Innovative Partnerships Program (IPP)

Overview and Opportunities

ESMD Technology Exchange Conference
Galveston, Texas
November 15, 2007
IPP Briefing to ESMD TEC – 11/15/07

About the Innovative Partnerships Program

• IPP is seeking to add value to NASA’s Mission Directorates and their programs and projects, through technology development and infusion to meet mission needs.

• IPP seeks leveraged funding to address these technology barriers via cost-shared, joint-development partnerships.

• IPP Seeks to transfer technology developed by NASA for commercial application and other benefits to the Nation

• IPP seeks increased participation from new sources of innovation for addressing NASA’s technology challenges.

• Facilitator
  – Bringing parties together, both inside and outside the agency.
  – Bridging communication gaps.

• Catalyst
  – Acting as a pathfinder for implementing new things – change agent.
  – Creating new partnerships.
  – Demonstrating effectiveness of new approaches and methods.

IPP Briefing to ESMD TEC – 11/15/07

*All fiscal year budgets shown are Full Cost Simplified
Policy and Statutory Authority for IPP

- 1958 National Aeronautics and Space Act
- 1968 Executive Order 12591: Facilitating Access to Science and Technology
- 1982 Small Business Innovation Research Development Act
- 1986 Federal Technology Transfer Act
- 1987 National Competitiveness Technology Transfer Act
- 1988 Omnibus Trade and Competitiveness Act
- 1991 American Technology Preeminence Act
- 1992 Small Business Research and Development Enhancement Act
- 1995 National Technology Transfer and Advancement Act
- 2000 Technology Transfer Commercialization Act
- 2005 NASA Authorization Act
- 2006 NASA Strategic Plan
Program Elements

Technology Infusion
- SBIR
- STTR
- IPP Seed Fund

Innovation Incubator
- Centennial Challenges
- New Business Models
- Innovation Transfusion

Partnership Development
- Intellectual Property management
- Technology Transfer
- New Innovative Partnerships
Innovative Partnerships Program Office

Director
Deputy Director
Secretary

Staff Functions
Resources Management
Administrative Officer
Chief Technologist
Communications

Technology Infusion
SBIR/STTR
Seed Fund

Innovation Incubator
Centennial Challenges
FAST
New Activities

Partnership Development
Technology Transfer
Intellectual Property
New Innovative Partnerships

IPP Offices at each of NASA's Field Centers
ARC DFRC GRC GSFC JPL JSC KSC LaRC MSFC SSC

IPP Briefing to ESMD TEC – 11/15/07
IPP Partnerships

“The Innovative Partnerships Program (IPP) will facilitate partnering with the U.S. private sector, and leverage private sector resources, to produce technologies needed for NASA missions. The IPP and NASA’s Mission Directorates will identify new opportunities to adopt technologies developed through innovative partnerships.”

2006 NASA Strategic Plan

Looking For:

• **Win-Win-Win**
  – (NASA-Partner-Taxpayer/Public Good)

• **Complementary Interests (1+1>>2)**
  – Common Interests
  – Compatible Goals
  – Skin in the Game
IPP’s Dynamic Innovation Process

Partnership Model

NASA Offerings
- $ Funding
- Facilities use
- Technology use
- Expertise access
- Brand Association
- Product Validation
- Space Env’t Access
- Intellectual Property
- Other
...  

Partner Offerings
- Technology
- Services
- Innovation
- Expertise
- Intell. Property
- Outreach
- $ Funding
- Facilities
- Other
...  

Partnership Mechanisms
- FAR Contracts
- Comm’l Contracts
- Grants
- Coop Agreement
- Space Act Agr
- MOU
- MOA
- Licensing
- Other
- ...

A. Incurred ‘Cost’ of offerings
B. Perceived ‘benefit’ to partner from NASA offerings

Value of partnership to NASA = D/A

C. Incurred ‘Cost’ of offerings
D. Perceived ‘benefit’ to Partner from partner offerings

Value of partnership to Partner = B/C
IPP objective should be to maximize partnership value for both NASA and partner.

