



# Report of the Commercial Space Committee

*NASA Advisory Council*



**Ms. Patti Grace Smith**  
**NASA Headquarters**  
**August 1, 2013**



# Commercial Space Committee (CSC) Members

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- ▶ **Patti Grace Smith, Chair**
  - ▶ Former FAA Associate Administrator for Commercial Space Transportation and consultant/advisor to space and aerospace companies
- ▶ **Bernard A. Harris, Jr., (M.D.)**
  - ▶ CEO of Vesalius Ventures, former NASA astronaut, and former SPACEHAB executive
- ▶ **Lon Levin**
  - ▶ Co-founder of XM Satellite Radio and other satellite businesses
- ▶ **Steve Oswald**
  - ▶ Founder and President of Syzygy Enterprises, former NASA astronaut, and former Boeing executive
- ▶ **Franceska Schroeder**
  - ▶ Principal attorney with Fish & Richardson
- ▶ **Wilbur C. Trafton**
  - ▶ Former NASA Associate Administrator for Space Flight and executive at ILS and Boeing
- ▶ **Joseph Boyle**
  - ▶ Consultant. Former Colonel in the U.S. Air Force Space and Missiles Command
- ▶ **Hoyt Davidson**
  - ▶ Founder and Managing Partner of Near Earth LLC, a Connecticut based investment bank and advisory firm
- ▶ **David M. Lengyel, Executive Secretary**
  - ▶ *Risk & Knowledge Management Officer, Human Exploration and Operations Mission Directorate, NASA HQ*



# Agenda

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- ▶ **Summary of Meeting Topics**
  - ▶ July 17, 2013 via Telecon/WebEx
  - ▶ July 30, 2013 at NASA HQ
  
- ▶ **Findings**
  
- ▶ **Proposed Recommendations**

# SUMMARY OF MEETING TOPICS



# Summary of Recent Meeting Topics

17 July 2013

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Topic: Commercial Cargo Status and Key Lessons Learned

Presenter: Alan Lindenmoyer, Bruce Manners, Mike Horkachuck

## Summary

- ▶ Orbital: 26 of 29 milestones completed for payments totaling \$280.5M out of \$288M
- ▶ Orbital: A-ONE Maiden Test Flight completed 21 April 2013. All mission objectives accomplished. Minor observations with corrective actions in place for next flight.
- ▶ Space X: COTS Space Act Agreement awarded August 2006 and amended in May 2011 with additional risk reduction milestones
- ▶ Some Key Lessons:
  - ▶ Government seed money was highly leveraged
  - ▶ Fixed price milestone payments maximized incentive to control cost and minimize schedule delays
  - ▶ A portfolio of multiple partners with different capabilities assured a balanced approach to technical and business risks
  - ▶ Commercial friendly intellectual property/data rights and limited termination liability encouraged investment of private capital
  - ▶ NASA should not expect companies to raise funds from financial markets unless there is a commitment to purchase operational services



# Summary of Recent Meeting Topics

30 July 2013

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**Topic:** Commercial Crew Update and Collaborations for Commercial Space Capabilities

**Presenter:** Philip McAlister

## Summary

**Commercial cargo** providers have either completed or are reaching the end of SAA milestones

- ▶ SpaceX successfully completed all COTS milestones in May 2012. Regular resupply flights to the ISS have commenced.
- ▶ Orbital successfully completed a maiden test flight of its Antares rocket on April 21, 2013 from the Mid-Atlantic Regional Spaceport.
- ▶ Tentative launch window for the COTS Demo Mission to the ISS (i.e., the final Orbital COTS milestone) is September 14-19, 2013.

**Commercial crew** is continuing to advance commercial crew transportation system designs. Significant maturation expected over the next year.

- ▶ Primary objective of **Certification Products Contracts (CPC)** is the delivery, technical interchange, and NASA disposition of early lifecycle certification products. Phase 2: **Commercial Crew transportation Capability (CCtCAP)** will cover all aspects of final development and certification of a crew transportation system, including design, manufacturing, testing, qualification, production and operation. The draft RFP for CCtCAP was released for comment on July 19. Award(s) are planned for next Summer.

