

National Aeronautics and Space Administration



OFFICE OF THE CHIEF TECHNOLOGIST



Dr. Bobby Braun
NASA Chief Technologist

NASA Small Business Symposium and Award Ceremony
December 1, 2010

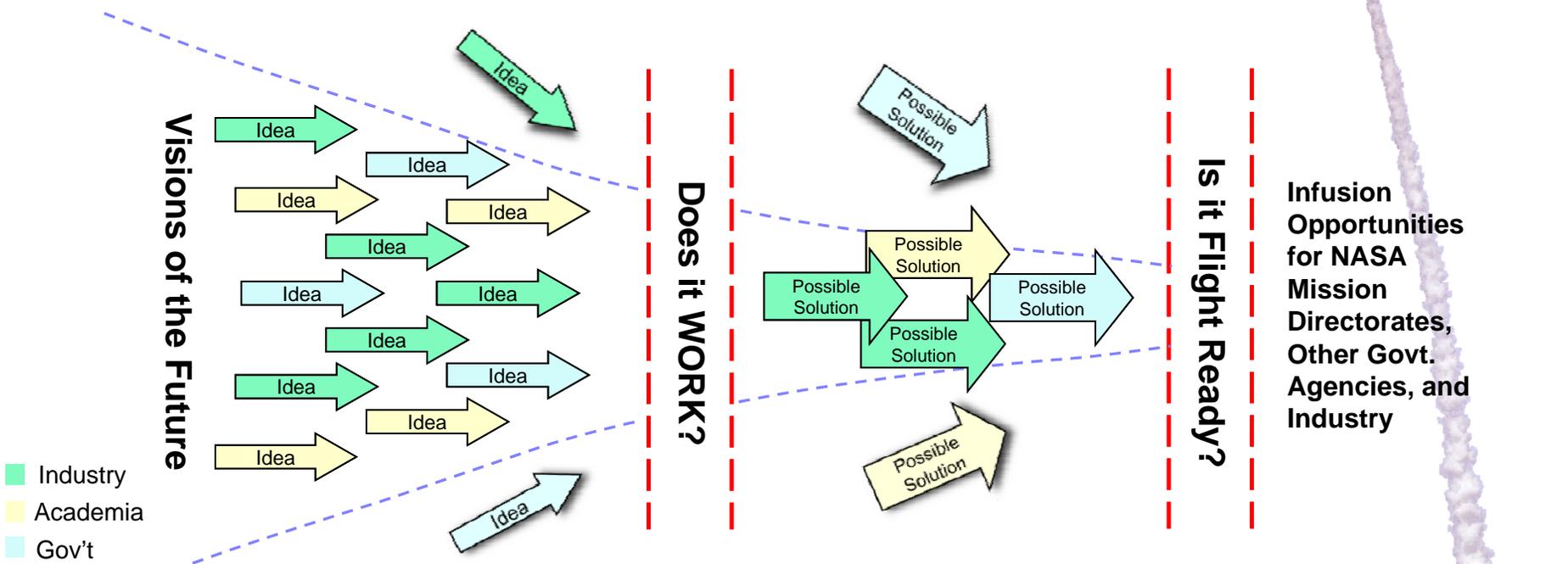
www.nasa.gov

Office of Chief Technologist Roles/Responsibilities



- **OCT established in February 2010**
- **OCT has six main goals and responsibilities:**
 - 1) Principal NASA advisor and advocate on matters concerning Agency-wide technology policy and programs.
 - 2) Up and out advocacy for NASA research and technology programs. Communication and integration with other Agency technology efforts.
 - 3) Direct management of Space Technology Programs.
 - 4) Coordination of technology investments across the Agency, including the mission-focused investments made by the NASA mission directorates. Perform strategic technology integration.
 - 5) Change culture towards creativity and innovation at NASA Centers, particularly in regard to workforce development.
 - 6) Document/demonstrate/communicate societal impact of NASA technology investments. Lead technology transfer and commercialization opportunities across Agency.
- Mission Directorates manage the mission-focused technology programs for directorate missions and future needs
- Beginning in FY 2011, activities associated with the Innovative Partnerships Program are integrated into the Office of the Chief Technologist

Space Technology Development Approach



Creative ideas regarding future NASA systems or solutions to national needs.



