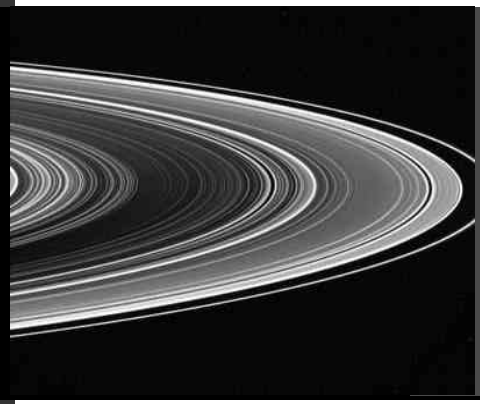


Providing Value Through Partnerships with NASA

Doug Comstock

Director, Innovative Partnerships Program

CANEUS "Fly-by-Wireless" Workshop

Dallas, Texas

March 27th, 2007

Topics

Who?

What?

Why?

How?

Where?

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?

2006 NASA Strategic Plan

Who?

What?

Why?

How?

Where?

"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."

Agency Organization

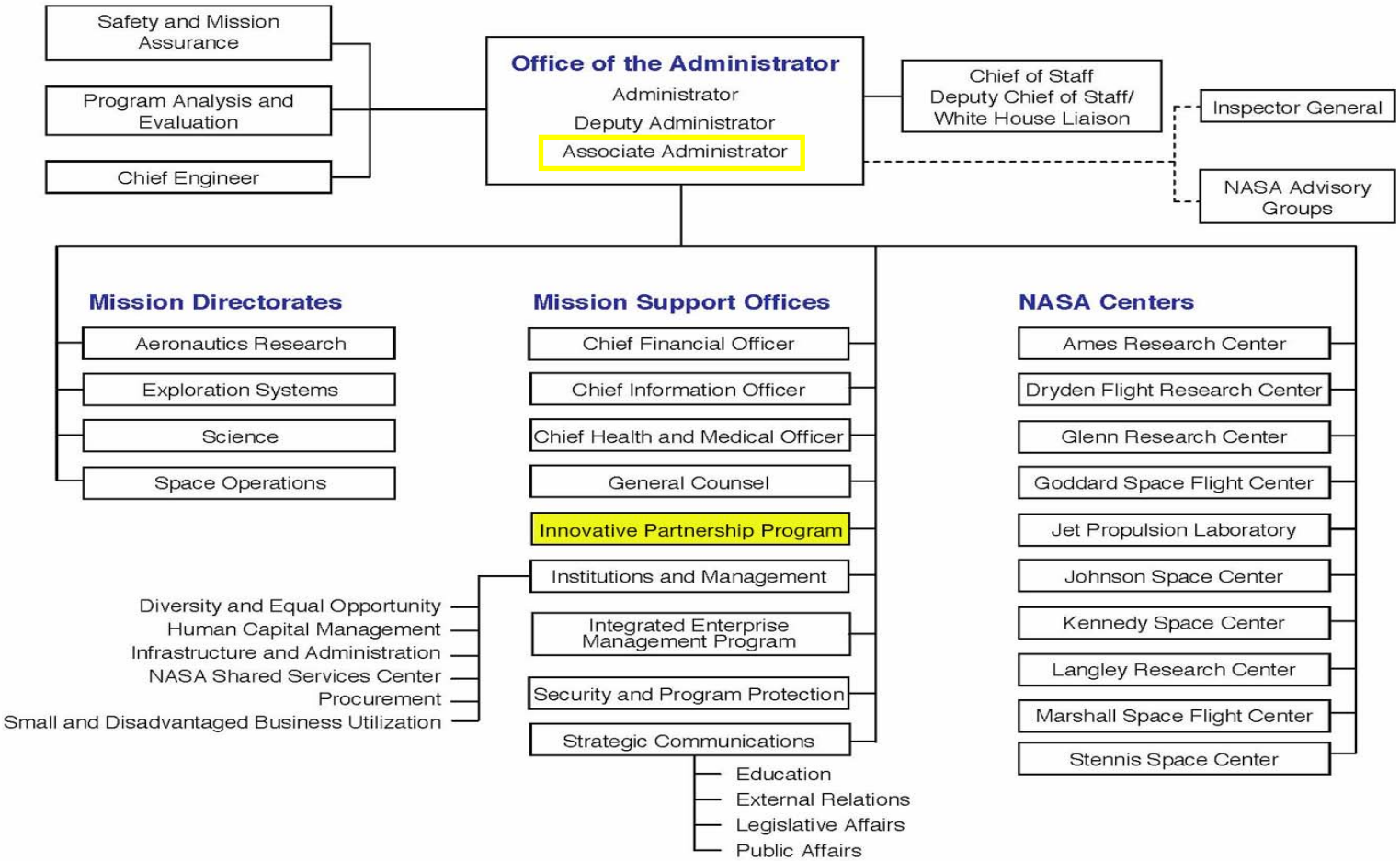
Who?

What?

Why?

How?

Where?



* In accordance with law, the offices of Diversity and Equal Opportunity and Small and Disadvantaged Business Utilization maintain reporting relationships to the Deputy Administrator and Administrator.