Refer back to the partnership model for value and ask:
- What impact will this aspect of the partnership have on value?
- What are other opportunities to increase value?
Program Elements

Technology Infusion
- SBIR
- STTR
- IPP Seed Fund

Innovation Incubator
- Centennial Challenges
- New Business Models
- Innovation Transfusion

Partnership Development
- Intellectual Property management
- Technology Transfer
- New Innovative Partnerships
IPP Technology for Mission Directorates

Technology Needs
- Communication

Innovative Partnerships Program
- SBIR/STTR
- Centennial Challenges
- Seed Fund
- Partnerships

Executed at the Field Centers

Technology Infusion
- Bridging the “Valley of Death”
- Narrow the gap and reduce risk
- Begin building bridges early

Mission Directorates
- Programs
- Projects

Executed at the Field Centers
SBIR/STTR: 3-Phase Program

- **PHASE I**
  - Feasibility study
  - $100K award
  - 6 months duration (SBIR)
  - 12 months duration (STTR)

<table>
<thead>
<tr>
<th>SBIR</th>
<th>FY03</th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
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<td>105.6</td>
<td>106.6</td>
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<td>267</td>
<td>312</td>
<td>291</td>
<td>267</td>
<td>259</td>
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<td>Phase 2 Awards</td>
<td>155</td>
<td>139</td>
<td>142</td>
<td>186</td>
<td>130</td>
</tr>
</tbody>
</table>

- **PHASE II**
  - Technology Development
  - 2-Year Award
  - Up to $750K (SBIR/STTR)

<table>
<thead>
<tr>
<th>STTR</th>
<th>FY03</th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
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<td>6.4</td>
<td>12.9</td>
<td>13.2</td>
<td>12.3</td>
<td>12.8</td>
</tr>
<tr>
<td>Phase 1 Awards</td>
<td>45</td>
<td>40</td>
<td>35</td>
<td>27</td>
<td>25</td>
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<tr>
<td>Phase 2 Awards</td>
<td>18</td>
<td>26</td>
<td>17</td>
<td>22</td>
<td>18</td>
</tr>
</tbody>
</table>

- **PHASE III**
  - Technology Infusion/Commercialization Stage
  - Use of non-SBIR Funds
  - Ability to award sole-source contracts without JOFOC based on specific SBIR authority – NASA and NASA primes.

SBIR is 2.5% of extramural R&D, STTR is 0.3% of extramural R&D.
• Every technology development investment dollar is critical to the ultimate success of NASA’s mission.
  – Ensure alignment and integration with Mission Directorate priorities.
  – Investments should be complementary with technologies being pursued by:
    • Other IPP investments and partnerships,
    • Mission Directorate programs and projects,
    • Prime contractors, and
    • Other agency SBIR/STTR investments.
• Ultimate objective is to achieve infusion of critical technologies into NASA’s Mission Directorates and their:
  – Flight programs/projects,
  – Ground or test systems, or
  – Other uses to advance NASA’s mission
• Mission Directorate establish high priority needs and existing gaps.
  – High priority needs are developed into topics for the annual solicitation.
  – Subtopics may be clustered to support the development and maturation of critical technologies for infusion.
SBIR Technologies on Mars Exploration Rovers

Maxwell Technologies of San Diego, California fabricated and tested an ASCII chip with single event latch up protection technology. Innovation enables the use of commercial chip technology in space missions, providing higher performance at a lower cost. Supplying A to D converter for Mars 2003 Rovers.

Yardney Technical Products of Pawtucket, Connecticut developed lithium ion batteries with specific energy of >100Wh/kg and energy density of 240 Wh/l and long cycle life. Subsequently, they won a large Air Force/NASA contract to develop batteries for space applications. They are supplying the batteries for the 2003 Mars Rovers.

Starsys Research of Boulder, Colorado developed several paraffin based heat switches that function autonomously. Heat switches control radiator for electronics package on Mars 2003 Rovers.
SBIR technology contributions to MSL/CheMin

Microwave Power Technology of Campbell, California developed a small-format carbon nanotube field emission cathode (CNTFE) X-ray tube for CheMin. While a tungsten cathode was ultimately baselined for the flight tube, the form, fit and function of the flight tube was derived from this SBIR.

