstrations Division

- Matures select crosscutting technology capabilities, that benefit multiple customers or enable multiple future space missions, **to flight readiness status (TRL 7)**. Includes flight test projects where in-space demo is needed before transition to direct mission applications.
 - **Edison Small Satellite Demonstration Missions Program:** Develops and operates a series of NASA-focused small satellite demonstration missions, in collaboration with academia and small businesses.
 - **Flight Opportunities Program:** Provides flight opportunity environments including reduced gravity, brief periods of weightlessness (parabolic arc flights), high altitude atmospheric research.
 - **Technology Demonstration Missions Program:** Matures select crosscutting technologies via flight demos. Includes partnerships with NASA Mission Directorates, industry, academia, other government agencies.
- A high percentage of this work (>70%) will be competed.

Proposed FY'12 Budget: NASA Space Technology Program



Mission Directorate: Space Technology
Theme: Space Technology

FY 2012 Budget Request

Budget Authority (\$ millions)	FY 2010	Ann CR. FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
FY 2012 President's Budget Request	275.2	-	1,024.2	1,024.2	1,024.2	1,024.2	1,024.2
SBIR and STTR	96.0	-	177.3	176.8	175.6	174.3	172.8
Partnership Development and Strategic Integration	20.3	-	19.5	19.4	19.3	19.1	19.0
Crosscutting Space Technology Development	7.5	-	433.3	432.1	429.2	425.8	422.4
Exploration Technology Development	151.4	-	261.3	259.3	257.5	255.5	253.4
ST Civil Service Labor and Expenses	0.0	-	132.9	136.6	142.6	149.5	156.6

Note: FY 2010 and FY 2011 figures have been adjusted to show comparable Exploration technology content from the Exploration account, and the movement of the Innovative Partnerships Program from the Cross Agency Support account, within the Space Technology account consistent with the FY 2012 Budget. The FY 2010 level shown does not include the \$51.7 million transferred to the Science and Exploration accounts, to be made available to the SBIR/STTR programs in FY 2011.



SBIR/STTR Program Funding

- SBIR and STTR are Congressionally mandated programs, administered by the US Small Business Administration (SBA) Office of Technology.
- SBA ensures through SBIR and STTR that small, high-tech, innovative businesses are a significant part of the Federal Government's R&D efforts.
- All Federal Agencies with an extramural R&D budget >\$100M (SBIR) or >\$1B (STTR) are required to participate.
 - **Participating agencies (including NASA) must reserve 2.5% of their extramural R&D budget for SBIR and 0.3% for STTR.**
 - Extramural budget: agency R&D, including FFRDCs and contractor-operated facilities, but excluding funds for government-owned and operated facilities.
- See <http://www.sba.gov> or <http://www.sbir.gov/> (an official US government source for SBIR information) and links therein for both general and Agency-specific information.
- NASA SBIR Web gateway: <http://sbir.nasa.gov/SBIR/SBIR.html>



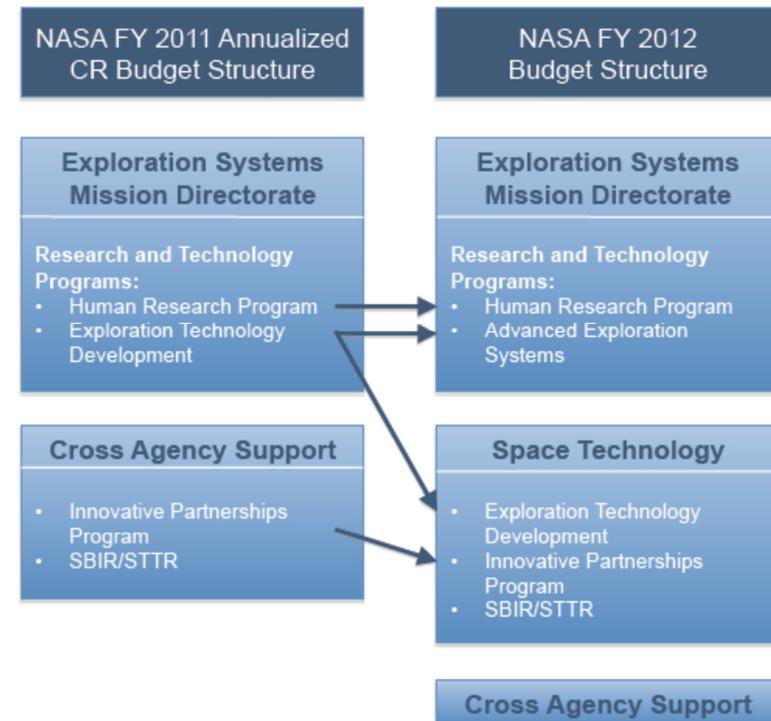
Crosscutting Space Technology Development – Potential Post Phase 2 Funding Sources

