Emerging Commercial Space Opportunities

Overview of OCT Activities
to assess
Emerging Commercial Space Industries

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TO:   Technology & Innovation Committee of the NASA Advisory Council
FROM:  Charles Miller
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Executive Summary

• Actively exploring non-traditional approaches/partnerships
  • per White House National Space Policy

• OCT-IPO leads NASA-wide Emerging Commercial activity
  – To energize, enable and facilitate new commercial space capabilities
  – Also provides “front door” for new emerging commercial space firms

• GOAL: Explore new opportunities beyond existing programs
  – This is **NOT** CCDEV, Commercial Crew, Commercial ISS cargo, CRuSR

• Conducted bottoms-up review of potential capabilities (2010)
  – Low-cost and Reliable Access to Space graded as the #1 top priority
  – Commercial In-Space Servicing is the #2 priority
    • e.g., Satellite servicing, orbital debris mitigation/removal, orbital transfer vehicles

• Based on studies, provide input to NASA leadership
  – Findings & Recommendations differ based on targeted commercial capability
  – Some recommendations already incorporated into OCT investment areas
• Analyze and assess emerging space markets, bringing this data into Space Technology selection processes and providing to other Mission Directorates.

• Advocate for foundational research investments and collaboration models like those employed by NACA in sparking the growth and success of the American aviation industry.

• Provide a single, front door to NASA for new commercial space concepts and ideas, including a Level II Emerging Space Office at Ames Research Center.

• Interface with Mission Directorates, field Centers, entrepreneurs, early-stage ventures, traditional aerospace firms, and commercial space advocacy organizations.

• Explore public-private partnership approaches and strategies.

• Promote exchange of technology, innovative partnerships and ideas among the U.S. government and the emerging commercial space industry.

• Emerging Space activities will be coordinated with NASA’s larger, on-going Commercial Space programs (such as COTS and CCDEV).

<table>
<thead>
<tr>
<th>Project</th>
<th>Labor $K</th>
<th>Proc. $K</th>
<th>Travel $K</th>
<th>Total $K</th>
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</thead>
<tbody>
<tr>
<td>Emerging Space</td>
<td>653</td>
<td>1,287</td>
<td>60</td>
<td>2,000</td>
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• **Principles**: A robust and competitive commercial space sector is vital to continued progress in space. The United States is committed to encouraging and facilitating the growth of a U.S. commercial space sector that supports U.S. needs, is globally competitive, and advances U.S. leadership in the generation of new markets and innovation-driven entrepreneurship.

• **Goals**: **Energize competitive domestic industries** to participate in global markets and advance the development of: satellite manufacturing; satellite-based services; space launch; terrestrial applications; and increased entrepreneurship.

• **Guidelines** (Selected excerpts):
  – **Purchase and use commercial space capabilities and services to the maximum practical extent …**
  – **Actively explore the use of inventive, nontraditional arrangements** for acquiring commercial space goods and services to meet United States Government requirements, including measures such as public-private partnerships, …
  – **Pursue potential opportunities for transferring routine, operational space functions** to the commercial space sector where beneficial and cost-effective.
• 50+ participants (from 10 NASA Centers & 4 MDs)

• Segmented new potential commercial capabilities into 8 areas
  – Low-cost & Reliable Access To Space (LCRATS)
  – Commercial In-Space Servicing (5 Segments: Propellant depot/transfer, satellite refueling/serving, orbital transfer, orbital assembly, debris removal/mitigation)
  – Commercial Human Spaceflight, Entertainment, Education
  – Lunar/NEO
  – Orbital Space Laboratory Research/Microgravity
  – New space communication & navigation
  – Human habitation, accommodations, ECLSS
  – Power Infrastructure and delivery

• Evaluated all 8 potential commercial capabilities for …
  – Outputs/Benefits to:
    • NASA, national security, economic growth, STEM education, social/cultural, environment
  – Inputs/Barriers
    • Investment, Markets/customers, Industry firm maturity, Tech maturity, Regulatory/Legal
  – Synergies and Linkages

• RESULTS
  – LCRATS unequivocally identified as #1 priority
  – Commercial In-Space Servicing (CISS) identified as clear #2 priority
  – Set up working groups to interview industry (LCRATS, CISS, 3 other areas)
• Completed identification and prioritization of Top 3-5 barriers to closing commercial business case
  – for Low-Cost & Reliable Access to Space
  – for Commercial In-Space Servicing (CISS)
  – and for other areas

• Identified many potential solutions
  – Several dozen potential solutions, including many non-budgetary

• Mapped potential solutions to top barriers
  – Assess strengths, weaknesses, costs, benefits of potential solutions

• Developed options for leadership consideration

• Contracted with Near Earth LLC (investment banking firm)
  – Study completed.
  – Final report being reviewed.
Emerging Commercial Forums/Events in 2011
to Promote, Enable and Facilitate Exchange of Technology and Innovation

• C/RASTE 2011:
  – Commercial & Gov’t Responsive Access to Space Technology Exchange
  – FOCUS: Low-cost, reliable, and frequent access to space and the technologies and implementation strategies needed to meet this goal
  – In partnership with USAF Research Laboratory
  – October 24-27, 2011 in Atlanta, GA

• NewSpace 2011
  – FOCUS: Public-private partnerships between U.S. government and emerging commercial space industry; and exchange of innovative ideas
  – Includes a commercial business plan competition
  – Hosted at Ames Research Center
Space Technology Grand Challenges
What is the Overlap with Emerging Commercial Space?

Make space part of humanity’s natural environment…

- Achieve economical, on-demand space access
- Enable in-space commercial/marketable services
- Improve spacecraft safety and protect astronaut health
- Enable publically accessible virtual presence and exploration

…manage space as a natural resource…

- Fully understand climate change and natural disasters
- Portable and economical energy on demand
- Understand and manage the near-Earth environment
- Invent tools of exploration that exploit in-situ resources

…and blaze our trail into the universe.

- Understand laws of the universe
- Discover Earth-like worlds and life beyond Earth
- Operate at the very limits of what is possible