

# Towards a Space Based Economy

Narayanan Komerath  
School of Aerospace Engineering  
Georgia Institute of Technology  
Atlanta

Testimony before the President's Commission on Implementation  
of the United States Space Exploration Policy  
March 24, 2004

## We are working on the “.. Beyond” part

- What happens after the return from Mars?  
The answer must be  
inspiring,  
credible,  
reliable.
- The President’s vision mandates **synergy** of robot/human, science/engineering and Moon/Mars schools of thought.
- These are critical steps towards the future Space based economy.

## Today's Show-Stoppers Are No Longer Technical

Each problem seen in the 1970s has at least one solution

- Lunar launcher/lander : mass driver; tethers; chemical; nuclear
- Lunar power: solar; nuclear
- Pressurized working volume: inflatables; used fuel tanks
- 1-G radiation shield: repetitive assembly with telepresence
- Beyond telepresence: tailored electromagnetic field; robotics

But each solution requires synergy and economic rationale

## Summary of the Space-Based Economy Concept

- Suppliers, manufacturers and customers located beyond Earth
- Trading between Space entities more than with Earth
- Critical mass of mutual interest and investment for expansion
- Government role in exploration, infrastructure and regulation
- International participation

# Evolution of a Space-based economy

## The Space Yellow Pages: Today's Large Projects

Robotic Planetary Missions

Hubble Space Telescope

GPS

GLONASS

GALILEO

Com-sats

Remote Sensing

Military Satellites

Human Missions to Mars

Lunar Resources

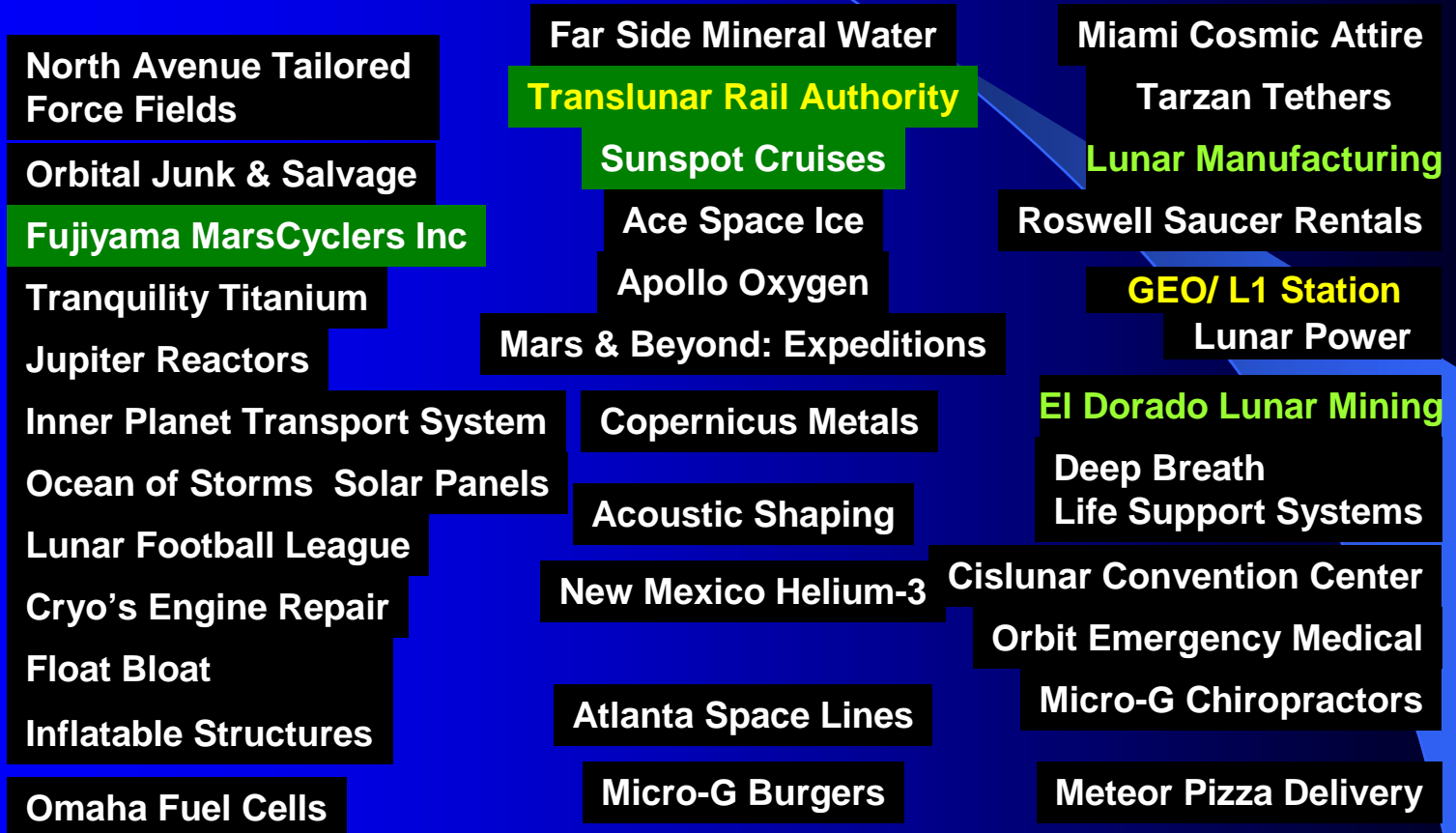
Return to the Moon:  
Heavy Lift + CEV

ISS

Launch To Earth Orbit

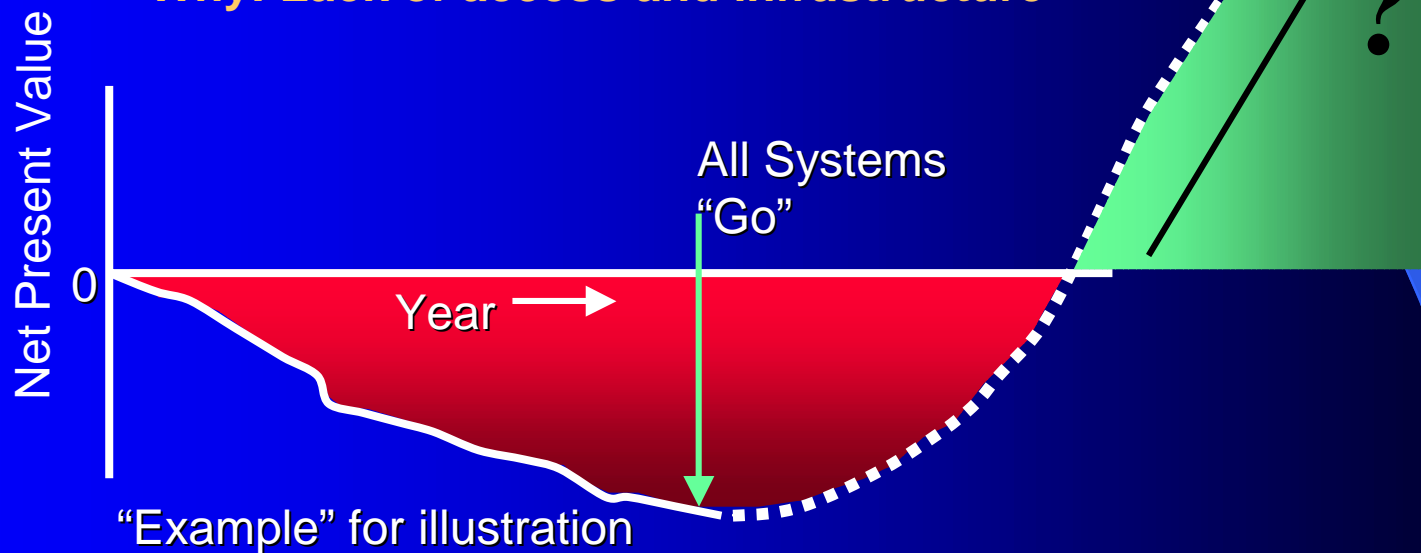
STS

# The Space Yellow Pages, 4th Generation:



## Show-Stopper: The Billion-Dollar Dive

- Business Plans for Space-based enterprise face huge, early R&D investment, with no return for 10+ years – and at most 1 shot at success.