**Collaborations Synopsis** may provide an additional partnering opportunity for U.S. private industry.

- ▶ Competitive announcement for the award of multiple Space Act Agreements (SAAs) to advance entrepreneurial space-related efforts released 17 July. Focuses on the development of integrated space capabilities, not individual technologies or subsystem development efforts
  - ▶ Efforts must be consistent with Strategic Goal 1: *extend and sustain human activities across the solar system*
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# Summary of Recent Meeting Topics

30 July 2013

**Topic:** International Space Station Commercial Utilization and CASIS Update

**Presenter:** Duane Ratliffe, Rod Jones, Michael Read, George Nelson (JSC)

## Summary

- ▶ CASIS: Charged with bringing non-traditional users to the ISS. Partnerships to date are in work: Merck (protein crystallization), Novartis (rodents), Cobra Puma (materials) Baylor College of Medicine (Omics), MD Anderson (stem cells), Boston Museum of Science, etc.
- ▶ Encouraging traditional contractors to develop needed capabilities (hardware, onboard analytics, services) using a fee-for-services approach
- ▶ NanoRacks. Only company to own h/w & sell services on ISS: Internal (CubeLabs, plate reader, microscopes, centrifuge), External (exposed platform, CubeSat deployer)
- ▶ Teledyne Brown Engineering: Investing ~\$20M in partnership with NASA to build, operate, and market a precision external pointing platform (MUSES)
- ▶ Nearly all commercial technology proposals to date have requested or required NASA cost sharing. NASA has enabled some of these proposals through milestone completion based contracts.
- ▶ Bigelow Expandable Activity Module (BEAM): Largest and most visible example of this cost sharing/contract method and in this case, fixed cost.
- ▶ Impediments to Commercial Research/Investment on ISS:
  - Lack of ISS exemption for Intellectual Property rights for Non-NASA entities
  - Uncertainty as to ISS life extension
  - Time from selection to actual flight
  - Must continue to evolve onboard capabilities
  - NASA requirements drive costs



# Summary of Recent Meeting Topics

30 July 2013

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**Topic:** Aeronautics Research Mission Directorate

**Presenter:** Bob Pearce

## Summary

- ▶ Aeronautics Research Strategy, Continuity, Strategic Analysis, and Community Dialogue
- ▶ Strategic trends: economics, technology development, demographic trends
- ▶ Aviation mega-drivers (3 vectors): Global Growth in Demand for High Speed Mobility, Global Climate Change, Sustainability, & Energy Transition, Technology Convergence
- ▶ Relationship to the NASA Strategic Space Technology Investment Plan (SSTIP): Technology Investments, Launch and In-Space Propulsion, Robotics and Autonomous Systems, Entry, Descent, and Landing, Lightweight Space Structures and Materials
- ▶ Promising Areas of Planned Collaboration Between ARMD and Space Technology: Technology Investments, Robotics and Autonomous Systems, Lightweight Space Structures and Materials
- ▶ Lessons learned and analogies applicable to commercial space were discussed



# Summary of Recent Meeting Topics

30 July 2013

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**Topic:** Uses of Prizes and Crowdsourcing

**Presenter:** Jennifer Gustetic

## Summary

- ▶ **Some benefits of prizes:**
    - ▶ Shine a spotlight on a problem or opportunity
    - ▶ Pay only for results
    - ▶ Explore a wide breadth and depth of potential solutions
    - ▶ Target an ambitious goal without predicting which team or approach is most likely to succeed
    - ▶ Reach beyond usual suspects to tap top talent
    - ▶ Stimulate private sector investment many times greater than the prize purse
  - ▶ **Variety of Potential Utilities for Competition Outcomes and Solutions:**
    - ▶ Research or TRL Advancement
    - ▶ NASA Operational Integration
    - ▶ NASA Operational Use
    - ▶ External Use
    - ▶ Education/ Outreach
    - ▶ Advance State of Art/ Demonstrate Proof of Concept
  - ▶ **Coming soon:**
    - ▶ Prizes and crowdsourcing related to the Asteroid Grand Challenge
    - ▶ New NASA Policy Directive on the use of Challenge-Driven Open Innovation at NASA
    - ▶ The phased roll out of a new website and public portal for all NASA prize and challenge opportunities
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# Summary of Recent Meeting Topics

30 July 2013

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**Topic:** Public-Private Partnerships for Space Capability Development

**Presenter:** Rebecca Spyke-Keiser

## Summary

- ▶ The purpose of this study is to provide economic intelligence on public-private partnership areas for space capability development that could meet NASA's mission objectives as well as strengthen US global competitiveness and promote the economic vitality of the nation
- ▶ *The study focuses on **10 areas of space capability development** that show positive indicators of **private sector interest and investment**, new business formation, and alignment with NASA's objectives – thus **making them strong candidates for economic stimulation** with increased NASA partnerships and, potentially, resources.*
- ▶ *Study Areas:* Satellite Servicing; Interplanetary Small Satellites; Robotic Mining; Cargo Transportation Beyond LEO; Crew Transportation Beyond LEO; Microgravity Research for Biomedical Applications; Liquid Rocket Engines; Wireless Power; Space Communications; Earth Observation Data Visualization.
- ▶ Summary: By leveraging public-private partnerships as a regular part of the agency's approach to space capability development, NASA's programs can be a fundamental driver of U.S. economic growth in the 21<sup>st</sup> century
- ▶ Recommendations:
  - ▶ Integrate economic analysis and market evaluation into agency strategic decision-making and acquisition process for program formulation
  - ▶ Engage in public-private partnerships in those areas that have attracted private capital, which have technical merit, and contribute to achieving NASA's overall Mission and are in the national interest
  - ▶ Develop a strategy and architecture for space exploration that includes public-private partnerships