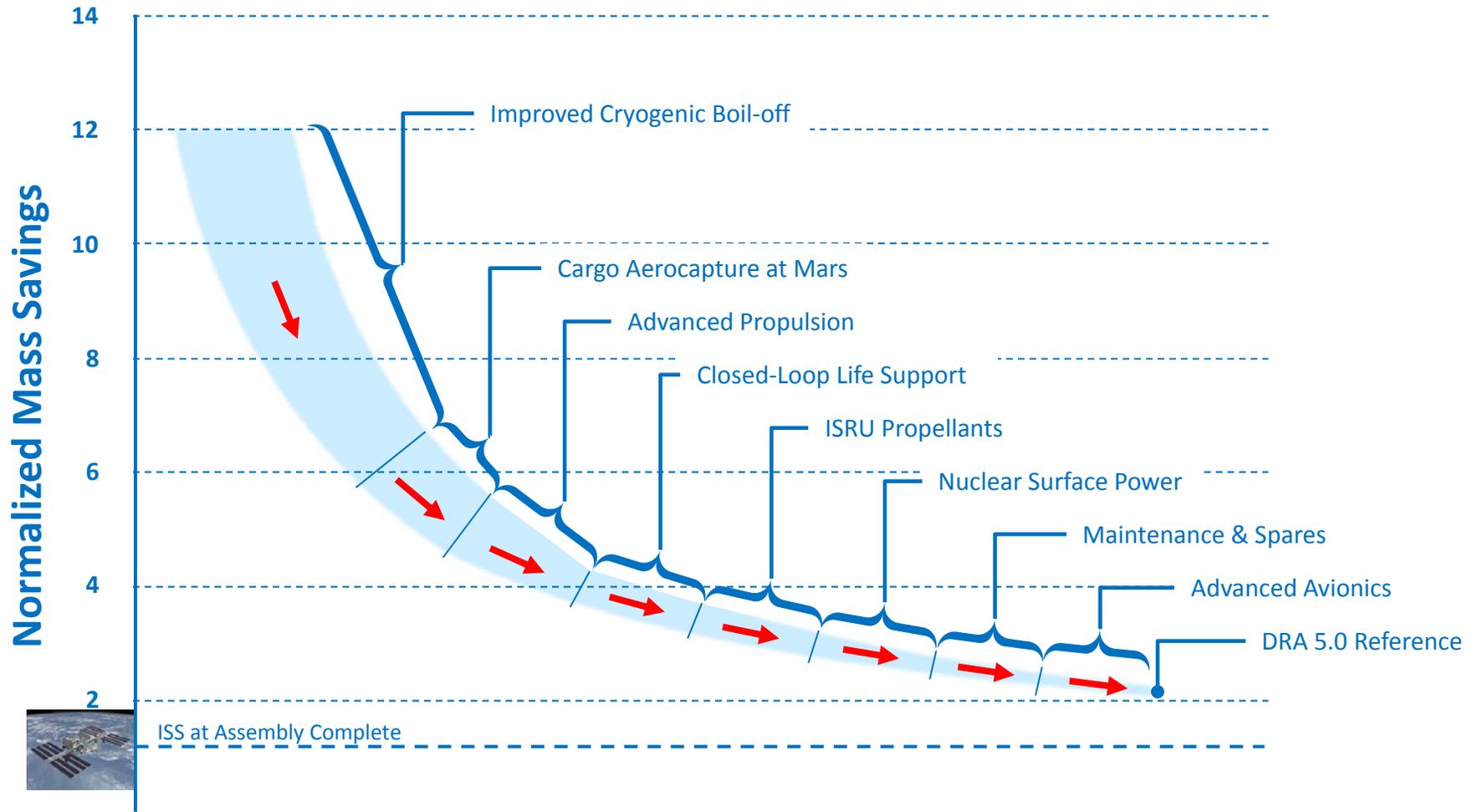
Prove feasibility of novel, early-stage ideas with potential to revolutionize a future NASA mission and/or fulfill national need.



