

# Agenda

## Part 0 – Brief Synopsis

## Part 1 – Background and Methodology

- Charter and Roadmap
- Methodology and Process

## Part 2 – Key Findings

- Common Barriers
- Common Themes and Categories

## Part 3 – Recommended Actions

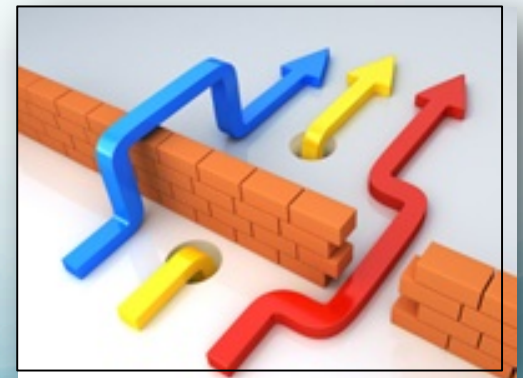
- Areas for Action
- High Impact Actions

## Part 4 – Recap & Epilogue



# A Brief Synopsis

- What is?
  - Innovation is valued and an increasing priority but significant barriers persist
  - Persistent Agency-wide barriers reflect systemic nature of challenges
  - Innovation is a wicked problem - no single, simple remedy exists
- What if?
  - Time, effort, & cost of innovation is accepted and routine
  - Processes account for distinctions between innovation and “execution”
- What will work?
  - Systemic approach – multiple pathways with multiple solutions
  - Sustained effort – many small solutions, assess solution effectiveness, reassess barriers, initiate additional targeted solutions
- Where to start?
  - Time for Innovation
  - Spaces for Innovation
    - Targeted/leveraged funding for Innovation
    - Processes that accommodate Innovation
    - Skunkworks – targeted innovation pathways



# B2I Mission and Vision

***“There’s a short-sighted tendency to call for cancellation of our long-range research programs, especially if instant, tangible monetary returns are not in evidence. This short-term approach to our long-term requirements can seriously jeopardize our future.”***

- Neil Armstrong (June 1970)

## Vision

- A bold, collaborative culture of optimism and trust that empowers the NASA workforce and leverages their talent, passion, and can-do attitude to enable the NASA mission.

## Mission

- Define innovation in context of NASA as an evolving Agency
- Identify common barriers to innovation at NASA
- Recommend actionable steps toward lowering or eliminating innovation barriers

## Diverse Perspectives

- Cultural Perspective: To be innovative, we must acknowledge and accept the time, effort, & cost of innovation as a routine part of our culture.
- One NASA Perspective: Connect across borders and create/share innovation capabilities
- Balanced Perspective
  - Balance short-term mission/project focus with longer term strategic technology
  - Encourage new, wild concepts enabling future capabilities and missions
  - Work with Agency & external partners to collaborate and pursue new opportunities

# NASA is Innovative. Right?

## Many data support NASA's innovativeness

- Top Ranking in 2013 Federal Employee Viewpoint Survey
- Best in government in adopting best commercial practices

## But there's room for improvement



# Innovation is an Agency Priority

## Office of the Chief Technologist

- Agency and Center Chief Technologists
- NASA Innovative Advanced Concepts (NIAC)
- Centennial Challenges



## Space Technology Program

- Flight Opportunities
- Small Spacecraft Technology Program
- Space Technology Research Grants
- Game Changing Development Program
- Technology Demonstration Missions



## Innovation Funds

- OCT Center Innovation Fund
- ARMD Seedling Fund
- Science Innovation Fund

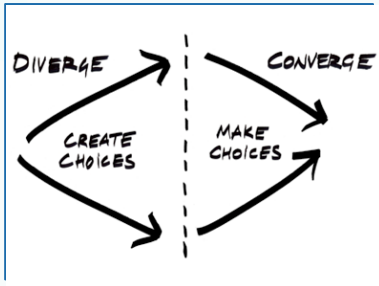
Open Innovation - NASA Innovation Pavilion & NASA@Work

