

AIAA LA-LV
Space Architecture Gathering
Conclusion

Expendable v Reusable Launch Vehicles

PAST



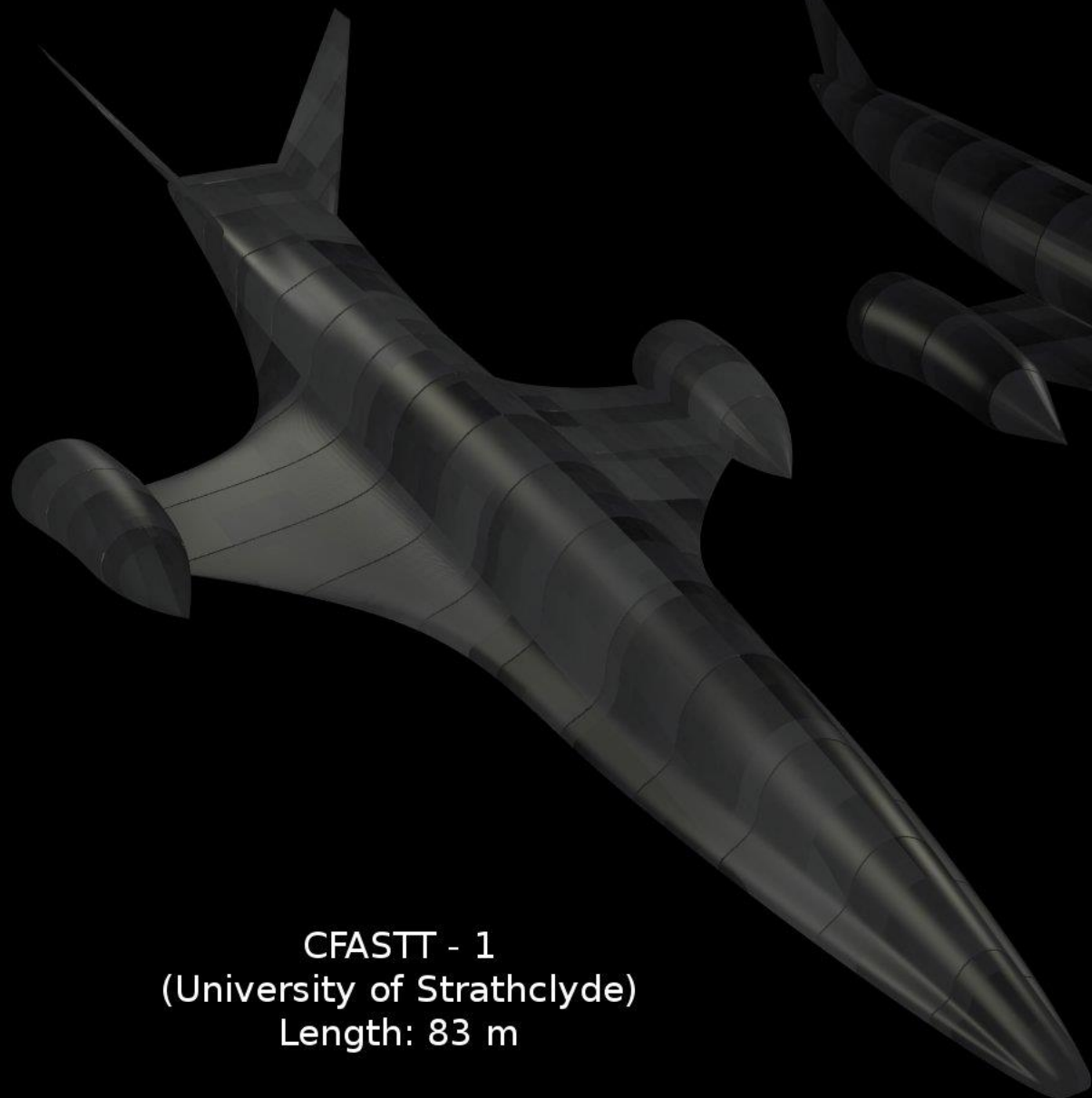
FUTURE



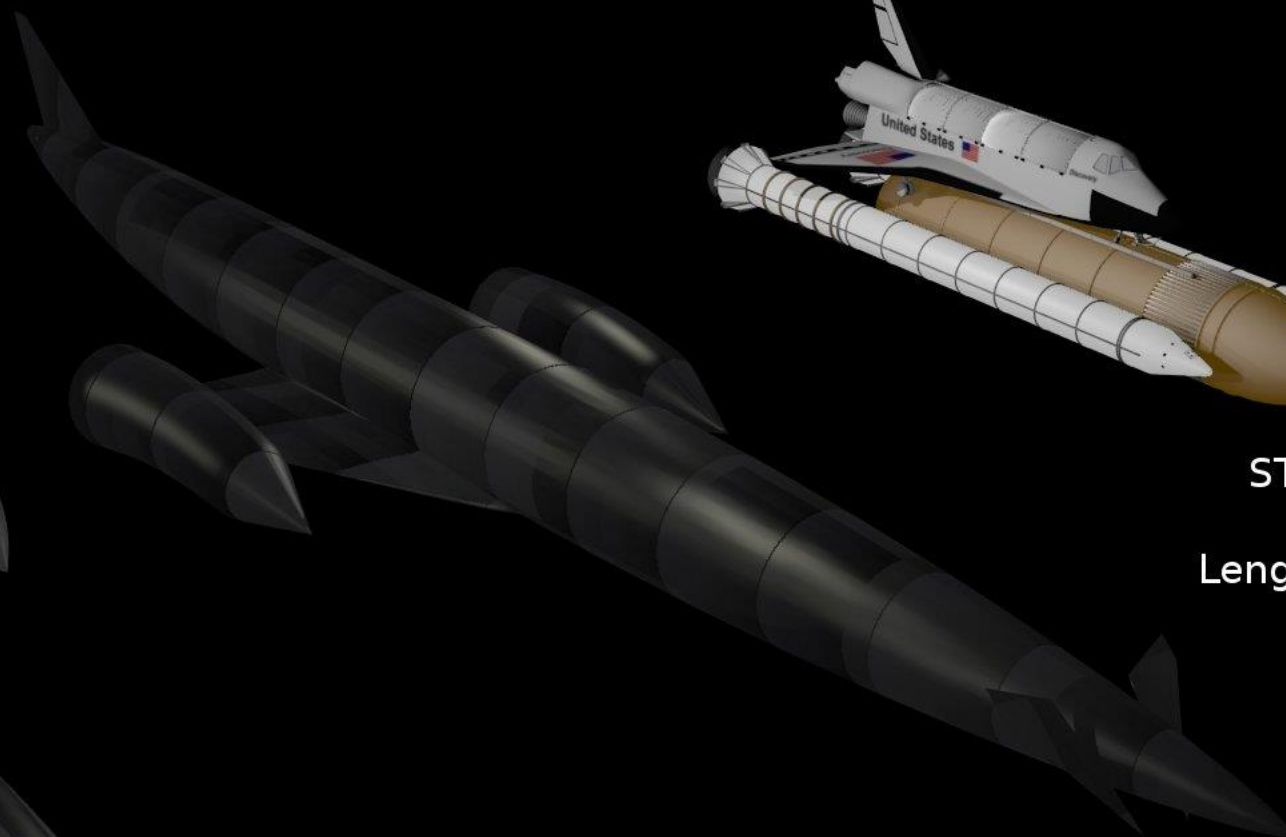


Fully Reusable TransAtmospheric Vehicles





CFASTT - 1
(University of Strathclyde)
Length: 83 m



SKYLON C2
(Reaction Engines)
Length: 83 m



STS Orbiter
(NASA)
Length: 37.24 m

Full Moon @ SpaceX



Planet Moon

<https://www.youtube.com/watch?v=L1wggKVZVp-o>