InXitu, Inc. of Mountain View, California developed a powder handling device for X-ray Diffraction Analysis based on Piezoelectrically-induced sample motion, and a miniature X-ray tube having a grounded cathode configuration is being developed to enable a further 2-fold reduction in the size of CheMin prototype instruments.
SBIR Contribution to Wireless Technology

Microgravity Instrumentation (And Structural Dynamics)

Invocon, Inc.
2006 SBIR Tibbetts Award

Wing Leading Edge Impact Detection System

Vehicle Health Monitoring Systems with Wireless Systems

Wireless Instrumentation and Data Recording

SCAT SBIR
Sensor Control and Acquisition Telecommunications Wireless Instrumentation Systems

Development Flight Instrumentation

Shuttle Arm Lead Cell Measurements
Payload Dynamics Measurements

Micro-Wireless Instrumentation Systems

Automated Leak Detection & Location
Ultra-WIS
Distributed Impact Detection
Launch & Activation Wireless Temperature Monitoring

SWIS – Launch to Activation Temps
IWIS Dynamics
MMA for JEM – Micro-G

EWIS - Dynamics

Wireless Instrumentation Systems

Invocon, Inc.
2006 SBIR Tibbetts Award

Vehicle Health Monitoring Systems with Wireless Systems

Wireless Instrumentation and Data Recording

Wing Leading Edge Impact Detection System

Photo Courtesy of NASA
Advanced Flexible Thin-Film PV (FTFPV)
UltraFlex (UF) Solar Array System

Initial UltraFlex solar array development conducted by AEC-Able under internal IR&D funding

Additional development under JPL contracts (UF selected for Mars ‘01 Lander and Mars Phoenix)

Further development and collaborative concentrator solar array efforts with Entech, Inc. (AEC-Able bought out by ATK)

UltraFlex-175 solar array selected as ST–8 validation experiment for flight in 2010 by NASA New Millennium Program for eventual use on science missions

SBIR

NASA GRC SBIR Phase I and Phase II funding for UltraFlex FTFPV solar array development

FTFPV and UF technology flown for 1 year in space on MISSE–5 Experiment (flight data feeds into UF array database)

UltraFlex design with multijunction photovoltaics baselined by Lockheed Martin to power the NASA Orion Service Module

NASA Glenn SBIR contracts with AEC-Able/ATK Space Systems on UltraFlex FTFPV develop a near-term, low-risk approach for applying thin-film solar cell technology to a lightweight array structure in order to increase system performance for specialized mission needs.

Science Mission Directorate

Exploration Systems Mission Directorate

NASA Glenn Research Center

Michael F. Piszczor 216–433–2237

Additional Phase III funding of $154K was added for inclusion & testing of CIGS thin-film cells into a fully functional gore assembly.

MISSE–5 flight experiment (1 year exposure on ISS) provides important data on durability of UltraFlex components for NASA missions.

ATK Space Systems
(formerly AEC-Able Engineering Co.)

Brian Spence 805–685–2433

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www.nasa.gov
SBIR State Information

State Technical Assistance Programs

Each state listed below operates a small business assistance program that might be able to help you. Select a state for more information.

• State Information Available on SBIR/STTR Website
• http://sbir.gsfc.nasa.gov/SBIR/states.htm
Technologies and Firms are Searchable

https://sbir.gsfc.nasa.gov/sbir/search/fundedTechSearch.jsp
IPP Seed Fund Program

- An annual process for selecting innovative partnerships for funding, to address the technology priorities of NASA’s Mission Directorates.
- Enhances NASA’s ability to meet Mission capability goals by providing leveraged funding to address technology barriers via cost-shared, joint-development partnerships.
- The IPP Office at NASA HQ provides an annual Seed Fund Announcement of Opportunity to all NASA Centers for selecting innovative partnerships for funding.
- The technology landscape covered by the successful proposals embraces the needs of all four Mission Directorates.
- Seed Fund operates through a collaboration of Center IPP Offices, NASA co-PI, and external co-PI.
- Proposals are evaluated against the following criteria:
  - Relevance/Value to NASA Mission Directorates.
  - Scientific/Technical merit and feasibility.
  - Leveraging of resources.
IPP Seed Fund Results

• **2006 Seed Fund results:**
  – 76 proposals received, evaluated by IPP and Mission Directorate experts.
  – 29 projects selected, providing $28.3 million for the advancement of critical technologies and capabilities.
    • $6.6 million IPP Office funds.
    • $7.5 million program, project, Center funds.
    • $14.2 million external partner funds.