- Candidate technologies should be applicable to:
 - More than one NASA Mission Directorate - Aeronautics (ARMD), Science (SMD), Exploration (ESMD), Space Operations (SOMD), or
 - Both a NASA Mission Directorate and an external Federal agency, or
 - Both a NASA Mission Directorate and a commercial application.
- Technologies applicable exclusively to one NASA Mission Directorate will probably not be considered under Crosscutting Space Technologies unless they are truly revolutionary.
 - Most technologies in this category should instead seek follow-on funding from MD-specific sources (more on that later).
- Advancement from the Early Stage Innovation Division into the mid-TRL Divisions is not automatic. **One good option is for your company to get onto an appropriate team (or lead a team) that is proposing to Game Changing Technology or Crosscutting Capability Demos.**
 - Use your NASA points of contact, either SBIR or non-SBIR connections.
 - Learn as much as you can about the Space Technology Program - and especially **its new initiatives.**



Exploration Technology Development – Potential Post Phase 2 Funding Sources

- Much of the ETD program will move from ESMD into Space Technology in FY'12.
- Developing long-range, Exploration-specific technologies to enable future human Exploration missions. ESMD is main customer.
- **Program components, depending on TRL, will be managed by Game Changing Development and Technology Demonstration Missions ... potential Post Phase 2 funding sources.**
- OCT's and ESMD's goal is to complete transition by start of FY'12.





Recent Space Technology Program Funding Opportunities

- SBIR/STTR, Flight Opportunities, Center Innovation Fund, and Centennial Challenges are ongoing programs, funded in 2011 CR based on enacted FY 2010 levels.
- Space Technology Graduate Fellowship call closed Feb 23; selections anticipated for start of Fall 2011 academic semester.
- Initial NIAC, Game Changing Development, and Technology Demonstration Mission proposal calls released March 1.

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

<http://nspires.nasaprs.com/external/>

- NIAC NRA for Phase 1 Studies ([NNH11ZUA001N](#)): Proposals due May 16, 2011.
- **Game Changing Development BAA for Unique And Innovative Space Technology ([NNH11ZUA001K](#)): Open through January 3, 2012.**
- Tech Demo Missions BAA ([NNM11ZDA001K](#)): Proposals due May 31, 2011.



More Updates on Space Technology Program Funding Opportunities

- OCT is not planning to make awards in some areas till FY'12:
 - Space Technology Research Grants
 - Franklin Small Satellite Subsystem Technology
 - Edison Small Satellite Demonstration Missions
- **Awards from already-issued proposal calls are contingent on available funds in FY'11 and FY'12.**
- **All proposals to OCT funding calls must align with major drivers - NASA OCT's Space Technology Roadmaps and Grand Challenges.**

NASA OCT Space Technology Roadmaps



- Prepared by NASA teams under OCT guidance - Integrated set of 14 draft roadmaps for National Research Council (NRC) review.
- With technical community input, NRC will provide its recommendation reports in 9/2011 (interim) and 1/2012 (final).

NASA SPACE TECHNOLOGY ROADMAP TECHNICAL AREA BREAKDOWN STRUCTURE

STR • TABS

TECHNOLOGY AREA BREAKDOWN STRUCTURE

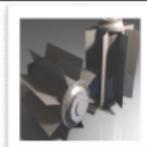


TA01		• LAUNCH PROPULSION SYSTEMS	TA08		• SCIENCE INSTRUMENTS, OBSERVATORIES & SENSOR SYSTEMS
TA02		• IN-SPACE PROPULSION TECHNOLOGIES	TA09		• ENTRY, DESCENT & LANDING SYSTEMS
TA03		• SPACE POWER & ENERGY STORAGE	TA10		• NANOTECHNOLOGY
TA04		• ROBOTICS, TELE-ROBOTICS & AUTONOMOUS SYSTEMS	TA11		• MODELING, SIMULATION, INFORMATION TECHNOLOGY & PROCESSING
TA05		• COMMUNICATION & NAVIGATION	TA12		• MATERIALS, STRUCTURES, MECHANICAL SYSTEMS & MANUFACTURING
TA06		• HUMAN HEALTH, LIFE SUPPORT & HABITATION SYSTEMS	TA13		• GROUND & LAUNCH SYSTEMS PROCESSING
TA07		• HUMAN EXPLORATION DESTINATION SYSTEMS	TA14		• THERMAL MANAGEMENT SYSTEMS