ITS
Sep 2016

BFR
Sep 2017

BFR
Sep 2018

Starship
Dec 2018

Starship
Sep 2019



WILEY

WILEY-PRAXIS Series in
Space Science and Technology

PRAXIS

THE MOON

AMUNDSE

**Resources, Future Development
and Colonization**

David Schrunk, Burton Sharpe,
Bonnie Cooper and Madhu Thangavelu



David Schrunk • Burton Sharpe • Bonnie Cooper • Madhu Thangavelu

THE MOON

Resources, Future Development, and Settlement

Second Edition



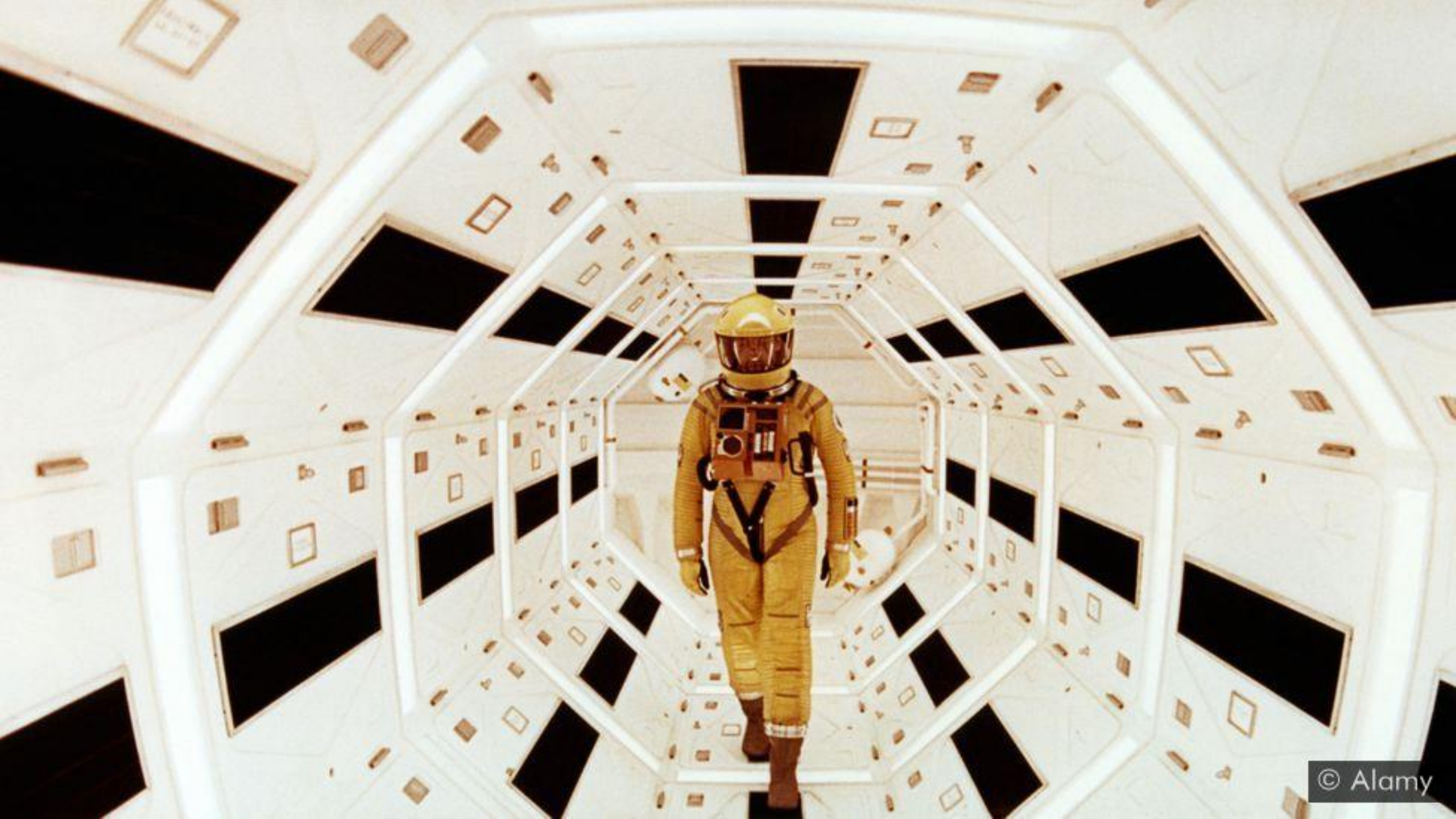
Springer

Human Spaceflight

- Humans in the Loop
- Crew in Charge & Control of Mission
- Autonomy
- Mission Success Determined by Crew

2001: A Space Odyssey





Solaris - Tarkovsky



Civilian Code of Conduct vs Military

Submariners









NASA & Private Space

- NASA as Customer
- Commercial Human Space Activity – Self Sustaining, Revenue Generating
- Birth of Space Tourism