- No repair, no rescue, no update, no synergy.
- **Why: Lack of access and infrastructure**



## Cut Launch Cost, or Reduce Need for Earth Launch?

- The Space-Based Economy answer is: “both”.
- Investment in space infrastructure will reduce need to launch from Earth, reduce entry barriers, and slash the cost of launching from Earth.
- Example: re-usable high-Isp upper stages for LEO-GEO.
- Lowered barriers – Larger demand – Increased volume – Lower Earth launch costs!



## Advantages of Space Based Economy Approach for an Individual Business

- Lower initial cost and risk: infrastructure; multiple options to deal with contingencies.
- Efficiencies of scale and mutual interest: pricing for mutual survival, and eventually in free competition.
- Market for by-products
- Various pieces of the economy support each other.
- Path to a self-sustaining economy which generates wealth.

## Today's Generation Wants Careers In Space

- Worldwide enthusiasm.
- **Expectation** of grand challenges – and **participation**.
- Nearby natural resources surpass those on Earth.
- Exploration leads to economic benefits. But...
- Sustained support for exploration comes from economics and popular participation.
- **Unique opportunity** to guide the development of the Space economy.

## How Can We Accelerate This Process?

Broaden public appeal beyond “aerospace” and “science & engineering”

Critical needs :

- Reliable, easy-access knowledge on problems, opportunities, and methods.
- Realistic expectation that “NASA means business” – government commitment to infrastructure development.
- User-friendly access to space experiment development and launches.

## A Five-Point Public Message

1. What has the space program done for us?
2. NASA is not all astronauts and rocket scientists
3. So where does your money go?
4. Why is Mars exploration an essential step?
5. Where is the space program headed?

The message must be inspiring, credible and reliable.

**Thank you!**