NASA OCT Space Technology Grand Challenges

- Open call for cutting-edge technological solutions that solve important space-related problems, radically improve existing capabilities or deliver completely new space capabilities.

<i>Space Technology Grand Challenges</i>				
Expand Human Presence in Space				
				
<u>Economical Space Access</u>	<u>Space Health and Medicine</u>	<u>Telepresence in Space</u>	<u>Space Colonization</u>	
Manage In-Space Resources				
				
<u>Affordable Abundant Power</u>	<u>Space Way Station</u>	<u>Space Debris Hazard Mitigation</u>	<u>Near-Earth Object Detection and Mitigation</u>	
Enable Transformational Space Exploration and Scientific Discovery				
				
<u>Efficient In-Space Transportation</u>	<u>High-Mass Planetary Surface Access</u>	<u>All Access Mobility</u>	<u>Surviving Extreme Space Environments</u>	<u>New Tools of Discovery</u>



Phase 2-E and SBIR Company Eligibility

- NASA has developed a Phase 2 Enhancement (2-E) policy to encourage transitioning SBIR research into NASA programs and the private sector.
 - **Can provide a company with up to \$150K of additional Phase 2 SBIR/STTR funds; company must provide matching (cost sharing) funds from a non-SBIR/STTR source.**
 - **Can extend an existing Phase 2 contract from 4 months up to one year.**
- NASA has provided eligible companies with official guidance, including what types of relationships between a small company and outside investors qualify as an investment.
 - If you have access to the NASA SBIR/STTR Contract Administration and Closeout Electronic Handbook (EHB), the guidance is also posted there. Or we can e-mail you a copy.
- To qualify for Phase 2-E:
 - During Phase 2, the small business must submit a Phase 2-E application via the Contract Administration and Closeout EHB. The submittal window is specified in advance by NASA HQ.
 - '07 Phase 2 companies were eligible in 2010. (NASA's first year for 2-E). JPL submitted 5 requests and all 5 were accepted.
 - **'08 Phase 2 companies are eligible this year, 2011. Proposals currently being submitted.**
 - '09 Phase 2 companies will be eligible next year, 2012.



NASA Phase 3 Contracts

- NASA may award Phase 3 contracts for products or services with non-SBIR/STTR funds. **An agency that wishes to fund a Phase 3 project is not required to conduct another competition. (This is an advantage over other types of post Phase 2 funding).**
- Phase 3 work may be for products, production, services, R/R&D, or any combination of these. A Federal agency may enter into a Phase 3 agreement at any time with a Phase 1 or Phase 2 awardee.
- There is no limit on the number, duration, type, or dollar value of Phase 3 awards made to a business concern.
- There is no limit on the time that may elapse between a Phase 1 or Phase 2 and a Phase 3 award.
- For more information see the NASA SBIR/STTR Proposal Solicitation.
 - The 2010 Solicitation is at
<http://sbir.nasa.gov/SBIR/sbirsttr2010/solicitation/index.html>
NASA HQ will publish the 2011 Solicitation on or about July 7, 2011.
- If you have a prospective NASA Phase 3 funding source, contact our SBIR Program Office for information on how to get it implemented.



NASA Post Phase 2 Funding vs. that of Other Agencies

- NASA's SBIR Program provides funds for Phase 1 (proof of concept), Phase 2 (demonstration/reduction to practice) and the Phase 2-E option (extension of a Phase 2 that increases infusion probability).
- Anything beyond that ---- needs to get its funds from elsewhere. **Post Phase 2 funds can be NASA or non-NASA, but they 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 2 commercialization, business development, and infusion programs to which SBIR companies can apply.
- There is currently no direct analog of these “umbrella” programs within NASA, so infusion into NASA programs and projects is individualized.
 - Some of these programs and strategies may eventually be adopted by NASA, as has been done with Phase 2-E.
 - SBIR 2.0 may accelerate this process (see next page).
 - Nevertheless, **most NASA infusion will continue to be on a case-by-case basis.**