Mature crosscutting capabilities that advance multiple future space missions to flight readiness status



The Value of Technology Investments Mars Mission Example*



- Without technology investments, the mass required to initiate a human Mars mission in LEO is approximately twelve times the mass of the International Space Station
- Technology investments of the type proposed in the FY 2011 budget are required to put such a mission within reach

* The ordering and impact of these technologies are an example valid for one particular architecture and is not intended as an architecture endorsement nor technology development prioritization

Early Stage Innovation Division



The Early Stage Innovation Division sponsors a wide range of low TRL efforts for advanced space system concept and initial technology development across academia, industry and at the NASA field Centers.

Early Stage Innovation includes:

- **Space Technology Research Grants Program** focuses on innovative research in advanced space technology grants & graduate fellowships for student research in space technology
- **NIAC Program** focuses on innovative aeronautics and space system concepts for future NASA missions
- **Center Innovation Fund Program** stimulates aerospace creativity and innovation at the NASA field Centers
- **SBIR/STTR Program** engages small businesses in our Nation's space enterprise and infuse these products across NASA missions
- **Centennial Challenges Prize Program** addresses key technology needs with new sources of innovation outside the traditional aerospace community

All Early Stage Innovation selections will be made competitively

Game Changing Technology Division



- *The Game Changing Technology Division focuses on maturing advanced space technologies that may lead to entirely new approaches for the Agency's future space missions and solutions to significant national needs.*
- *Through significant ground-based testing and/or laboratory experimentation, the Game Changing Technology Division matures technologies in preparation for potential system level flight demonstration. Success is not assured with each investment; however, on the whole and over time, dramatic advances in technology, enabling entirely new NASA missions and potential solutions for a variety of society's technological challenges are expected.*
- *A broad spectrum of space system technologies will be developed ranging from launch vehicle subsystems, spacecraft technologies, in-space capabilities, and surface systems that support robotic and human exploration.*

Game Changing Technology Division includes:

- **Game Changing Development Program** focuses on innovative ideas enabling new capabilities or radically altering our current approaches to space systems
- **Franklin Small Satellite Subsystem Technology Program** enables small satellites to provide game changing capabilities for the space sectors

**Greater than 70% of GCT funds (FY11-FY15) will
applied to competitive selections**

Crosscutting Capability Demonstrations Division



- *The Cross-Cutting Capability Demonstrations Division focuses on maturation to flight readiness of cross-cutting capabilities that advance multiple future space missions, including flight test projects where in-space demonstration is needed before the capability can transition to direct mission application.*
- *Matures a small number of technologies that benefit multiple customers to flight readiness status (TRL 6) through Projects that perform relevant environment testing.*

Crosscutting Capability Demonstrations Division includes:

- **Technology Demonstration Missions Program** matures, through flight demonstrations, a small number of Agency crosscutting technologies in partnerships with the Mission Directorates, industry, and other government agencies
- **Edison Small Satellite Missions Program** develops and operates a series of NASA-focused small satellite demonstration missions in collaboration with academia and small business
- **Flight Opportunities Program** provides flight opportunities of reduced-gravity environments, brief periods of weightlessness, and high-altitude atmospheric research

Greater than 70% of CCD funds (FY11-FY15) will be applied to competitive selections

NASA Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Program



Level II Program Office: ARC



2009 NASA SBIR grant for an advanced Lunar Surface Navigation system



Inflatable Technology to develop a rigidized thin film antenna for large aperture ground-based antenna; i.e. lunar ground station

Objective: To engage and provide opportunity to small businesses to participate in Federal Research activities and encourage cooperative research and development with non-profit research institutions, such as a university; with a primary objective of developing and facilitating the transfer of technology from research institutions through the entrepreneurship of small business contracts that result in technology to meet NASA's needs.