Innovative Partnerships Program Office

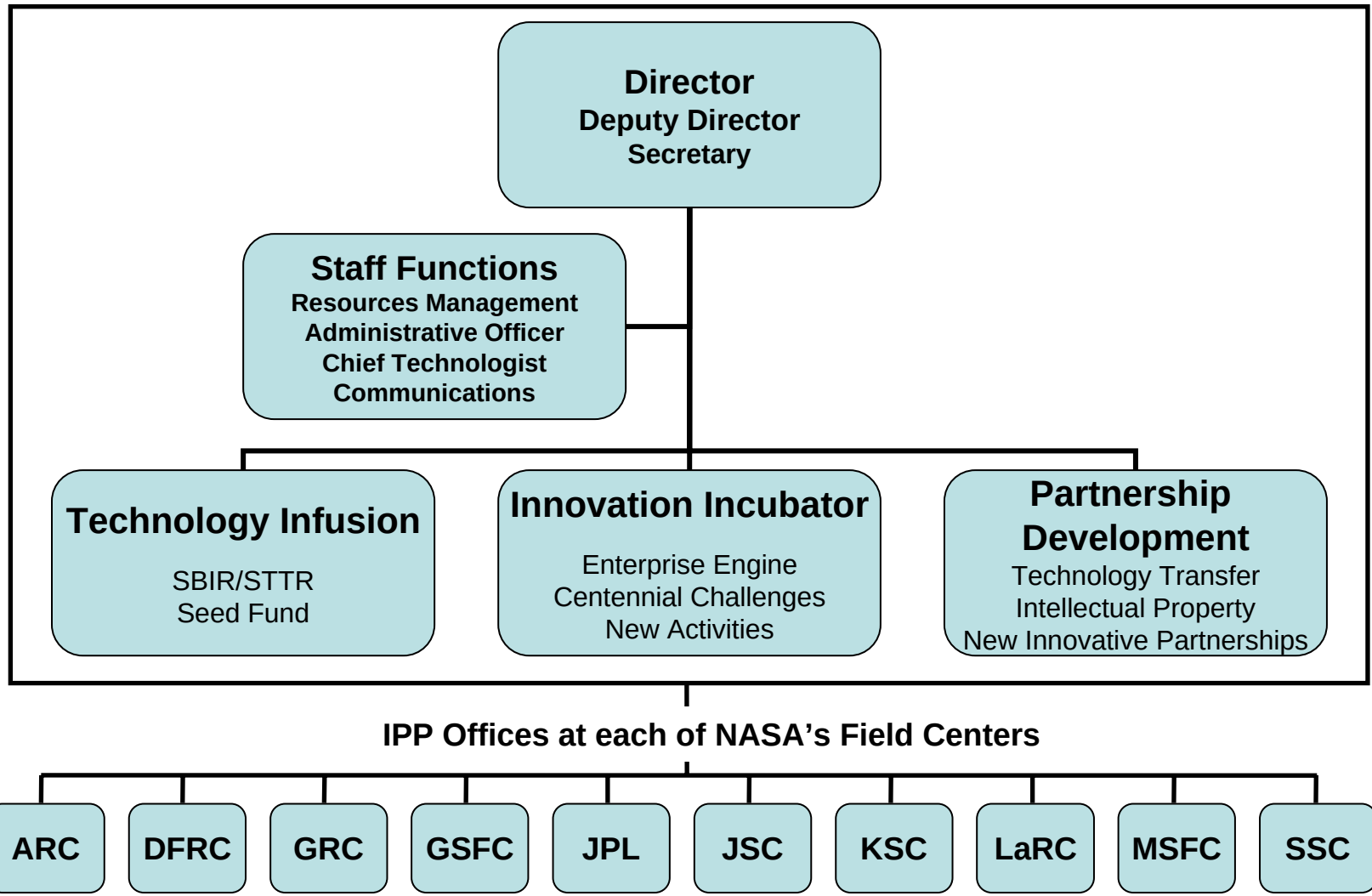
Who?

What?

Why?

How?

Where?



FY 2008 Budget Request

Who?

What?

Why?

How?

Where?

Budget Authority (millions)	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012
Science, Aeronautics and Exploration	**$10,650.6**	**$10,483.1**	**$10,868.4**	**$11,364.1**	**$15,386.5**	**$15,888.6**
Science	**$5,466.8**	**$5,516.1**	**$5,555.3**	**$5,600.6**	**$5,656.9**	**$5,802.7**
Planetary Science	$1,411.2	$1,395.8	$1,676.9	$1,720.3	$1,738.3	$1,748.2
Heliophysics	$1,028.1	$1,057.2	$1,028.4	$1,091.3	$1,241.2	$1,307.5
Astrophysics	$1,563.0	$1,565.8	$1,304.2	$1,268.9	$1,266.2	$1,393.8
Earth Science	$1,464.5	$1,497.3	$1,545.8	$1,520.1	$1,411.2	$1,353.2
Exploration Systems	**$4,152.5**	**$3,923.8**	**$4,312.8**	**$4,757.8**	**$8,725.2**	**$9,076.8**
Constellation Systems	$3,232.5	$3,068.0	$3,451.2	$3,784.9	$7,666.0	$7,993.0
Advanced Capabilities	$920.0	$855.8	$861.6	$973.0	$1,059.1	$1,083.9
Aeronautics Research	**$529.3**	**$554.0**	**$546.7**	**$545.3**	**$549.8**	**$554.7**
Aeronautics Technology	$529.3	$554.0	$546.7	$545.3	$549.8	$554.7
Cross-Agency Support Programs	**$502.0**	**$489.2**	**$453.5**	**$460.4**	**$454.7**	**$454.4**
Education	$167.4	$153.7	$152.8	$152.7	$149.8	$149.6
Advanced Business Systems	$97.4	$103.1	$69.4	$71.6	$67.6	$67.5
Innovative Partnerships Program	$215.1	$198.1	$197.2	$199.8	$200.0	$200.0
Shared Capability Assets Program	$22.1	$34.3	$34.2	$36.2	$37.3	$37.2
Exploration Capabilities	**$6,108.3**	**$6,791.7**	**$6,710.3**	**$6,625.7**	**$3,036.6**	**$2,978.0**
Space Operations	**$6,108.3**	**$6,791.7**	**$6,710.3**	**$6,625.7**	**$3,036.6**	**$2,978.0**
Space Shuttle	$4,017.6	$4,007.5	$3,650.9	$3,634.4	$116.2	$0.0
International Space Station	$1,762.6	$2,238.6	$2,515.1	$2,609.2	$2,547.5	$2,600.8
Space and Flight Support (SFS)	$328.1	$545.7	$544.3	$382.0	$372.9	$377.2
Inspector General	**$33.5**	**$34.6**	**$35.5**	**$36.4**	**$37.3**	**$38.3**
Inspector General	**$33.5**	**$34.6**	**$35.5**	**$36.4**	**$37.3**	**$38.3**
NASA FY 2008	**$16,792.3**	**$17,309.4**	**$17,614.2**	**$18,026.3**	**$18,460.4**	**$18,905.0**
Year to year increase		*3.1%*	*1.8%*	*2.3%*	*2.4%*	*2.4%*

