Jamestown on the Moon

First Settlement outside Earth
on the Moon

Presentation to the Lunar Road Map Team

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www.JamestownOnTheMoon.org


Astronomer-Astronauts –
Men, Machines & Robots

Commodities from Space:

"Zero" Mass & Speed of Light

- **Information : 40%+ of economies**
  - **Communications**
    - C-Band, Ku-Band, LEO-HEO-GEO
    - GPS, Navigation
  - **Observations**
    - Earth Resources, Environment, Weather, Climate
    - Solar System, Milky Way, Galaxy
- **Energy: Enabling Resource**
  - **Solar**: Lunar SP, SPS
  - **Nuclear**: Fission, Fusion, He3

A CONDOMINIUM OF LARGE OBSERVATORIES

- Across the electromagnetic spectrum
- Vast distributed aperture instruments across the Moon and co-ordinated with instruments on Earth
- Common "on board" data processing, management, servicing, repairs and updating of facilities
- On the Poles of the Moon and other key locations on the front, back and rim of the Moon

Large Astronomy Spacecraft Cost Structure

Programs	Instruments	Housekeeping (Condominium)
Chandra	58%	42%
GRO	48%	52%
HST (original)	53%	47%
HST Mods & Enhancements	62%	38%
SIRTF	49%	51%
Average	54%	46%

Astronomy Life Cycle

Risk Cost Assurance Assessment

Probabilities	Space Based	Moon Based
Launch	0.92	0.99
Infant Mortality	0.27	0.01
Operational	0.2	0.1
Repair/ Refurbishment	N.A.	0.9
Updating/ Evolution	N.A.	0.9
Prob. of Program Continuity	0.4	N.A.
Assurance of Continuity of Observations		
Combined - Standard	0.37	0.999
Combined -"NRO" Type	0.98	0.999
RoM Additive (Incremental) Cost Assessment (in addition to Moon Base - ISRU Costs)		
One Life Cycle	205	100
Assured "NRO"	525	100

Observation of Earth's Neighborhood from the Lunar Surface

Observation & tracking of earth orbiting and cislunar objects and activities

Long-dwell high-resolution earth-system observation

Ultra-long range identification and tracking of earth-orbit-crossing objects

Large distributed aperture optical and RF collectors (active and passive)

No Atmospheric Distortion

Large Stable Earth-Facing Surface

Laser and high rate RF communications

Solar and Nuclear Power Availability

“In-Space” Resource Station Moon

- Delta V: 36 fold advantage
- Stable Platform
- Unlimited Energy Resources
  - Solar, He-3
- Water, Hydrogen, Oxygen
- Most Mineral Resources
- Ideal Cis- and Translunar Operations Base

"IN-SITU" ENERGY TECHNOLOGIES
(Production, Storage, Distribution)

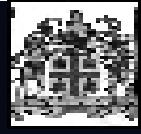
- **NUCLEAR**
  - Prometheus,
  - Other 'Conventional' Fission Reactors
  - Novel Fission/'Conventional Fusion'
- **SOLAR POWER Plants**
  - For Lunar uses/requirements
  - For Cis-Lunar applications
  - For Terrestrial and Trans-lunar Applications
- **CONVENTIONAL FUSION**
  - Tokomaks, Novel Concepts
- **^{3}HE CLEAN FUSION**
  - Mining, Storage, Transport
  - Demonstration
- **"PLOWSHARE" ON THE MOON**


TEN YEAR ENERGY GOALS:
2020-1MWe, 2025-10MWe, 2030-1GWe
#6
#5
#2
#1
#3
#4
1 GWe+ on the Moon will change all of Cis-Lunar Space
D. Criswell

SPACE TRANSPORTATION TECHNOLOGY RDT&E

- In-situ Fuels Production & Distribution
- Fuel-less Space Transportation
  - Electro-magnetic launch/landing
  - Solar/Laser/Microwave/Plasma Sail Concepts
  - Lunar Space Elevators to L1
  - Particle Beam Applications
- Ten Year Goals
  - 2020: O/H 100 MT, 2025: EMP, 2030: SPACE ELEVATOR TO L1

Status of Lunar Space Elevator (LSE) Concept to L1 and L2



- Can be constructed with **existing composite** materials
- **No Space debris**, free oxygen, other atmospheric problems
- **Does not require** – but could make use of -nano-tube carbon composites
- **Ideal method of delivering Lunar supplies** to Cis-lunar and Trans-lunar Space and **unloading** cargo to the Moon
- LSE materials technologies can be used for surface transport links to **Polar and other regions** on the Moon
- Funded **NIAC study** as of late 2004

Large Solar Power Satellites

Peter Glaser 1968 - et. al.

