NAC Technology and Innovation Committee

- Background
- Examples and recommendations
- Life sciences and innovation (JSC and beyond)
- The Hamilton Sundstrand water system (SOMD)
- **Recommendations (from 22 April 2010 meeting)**

Our members

- William Ballhaus, Vice-Chair – Aerospace Corp., Lockheed, Ames Center director
- John Cassidy - SVP science & tech, United Technologies
- Eric Haseltine – Disney, NSA (National Security Agency)
- Matt Mountain - Space Telescope Science Institute
- Dava Newman – MIT, space suits, etc.
- Alain Rappaport – Microsoft, medicine, ex-NASA
- Susan Ying – Boeing Phantom Works
- Esther Dyson, Chair – Internet, health care, start-ups, cosmonaut

NTEC approach

- [incorporating Bobby Braun's presentation [need link] by reference]

- The Council firmly supports the newly defined push model for the development of disruptive space technologies and the NASA Technology Executive Council process for managing and prioritizing future NASA technology investments. The Council also endorses the openness of the technology research calls proposed by the Chief Technologist.

- Rationale: The T&I Committee liked the structure outlined by Bobby Braun, but want to ensure that the human relationships around the structure also work.

For example: Life Sciences*

- SLSD solicited for Open Innovation Service Providers (OISP) and made 2 awards
  - InnoCentive- posts individual challenges/gaps to their established network of solvers, solutions are sought and granted a financial award if the solution is found viable by the posting entity.
  - Yet2.com- acts as an actual technology scout by searching their network of companies, development organizations and experts for potential solutions based on the specific challenges or gaps, bringing together buyers and sellers of technologies who then establish technology development partnerships.
- SLSD ran a third open source code competition through Harvard Business School with TopCoder
- *Slides courtesy of Jeffrey Davis, SLSD

Space Life Sciences Directorate*

- The Space Life Sciences Directorate's (SLSD) system for innovation involves three key components:

  - Evidence-based risk management system
    - Continuously evaluates all human system risks across current and future operations
    - Identifies gaps in the research, technology, operations and service portfolios
  - Portfolio mapping of gaps to determine optimal collaborative strategy
  - Strategic system to drive innovation
    - Optimize SLSD research, technology, operations, and service portfolios through strategic alliances and collaboration (including open innovation)

- *Slides courtesy of Jeffrey Davis, SLSD

Life & Physical Sciences

- The Council recognizes the importance of Life and Physical Sciences research in future human exploration activities and urges the Agency to engage in deliberative and inclusive discussions on how to address this area coherently within the NASA organization structure.

- Rationale: The Committee wants to ensure that this topic, which extends across almost all NASA's activities, is well-coordinated.

ISS as an Acquisition Test Bed*

- ISS Is serving as a platform for Research, Commercial, and Engineering Test Bed activities but there is more we can use it for
- Problem? Does NASA lack innovation in acquisition?

  NASA NEEDS INNOVATION IN ACQUISITION
- Claims?
  - Contractors claim that if NASA would just tell us what they want the hardware to do and what the interfaces are, they can build it …..
    - Faster
    - Cheaper
    - Just as reliable
    - Without any more risk

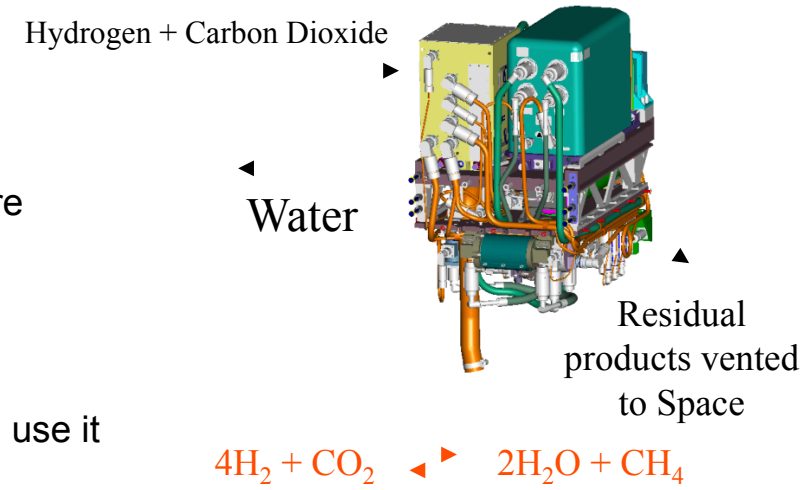
OK….. But are they ready to take the risk?

