Lunar Commercialization Workshop

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Lunar Commercialization Workshop Agenda

- Overview and workshop description
  - 20 minutes
- Development of Business Plans
  - 120 minutes
- Presentation of business plans to panel
  - 60 minutes - split evenly among the teams
- Wrap-up and discussion
  - 10 minutes
Lunar Commercialization Workshop Description

**Goals**
- Explore viability of using public-private partnerships to open space frontier

**Rules**
- Form 3 teams - each team represents a space entrepreneurial company
- Create innovative business plans for commercialization of the Moon
  - Business concept description, market strategy
  - Return on investment, pricing, schedule
  - Competition and other impediments
  - Operations and management plan
- Present plan to panel - scored against each of the four elements
- Best plan awarded prize
Lunar Commercialization Workshop - Scoring

- Create an innovative business plan
  - Business concept description, market strategy
    - Describe the product/service
    - Describe the customer profile
    - What is your marketing strategy?
    - What is your business model?
  - Return on investment, pricing, schedule
    - What services would you provide and what are their cost to you
    - What do you charge for the services?
    - What is your return on investment - over what time period?
  - Competition and other impediments
    - Who is your competition?
    - What are your major risk areas?
  - Operations and management plan
    - What facilities/infrastructure needs?
    - Who is your management team and what is their experience?
Public-Private Partnerships

- Government procures what it needs from private industry instead of developing and operating the mission on its own

- **Benefits to Government**
  - Usually cheaper over the life cycle
  - Government does not have to conduct operations and maintain infrastructure
  - Ability to leverage resources with commercial sector

- **Benefits to Industry**
  - Gain expertise, helps develop new sector
  - Develop infrastructure and retire risk
  - Commercial success is critical to opening the space frontier
Open Architecture: Infrastructure
Open for Potential External Cooperation

- Lander and ascent vehicle
- EVA system
  - CEV and Initial Surface capability
  - Long duration surface suit
- Power
  - Basic power
  - Augmented
- Habitation
- Mobility
  - Basic rover
  - Pressurized rover
  - Other, mules, regolith moving, module unloading
- Navigation and Communication
  - Basic mission support
  - Augmented
  - High bandwidth
- ISRU
  - Characterization
  - Demos
  - Production

- Robotic Missions
  - LRO- Remote sensing and map development
  - Basic environmental data
  - Flight system validation (Descent and landing)
  - Lander
  - Small sats
  - Rovers
  - Instrumentation
  - Materials identification and characterization for ISRU
  - ISRU demonstration
  - ISRU Production
  - Parallel missions
- Logistics Resupply
- Specific Capabilities
  - Drills, scoops, sample handling, arms
  - Logistics rover
  - Instrumentation
  - Components
  - Sample return

**US/NASA Developed hardware**
Lunar Commercialization

- Lunar Commercialization complements national Lunar objectives
  - Early, small scale Lunar transportation enabled by private sector
    - Commercial delivery system -- “FedEx Lunar”
  - Near-term technology demonstrations on the Lunar surface
    - Constellation technology risk reduction
  - Early start to Lunar science campaign
  - Enable more commercial opportunities relative to the moon
    - Commercial Lunar communications, navigation
Possible Lunar Commercialization Elements

- Utilize emerging commercial capability to land payloads on the Moon
- Includes lunar data purchase and/or agency lunar instrument delivery
- Cost to agency that is less than a dedicated NASA robotic mission ($100M+ if conducted by Agency)
- Operations could begin in 2010 timeframe
- Small payloads ($100M or less)
- Frequent, multiple flights
- Commercially-leveraged: Open Competition for lunar transportation services
- Fixed price service
- Industry provides the “Fed-Ex” to the surface
Lunar Commercialization

**Exploration Demand**

- The Constellation Program Office has identified lunar data needs, of which a subset would require in-situ measurement
  - Dust characterization & mitigation
  - Landing site reconnaissance
  - Lunar model validation (tie to ground truth)
  - Local radiation measurement
  - Spacecraft charging evaluation
  - Regolith handling/site preparation
  - ISRU characterization and demonstration
  - Hydrogen form and location characterization
  - Lighting perspective (permanent low incidence at poles)

**Technology demonstration**

- Communications (surface mobile comm)
- Mechanisms (1/6G performance, dust impact on lifetime)
- Materials (dust compatibility)
- Thermal (surface influence, radiator dust exposure)
- Navigation and guidance (Precision Landing)
- Propulsion (system performance, plume interaction)
- Mobility (traction, dust impact)
- Power (Re-charging mobile robotic assets, fuel cell tech)
- Avionics (Open architecture, Rad hard)
- Cryo handling & storage (test demo)
- ECLSS (water loop performance in 1/6g, dust filters)
Lunar Commercialization

- **Science Demand**
  - Exploration of the South Pole-Aitken Basin remains a priority
  - Diversity of lunar samples is required for major advances
  - The Moon may provide a unique location for observation and study of Earth, near-Earth space, and the universe
Commercial Capability

- Market Supply side - transportation
  - Google Lunar X-Prize (GLXP): Astrobotic Tech, Odyssey Moon, others
- Individual instruments delivered near term at an estimated cost on order of $1M to $3M dollars per kilogram
- Launch is clearly a large expense, and a significant portion of the total mission costs
  - Falcon 9 / Minotaur V class
    - $25M - $35M
    - TLI: 465 kg (1025 lbm)
  - Possible to fly as secondaries
    - Secondary payload adapter (ESPA)
    - 180kg
    - ~$2M
Good Luck