***All fiscal year budgets shown are Full Cost Simplified**

Policy & Statutory Authority

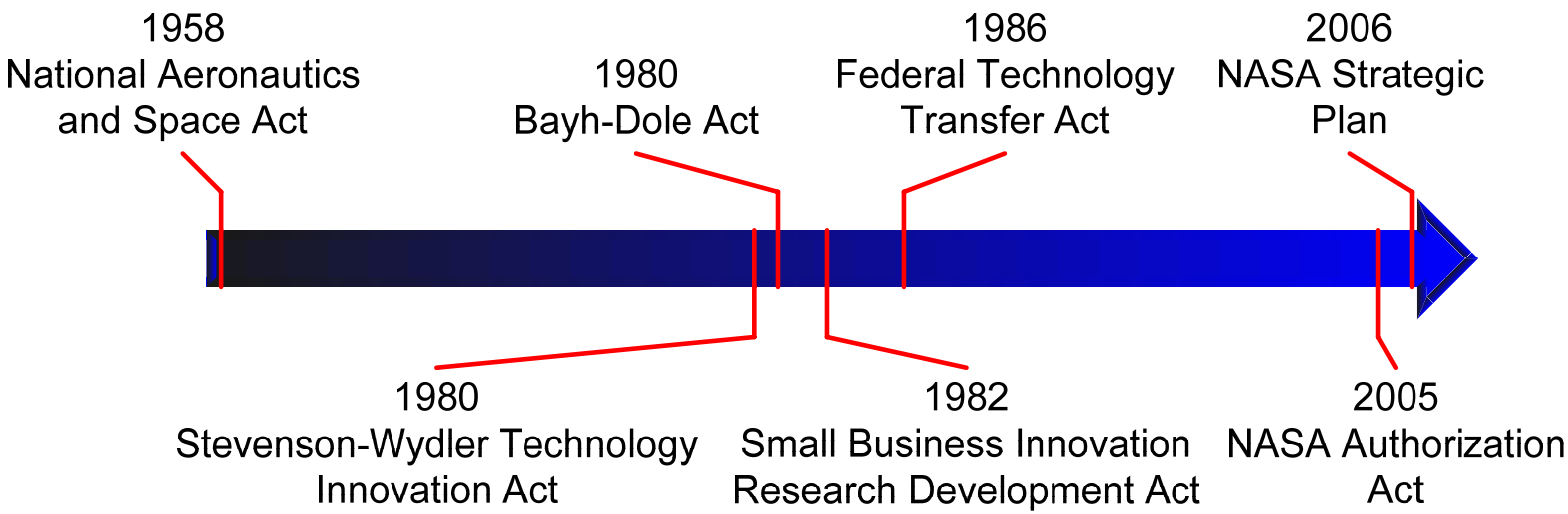
Who?

What?

Why?

How?

Where?



What Does IPP Do?

IPP Themes

Who?

What?

Why?

How?

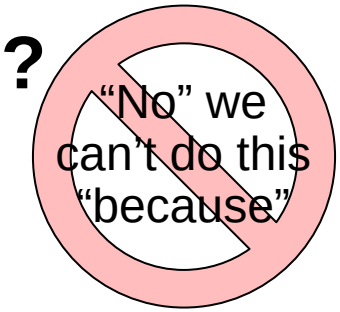
Where?

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”