SBIR 2.0 Initiative

- White House Innovation and Entrepreneurial Working Group (IEWG) - a Federal Interagency Working Group formed in response to the President's emphasis on the importance of innovation to the U. S. economy.
- For more background, see Chris Rinaldi's Thursday presentation "Federal and DoD SBIR Improvement Initiatives" from the 2010 SBIR Beyond Phase 2 Conference.
 - Previously was publicly available on-line. Contact our office if you'd like a PDF copy.
- Includes a subgroup created to focus on SBIR Best Practices.
- Recommended six initiatives that could be done in a short time frame at modest cost, to make the SBIR program more "entrepreneur-friendly".
- **One initiative of particular interest to infusion: Bridge Financing in Support of Commercialization.**
 - Would expand the number of Federal agencies offering bridge programs in FY' 11, **targeting part of their SBIR budget to support commercialization of Phase 2 technologies.**
 - **Would leverage third-party (non-SBIR) funding investments** to share and distribute technology development risks.
 - The SBIR agencies which currently offer such programs (DoD, NIH, NSF) would serve as role models.
 - Opportunity for NASA to get involved..? Would need to be structured and approved at HQ level.



NASA SMD: Some Potential Post Phase 2 Funding Sources

- **Research Opportunities in Space and Earth Sciences (ROSES) NRA**
 - Covers a range of post Phase 2 TRL levels.
 - Can also pursue ROSES in parallel with an ongoing Phase 1 or 2.
 - See next two pages for detailed opportunities.
- **NASA Pre-project and Project funding**
 - Case-by-case basis.
 - Tech Monitor's project and program office connections are especially important here.



How the ROSES NRA is Relevant

- Annual NASA Research Announcement (NRA), solicits basic and applied research in support of NASA's SMD.
- Covers all aspects of basic and applied supporting research and technology in space and Earth sciences. Contains 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 science experiment hardware). Typical period of performance is 4 years.**
- A program element may select anywhere from a few 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 number or teaming arrangements.
- The 2011 ROSES NRA is at

[http://nspires.nasaprs.com/external/solicitations/summary.do?
method=init&solId={AEF75D0F-2272-7DE7-D52A-295B47C8F5CF}&path=open](http://nspires.nasaprs.com/external/solicitations/summary.do?method=init&solId={AEF75D0F-2272-7DE7-D52A-295B47C8F5CF}&path=open)



ROSES NRA Elements that are Particularly Applicable (in years in which they' re competed)

- Astronomy & Physics Research and Analysis (APRA)
- Mars Fundamental Research
- Lunar Advanced Science and Exploration Research
- Advanced Component Technology (ACT)
- Advanced Information Systems Technology (AIST)
- Mars Technology Project (MTP)
- Astrobiology Science and Instrument Technology Development (ASTID)
- Astrobiology Science and Technology for Exploring Planets (ASTEP)
- Planetary Instrument Definition and Development (PIDDP)
- Mars Instrument Development Project (MIDP)
- Strategic Astrophysics Technology
- Instrument Incubator Program (IIP)
- Airborne Instrument Technology Transition (AITT)



NASA ESMD: Some Potential Post Phase 2 Funding Sources

- From ESMD's Exploration Enterprise Workshop, Galveston, TX, 5/25/10 (AIAA-sponsored conference)

http://www.nasa.gov/exploration/new_space_enterprise/home/workshop_home.html

- **This workshop presented NASA's initial plans for the potential Human Space Exploration programs, announced in the FY2011 Budget Request, to industry, academia, and NASA personnel.**
- The presentations were Web-streamed and are publicly available on the above website. Or our office can e-mail you copies if you wish.
- Research and technology opportunities include:
 - Enabling Technology Development and Demonstration (ETDD)
 - Heavy Lift and Propulsion Technology
- Initial flight demo opportunities for developed technologies include:
 - Flagship Technology Demonstrations
 - Exploration Robotic Precursor Missions



NASA SOMD: Some Potential Post Phase 2 Funding Sources

- **A major driver continues to be SCaN (Space Communications and Navigation).**
- SCaN SBIR Commercialization Workshop held 8/26/2010 at NASA ARC.
 - Presentations are publicly available at https://www.spacecomm.nasa.gov/spacecomm/programs/technology/sbir/presentations_2010/default.cfm or we can e-mail you copies if you wish.
- Technology areas of interest include optical communications, RF communications, communications operations software, networking technology, antenna technologies, positions/networking/timing (PNT), software defined radio, SCaN and crosscutting infrastructure, and power efficient use of allotted communication bandwidth.
- For further details, including specific NASA needs and opportunities for working with SCaN prime contractors: contact the Workshop leads, Luis Mederos (NASA ARC; SOMD SBIR Field Center Program Manager) and Jim Stegeman (NASA GRC; Space Operations Mission Directorate Rep).