• **2007 Seed Fund results:**
  – 75 proposals received, evaluated by IPP and Mission Directorate experts.
  – 38 projects selected, providing $33.9 million for the advancement of critical technologies and capabilities.
    • $9.3 million IPP Office funds.
    • $12.1 million program, project, Center funds.
    • $12.6 million external partner funds.

• **In the last two years, an investment of $15.9 million by IPP facilitated the generation of 67 partnerships and was leveraged by a factor of four, providing a total of $62.2 million for the advancement of critical technologies and capabilities for the Agency.**
Seed Fund Technology Spectrum

Technology Spectrum

- Human Habitats
- NGATS
- Avionics
- Space Radiation
- Communications
- Sensor Networks
- Optics/Telescopes
- Power & Propulsion
- ISRU
- ISHM
- Decision Support Sys

FY06 Seed Fund TRL Advancement
FY07 Seed Fund TRL Advancement

TRL Pre Seed Fund
TRL Post Seed Fund

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FY06 Demonstration Highlights


- **Cryostable Low-cost Mirror**
  (Deep Space Missions)

- **Inflatable Human Habitat**
  (Human Lunar)

- **4D Flight Mgmt**
  (NGATS)

- **Inflatable Decelerator**
  (AFL MARS and COTS)

- **Li-Ion Battery for PLSS**
  (Human EVA)

- **Cryo-tracker Flight Qualification**
  (Atlas/Centaur Launches)

- **ISHM - Test Stand and J2X Engine**
  (Aries 1 Upper Stage)
Program and Project Benefits

- This letter expresses my personal appreciation for the support that your Innovative Partnerships Program Office (IPPO) has provided to the Exploration Launch Office (ELO) at the Marshall Space Flight Center (MSFC) during FY06.

- Thanks to the support, we have been able to attract external partners to work with us in advancing technologies that would otherwise not have been pursued. These technologies will certainly enhance our ability to meet the challenges we face in meeting the goals of the Agency.
  - Hardware Maturation and Cryogenic Testing of an Optical Cryogenic Mass Flow Sensor
  - Magnetostrictive Regulator Development
  - Thermal Stir Welding (TSW) Development
  - Validation of Cryogenic-Composite Over-Wrapped Pressure Vessels
  - Prototype Development and Technology Demonstration of Apparatus for Reading Two-Dimensional Identification Symbols Using Visual and Sensing Technologies

Steve Cook, Manager, Exploration Launch Office
Program Elements

- SBIR
- STTR
- IPP Seed Fund

- Centennial Challenges
- New Business Models
- Innovation Transfusion

- Intellectual Property management
- Technology Transfer
- New Innovative Partnerships

Technology Infusion
Innovation Incubator
Partnership Development

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• Section 203 of the 1958 National Aeronautics and Space Act, as amended, states that NASA
  “...in order to carry out the purpose of this Act, shall... seek and encourage, to the maximum
  extent possible, the fullest commercial use of space; and... encourage and provide for Federal
  Government use of commercially provided space services and hardware, consistent with the
  requirements of the Federal Government.”
• The Commercial Space Act of 1998 stated that
  “a priority goal of constructing the International Space Station is the economic development of
  Earth orbital space.” The law further states that “competitive markets... should therefore govern
  the economic development of Earth orbital space.”
• In the “Vision for Space Exploration”, President Bush charged NASA to
  “promote international and commercial participation in exploration to further U.S. scientific,
  security, and economic interests.”
• The NASA Authorization Act of 2005 states that
  “In carrying out the programs of the Administration, the Administrator shall … work closely with
  the private sector, including by … encouraging the work of entrepreneurs who are seeking to
  develop new means to send satellites, crew, or cargo to outer space.”
• The President’s Science Advisor and OSTP Director, Dr. John Marburger, made the following
  remarks at the 44th Robert H. Goddard Memorial Symposium on 15 March 2006
  “As I see it, questions about the vision boil down to whether we want to incorporate the Solar
  System in our economic sphere, or not. Our national policy, declared by President Bush and
  endorsed by Congress last December in the NASA authorization act, affirms that, ‘The
  fundamental goal of this vision is to advance U.S. scientific, security, and economic interests
  through a robust space exploration program.’”
• The fifth of six strategic goals in the 2006 NASA Strategic Plan states that NASA will
  “Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.”
ESMD Commercial Development Policy (ECDP)