IPP's Dynamic Innovation Process

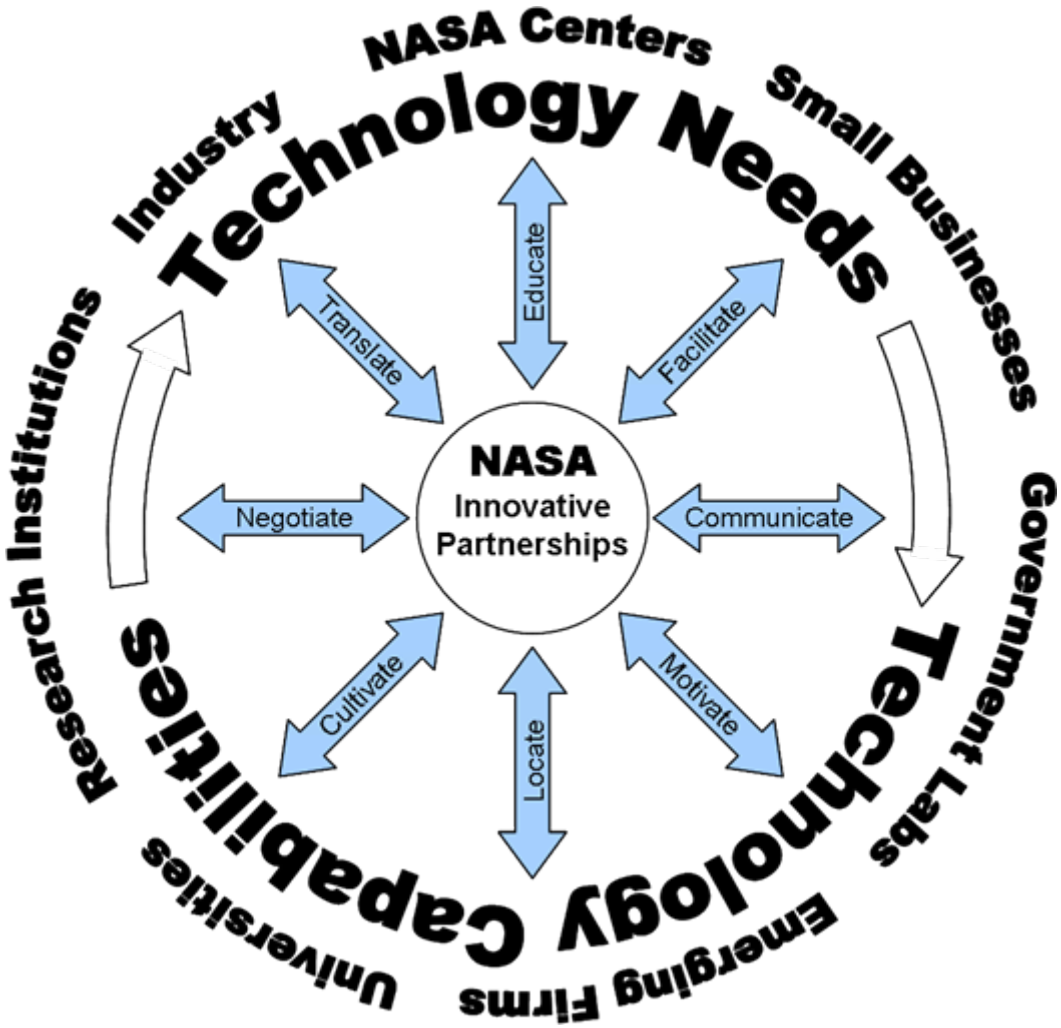
Who?

What?

Why?

How?

Where?



Agency Capability Landscape

Who?

What?

Why?

How?

Where?

Exploration Systems

• High Strength/Light Weight
• Multifunctionality • Thermal Management

Space Operations

Space Shuttle: Return to Flight

Space Communications

ISS: Completion

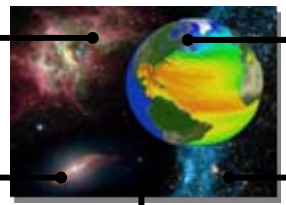
Space Transportation

Science

Heliophysics

Earth Science

Planetary Science



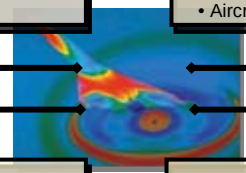
Astrophysics

Management & Policy

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: Airportal

Aeronautics Test
Protect and maintain key research and test facilities

Partnership Model

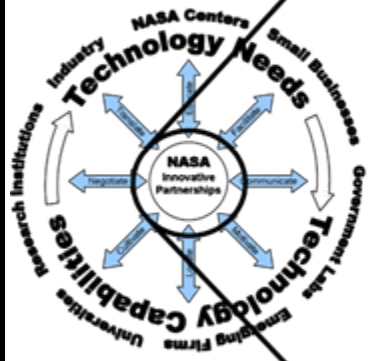
Who?

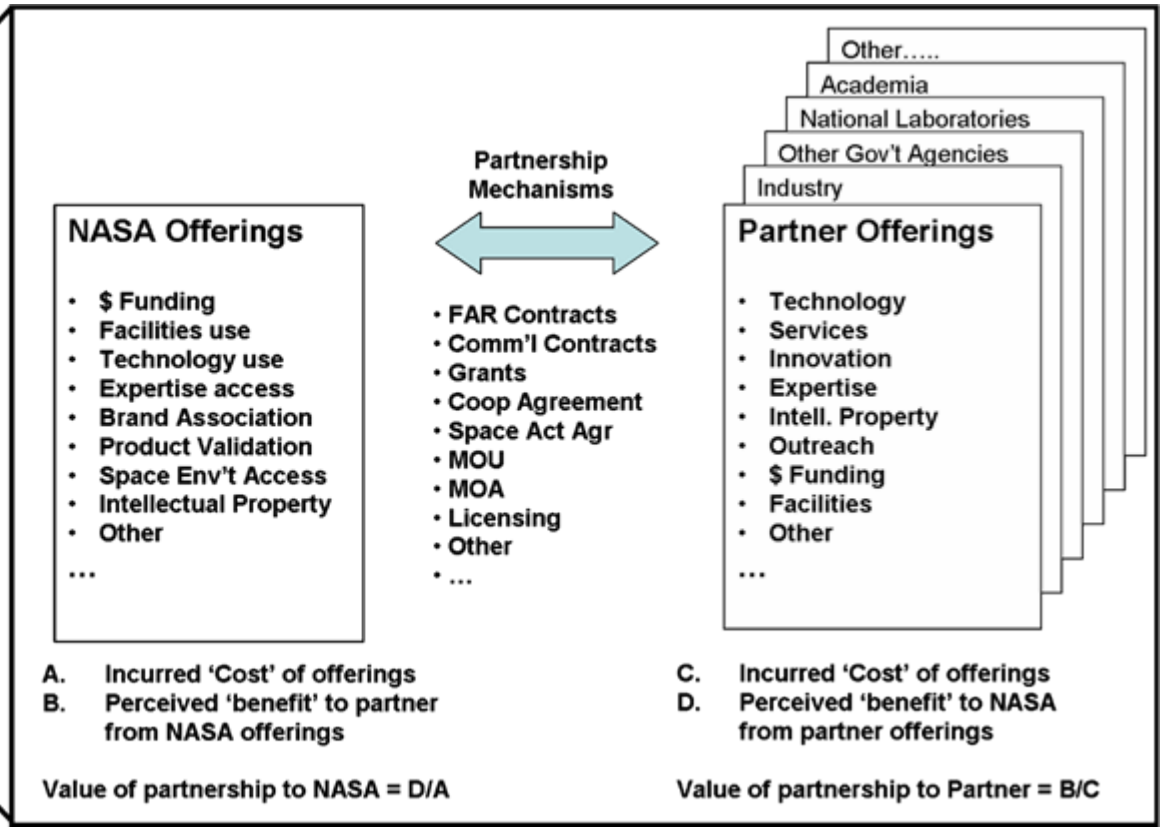
What?

