

# Strategy for Commercializing Comm and Nav at the Moon

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# What's new?

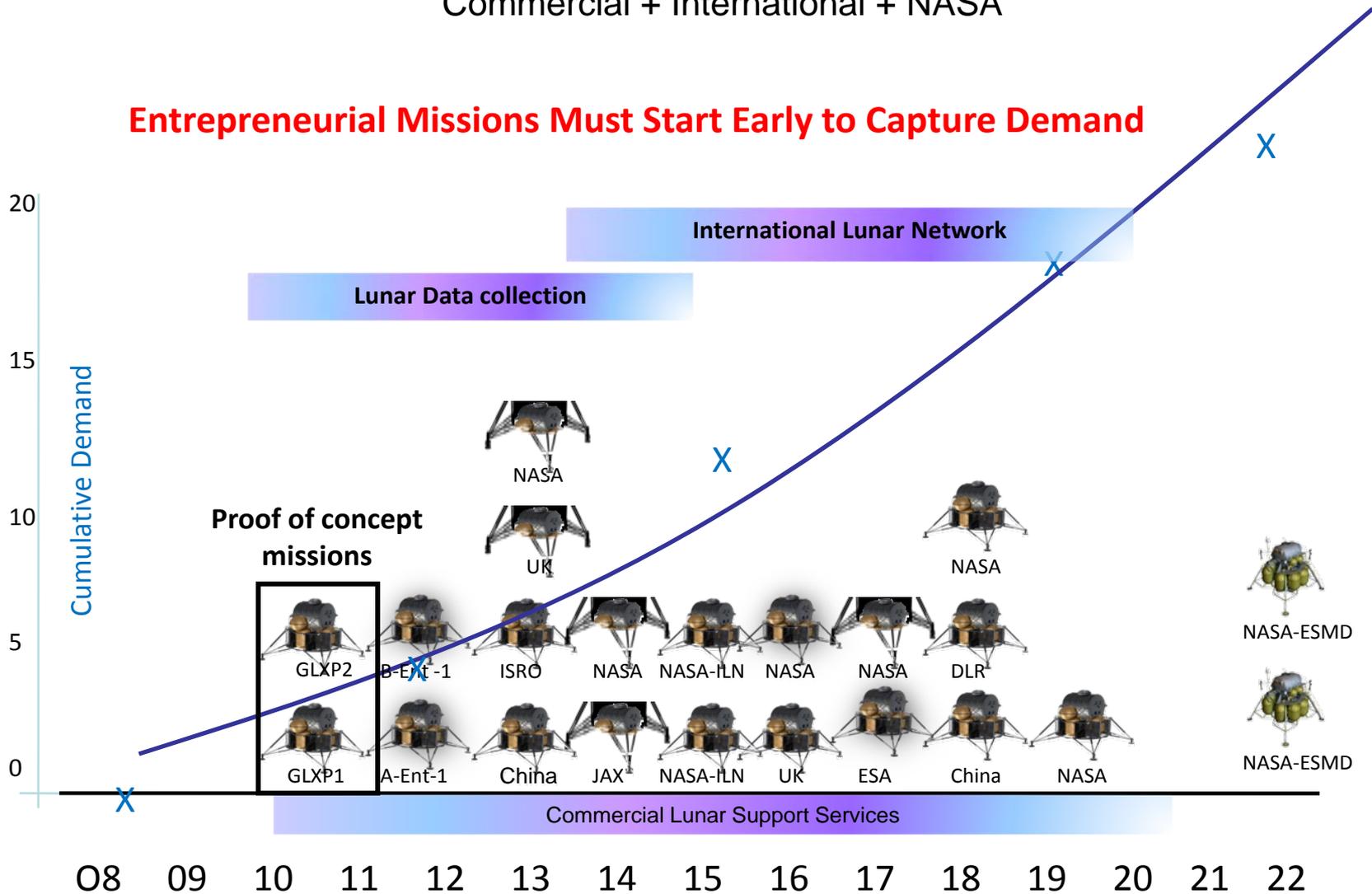
- “New Space” accomplishments
  - The “New Space” industry will be at the Moon before NASA
- “New Space” industry characteristics
  - Low Cost Service leads to high market demand
    - Agencies, both civil and military
    - Governments including China
    - Consumer markets
      - Exploration
      - Energy
      - Tourism
  - Low cost development and operations
    - Innovative development
    - Fewer people
  - Incremental development
  - Skunk-works teams
  - Fixed Price services

