Providing Value Through Partnerships with NASA

Doug Comstock
Director, Innovative Partnerships Program

CANEUS "Fly-by-Wireless" Workshop
Dallas, Texas
March 27th, 2007
Topics

1. **Who** does partnering at NASA?

2. **What** does IPP do?

3. **Why** does NASA do partnerships?

4. **How** are partnerships implemented?

5. **Where** can I find my IPP contact?
Who does Partnering at NASA?
“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.”
## FY 2008 Budget Request

**Budget Authority (millions)**

<table>
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<td>$6,710.3</td>
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<td>Space and Flight Support (SFS)</td>
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<td>$544.3</td>
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<td><strong>NASA FY 2008</strong></td>
<td>$16,792.3</td>
<td>$17,309.4</td>
<td>$17,614.2</td>
<td>$18,026.3</td>
<td>$18,460.4</td>
<td>$18,905.0</td>
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</tbody>
</table>

**Year to year increase**

- 3.1%
- 1.8%
- 2.3%
- 2.4%
- 2.4%

*All fiscal year budgets shown are Full Cost Simplified*

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**CANEUS "Fly-by-Wireless" Workshop**

Doug Comstock
March 27, 2007
What Does IPP Do?
**WHO?**

**CANEUS "Fly-by-Wireless" Workshop**

**WHY?**

**What?**

**Why?**

**How?**

**Where?**

**IPP Themes**

**PRIMARY ROLES**

- **Facilitator**
  - Bring parties together (both inside and outside)
  - Bridge communication gaps

- **Catalyst**
  - Implement new things = change agent
  - Create new partnerships
  - Demonstrate new approaches and methods

**HOW DO WE APPROACH AN ISSUE?**

- Always add value to Agency priorities and objectives
- Mindset must be “Yes” we can do this “if”

“No” we can’t do this “because”
CANEUS "Fly-by-Wireless" Workshop
Agency Capability Landscape

Who?

What?

Why?

How?

Where?

Exploration Systems

Productivity
- US Strategic Vision
- Human-Machine Symbiosis
- Sensors/Nano-electronics/Computing
- Data Mining
- Full Cells/Energy Storage

Safety
- Radiation
- Life Support
- Counter Measures
- Vehicle Health Mgmt.

Cost
- High Strength/Light Weight
- Multifunctionality
- Thermal Management

Space Operations

Space Shuttle: Return to Flight
- ISS: Completion
- Space Communications
- Space Transportation

Science

Heliophysics
- Planetar Science
- Astrophysics

Earth Science

Aeronautics Research

Fundamental Aeronautics
- Subsonics: Fixed Wing
- Subsonics: Rotary Wing
- Supersonics
- Hypersonics

Aviation Safety
- Integrated Vehicle Health Mgmt.
- Integrated Intelligent Flight Deck
- Integrated Resilient Aircraft Control
- Aircraft Aging & Durability

Airspace Systems
- NGATS: Airspace
- NGATS: Airport

Aeronautics Test
- Protect and maintain key research and test facilities

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March 27, 2007
Partnership Model

Who? CANEUS "Fly-by-Wireless" Workshop

What?

Why?

How?

Where?

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

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

Value of partnership to NASA = D/A

Partnership Mechanisms

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

Value of partnership to Partner = B/C

Other:
- Industry
- Other Gov’t Agencies
- National Laboratories
- Academia
- Other
IPP objective is to maximize partnership value for both NASA and partner.
Program Elements

Who?

What?

Why?

How?

Where?

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
SBIR/STTR: 3-Phase Program

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

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

- 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 Programmatic Profile

<table>
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<tr>
<th></th>
<th>FY02</th>
<th>FY03</th>
<th>FY05</th>
<th>FY06*</th>
<th>FY07**</th>
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<td>Millions of $</td>
<td>107.3</td>
<td>107.5</td>
<td>110.0</td>
<td>105.6</td>
<td>101.6</td>
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<td>Phase 1 Awards</td>
<td>312</td>
<td>291</td>
<td>297</td>
<td>260</td>
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<td>Phase 2 Awards</td>
<td>155</td>
<td>139</td>
<td>142</td>
<td>130</td>
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* FY06 program Budget Awarded in FY07 (September 06)
** FY07 President’s Budget Request
STTR Programmatic Profile

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<th>FY04</th>
<th>FY05</th>
<th>*FY06</th>
<th>**FY07</th>
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<tr>
<td>Phase 2 Awards</td>
<td>18</td>
<td>26</td>
<td>17</td>
<td>14</td>
<td></td>
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</table>

* FY06 Budgeted Awards actually made in FY07 (September 06)
** FY07 President’s Budget Request

Who?
What?
Why?
How?
Where?
SBIR Contribution to Wireless Technology

Who?