Why?

How?

Where?





Partnership Model – Value Proposition

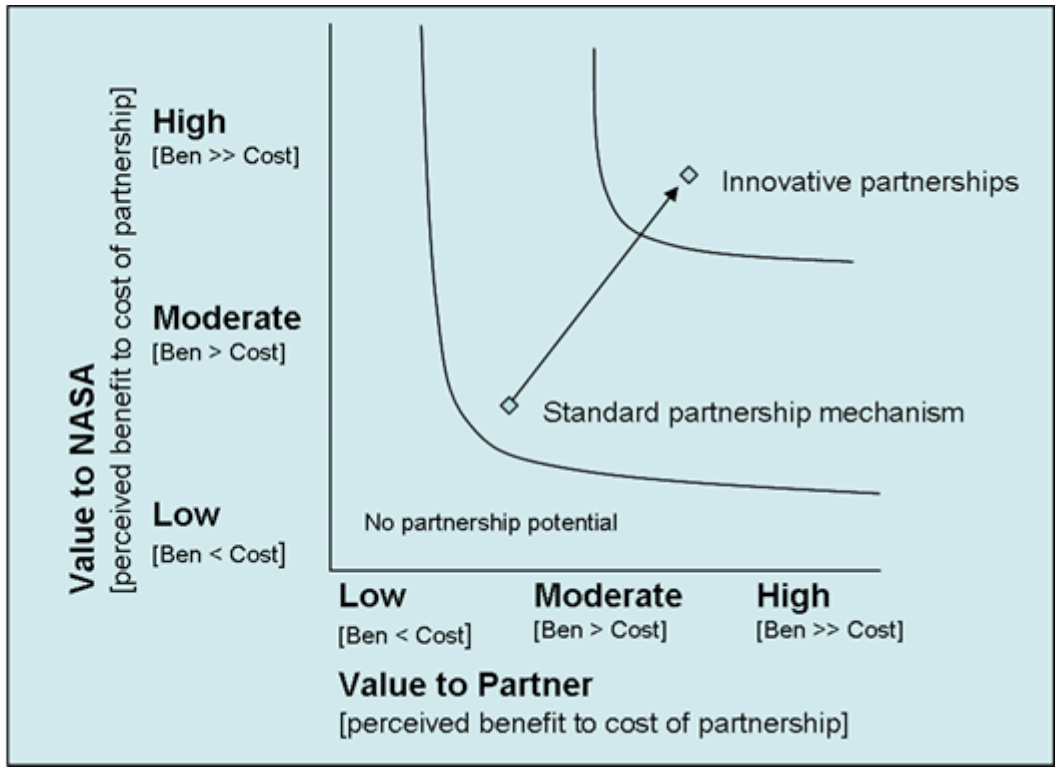
Who?

What?

Why?

How?

Where?



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

Who?

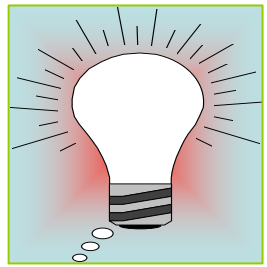
What?

Why?

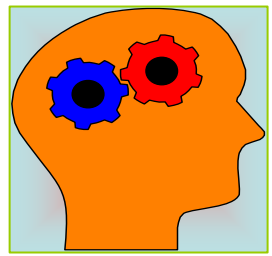
How?

Where?

- 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

Who?

What?

Why?

How?

Where?

	FY02	FY03	FY05	FY06*	FY07**
Millions of $	107.3	107.5	110.0	105.6	101.6
Phase 1 Awards	312	291	297	260	
Phase 2 Awards	155	139	142	130	

* FY06 program Budget Awarded in FY07 (September 06)
** FY07 President's Budget Request

STTR Programmatic Profile

Who?

What?

Why?

How?

Where?

	FY03	FY04	FY05	*FY06	**FY07
Millions of $	6.4	12.9	13.2	12.7	12.2
Phase 1 Awards	45	40	35	27	
Phase 2 Awards	18	26	17	14	

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

SBIR Contribution to Wireless Technology

Who?