1995 Concept

NRC-ASEB SPS Minority Report 1980/1

(Tom Paine and Klaus Heiss):

“Use of Lunar Resources and Operations Critical for SPS”

See also Lunar Enterprise Study of 1989

And 1995 Assessment

HUMAN KNOWLEDGE ARCHIVE & GLOBAL ACCESS/DISTRIBUTION

- Library of Congress or "Alexandria"
- Major Project in late 1940's
- Safeguarded on the Moon
- Tele-Education Opportunities/Applications

- Goal through 2030:
  - Digitize & Archive & Store on the Moon Us Library Of Congress ("Digital Heritage Library")
  - Make available for worldwide access & Distribution

Human Health: NASA Martians in Denial?

- **"Safe Passage: Astronaut Care for Exploration Missions" (2001)**

- John R. Ball and Charles H. Evans, Jr., *Editors*
- Committee on
  Creating a Vision for Space Medicine
  During Travel Beyond Earth Orbit
- Board on Health Sciences Policy
- INSTITUTE OF MEDICINE

Robust Moon vs. Mars Romance

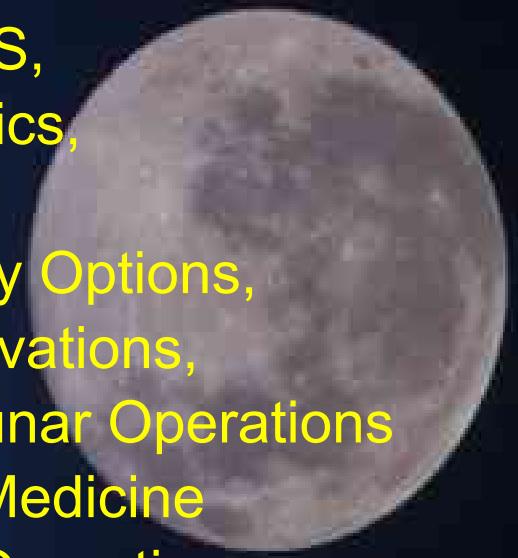
- **Robust Moon:** then on to other places
  - **Habitats/Settlements** Technologies
  - **Human Health** Answers
    - Tele-Medicine, Tele-Operations
  - "in-situ" **mining and production**
    - robotics
  - **Energy** Supplies
    - For Moon, for Cis-lunar, for Earth
  - **Observations**:
    - Earth, Sun-Earth, Astronomy
  - **Communications**
    - Human Digital Heritage
- **Enables early private Sector investments**
- **Enables Mars and beyond Missions**

- **Mars Romance**:
  - **Serious Human/Mental Health** issues (show stoppers as of now)
  - Unknown/unknowable **CEV design questions**
  - **ZERO "Earth" applications**
    - **No energy supply prospects**
    - **No Earth-, Cis-lunar observations**
    - **Few environmental/ climate contributions**
- **The answers / enablers for future Mars missions and beyond are "buried" on the Moon.**