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What?

Microgravity Instrumentation
(And Structural Dynamics)

Invocon, Inc.
2006 SBIR Tibbetts Award

SCAT SBIR
Sensor Control and Acquisition
Telecommunications
Wireless Instrumentation Systems

Development Flight Instrumentation

Micro-Wireless Instrumentation Systems

Wing Leading Edge Impact Detection System

Vehicle Health Monitoring with Wireless Systems

Wireless Instrumentation and Data Recording

Doug Comstock
March 27, 2007
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.
The IPP Seed Fund has been established to enhance 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 provided a Seed Fund Announcement of Opportunity to all NASA centers and received 76 proposals.

All Seed Fund proposals, to be executed over a period of one year, were developed through the collaboration of three principal partners:
- a Partnership Manager (Center IPPO);
- a Co-Principal Investigator (NASA Program or Project Office); and
- an External Co-Principal Investigator (Private Sector, Academia, Gov’t Lab).

There were three principal criteria for selection:
- relevance and value to NASA Mission Directorates,
- scientific/technical merit and feasibility, and
- leveraging of resources.

All proposals were reviewed by a HQ team of IPP and Mission Directorate experts, and 29 proposals were selected for funding.
IPP Seed Fund

- The technology landscape covered by the successful proposals embraced the needs of all four of NASA’s Mission Directorates.
- An additional highlight of the Seed Fund effort was the leveraging of funds as a result of contributions from the three partners:
  - $6.6 million of IPP Office funds,
  - $7.5 million came from Program, Project, Center funds, and
  - $14.2 million came from External Partner funds.
- An investment of $6.6 million by IPP facilitated the generation of 29 partnerships and was leveraged by more than a factor of four, providing a total of $28.3 million for the advancement of critical technologies and capabilities for the Agency.
- The IPP Office plans to continue the Seed Fund with an annual process for selecting additional innovative partnerships for funding, to address the technology priorities of NASA’s Mission Directorates.
Seed Fund TRL Advancement

Numbers of Seed Fund Projects

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<th>TRL 3</th>
<th>TRL 4</th>
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<th>TRL 6</th>
<th>TRL 7</th>
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<td>7</td>
<td>5</td>
<td>3</td>
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Current TRL

TRL Post-Seed Fund

Who?

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Prizes

NASA’s Connection to Prizes

Early European Aviation Prizes Led To The Creation of NACA

- Progress of European aviation due to prizes and competitions troubling to US observers
- Dr. Albert F. Zahm dispatched to Europe to study the situation there
- Zahm’s report emphasized the disparity between European progress and American inertia
- Report led to the creation of the National Advisory Committee for Aeronautics the predecessor of NASA

How Do Prizes Benefit NASA?

- Increased Participation by New Sources of Innovation
- Leveraging of Tax-Payers’ Dollars
- Innovative Technology Development to Meet NASA’s Needs
- Increased Awareness of Science and Technology
- Hands-on Training for Future Workforce

Doug Comstock
March 27, 2007

CANEUS "Fly-by-Wireless" Workshop
### Centennial Challenge Competitions in 2007

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<tr>
<th>Competition</th>
<th>Purses</th>
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<td>Astronaut Glove</td>
<td>$250K</td>
<td>May 2-3 ’07</td>
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<tr>
<td>Regolith Excavation</td>
<td>$250K</td>
<td>12 May ’07</td>
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<tr>
<td>Personal Air Vehicle</td>
<td>$250K</td>
<td>4-12 August ’07</td>
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<td>Beam Power</td>
<td>$500K</td>
<td>October ’07</td>
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<tr>
<td>Tether</td>
<td>$500K</td>
<td>October ’07</td>
</tr>
<tr>
<td>Lunar Lander</td>
<td>$2M</td>
<td>October ’07</td>
</tr>
<tr>
<td>MoonROx (possible)</td>
<td>$250K</td>
<td>Exp. June ’08</td>
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</table>

**Who?**

**What?**

**Why?**

**How?**

**Where?**

**CANEUS "Fly-by-Wireless" Workshop**

**Doug Comstock**

**March 27, 2007**
FY06 Partnerships Summary

• During FY 2006, the Innovative Partnership Program (IPP) facilitated:
  
  – Over 200 partnerships with the private sector, federal and state government, academia, and other entities
  
  – Over 50 license agreements with private entities for commercial and quality of life applications
  
  – Reporting of more than 750 new technologies developed for evaluation of patent protection
  
  – More than 400 software agreements for commercial application of NASA software
GPS Technology

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, 1996 - 2006: ~$20M
Software royalties, 1996 - 2006: ~$5M;
Awards: Space Technology Hall of Fame, 2003
Y. Bar-Sever, S. Lichten JPL. January 2007