# FINDINGS



# Finding CSC-2013-F1

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**Finding Title:** COTS is a good example of public/private partnerships

**Finding:** COTS yielded significant benefits for both NASA and the nation

**Major Reasons for the Finding:**

1. It developed two lower cost launch systems and spacecraft for about an \$800M investment for both ISS cargo and other medium payload launch capabilities
2. COTS/CRS provides the potential to revitalize the commercial launch industry and recapture the U.S. share of commercial launches
3. Including well defined scope of potential service contracts up front creates confidence and provides risk reduction for investors
4. Based on the positive COTS experience to date, NASA should decide whether to employ follow-on contracts after 2015
5. Resist requirements creep during operations phase to maintain the low-cost characteristic of the systems



# Finding CSC-2013-F2

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**Finding Title:** Extension of International Space Station beyond 2020

**Finding:** The Committee supports the extension of the ISS for critical research in areas of materials processing, space environment and medicine, particularly to exploit the outreach to pharmaceutical companies.

**Major Reasons for the Finding:** In order for the ISS to be fully utilized for projects requiring longer lead times, NASA must provide sufficient opportunity for research and commercial activity. Ample time is required to support return on investment (ROI) for closing the business case.



# Finding CSC-2013-F3

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## **Finding Title:** Budget for Larger Prizes

**Finding:** The Committee applauds NASA's smart and aggressive approach in the use of prizes and crowdsourcing. NASA Should look for ways to budget at least one larger prize over the next three years.

**Major Reasons for the Finding:** Breakthrough results from prize competition often result from larger prize values. NASA has been effectively using prizes for a number of years but has yet to budget to the level required for large, "game changing" results.



# Finding CSC-2013-F4

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**Finding Title:** Commercial Market Study Validation; Public/Private Partnerships Study (Commercial Market Study Validation)

**Finding:** The Committee supports the great work done by the internal NASA group that conducted the “Commercial Market Study” and finds that the product will benefit from validation by an independent private sector review.

## **Major Reasons for the Finding:**

1. The collection and presentation of data shows significant market opportunities across areas important to NASA
2. As this was an internal effort, it could benefit from external validation



# PROPOSED RECOMMENDATIONS



# Proposed Recommendation: CSC-2013-R1

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**Short Title of Recommendation:** Commercial Crew Continued Competition

**Recommendation:** The Committee recommends continuing the current level of competition for Commercial Crew. Competition among more than one industry partner during the development phase is important to safety, schedule, performance and cost.

**Major Reason for Recommendation:**

- ▶ Even at the current level of funding, NASA stands to benefit from continued competition
- ▶ A competitive environment provides strong incentive for companies to meet and exceed NASA's safety certification requirements
- ▶ Competition prevents NASA from becoming dependent on a sole provider
- ▶ Competition drives cost-sharing by industry which leverages government funds and encourages industry partners to "stay in the game" when encountering difficulties
- ▶ Continued competition enables a new industry that can serve longer term needs of government and commercial customers
- ▶ All providers have demonstrated good faith and capabilities according to schedule

**Consequences of No Action on the Recommendation:** Prematurely eliminating competition before additional milestones are achieved is a risk to NASA satisfying the goals and objectives of the Program. This program is essential to meeting the agency's goal of utilizing commercial space to fulfill its missions.

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# Proposed Recommendation: CSC-2013-R2

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**Proposed Title of Recommendation:** ISS exemption for Intellectual Property (IP) rights

**Recommendation:** The Committee recommends that NASA expedite ISS exemption for Intellectual Property rights.

**Major Reason for Recommendation:**

- ▶ Non-NASA funded users of ISS must be able to retain their IP rights. The ability to retain their IP is critical to supporting research and promoting business opportunities.

**Consequences of No Action on the Recommendation:** ISS will be unattractive to universities, private industry, including pharmaceutical companies; and research institutions, thereby limiting utilization.



# Proposed Recommendation: CSC-2013-R3

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**Short Title of Recommendation:** NASA/ARMD should reach out to the commercial space tourism industry to explore possible technology development

**Recommendation:** The Committee recommends that ARMD reach out to the burgeoning commercial space tourism industry to identify research and development opportunities

**Major Reason for Recommendation:** Currently, ARMD has no apparent tasking to work with the commercial space tourism industry to explore possible technology development

**Consequences of No Action on the Recommendation:** Like the traditional airline industry, the commercial space tourism industry could benefit greatly from appropriate research and development projects within NASA. ARMD could also benefit from exposure to and collaboration this new emerging industry

# QUESTIONS?