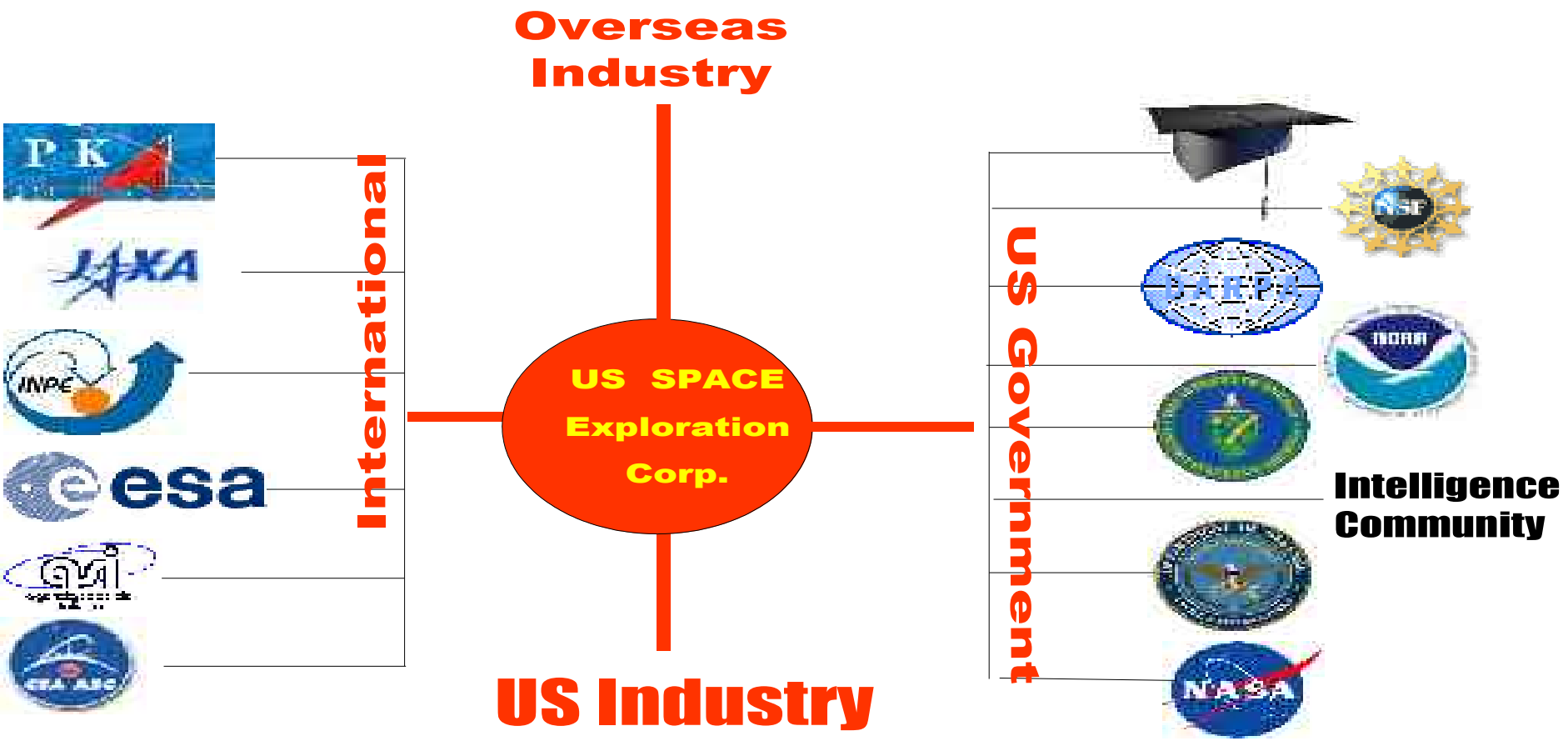
Robust Moon:
Gate to Self-sustaining Space Enterprise

- **US Government:**
- **Current NASA Budget**
  - Projections through 2020
  - Strong 2020 – 2030 Lunar Program as outlined
  - Space Transportation and Ports Infrastructure for:
    - **CELSS, Robotics, ISRU, Energy Options, Observations, Cis-Lunar Operations**

- **Private&International Investments:**
  - CELSS,
  - Robotics,
  - ISRU,
  - Energy Options,
  - Observations,
  - Cis-Lunar Operations
  - Tele-Medicine
  - Tele-Operations
- Space Port to Destinations beyond



Organizing for Success



US Space Exploration and Development: Industry – Government – International Partnerships in implementing a Moonbase

Industry can Increase Total Investment in Exploration Infrastructure