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 ht. from 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

Y. Bar-Sever, S. Lichten JPL. January 2007

CANEUS "Fly-by-Wireless" Workshop

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March 27, 2007
Why Does NASA Do Partnerships?
Looking For:

- Win-Win-Win
  - (NASA-Partner-Taxpayer/Public Good)
- Complementary Interests ($1+1>>2$)
  - Limited Rivalry
  - Compatible Goals
  - Common Goals
Strategic Goals

Provide:
• Leveraged technology investments
• Dual-use technology-related partnerships
  – create socio-economic benefits within the broader community through technology transfer
• Technology solutions for NASA

Enable:
• Cost avoidance
• Accelerate technology maturation

Increase:
• NASA's connection to emerging technologies in the external communities
“Fly-by-Wireless”:
An Agency-wide Crosscutting Technology

Who?

What?

• Modularity to add measurements and upgrades as needed.

• Reduce Infrastructure and Logistics from wired systems.

• Reduce Faults in connectivity from wires/connectors.

• Functionality and redundancy that augments wired systems.

• Weight and Volume reductions for mission performance.

• Item Identification, Location/Motion and Sensor readings.

• Reduce test instrumentation schedules and costs.

• Overcome the physical connectivity challenges with wires.

Why?

How?
Overarching Constraints of Space Systems

• Performance in Extreme Environments
  \textit{(Radiation, Temperature, Zero Gravity, Vacuum)}
• Frugal Power Availability
• High Degree of Autonomy and Reliability
• Human “Agents” and “Amplifiers”
Who?  

CANEUS "Fly-by-Wireless" Workshop  

What?  

Why?  

How?  

Where?  

Advanced concept studies to support funding decisions  

Infusion into Project  
(driven by: available PDR schedules)  

Technology Maturation  
(driven by: flight validation opportunities)  

Core Technology R&D  
(driven by: “disruptive” technologies)
How Are Partnerships Implemented?
# Summary of Partnering Tools

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<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>
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<td><strong>Purpose</strong></td>
<td>Used by NASA to acquire goods,</td>
<td>Used by NASA to sponsor activities</td>
<td>Used by NASA for collaborations, excess</td>
<td>Used by NASA to transfer specific rights</td>
<td>Used by Ames Research Center (ARC) and Kennedy</td>
<td>Rarely used by NASA for cooperative</td>
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<td></td>
<td>services, or both.</td>
<td>that relate to a public purpose</td>
<td>capacity, leases, property loans, or any</td>
<td>associated with a NASA-owned invention.</td>
<td>Space Center (KSC) to lease under-utilized</td>
<td>research and development.</td>
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<tr>
<td></td>
<td></td>
<td>(generally R&amp;D).</td>
<td>combination.</td>
<td></td>
<td>real property assets.</td>
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<td><strong>Competition Required?</strong></td>
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<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<td><strong>Notable Requirement(s)</strong></td>
<td>-Goods or Services</td>
<td>-Public Purpose</td>
<td>-No Formal &quot;Requirements&quot;</td>
<td>-Intellectual Property</td>
<td>-Real Property</td>
<td>-Federal Lab -R&amp;D</td>
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<td></td>
<td>-Mission Need</td>
<td>-NASA Substantial Involvement</td>
<td>-NASA does have &quot;Guidelines&quot;</td>
<td>-Royalty-Based Commercialization</td>
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<tr>
<td></td>
<td></td>
<td>(for Cooperative Agreement)</td>
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<td><strong>NASA Cash to the Non-NASA Party</strong></td>
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<td>Yes</td>
<td>Yes, but it's very rare.</td>
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<td>Office of Procurement</td>
<td>Technology Transfer Office</td>
<td>Office of General Counsel*</td>
<td>ARC and KSC</td>
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<td>$</td>
<td>Flexibility</td>
<td>Possible Exclusive Rights to an Invention</td>
<td>In-Kind Consideration for Real Property</td>
<td>Advanced Licensing of Inventions Not Yet</td>
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<td></td>
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<td>that may be Patentable</td>
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<td>Invented</td>
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<td><strong>Notable Disadvantage</strong></td>
<td>Standard Regulations and Provisions</td>
<td>Standard Regulations and Provisions (but not nearly as large as the FAR)</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 &quot;Guidelines&quot; documented in an SAA Guide</td>
<td>37 CFR Part 404, also referred to as the &quot;Licensing Regulations&quot;</td>
<td>No Formal Regulation</td>
<td>No Formal Regulation</td>
</tr>
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**CANEUS "Fly-by-Wireless" Workshop**