- Provide opportunities to participate in Federal Research activities
- Encourage cooperative research and development with non-profit research institutions

Acquisition Strategy

- Current Authorization provides for SBIR funding at a minimum of 2.5 percent of NASA's extramural research and development expenditures
- Modeled after SBIR, STTR is a separately funded activity; with funding set at a minimum of 0.3 percent of extramural research and development expenditures

Awards

- **Phase 1:** Up to 400 awards per year
- **Phase 2:** Up to 200 awards per year

Collaboration

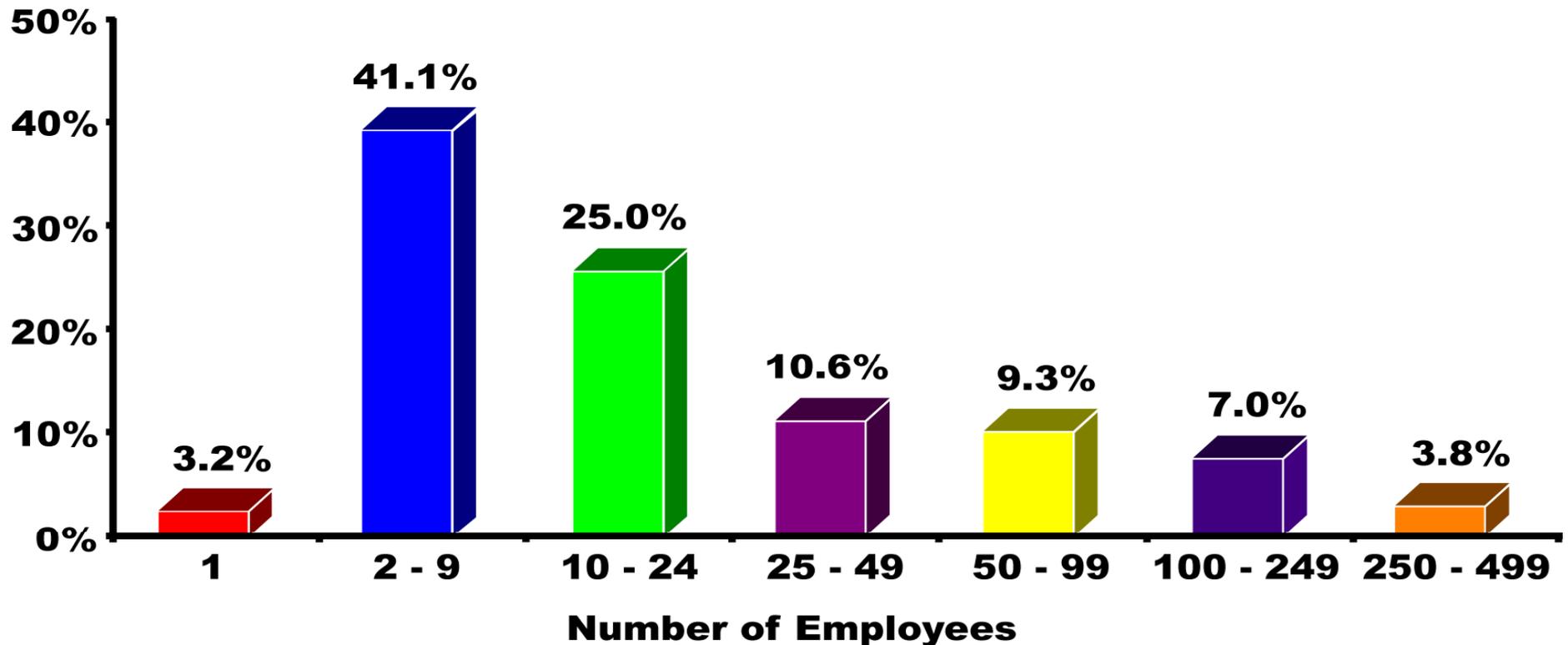
- Proposals welcome from small business concerns, in partnership with non-profit research institutions; such as a university.
- The percentage of new firms participating in NASA's SBIR/STTR programs each year has been in the 30-50% range, yielding new applicants each year. New participants have submitted between 20-35% of the total number of proposals in any given year.