Money on the line?

- Why not use ISS requirements as a way to test some of the concepts?
- The Industrial Base that supplies NASA is shrinking? Why?

- *slides from Jason Crusan, chief technologist for SOMD

Flight Hardware on a Service Contract



Water Production Services on the ISS

What does it mean?

- NASA pays for a service instead of a piece of hardware
- Don't own the hardware once it is built

What does it look like?

- Looks like a utility contract at your house
- You pay for the availability of the service (whether you use it or not, like your land phone line) or the amount used (water, sewer, power)
- Have to define limits on resources used to enable the service
  - In this case: upmass, crew time, and system interfaces

Why would you do it?

- Minimizes NASA risk because we only pay for the service when it is available
  - Fixed price for the service defines NASA maximum commitment and puts the contractor's "skin in the game" throughout the entire life cycle
- Minimizes NASA involvement in design and development
  - If the contractor only gets paid when and if it works, they are more motivated than anyone else to build a high quality/high reliability system
- Demonstrate another type of contract that moves closer to commercialization of space

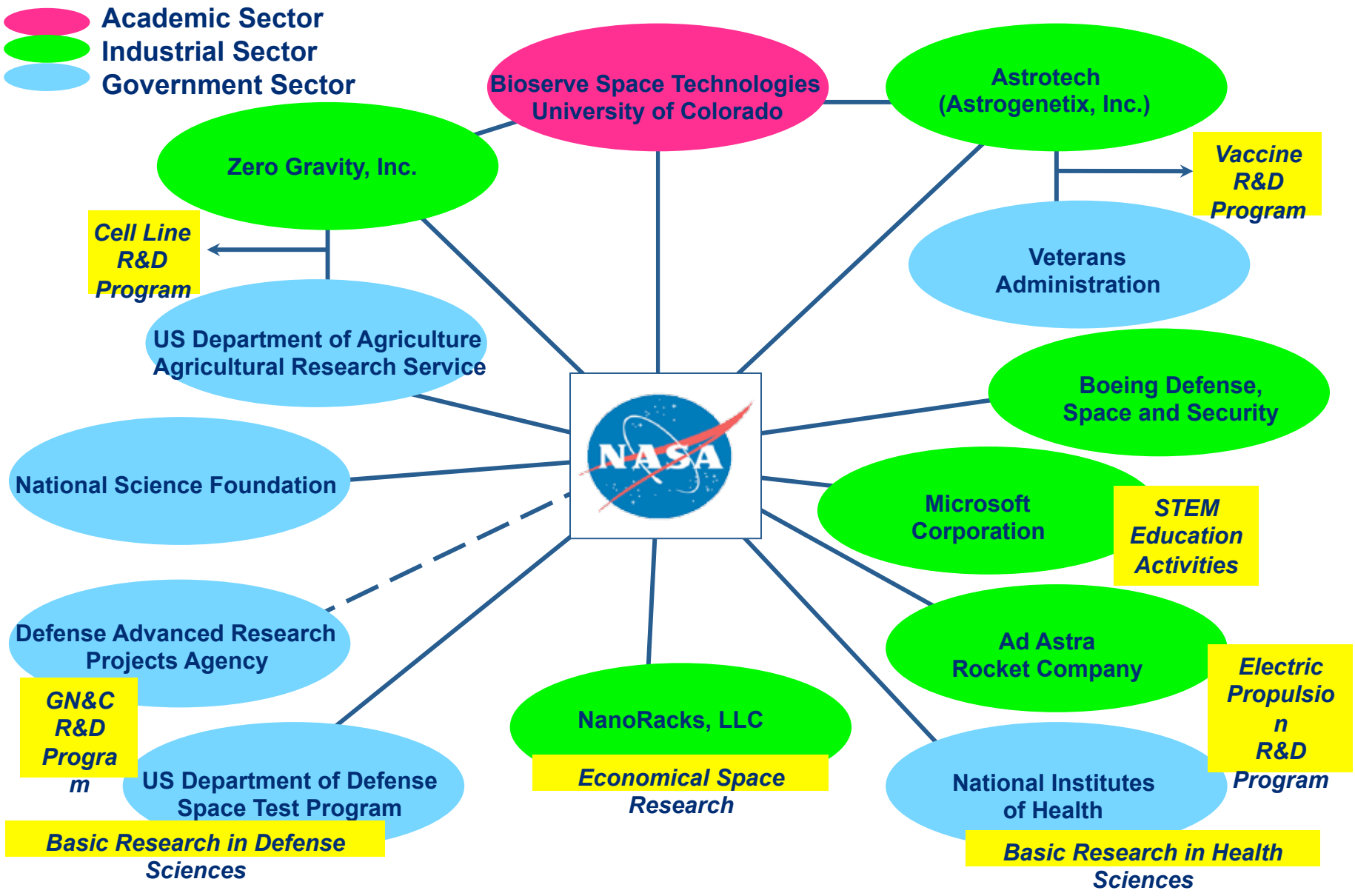
Innovation outside technology

- The Council believes that NASA should continue to embrace innovation in process areas within NASA such as business and acquisition practices, and in external partnerships.

- The T&I Committee was particularly impressed with the Space Operations Mission Directorate's innovative flight hardware service contract with Hamilton Sundstrand for water production services on ISS and encourages additional similar innovations along these lines or other new approaches.

- Rationale: The Committee believes NASA can and should be innovative at its core, not just in specified "innovation programs."

Example: Current National Lab Partnerships*



Current National Lab Partnerships*

Began signing formal agreements in September ’07

- National Institutes of Health (MOU, 9/12/07)
  - Issued 3-year rolling Funding Opportunity Announcement (FOA) Mar. ‘09 for peer-reviewed grants up to $450K each, with 9/27 institutes participating
- Bioserve Space Technologies, University of Colorado (SAA, 5/9/08)
  - Veteran of > 40 flight experiments since 1991 with two Commercial Generic Bio-processing Apparatus (CGBAs) currently on-board ISS.