**Really Different than NASA**

# Lunar Payload Service/Data Demand Forecast

Commercial + International + NASA

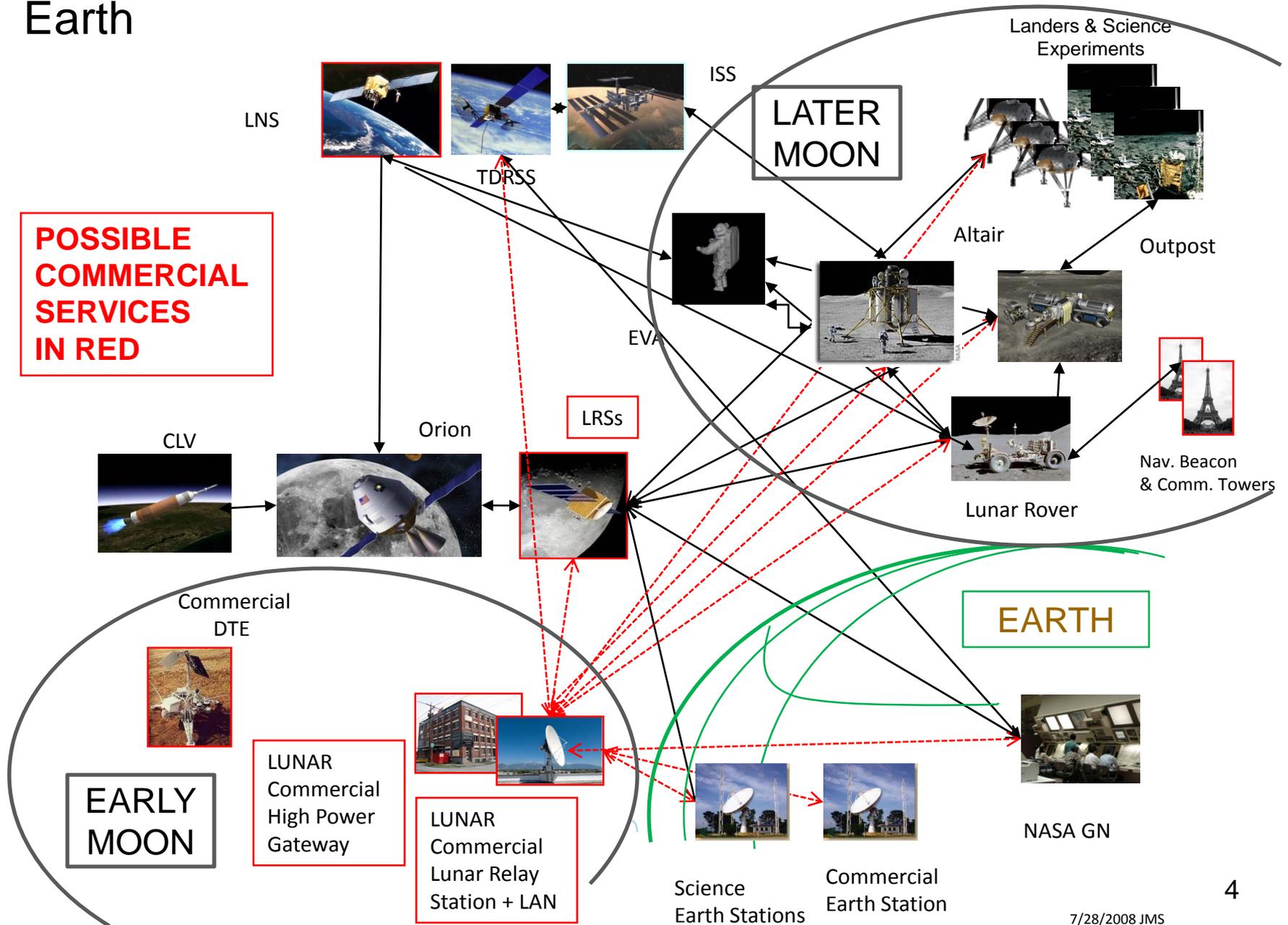
**Entrepreneurial Missions Must Start Early to Capture Demand**



Note: ENT missions not counted

Year	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22
Cumulative Missions	0	0	2	4	8	10	12	14	16	19	20	20	20	20	22