NASA Human Resource Portal - Innovation@NASA

NASA CIO - NASA IT Labs



# The B2I Methodology



## Develop actionable solutions

- Engage centers for diverse range of options
- Team collaboration to integrate and prioritize

## Map barriers to cross-cutting themes

- Address multiple categories of barriers
- Potential for high impact

## Combine and compare to identify Agency-Level barriers

- Achieved through team consensus
- Agency-Level: Barriers broadly affect Centers but Centers have limited/no control over them

## Broadly engage every field center

- Each Center identified Center-Level innovation barriers (surveys, focus groups, interviews, data-mining, etc.)

## Define Innovation

- Establish a shared understanding of innovation from a NASA perspective



# Defining Innovation

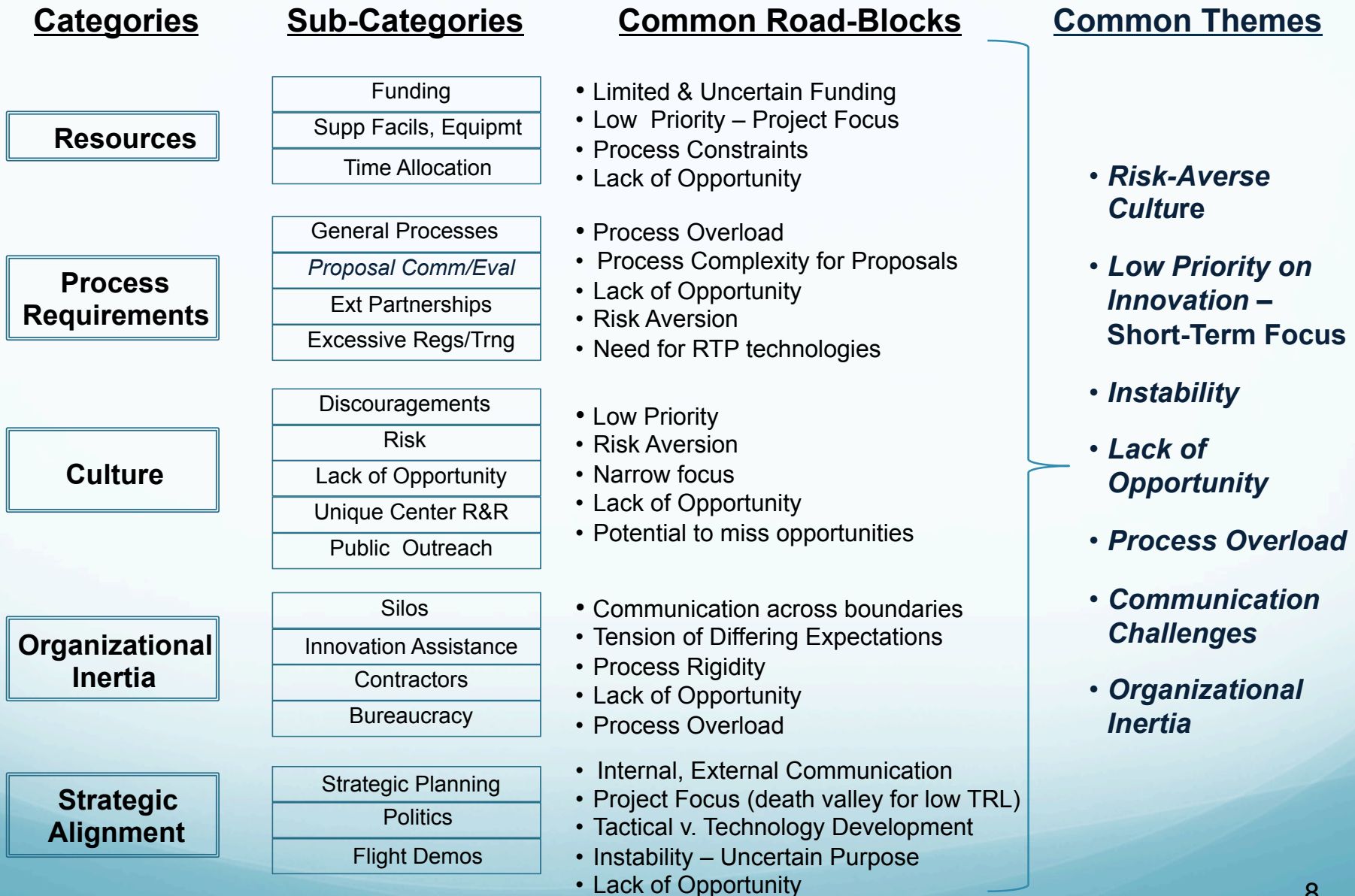
“Application of creative ideas to improve and generate value for the organization”