<http://sbir.gsfc.nasa.gov/SBIR/SBIR.html>

Who Participates in SBIR?



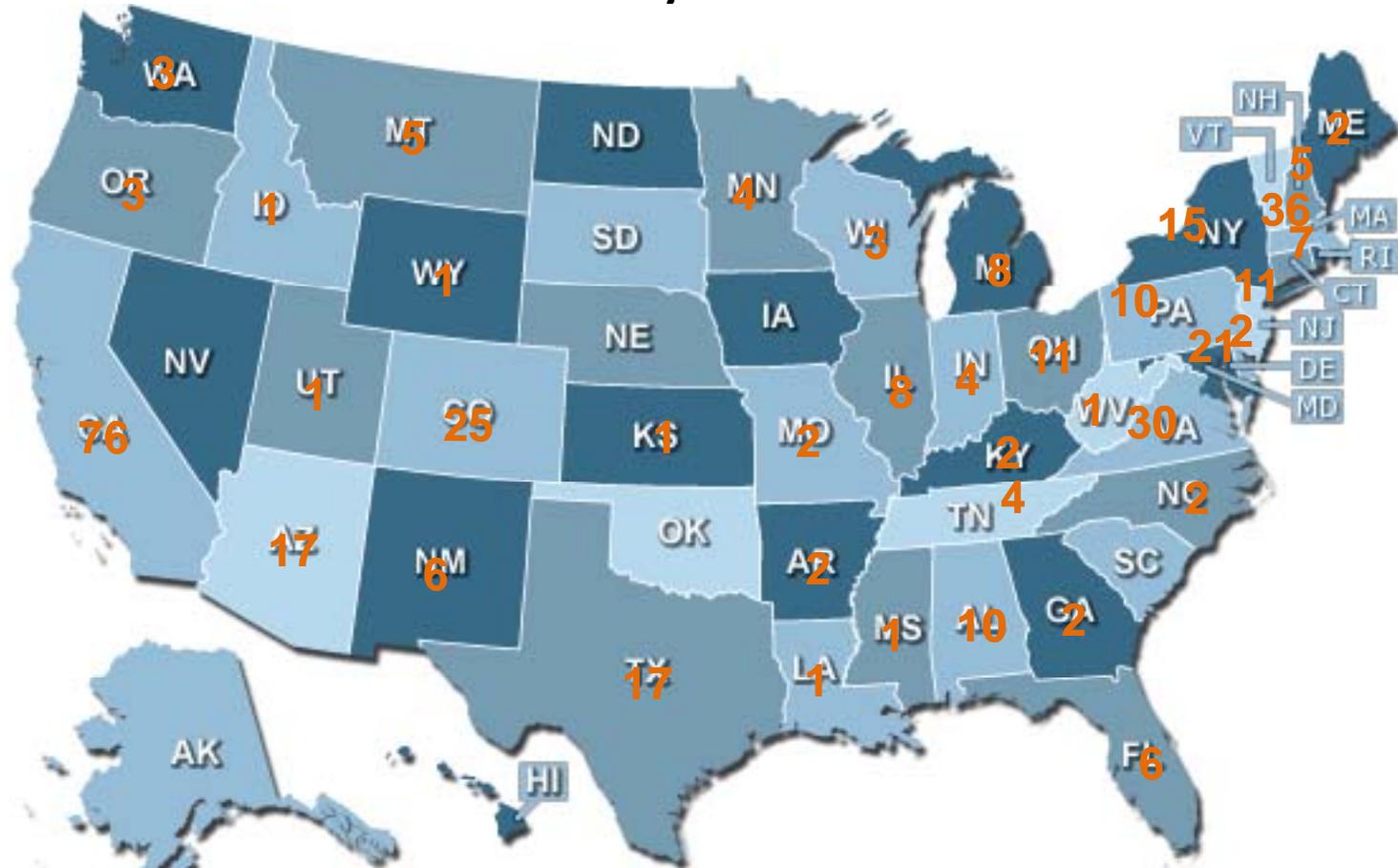
- ✓ Firms are typically small and new to the program.
- ✓ About 1/3 are first-time Phase I awardees.
- ✓ Small hi-tech firms from across the country.