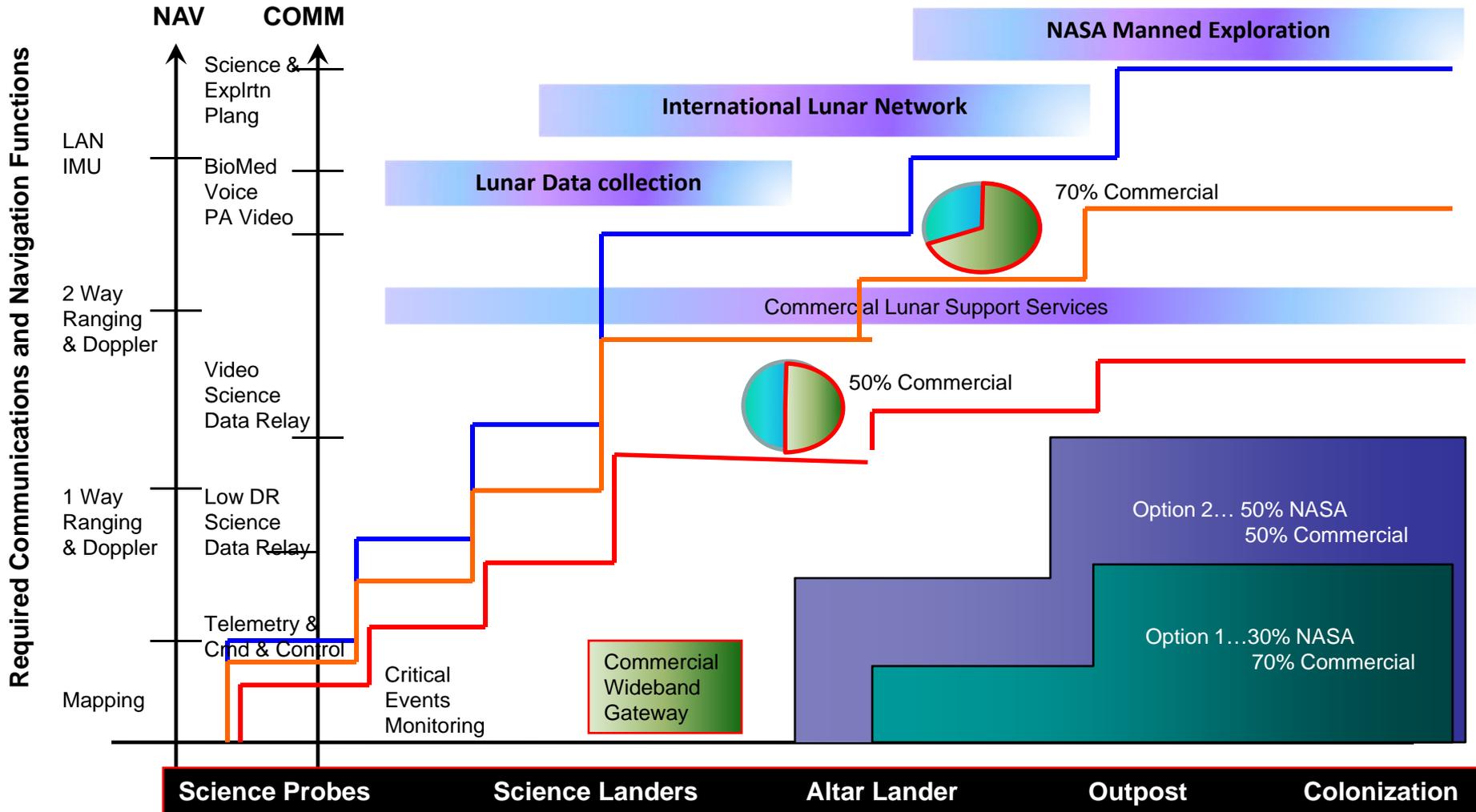
# NASA C&N Need Lines at the Moon and Earth



# Commercialization Strategy

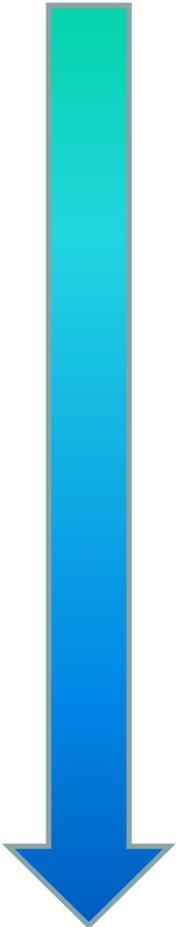
- 50-70% C&N led by industry backbone enabling NASA expansion for Human Exploration
- Foster industry interest in NASA C&N capability needs
  - Collaborate where possible, employing partnerships for the development of Technologies, Subsystems, Systems and services that both can use
  - Collaborate on the “Lindy-Prize” of space exploration
  - Focus on interoperability like the Mars program
- Think backwards from Mars to Moon to Earth and develop C&N capabilities that both NASA and Industry can use too