Leveraging Other Agencies' Resources

- We can leverage other agencies' tech infusion resources by:
 - Picking up connections at conferences where accomplishments of SBIR companies are highlighted: e. g. SBIR Beyond Phase 2, Navy Opportunity Forum, and the SBIR National Conferences.
 - JPL SBIR personnel usually attend these, and we can then distribute the latest technology and programmatic news to interested JPL researchers and managers.
 - Staying aware of relevant SBIR technologies developed by other agencies (particularly DoD) that are also potentially applicable to NASA.
 - Involvement with joint-agency SBIR solicitations (NEW).
 - This is another initiative recommended under NASA 2.0.
 - If NASA is not one of the sponsoring agencies, we may still have the opportunity to participate as reviewers and see firsthand what technologies small companies are developing. If they are relevant to NASA/JPL applications and technology needs, we can then encourage companies to respond to NASA's SBIR proposal solicitation.

Beyond Phase 2 Conference: Commercialization and Business Development Resources



- The 2010 Conference presentations were formerly publicly available at the conference website. We can e-mail you copies if you wish. These may be of particular interest:
- Alfred Clark – Dawnbreaker
 - Lots of good recommendations for small companies on technology transition, commercialization assistance and partnering.
- John Williams – Navy
 - Transition programs and commercialization assistance for small companies. The Navy is an excellent role model for other sponsoring organizations.
- Mary Ann Beyster – Organizing and Financing
 - Financing and organizational models for small companies - Options and selecting.
- Partnering with Primes and Getting into Supply Chains (Not an exhaustive list of primes, but these are the ones that presented at the conference):
 - Nafiz Karabudik – Partnering with Lockheed Martin
 - Scott Gillette – Partnering with Northrop Grumman
 - Rich Hendel – Partnering with Boeing
- 2011 Conference will be September 12-15

<https://www.beyondphaseii.com/2011/index.aspx>



Other Commercialization and Business Development Resources

- **Spring and Fall National SBIR Conferences, and also 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
 - You are encouraged to attend and participate.
 - Presentations from previous Conferences are openly posted on their websites, but not indefinitely. We can e-mail you copies if you're interested.
 - 2011 Spring National Conference (April): Madison, WI
 - 2011 Fall National Conference (dates TBA): New Orleans, LA
- **SBIR Gateway** is a broad scope SBIR information site. Includes news items, search services, conference information, assistance services and more.

Website: <http://www.zyn.com/sbir/>



Establishing NASA Points of Contact

- We may communicate with companies about NASA/JPL needs, technical relevance, applications, technical subtopic details and clarifications, etc.
 - The one exception is the Blackout Period (from Solicitation Release in early July through Phase I Awards Announcement in November).
- You are encouraged to contact us!
 - If you do not already have NASA technical point(s) of contact, you can contact the **SBIR Technology Infusion Manager (TIM)** or the **Field Center Program Manager at the desired Center(s)**.
 - <http://sbir.nasa.gov/SBIR/pgminfo.htm>
 - We can provide you with relevant leads and points of contact.



NASA SBIR Solicitation Development - 2011

PMO Analysis of 2010 Solicitation	January
2011 Solicitation Development Guidelines	January 24
2011 Solicitation EHB Open	February 2
Topics from MDs	February 11
Subtopic description drafts from Centers	February 25
SBIR Solicitation Development Workshop	March 2-3
Revised topics and subtopics	February 2 – April 22
Final topics and subtopics due in EHB	April 13-22
Mission Directorate (MDR) Concurrence	April 29
PMO review and finalization	May 26
Preparation of Website/Printed Copies	May 30 – July 6
Official Solicitation Released	July 7
Solicitation Closed	September 1



JPL Points of Contact

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