- **Purpose**
  - Provide ESMD with a set of best practices, ideas, and concepts which all ESMD programs, projects, and activities should be cognizant of and work toward with respect to encouraging commercial space capabilities.

- **Applicability**
  - The ECDP applies to the evaluation and execution of tasks and activities for all ESMD programs and projects. The ECDP should be addressed by all proposals for ESMD programs and projects tasks and activities.

- **Objective**
  - The objective of the ECDP is to encourage the development of commercial space capability industries that can accomplish NASA exploration mission goals at a lower cost and cost risk to NASA through “fixed price” acquisition of commercial goods and services.

- **Goals**
  - To encourage the development of commercial space capabilities and markets.
  - To encourage “Buy Commercial” instead of “Government Provided” decisions.
  - To encourage commercial representation and opportunities in NASA’s exploration architectures.

*Approved by ESMD DPMC and signed by AA Horowitz in October, 2007.*
How Do Prizes Benefit NASA?

- Increased Participation by New Sources of Innovation.
- Leveraging of Tax-Payers’ Dollars.
- Increased Awareness of Science and Technology.
- Hands-on Training for Future Workforce.
## Funded Centennial Challenge Competitions

<table>
<thead>
<tr>
<th>Competition</th>
<th>Total</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
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<tbody>
<tr>
<td>Astronaut Glove</td>
<td>$1M</td>
<td>250</td>
<td>350</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regolith Excavation</td>
<td>$750K</td>
<td>250</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Air Vehicle</td>
<td>$2M</td>
<td>250</td>
<td>300</td>
<td>400</td>
<td>500</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>Beam Power</td>
<td>$2M</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>500</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Tether</td>
<td>$2M</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>500</td>
<td>600</td>
<td></td>
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<tr>
<td>Lunar Lander</td>
<td>$2M</td>
<td>2,000</td>
<td></td>
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<tr>
<td>MoonROx</td>
<td>$1M</td>
<td>250</td>
<td>750</td>
<td></td>
<td></td>
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</table>
And The Winner Is...

...Peter Homer
Lunar Regolith “Sandbox”

Dimensions: 4m x 4m
Regolith: 8 tons, 25cm (avg)
## Past Competitions

<table>
<thead>
<tr>
<th>Name</th>
<th>Event Dates</th>
<th>Purses</th>
<th>Winners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astronaut Glove</td>
<td>2-3 May ’07</td>
<td>$250K</td>
<td>• Peter Homer/$200K</td>
</tr>
<tr>
<td>Regolith Excavitation</td>
<td>11-12 May ’07</td>
<td>$250K</td>
<td>• None</td>
</tr>
<tr>
<td>Personal Air Vehicle</td>
<td>4-12 Aug ’07</td>
<td>$250K</td>
<td>• Vance Turner-$100K Vantage Prize&lt;br&gt;• Dave and Diane Anders / $50K Noise Prize&lt;br&gt;• John Rehn / $25K Handling Qualities&lt;br&gt;• Vance Turner / $25K Shortest Runway Prize&lt;br&gt;• Vance Turner / $25K Efficiency Prize&lt;br&gt;• Dave and Diane Anders / $15K Top Speed First Prize&lt;br&gt;• Vance Turner / $10K Top Speed Second Prize</td>
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<tr>
<td>Beam Power</td>
<td>13-21 Oct ’07</td>
<td>$500K</td>
<td>• None</td>
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<tr>
<td>Tether</td>
<td>13-21 Oct ’07</td>
<td>$500K</td>
<td>• None</td>
</tr>
<tr>
<td>Lunar Lander</td>
<td>26-28 Oct ’07</td>
<td>$2M</td>
<td>• None</td>
</tr>
<tr>
<td>MoonROx (First to Demonstrate)</td>
<td>Exp. Jun ’08</td>
<td>$1M</td>
<td>• No Registrants to date</td>
</tr>
</tbody>
</table>
Narrowing the Gap