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**Doug Comstock**

**March 27, 2007**
**Licensing Overview**

**license noun**
1. the legal right to use a patent owned by another

**Types:**
- Nonexclusive
- Exclusive
- Partially Exclusive (field of use, geographic area)

**Licensing Fees By:**
- Upfront Fee AND/OR
- Annual Royalties

**Termination Can Occur IF:**
- Director determines licensee not executing plan
- Breach of agreement
- False statements
Langley Example

- High-temperature polyimide material developed for aerospace applications
- Suited for a wide range of high-temperature applications
- Licensed to Unitech (VA)
- Commercially available and used by industry and NASA

NASA material takes the heat
Space Act Agreement

**space act agreement**

1. NASA’s vehicle for establishing legally enforceable promises between the Agency and another partner

**Types:**
- Reimbursable
- Non-Reimbursable
- Funded (Rarely Used)

**Restrictions:**
- NASA Relevant SOW
- NASA Contributions must be unique
- Commitment of NASA resources
NASA and Google to Bring Space Exploration Down to Earth

MOFFETT FIELD, Calif. - NASA Ames Research Center and Google have signed a Space Act Agreement that formally establishes a relationship to work together on a variety of challenging technical problems ranging from large-scale data management and massively distributed computing, to human-computer interfaces.

As the first in a series of joint collaborations, Google and Ames will focus on making the most useful of NASA's information available on the Internet. Real-time weather visualization and forecasting, high-resolution 3-D maps of the moon and Mars, real-time tracking of the International Space Station and the space shuttle will be explored in the future.

"This agreement between NASA and Google will soon allow every American to experience a virtual flight over the surface of the moon or through the canyons of Mars," said NASA Administrator Michael Griffin at Headquarters in Washington. "This innovative combination of information technology and space science will make NASA's space exploration work accessible to everyone," added Griffin.
Where Can I Find My IPP Contact?
Conclusion

- IPP offers many opportunities to provide value through partnership with NASA.
- We’ve got a highly dedicated workforce at each of the ten Field Centers wanting to help you.
- How can you tap into this resource?

- IPP Website
  - http://www.ipp.nasa.gov/

- Contact the IPP Chief at your Field Center to follow up on any potential areas of interest.
### IPP Center Contacts

<table>
<thead>
<tr>
<th>Center</th>
<th>Name</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC</td>
<td>Rich Pisarski</td>
<td><a href="mailto:rpisarski@mail.arc.nasa.gov">rpisarski@mail.arc.nasa.gov</a></td>
<td>(650) 604-0149</td>
</tr>
<tr>
<td>DFRC</td>
<td>Gregory Poteat</td>
<td><a href="mailto:greg.poteat@dfrc.nasa.gov">greg.poteat@dfrc.nasa.gov</a></td>
<td>(661) 276-3872</td>
</tr>
<tr>
<td>GRC</td>
<td>Kathy Needham</td>
<td><a href="mailto:Kathleen.K.Needham@nasa.gov">Kathleen.K.Needham@nasa.gov</a></td>
<td>(216) 433-2802</td>
</tr>
<tr>
<td>GSFC</td>
<td>Nona Cheeks</td>
<td><a href="mailto:Nona.K.Cheeks@nasa.gov">Nona.K.Cheeks@nasa.gov</a></td>
<td>(301) 286-8504</td>
</tr>
<tr>
<td>JPL</td>
<td>Ken Wolfenbarger</td>
<td><a href="mailto:james.k.wolfenbarger@nasa.gov">james.k.wolfenbarger@nasa.gov</a></td>
<td>(818) 354-3821</td>
</tr>
<tr>
<td>JSC</td>
<td>Michele Brekke</td>
<td><a href="mailto:michele.a.brekke@nasa.gov">michele.a.brekke@nasa.gov</a></td>
<td>(281) 483-4614</td>
</tr>
<tr>
<td>KSC</td>
<td>Dave Makufka</td>
<td><a href="mailto:David.R.Makufka@nasa.gov">David.R.Makufka@nasa.gov</a></td>
<td>(321) 867-6227</td>
</tr>
<tr>
<td>LaRC</td>
<td>Marty Waszak</td>
<td><a href="mailto:m.r.waszak@nasa.gov">m.r.waszak@nasa.gov</a></td>
<td>(757) 864-4015</td>
</tr>
<tr>
<td>MSFC</td>
<td>Jim Dowdy</td>
<td><a href="mailto:Jim.Dowdy@nasa.gov">Jim.Dowdy@nasa.gov</a></td>
<td>(256) 544-7604</td>
</tr>
<tr>
<td>SSC</td>
<td>John Bailey</td>
<td><a href="mailto:John.W.Bailey@nasa.gov">John.W.Bailey@nasa.gov</a></td>
<td>(228) 688-1660</td>
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Who?  
CANEUS “Fly-by-Wireless” Workshop
What?  
Why?  
How?  
Where?  
Questions?