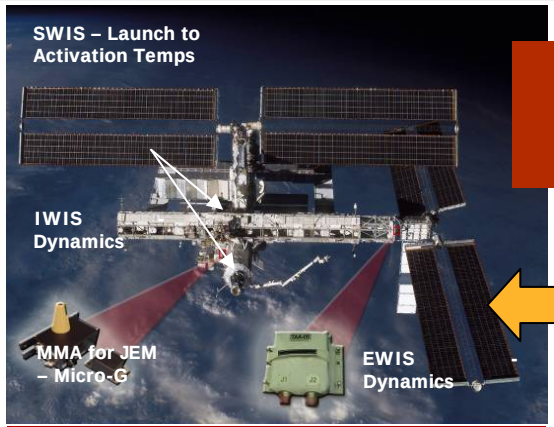
What?

Why?

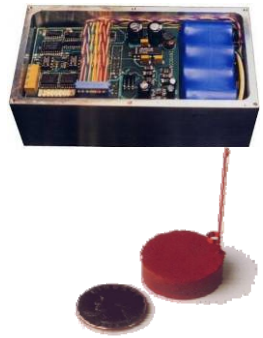
How?

Where?

SCAT SBIR
Sensor Control and Acquisition Telecommunications
Wireless Instrumentation Systems

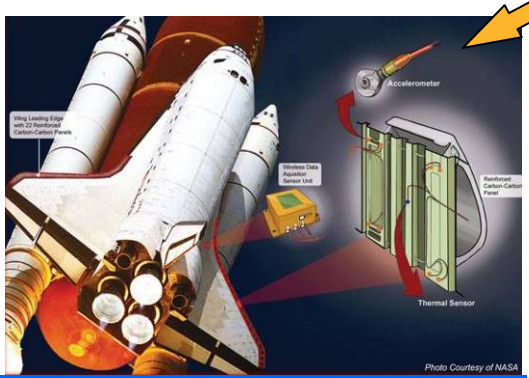


Microgravity Instrumention
(And Structural Dynamics)



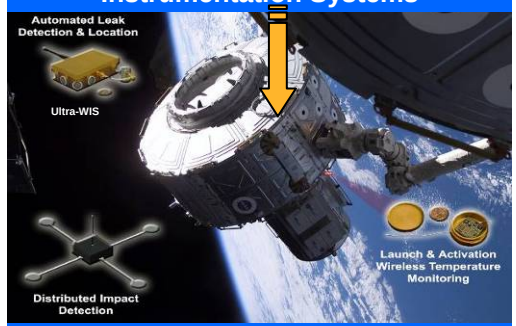
Development Flight Instrumentation

Invocon, Inc.
2006 SBIR Tibbetts Award

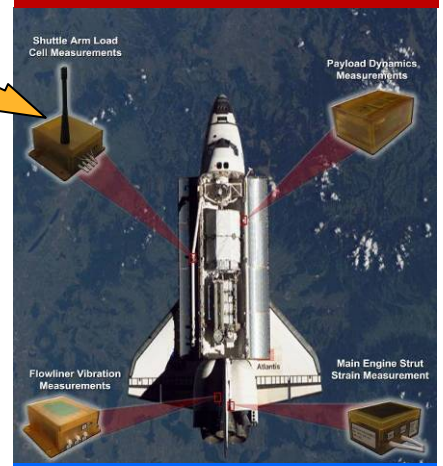


Wing Leading Edge Impact Detection System

Micro-Wireless Instrumentation Systems



Vehicle Health Monitoring with Wireless Systems



Wireless Instrumentation and Data Recording

SBIR Technologies on Mars Exploration Rovers

Who?

What?

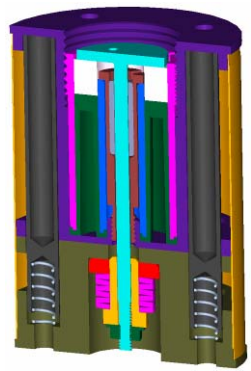
Why?

How?

Where?

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.

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.



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.

IPP Seed Fund

Who?

What?

Why?

How?

Where?

- 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

Who?

What?

Why?

How?

Where?