• Rule of thumb for technology infusion is TRL 6 by PDR.
  – TRL 6 requires system/subsystem model or prototype demonstration in a relevant environment.
• IPP has been tasked to demonstrate the purchase of services from the emerging commercial space sector for parabolic aircraft flight and suborbital flight.
  – IPP is working with NASA’s Shared Capability Assets Program (SCAP) and the Glenn Research Center (GRC), to use the pending IDIQ contract for parabolic aircraft services.
  – IPP is establishing an activity for Facilitated Access to the Space Environment for Technology Development and Training (FAST).
  – IPP’s FAST activity will offer funds and seek leveraging through partnerships to access parabolic aircraft services as first step.
  – This will demonstrate the business model for purchasing services and advance technology readiness for NASA’s research and technology needs (SBIR/STTR and other technologies).
• By narrowing the gap, risk is reduced, and infusion is more likely.
Objective: Advancing technology maturity to enhance technology infusion.

- Problem = Mid-TRL “Valley of Death”.
- Lack of opportunities to test in microgravity environment.
- Key Element to achieving TRL 6 is demonstration of prototype in relevant environment.

Provide access to commercial microgravity flight services to advance NASA technologies, reducing risk levels to enable more infusion. Also demonstrates procurement of commercial space services by NASA for successful Agency use.

- Targeted at needed Technologies that would benefit from microgravity testing.
- IPP portfolio (SBIR/STTR, Seed Fund, etc.) and other technologies.
- Leverage Funds for Technology Demonstration in Parabolic Microgravity Flight Testing.
- Competitive process modeled after “IPP Seed Fund”.
- **Status:** Microgravity Services procurement pending.
Problem: There is significant potential for NASA to learn and benefit from innovative technologies, processes and practices occurring outside the Agency; some potential currently realized on ad hoc basis.

Goal: Create strategic connections between innovative external organizations and NASA for increased Agency benefit from external creativity.

Project Components

- **Innovation Ambassadors**: Technical training program for ~1 year at an external organization focusing on identifying innovations

- **Innovation Scouts**: Workshops with NASA to external organizations focusing on specific innovations

- **Agency Dissemination**: Use existing mechanisms to communicate innovations (APPEL, ASK magazine, IPP website, etc.)

- **Partnering Organizations**: Office of Human Capital; Office of Chief Engineer.

- **Status**: Release Innovation Ambassador solicitation Nov/Dec [Assignment 2008].
Program Elements

- Technology Infusion
  - SBIR
  - STTR
  - IPP Seed Fund

- Innovation Incubator
  - Centennial Challenges
  - New Business Models
  - Innovation Transfusion

- Partnership Development
  - Intellectual Property management
  - Technology Transfer
  - New Innovative Partnerships
Partnership Connections – IPP Publications

http://www.techbriefs.com/

Electronics & Computers
Semiconductors & ICs
Mechanics
Information Sciences
Materials
Software
Manufacturing & Prototyping
Machinery & Automation
Physical Sciences
Bio-Medical
Test & Measurement

http://www.sti.nasa.gov/tto/

http://www.sti.nasa.gov/spinoff/searchrecord

http://ipp.nasa.gov/innovation/index.html

http://ipp.nasa.gov/
NASA Technologies Enhance Our Lives

**International Space Station**

- Improves CPR
- Detects cardiovascular disease
- Assists patients with cognitive disorders
- Evaluates nerve function
- Fights acne
- Broadens cellular analysis
- Enhances diagnostic imaging

**Space Telescopes and Deep Space Exploration**

- Eases air traffic management
- Advances rotorcraft design
- Improves flight safety
- Boosts helicopter performance
- Protects general aviation aircraft

**Satellites and Imaging Technology**

- Detects potential threats
- Sharpens views in critical situations
- Cleans air and water for indoor environments
- Protects machines and the environment

Innovative technologies from NASA’s space and aeronautics missions (above) transfer as benefits to many sectors of society (below).