SBIR 2009 Phase 1 Demographics



Number of SBIR 2009 Phase 1 Awards By State



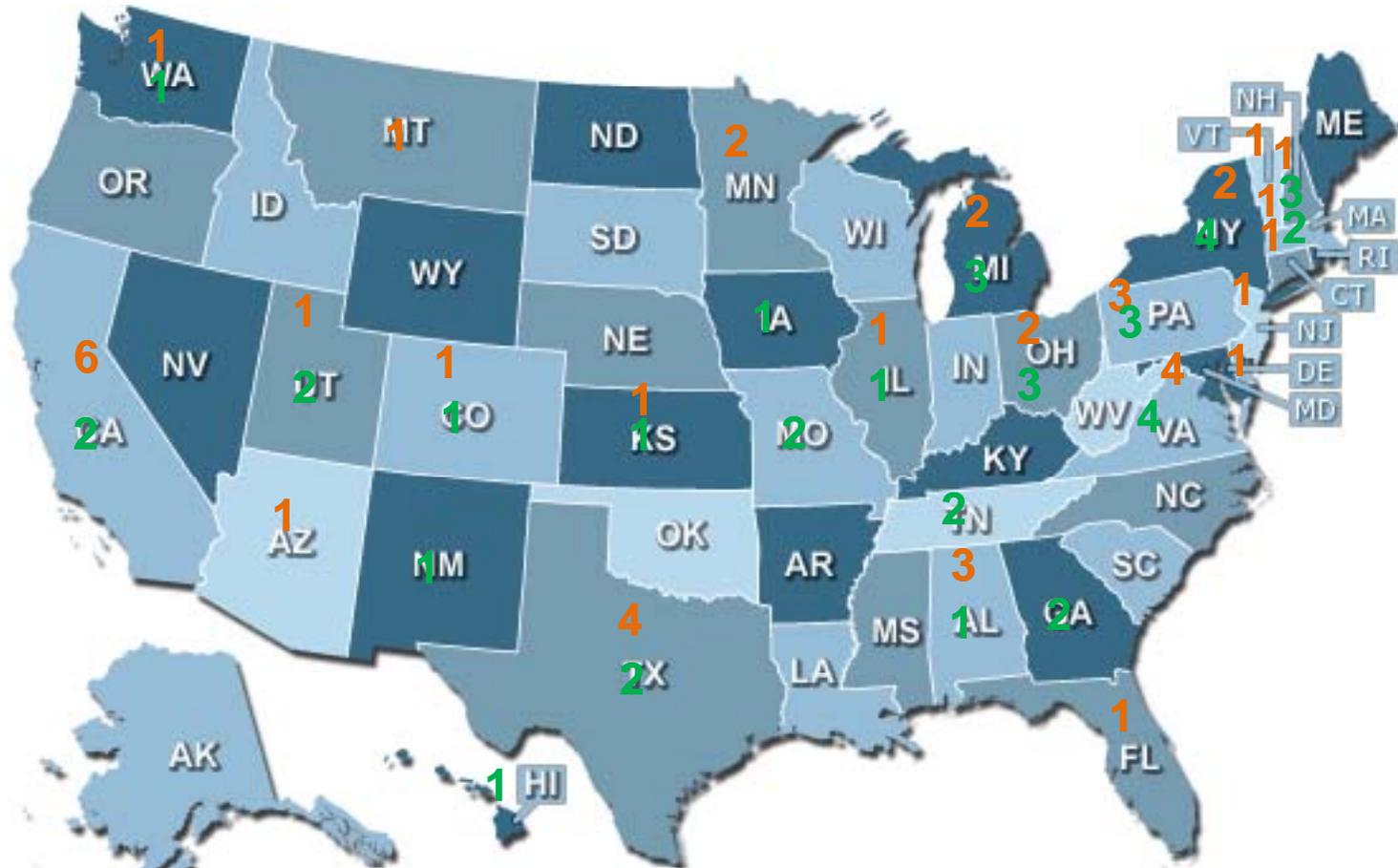
Number of Distinct States with Awards*: 39