- 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

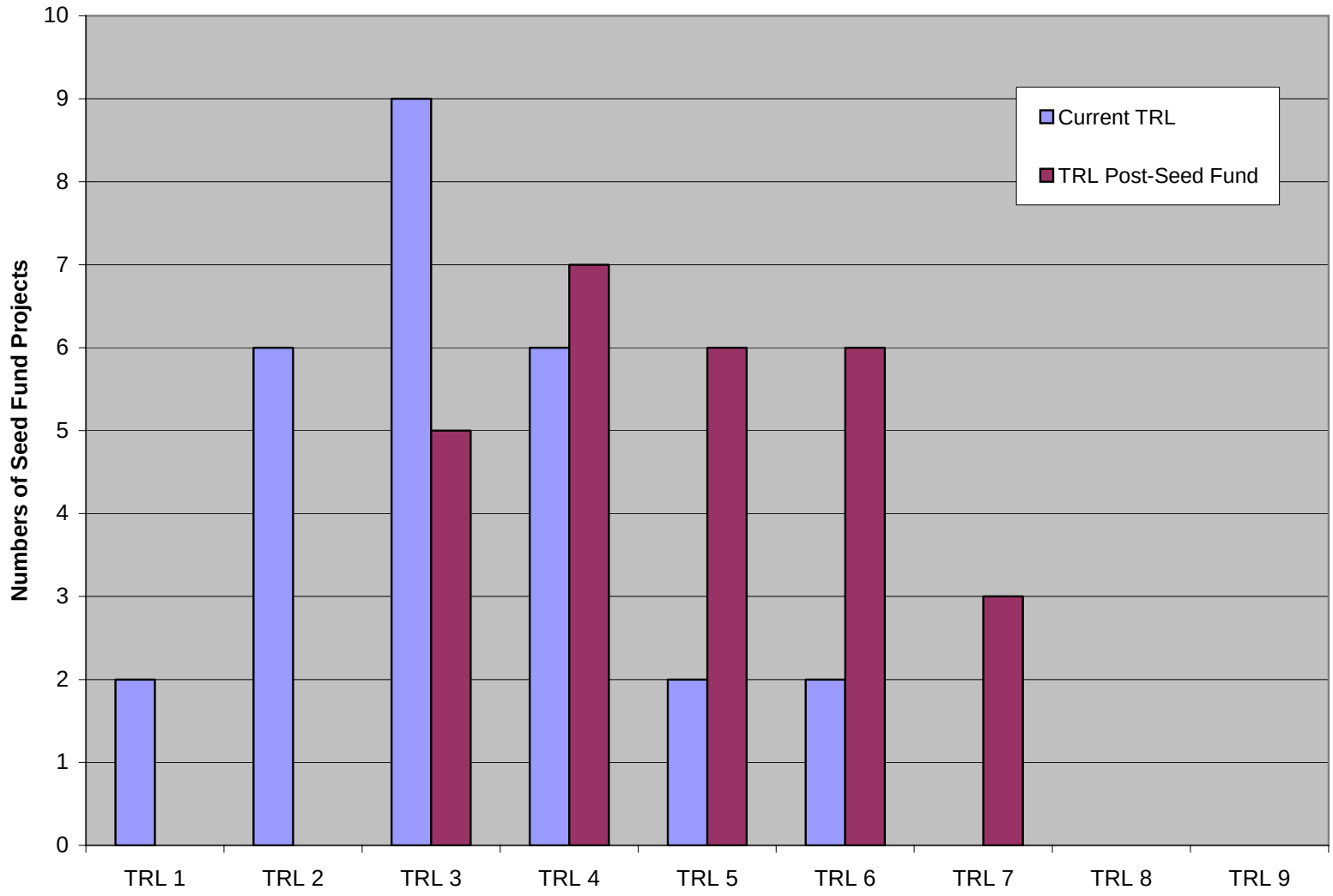
Who?

What?

Why?

How?

Where?



Prizes

Who?

What?

Why?

How?

Where?

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

  – *Source: Bilstein, Orders of Magnitude A History of the NACA and NASA, 1915-1990, NASA SP-4406,National Aeronautics and Space Administration, Washington, DC, 1989."*

How Do Prizes Benefit NASA?

Who?

What?

Why?

How?

Where?

- 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

Centennial Challenge Competitions in 2007

Who?

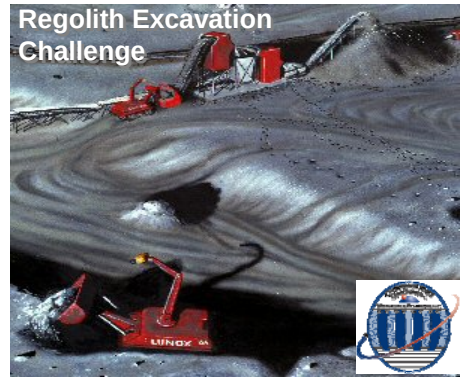
What?

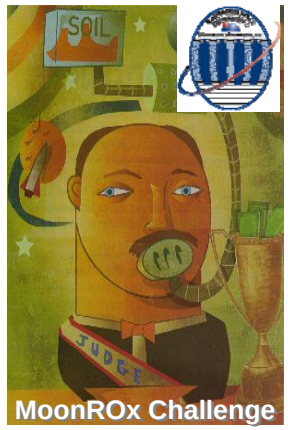
Why?

How?

Where?

Competition	Purses	Comp. Date
Astronaut Glove	$250K	May 2-3 ’07
Regolith Excavation	$250K	12 May ’07
Personal Air Vehicle	$250K	4-12 August ’07
Beam Power	$500K	October ‘07
Tether	$500K	October ’07
Lunar Lander	$2M	October ’07
MoonROx (possible)	$250K	Exp. June ’08





FY06 Partnerships Summary

Who?

What?

Why?

How?

Where?

- 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

Who?

What?

Why?

How?

Where?

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

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

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

Why Does NASA Do Partnerships?

Overview

Who?

What?

Why?

How?

Where?

Looking For:

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

Strategic Goals

Who?

What?

Why?

How?

Where?

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?

Why?

How?

Where?

- 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.

NASA's Exploration Roadmap

Who?

What?

Why?

How?

Where?

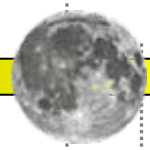
05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Initial CEV Capability

1st Human CEV Flight

Lunar Outpost Buildup

Lunar Robotic Missions

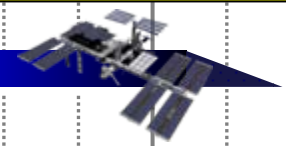


7th Human Lunar Landing

Science Robotic Missions

Mars Expedition Design

Commercial Crew/Cargo for ISS



Space Shuttle Ops

CEV Development

Crew Launch Development

CEV Production and Operations

Lunar Lander Development

Early Design Activity

Lunar Heavy Launch Development

Earth Departure Stage Development

Surface Systems Development

Overarching Constraints of Space Systems

Who?

What?

Why?

How?

Where?