Each benefit featured in *Spinoff 2007* is listed with an icon that corresponds to the mission from which the technology originated.
Partnership Activities in FY06

• During FY 2006, the Innovative Partnership Program (IPP) facilitated many partnerships and agreements, as summarized below:
  – Over 200 partnerships with the private sector, federal and state government, academia, and other entities for dual use technology development and reimbursable use of NASA facilities.
  – Over 50 license agreements with private entities for commercial and quality of life applications of NASA developed technology.
  – Reporting of more than 750 new technologies developed by NASA civil servants and contractors, and evaluation for patent protection.
  – More than 400 agreements for commercial application of software developed by NASA.
### Summary of Partnering Tools

<table>
<thead>
<tr>
<th></th>
<th>Contract</th>
<th>Cooperative Agreement</th>
<th>Space Act Agreement</th>
<th>Patent License</th>
<th>Enhanced Use Lease</th>
<th>CRADA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Used by NASA to acquire goods, services, or both.</td>
<td>Used by NASA to sponsor activities that relate to a public purpose (generally R&amp;D).</td>
<td>Used by NASA for collaborations, excess capacity, leases, property loans, or any combination.</td>
<td>Used by NASA to transfer specific rights associated with a NASA-owned invention.</td>
<td>Used by ARC and KSC to lease under-utilized real property assets.</td>
<td>Rarely used by NASA for cooperative research and development.</td>
</tr>
<tr>
<td><strong>Competition Required?</strong></td>
<td>Generally, Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Notable Requirement(s)</strong></td>
<td>-Goods or Services -Mission Need</td>
<td>-Public Purpose -NASA Substantial Involvement (for Cooperative Agreement)</td>
<td>-No Formal “Requirements” -NASA does have “Guidelines”</td>
<td>-Intellectual Property -Royalty-Based Commercialization</td>
<td>-Real Property</td>
<td>-Federal Lab -R&amp;D</td>
</tr>
<tr>
<td><strong>NASA Cash to the Non-NASA Party</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, but it’s very rare.</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Process Owner</strong></td>
<td>Office of Procurement</td>
<td>Office of Procurement</td>
<td>Technology Transfer Office</td>
<td>Office of General Counsel*</td>
<td>ARC and KSC</td>
<td>Undefined at this time.</td>
</tr>
<tr>
<td><strong>Notable Advantage</strong></td>
<td>$$$</td>
<td>$</td>
<td>Flexibility</td>
<td>Possible Exclusive Rights to an Invention that may be Patentable</td>
<td>In-Kind Consideration for Real Property</td>
<td>Advanced Licensing of Inventions Not Yet Invented</td>
</tr>
<tr>
<td><strong>Notable Disadvantage</strong></td>
<td>Standard Regulations and Provisions (but not nearly as large as the FAR)</td>
<td>Standard Regulations and Provisions</td>
<td>Historically, SAAs are contain less rigor vs. a procurement contract.</td>
<td>Royalty Payments as Consideration</td>
<td>Limited to Two NASA Centers</td>
<td>No Cash Contribution Allowed From NASA</td>
</tr>
<tr>
<td><strong>Authority</strong></td>
<td>Space Act; 31 USC 6303; 10 USC 2302</td>
<td>Space Act; 31 USC 6304; 31 USC 6305</td>
<td>Space Act</td>
<td>35 USC 207</td>
<td>Space Act; 42 USC 2459j</td>
<td>15 USC 3710a</td>
</tr>
<tr>
<td><strong>Regulation</strong></td>
<td>Federal Acquisition Regulations</td>
<td>Grant and Cooperative Agreement Handbook (14 CFR Part 1260)</td>
<td>No Formal Regulation; NASA has “Guidelines” documented in an SAA Guide</td>
<td>37 CFR Part 404, also referred to as the “Licensing Regulations”</td>
<td>No Formal Regulation</td>
<td>No Formal Regulation</td>
</tr>
</tbody>
</table>
NRO/AIAA Space Launch Integration Forum
Innovative Technologies for Space

Invocon, Inc.
Karl Kiefer, President & CEO
- Wireless Instrumentation Systems – Sensor Control and Acquisition Telecommunications