* Award count Includes 335 regular program awards plus 31 stimulus awards

STTR 2009 Phase 1 Demographics



Number of STTR 2009 Phase 1 Awards By State



Firm Distinct States with Awards*: 23

Research Institution Distinct States with Awards*: 21

* Award count Includes 32 regular program awards plus 10 stimulus awards

SBIR/STTR: 3-Phase Program



- **Phase 1**
 - Feasibility study
 - \$150K Contract Award (**\$100K current NASA Solicitation**)
 - 6 months duration (SBIR)
 - 12 months duration (STTR)
- **Phase 2**
 - Technology Development
 - 2-Year Contract Award
 - \$1Mil (SBIR/STTR) (**\$750K current NASA Solicitation**)
 - **\$150K Phase-2E/Phase 3 Bridge Option (New program Feature)**
- **Phase 3**
 - Technology Infusion/Commercialization Stage
 - Use of non-SBIR Funding Agreements
 - Ability to award sole-source contracts without - Further need for Justification Other than Full and Open competition; (NO-JOFOC) based on specific SBIR authority – NASA and NASA primes.

SBIR Technology Enhances High Profile Missions



Mars Exploration Rovers

ASIC chip for memory modules and analog-to-digital converters.

Lithium-ion batteries for battery packs.

Heat switches to control radiator for electronics package.

Stardust and Orion

ARC-invented heatshield technology Phenolic Impregnated Carbon Ablator (PICA)

SBIR awards to FMI advance manufacturing scalability of the technology

PICA selected as an enabling technology for successful STARDUST mission

STARDUST success leads to further application as heatshield on crewed reentry vehicles

Space Shuttle and ISS

Sensor Control and Acquisition Telecommunications (SCAT)

Wireless Instrumentation Systems

SWIS - Launch to Activation Temps

IWIS - Dynamics

MMA for JEM - Micro-G

EWIS - Dynamics

Microgravity Instrumentation (And Structural Dynamics)

Automated Leak Detection & Location

Ultra-W

Distributed Impact Detection

IVHM Integrated Vehicle Health Monitoring

Wing Leading Edge Impact Detection System

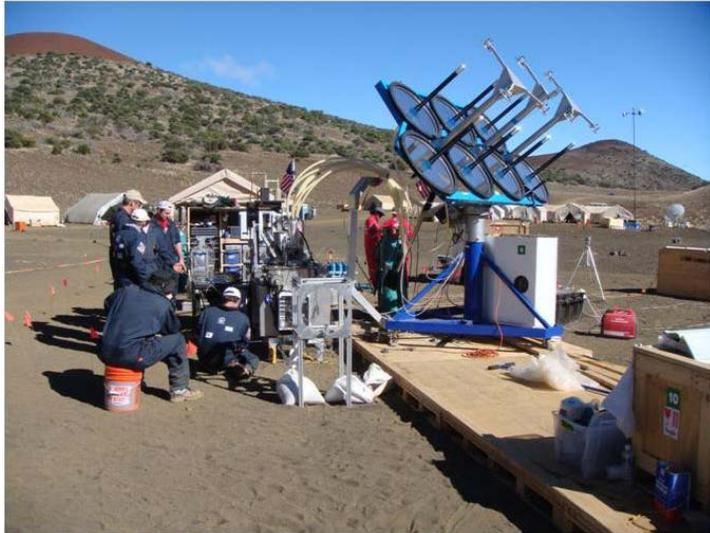
Mars Phoenix Lander

Icy Soil Acquisition Device supplied by Honeybee Robotics, Inc.

Lithium ion batteries supplied by Yardney Technical Products, Inc.