*Not just technology,  
Not just revolutionary,  
Not just a word, but ...*

*Ingrained in every aspect of the Agency*

- Relevant to every person to improve performance and growth through improvements in *efficiency, productivity, and quality*
- Relevant to every organization to adopt forms and practices to better address strategic goals (e.g., adopting best practices)
- Relevant to projects and teams by encouraging and developing “breakthroughs” and “disruptive innovations” to overcome technical challenges – *both near- and far-term*

# Common Barriers (70+) → Common Themes (7)



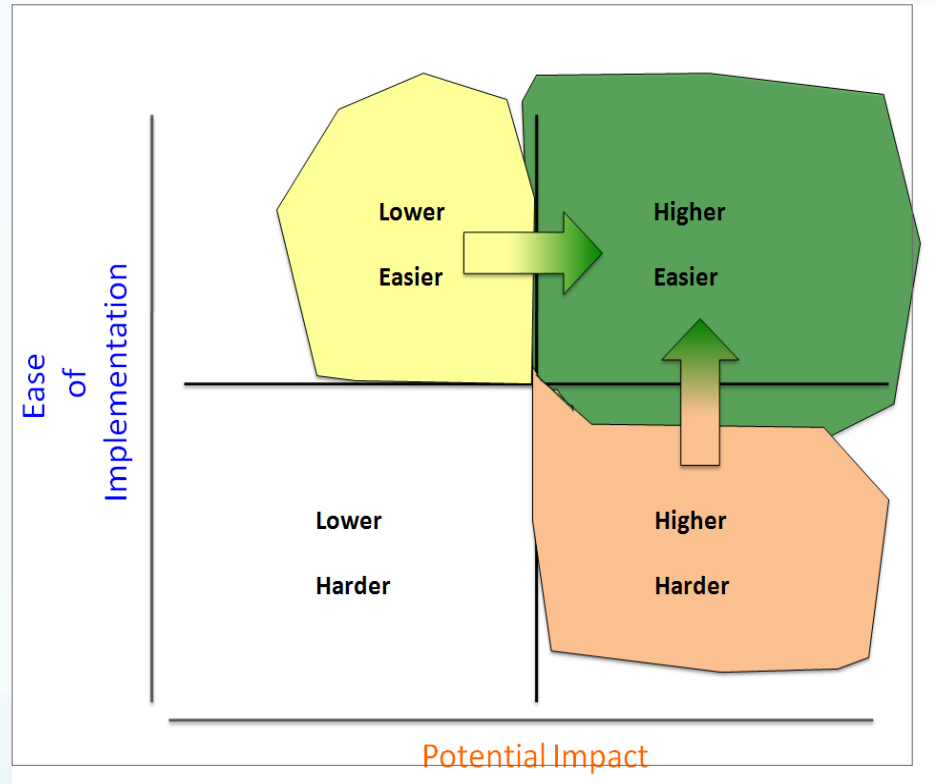


# Down-selecting / Refining Solutions (~280 to ~35)

## Recommendation Development

- **Basis:** Collected 280+ recommendations from across the centers
- **Criteria:**
  - **Actionable**
  - **Cut across themes**
  - **Address multiple barriers**
  - **Complement/leverage each other**
- **Strategy:**
  - Achieve early wins with most potential value to the Agency
  - Follow-on solutions downstream to sustain impact
    - ★ Consider multiple solution paths
  - Revisit promising options beyond current scope
- **Selection:** Voted on “best” recommendations and sorted, combined, prioritized (from ~35 to 16) and developed 5 high impact actions