- Performance in Extreme Environments *(Radiation, Temperature, Zero Gravity, Vacuum)*
- Frugal Power Availability
- High Degree of Autonomy and Reliability
- Human “Agents” and “Amplifiers”

IPP Technology Portfolio: A TRL View

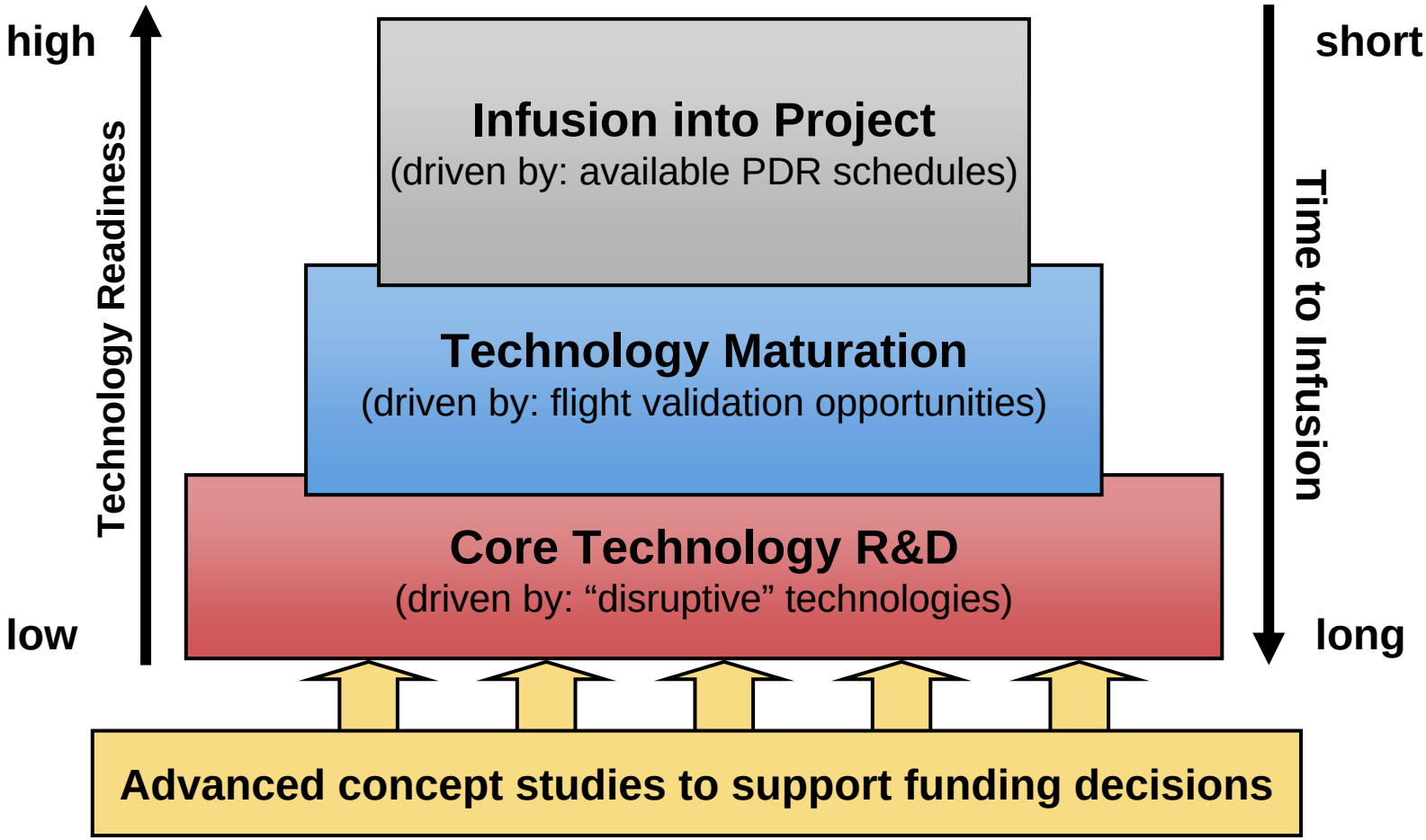
Who?

What?

Why?

How?

Where?



How Are Partnerships Implemented?

Summary of Partnering Tools

Who?

What?

Why?

How?

Where?

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

Licensing Overview

Who?

What?

Why?

How?

Where?

li·cense *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

NASA material takes the heat

- 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

Space Act Agreement

Who?

What?

Why?

How?

Where?

space act a·gree·ment

noun

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

“Non-reimbursable” Example

Who?

What?

Why?

How?

Where?

- **RELEASE: 06-371**

  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

Who?

What?

Why?

How?

Where?

- 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

Who?

What?

Why?

How?

Where?

Center	Name	Email	Phone
ARC	Rich Pisarski	rpisarski@mail.arc.nasa.gov	(650) 604-0149
DFRC	Gregory Poteat	greg.poteat@dfrc.nasa.gov	(661) 276-3872
GRC	Kathy Needham	Kathleen.K.Needham@nasa.gov	(216) 433-2802
GSFC	Nona Cheeks	Nona.K.Cheeks@nasa.gov	(301) 286-8504
JPL	Ken Wolfenbarger	james.k.wolfenbarger@nasa.gov	(818) 354-3821
JSC	Michele Brekke	michele.a.brekke@nasa.gov	(281) 483-4614
KSC	Dave Makufka	David.R.Makufka@nasa.gov	(321) 867-6227
LaRC	Marty Waszak	m.r.waszak@nasa.gov	(757) 864-4015
MSFC	Jim Dowdy	Jim.Dowdy@nasa.gov	(256) 544-7604
SSC	John Bailey	John.W.Bailey@nasa.gov	(228) 688-1660

Questions?