# Proposed C&N Cmzn Strategy Options

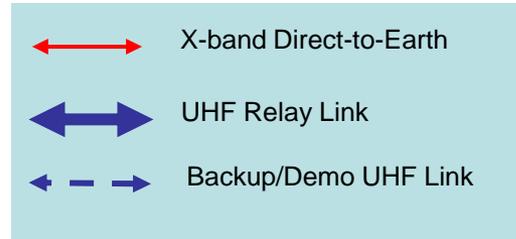
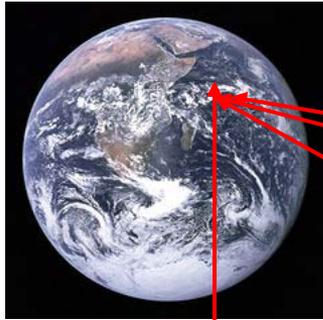


# Proposed Investment Strategies for C&N Commercialization

- NASA Industry Commercial Investment Collaboration Path
  - **IRAD model:** An investment by industry with partial recoupment from USG: Anticipating an acquisition.
    - Target ~ \$10M
    - Least investment by both NASA & Industry: Minimum Risk to both
  - **Prize Model:** Centennial Challenge Prize Offered by NASA for industry achievement of NASA established goals. No payment unless goal is achieved:
    - Target ~ \$25M
    - NASA owns “What” not “How”
    - Some investment by both: Some Risk by both.
  - **Commercial Orbital Transfer System Model:** Shared Development cost paid by NASA to demonstrate a capability on agreed milestones and as required by NASA:
    - Target ~\$50M
    - Many suppliers
    - Shared Fixed Costs. NASA owns “What” not how.
    - Substantial investment by Both NASA and firms; Shared Risk
  - **New Commercialization Model:** NASA procures systems from “New Space” service providers, then uses IDIQ to commercialize operations
    - Target ~ \$150M
    - Many Suppliers
    - NASA owns What, Industry owns How: Shared Risk
  - **New Procurement Model:** DDT&E paid by NASA. Cost + Contracts with “New Space” Suppliers for services and data not hardware. NASA Owns “What”.
    - Target ~\$200M
    - NASA pays full cost including DDT&E and Operations;
    - NASA owns “What” : NASA and Supplier share Risk



# Proposed “New Space” Commercialization Prize Challenge?



**MGS**



**Odyssey**



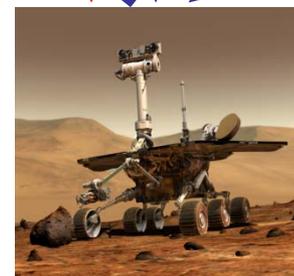
**Mars Express**



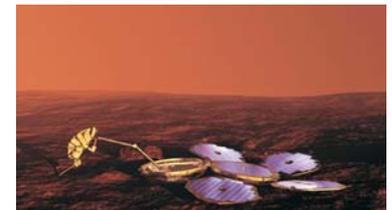
- **Size Mars Comm system for Lunar missions**
- Prize = ~ \$50M
- Can serve as essential C&N for Lunar Comm
- Proven capability
- Scalable