## Solution Mapping



# Consensus Recommendations

*Protect and sustain resources for innovative ideas and provide opportunities, assistance, and recognition to innovators*

## Key Areas to Focus Action:

- Select an initial set of high leverage actions to achieve early wins with most potential value to the Agency
- Pursue multiple solution paths
- Sustain follow-on efforts to implement other recommendations to sustain impact
- Revisit promising options beyond the current scope

## Top 5 Solutions

- 1. Corporate Time for Creative Thinking**
- 2. Innovation Labs & Creative Spaces**
- 3. Innovation Funding & Project Investments in Innovation**
- 4. Process Streamlining**
- 5. Skunkworks**

# 1. Time for Creative Thinking

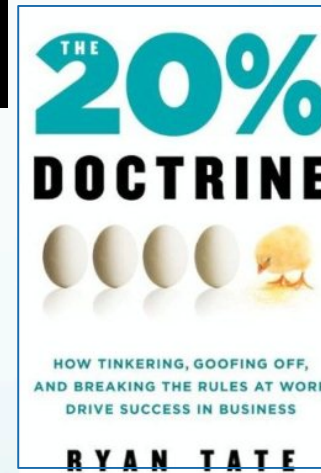
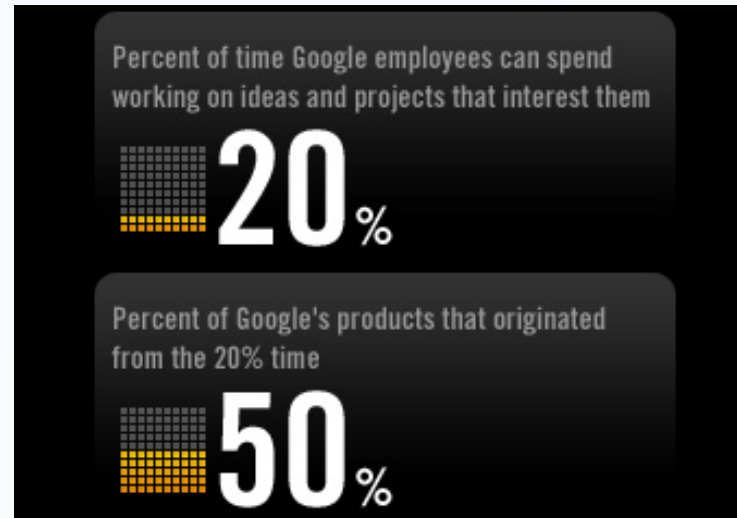
**Description:** Replicate best practices of companies where employees are allowed, *and encouraged*, to spend a % of time (min-max) to pursue innovative ideas, whether or not directly related to their current projects.

## **Benefits:**

- Incentivizes innovative thinking
- Allows people the freedom to find their creative strengths
- Enables exploration of solutions to strategic needs even beyond the immediate sandbox