Qualtech Systems, Inc.
Dr. Krishna R. Pattipati
- Supportability Engineering & Intelligent Health-Management for NASA Exploration Systems

Armadillo Aerospace
Neil Milburn
VP, Federal Liaison & Program Manager
- Modular Vehicle Approach to Responsive Space Access and Fractionated Space Architecture

General Atomics
Meera Venkatesh
- First Stage Highly Reliable Reusable Launch System
- Integrated Systems Health Monitoring

Sierra Lobo, Inc.
Mark Haberbusch
Director of Research & Technology
- Cryo-Tracker® Mass Gauging System

IPP Briefing to ESMD TEC – 11/15/07
Spectral Imaging Partnerships

**NASA Investment**

- NASA funded airborne whisk broom spectrometer
- Built in 1989 and operated through present

**Tech Transfer/Partnerships**

- Partnership with another agency to develop a new airborne spectrometer (MaRS)
- MaRS uses Offner and push broom design for improved performance metrics (radiometric precision, uniformity, simplicity, reliability)
- Partner provides $10M in funding to increase technology from TRL 3 to 7
- 24 month build
- Demonstrated in 2006

**Benefits to NASA**

- NASA selects advanced push broom, compact spectrometer (Moon Mineralology Mapper) for joint NASA/ISRO experiment
- Based on MaRS design
- 24 month build
- Launch in 2008
GPS Tech Transfer and Industry Partnership Sample of Return on Investment at JPL

**NASA Seed Investment**

- **GPS science receiver**
  1990’s: ~$0.5M/year for developing BlackJack receiver

- **Real-Time GIPSY (RTG) software**
  Mid 90’s: ~$0.5M total for software development

- **Global Differential GPS (GDGPS) System**
  2000-2002: $500K/year for a prototype

**Partnership highlights:**
Non-NASA funding, 96-06: ~$20M
Software royalties, 96-06: ~$5M;
Space Technology Hall of Fame, 2003

**Tech Transfer/Investment from Outside NASA**

- Technology transfer to industry enabled low-cost, COTS receiver. Investment by industry ~$10M

  1995-2000: $0.5M/year from FAA to mature RTG, support WAAS.

  2001-present: ~$8M from industry and DoD for operational GDGPS System.

  Investment by Industry outside JPL in GDGPS-related infrastructure and services: ~ $20M

**Broad Benefits to NASA**

- Industry provides BlackJack-based science receivers to Jason, ICESat, OSTM, COSMIC

  RTG is NASA Software of the Year 2000; RTG powers GDGPS

- **Real time sea height Jason-1**
- **Free global access to GDGPS corrections through Inmarsat ($1M/year value)**
- **Real time airplane positioning enables UAV-SAR mission**
- **TDRSS Augmentation Service for Satellites (TASS) enabled**
- **Real-time atmospheric sensing from COSMIC constellation**
What Can IPP Provide?

• Funding or Leveraged Resources
  – NASA SBIR/STTR funds several hundred small businesses
  – IPP Seed Fund seeks partnerships to leverage resources with the private sector and other Federal labs
  – Centennial Challenges offers millions in purses

• Technology and Software
  – Access through licensing or other partnerships

• Facilities
  – Access to NASA’s facilities through partnerships

• Expertise
  – Access to NASA’s technical expertise through partnerships

• Facilitation to enable partnerships

• Advocacy as a change agent to try new things
Summary

- IPP is seeking to add value to NASA’s Mission Directorates and their programs and projects, through technology development and infusion to meet mission needs.
- IPP provides benefits to NASA’s programs and projects through several sources.
  - There is a track record of success, but we are aggressively pursuing better integration and more infusion.
  - IPP is working to better identify priority needs across the agency, to help in shaping our portfolio of investments and partnership opportunities.
- There is tremendous potential, and with technology resources so scarce we are working diligently to harness that potential.
- IPP will continue to transfer NASA’s technology for public benefit and integrate successes into NASA messaging.
- IPP has a highly dedicated workforce at each of the ten Field Centers, they are working to build stronger connections to programs/projects at their center to better understand needs, build working relationships and increase infusion.
Interested in partnering with NASA?

Contact the relevant IPP Center Chief(s):

<table>
<thead>
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