SpaceDev (formerly Starsys) contributed to the design of the Microscopy Electrochemistry and Conductivity Analyzer (MECA)

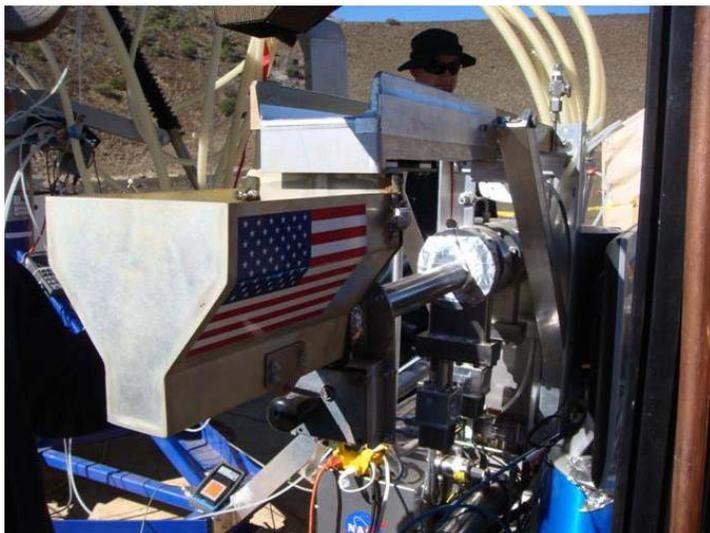
“Dust to Thrust” Demo on Mauna Kea Included Four SBIR Products



Fiber Optic Solar Concentrator from PSI



Carbothermal Reduction from Orbitec



Pneumatic Regolith Feed from Honeybee



Lox/Methane Engine from Wask

SBIR/STTR Program Submission & Schedule



2010 Program Solicitation

- » Phase 1 Opening Date: 07/19/2010
- » Phase 1 Closing Date: 09/02/2010
- » Phase 1 Announcement: Dec 2010
- » Phase 2 SBIR selection: Oct 2011
- » Phase 2 STTR selection: April 2012

2011 Program Solicitation

- » Phase 1 Opening Date: July 2011
- » Phase 1 Closing Date: Sept 2011
- » Phase 1 Announcement: Nov 2011



<http://sbir.nasa.gov>

SBIR/STTR Benefits within OCT (1 of 2)



1. **Agency Technology Roadmap.** OCT will better integrate and provide strategic guidance for technology investments across NASA. As one of the three large programs within Space Technology, SBIR/STTR will focus on incorporating small businesses into the research portfolio.
 - OCT is working with the NRC to develop a NASA Technology Development Roadmap focusing on 15 Technology Areas determined in consultation with the Mission Directorates (expected October 2011). OCT is considering changing the SBIR/STTR FY12 solicitation (topics and subtopics) to be aligned with strategic needs identified in the NASA Technology Development Roadmap.
2. **10 Integrated Space Technology programs.** The OCT Space Technology Programs are coupled provide transition paths for research and technology from low TRL (Early Stage Innovation) to higher TRL (Game Changing Technology and Cross Cutting Capabilities). This approach provides additional opportunities for SBIR/STTR proposers to mature their technologies.
3. **NASA Technology Practitioners.** OCT is driving cultural change toward greater creativity and innovation at NASA. Housing the Center Chief Technologists together with Technology Partnership representatives, Space Technology programs, including SBIR/STTR, will have greater visibility at the NASA Centers.

SBIR/STTR Benefits within OCT (2 of 2)



4. **Increased Flexibility.** FY11 solicitations are planned for Summer 2011 release and will include the potential for higher award amounts to small businesses. In FY12, solicitations may provide increased flexibility in award amounts, project duration, reporting, infusion into other NASA programs, partnerships, and who can and cannot participate.
5. **Space Technology Funding.** With SBIR/STTR part of Space Technology, funding will no longer come from Cross-Agency Support (CAS) but instead will be program dollars, changing its authorization into two-year dollars.