## **Actions:**

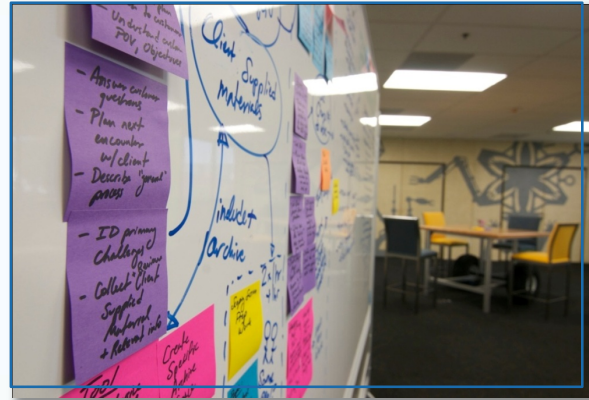
1. *Solicit support from NASA senior management and joint leadership teams for flexible charging*
2. *Demonstrate concept relevance to NASA's strategic goals*
3. *Specifically include people reassigned to work urgent mission needs, so they are allowed keep their hand in innovative projects*



## **Related Activities:**

- NASA OHCM Study Team
- Center Innovation Funds (CIF's)
- Relaxed FTE charge codes (several Centers)
- Collaboration spaces (several Centers)
- GRC R&T Directorate declared 10% time for Innovation & Creativity

# 2. Innovation Labs & Creative Spaces



## Benefits:

- Recognizes that creative problem-solving requires different skills and mindsets
- Avails ongoing Center investments and establishes best practices & lessons learned for future innovation labs & spaces
- Identifies unique facilities available to increase & leverage collaboration among Centers
- Provides a basis for virtual Agency-wide “skunkworks” ([links to other recommendations](#))



## Actions:

1. Encourage all Centers to establish dedicated support for Innovation Labs & other creative spaces
2. Encourage cross-center sharing of methods, best practices, successes, and instructive failures.
3. Identify associated POC's as resources for other centers planning or developing similar or unique facilities

## Related Activities:

- ARC:** Quickshop, Spaceshop, ARC Tek Forum  
**GRC:** Creativity & Innovation Commons, I-Lab  
**GSFC:** Mission Design, Instrument Design, and Architecture Design Labs  
**KSC:** Cyber Café, Innovation SPACE, Design Visualization Lab  
**JPL:** Left Field, Innovation Foundry  
**JSC:** Collaboration Centers & creative spaces, IRAD Poster Sessions  
**LaRC:** NavCenter, pFAB/iFAB  
**MSFC:** Propulsion Research Lab

# 3. Projects & Innovation Funding

**Description:** Require *new* flight programs/projects to include an element of innovation (e.g., hardware, software, process, procurement) that contains potential for high-payoff and promotes acceptance of informed risk.

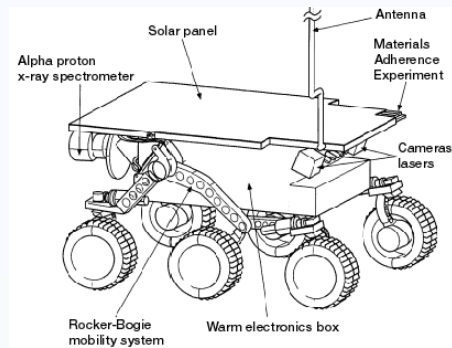
## **Benefits:**

- Establishes a cultural norm – expectation that projects will factor in (accept) informed, appropriate R&D risk
- Affords contractors opportunities to be key contributors to NASA's vision (current contracts can act as limiters)
- Increases resources available for investment in new ideas/solutions

## **Actions:**

1. Form a tiger team with OCFO, Procurement, and Legal to lay out a pathfinder strategy
2. Include innovative solutions/approaches in project formulation and assessment
3. Fence a % of new project budgets for innovative technology development