**Spirit**



**Opportunity**



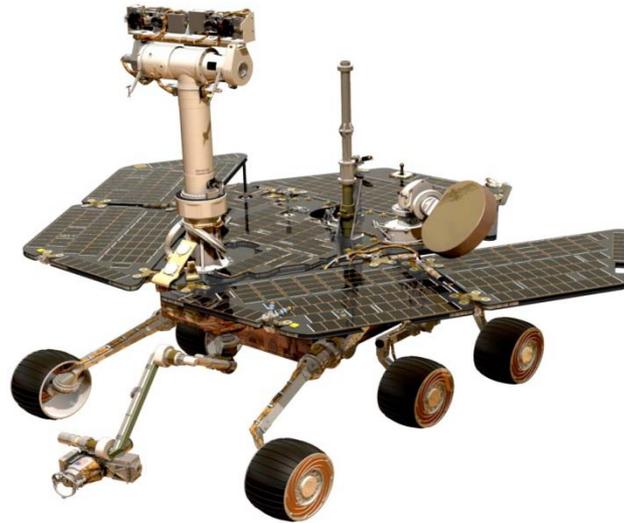
**Beagle 2**

# More on the Prize Challenge Proposal

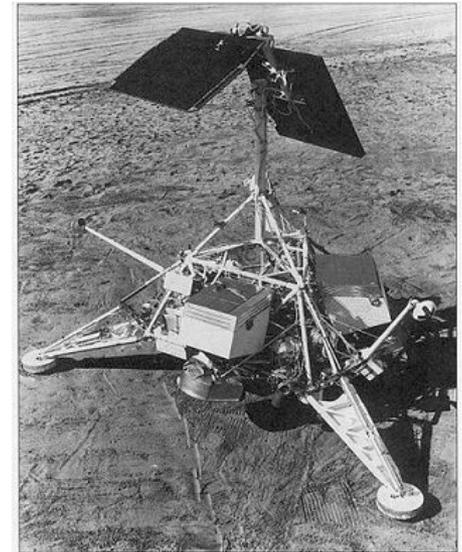
Make the Lander C&N like Spirit or Surveyor C&N ... or  
Make the Video System like Spirit or Surveyor ... or ?

- Spirit and Surveyor Missions are the precedent
- Surveyor landed June 2, 1966
- Spirit landed 10 Jun 2003
- Mars Lander + Rover + Relays
  - Lander 15 Watts
  - Lander life 5 Years
  - Landed by Industry
- Capabilities have been demonstrated
- Mature technologies, mission plans, lander designs, mission operations

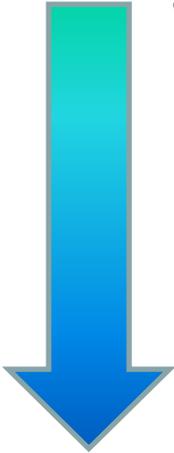
Spirit, 2003



Surveyor, 1966

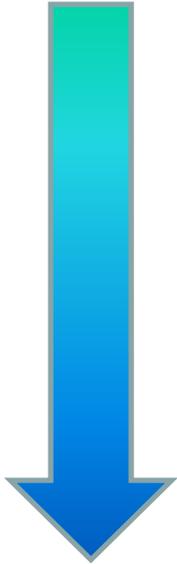


# Proposed COTS Challenge

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- **Industry** to establish 70% of C&N for Lunar operations using shared investments with NASA like Falcon
    - Telemetry
    - Video
    - Low Data Rate Science Data Relay
    - High Data Rate Science Data Relay
    - Wideband Gateway
  - **NASA** to develop
    - Voice
    - Biomed Video
    - Experiment planning and operations
    - Outpost + Rover + Surface Comm
- 

# Proposed Commercialization Challenge

- NASA to fund the initial C&N services it develops for manned exploration employing the “New Space” Service providers
- NASA to develop backbones of services that can be expanded by, and transitioned too, commercial service providers, in much the same way NASA commercialized the Polar Network on Earth.
  - Expanded Comm with more relay satellites for redundancy and safety
  - Expanded Comm with commercial wireless surface communications LANs
  - Expanded Comm & NAV stations beyond 3 Earth-Based Ground Stations. Six more are desired
  - Expanded Comm & NAV capability with a commercial Navigation Satellite System
  - Expanded Comm & NAV capability with mobile earth landing tracking stations
  - Expanded Comm & NAV capability to include lunar surface nav aids



# Procurement Challenge

- NASA procures C&N Capability. Requirements include a C&N backbones for Communications and Navigation in such a way as to enable expansion by commercial service providers
- More expensive but most secure and dependable service for human lunar exploration for NASA and its International partners
- Risk is that NASA won't show up in time for commercial C&N

# Summary

- US Industry will be there before NASA
  - Google X-Prize
  - ATK
  - Etc.
- Some Markets will be there before NASA
- NASA needs industry support early in its lunar exploration program
- NASA intends to foster commercialization of the Lunar C&N service industry
- December 2008 is the target date for defining NASA Essential C&N
- Beyond Essential C&N will be left to industry

# Backup

# Aggregate Lunar C&N Demand

Entrepreneurial Missions Must Start Early to Capture Demand