- Spacehab, Inc. (SAA, 5/27/08) now dba Astrotech/Astrogenetix
  - Successful vaccine development program for bacterial pathogens; completed for salmonella and pending FDA Investigational New Drug (IND) classification; staphylococcus underway.
- Zero Gravity, Inc. (SAA, 5/27/08)
  - CRADA w/USDA for plant & animal cell line development; limited funding from Maryland State Technology Economic Development Corp (TEDCO)
- U.S. Department of Agriculture, Ag Research Service (MOU, 7/23/08)
  - Completed initial plant & animal genesis flight experiments on STS-118/126; six priority research themes identified in Feb. ‘09 workshop of ARS national program leaders
- Ad Astra Rocket Company (SAA, 12/5/08)
  - Electric propulsion test bed based for VASIMR (Variable Specific Impulse Magnetoplasma Rocket) technology.
- NANORACKS LLC (SAA, 9/21/09)
  - Utilize the ISS by launching hardware that enables multiple small payloads to be operated within an Expedite the Processing of Experiments to Space Stations (ExPRESS) Rack (ER) locker on a commercial basis.
- National Science Foundation
- Microsoft

Pending MOUs with USGS, NOAA, DARPA and other Commercial Firms

*slides from Jason Crusan, chief technologist for SOMD

Share the work, share the results

- The Council strongly urges NASA to quickly engage with other Federal Agencies and Departments as it develops its new technology programs. For example, the Committee is eager to see engagement with the Defense Department in the areas of launch propulsion and heavy lift technology.

- Rationale: NASA can both benefit from and contribute to R&D in other parts of the government. The benefit will redound not just to NASA and the other agencies, but to the entire country.

Diversity through mobility

- The Council encourages NASA to engage in more cross-fertilization of personnel among NASA Centers and between NASA and outside organizations as a way encouraging innovation as the Agency plans and implements its new technology programs and in general.

- Rationale: Innovation results from exposure to new ideas, new people, new workplaces.

Next??

- Looking forward to a joint meeting with Commercial Space, Exploration and other Committees over time
- Jeff Davis, director of Space Life Sciences, will present to the T&I Committee at its next meeting
- Next meeting: 2-3 August at Jet Propulsion Lab, Pasadena, CA