## **Sojourner**



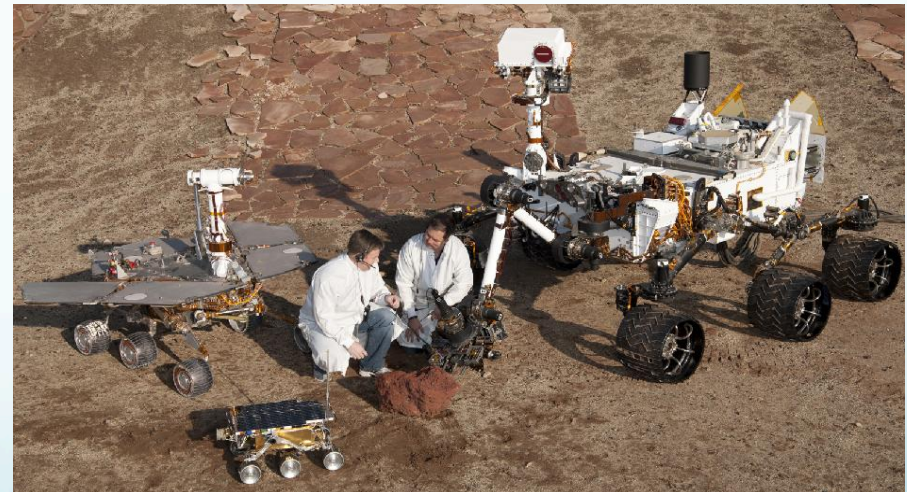
Pathfinder Mission leadership did not want Sojourner

Many scientists saw no need for a mobile platform

It was developed by a small team, largely in a rundown building on the edge of lab

The team was left mostly to themselves

**... yet a \$25M flight experiment revolutionized planetary exploration**



## **Related Activities:**

- HEOMD - AES, HRP
- OCT Game-Changing
- ARMD Seedling Fund

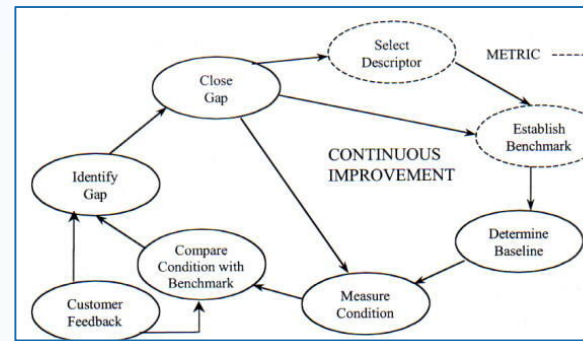
# 4. Process Streamlining

**Description:** Mandate reduction of process requirements with thresholds to enable tailoring and streamlining (especially critical for low TRL projects).



## **Benefits:**

- Recognizes tendency to be overly conservative / risk averse – implication of compliance costs and accumulation of requirements
- Reduces burden of too many approvers – review by specified SME's
- Avoids new processes.



## **Actions:**

1. Streamlined Class D requirements for low-cost missions (quick-turnaround).
2. Tailor 7120 guidelines based on project dollar value and/or complexity.
3. Allow specific tailoring for low TRL's and set a goal as guidance (e.g., 50% of 7120 process requirements)
4. Apply metrics such as Reduce Cycle Time.
5. Encourage ISO/AS1 compliance vs. 3<sup>rd</sup> party registration (more labor- & resource-intensive)

## **Related Activities:**

- 7120 Updates
- LCROSS



# 5. NASA Skunkworks

**Description:** Establish a true, sustainable NASA “Skunkworks” as a critical innovation pathway strategically aligned with NASA challenges.

## **Benefits:**

- Demonstrates commitment to fostering breakthrough, revolutionary challenges
- Specific mechanism to integrate innovation initiatives (creative spaces, dedicated resources (time, funding), process streamlining, etc.)
- Innovation solutions, game-changers (S-Curves) and possible breakthroughs.

## **Actions:**

1. *Identify a key challenge and provide seed money/ sponsor.*
2. *Competitively select composite team (multi-disciplinary, multi-Center, etc.).*
3. *Add team position of “Scrounger” (searches across the Agency for non-\$\$ resources)*
4. *Buffer the team from external influences and include both colocated and virtual project teams.*
5. *Link to/leverage Innovation Labs across the Agency.*



## **Related Activities:**

- Centaur 2 Rover/Excavator
- Robonaut 2
- NESC MLAS and Composite Crew Module

# Recap & Follow-On

- Completed comprehensive “grassroots” study of NASA barriers to innovation
- Identified diverse range of solutions to address Agency-level barriers
- Developed 5 high impact actions
  - Corporate Time for Creative Thinking and Innovating
  - Innovation Labs and Creative Spaces
  - Innovation Funding & Project Investments in Innovation
  - Process Streamlining
  - Skunkworks
- Completed white paper to document the B2I study and identify additional actions to address innovation barriers
- Engaged and supported Agency innovation efforts
  - Shared results with Agency leadership
  - Office of Human Capital Management – Workforce Flexibility
  - Centers are acting on B2I recommendations



# Epilogue

- Agency Initiatives
  - Administrator Messages
    - ✦ **“NASA and the Importance of Risk”** - ...” risk intolerance is a guarantee of failure to accomplish anything of significance”...
    - ✦ **“Preparing our Workforce for the Future”** - ...”employees have a role in building upon our existing strengths and removing barriers”... ”project managers will allow the flexibility within their existing charge codes for these opportunities”... ”project managers will support and fund innovative efforts”... ”Managers should be versatile and open to innovative and different ways of doing business”...
  - STMD planning Early Career Initiative (ECI) in FY14 to foster the next step in professional development of early career NASA innovators. Composed of young “skunkworks” teams with external partners.
- Numerous activities are ongoing across NASA to encourage innovation
  - GSFC “Research Engineering Program” – pair engineers with scientists to focus on developing the next generation of science sensors and instruments
  - DFRC Technology Forums, MSFC Innovation & Technology Information Exchange – showcasing technologies and opportunities for knowledge sharing and fostering ideas for new innovation projects
  - JPL reevaluating Flight Practices and Procedures for smaller missions like Tech Demos, Cubesats, etc.
  - GRC “I-Lab” – work spaces, tools, white boards, and several 3-D printers to allow engineers and researchers to explore new ideas and concepts
  - KSC Spaceport Innovators – grassroots innovation group identified ways to cut cost at KSC and Sr. Management assigned actions to KSC orgs
  - LaRC/MSFC – IdeaLab collaborative innovation management tool
- Barriers continue to emerge and evolve that require further attention
  - Conference Attendance Policy restricts a key pathway for collaboration
  - Budget pressure on Centers’ ability to invest in innovation

# Epilogue – More Examples

- Numerous activities are ongoing across NASA to encourage innovation
  - KSC Kick Start – 1 minute idea pitches to selection panel for small kick start funding of innovative ideas
  - GSFC new set of processes for Class D payloads significantly reduces overhead balancing risk and reward
  - GSFC applying "Human Centered Design" approach to challenges from the selecting focused technical thrusts to improving Center-wide communications
  - DFRC created an innovation room complete with multiple spaces fostering collaboration
  - KSC Proposal Portal – Simplifying the proposal process
  - JPL considering recommendation to "require new flight programs to include an element of innovation"
  - LaRC authorizing labor for IRAD as part of existing funded projects
  - Innovation Days (multiple centers) – recurring events showcasing technology projects, technical accomplishments, in-house capabilities and services

# B2I Sponsors and Team

## Sponsors

- Center Technology Council (Center Chief Technologists) - John Saiz, Rich Antcliff
- OCT – Jim Adams (Deputy Chief Technologist)

## Team Members – current (former)

- ARC Craig Burkhard, Ingrid Desilvestre
- DRFC Syri Brooks (Nalin Ratnayake)
- GRC Jim Zakrajsek, Lynn Boukalik (Roshanak Hakimzadeh)
- GSFC Ted Swanson
- JPL Aaron Parness
- JSC Sharon Thomas (Lisa Lundquist, Andrew Thomas)
- KSC Martin Steele, Billy McMillan, David Miranda (Shannon Skinn)
- LaRC Marty Waszak, Co-Lead
- MSFC Harold Gerrish, Co-Lead
- SSC John Lansaw