THE WHITE HOUSE

A New Era for Deep Space Exploration and Development

Product of
THE WHITE HOUSE
NATIONAL SPACE COUNCIL

JULY 23, 2020

New Era Report is about Values – Free World Values

- Administration Agnostic
- Seeks to reaffirm US Preeminence in Human Spaceflight
- Lays out the logic of the work of NSC of the last four years
- Free World Values
- American Values
- Projects Free World Values into Human Space Activity
- American Largesse
- E Pluribus Unum

Competition of Ideas at the
Narrative & Mission Design Stage
Global Consensus & Collaboration
during Execution

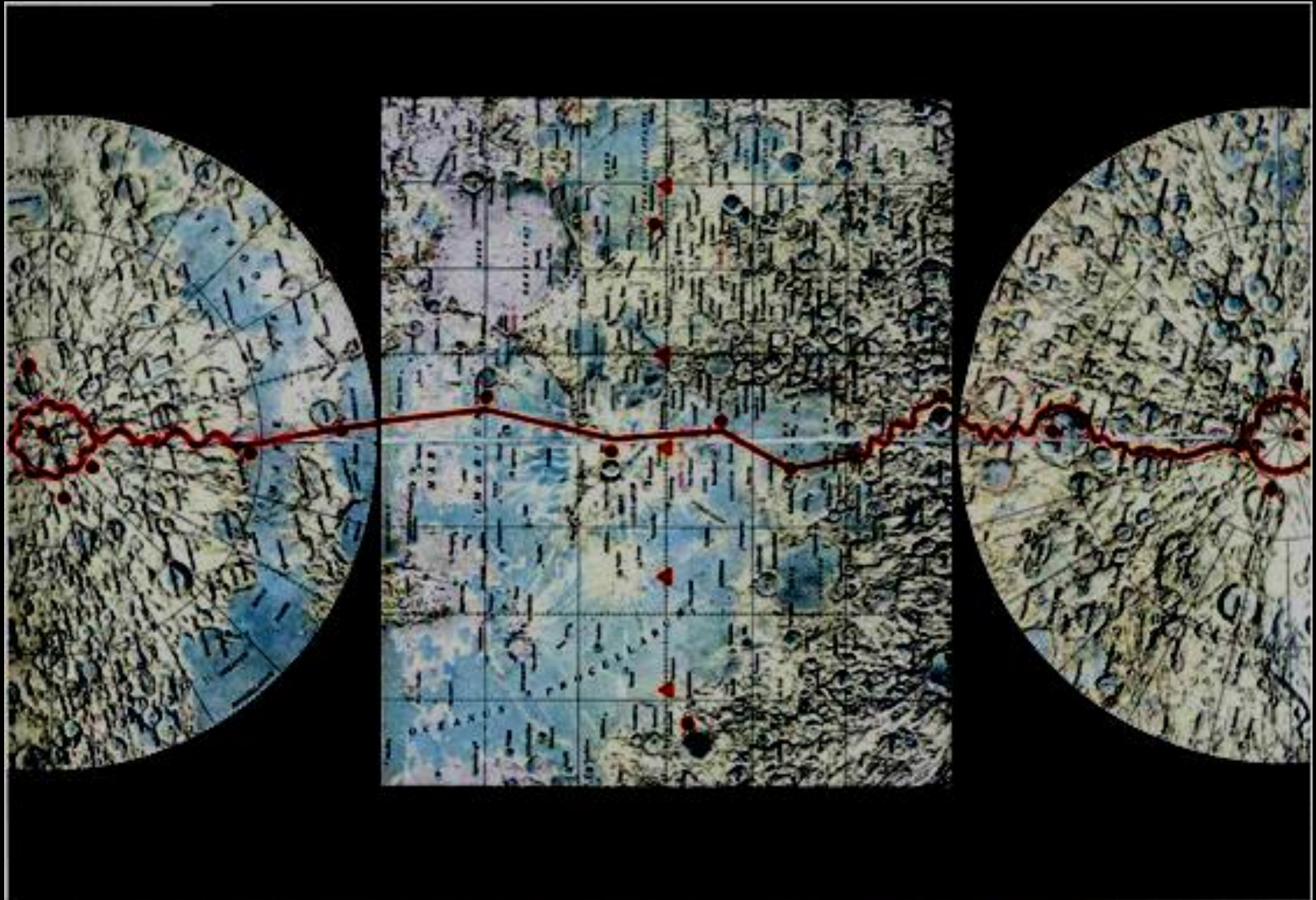
NASA - Only One(1) Current Lunar Mission Concept

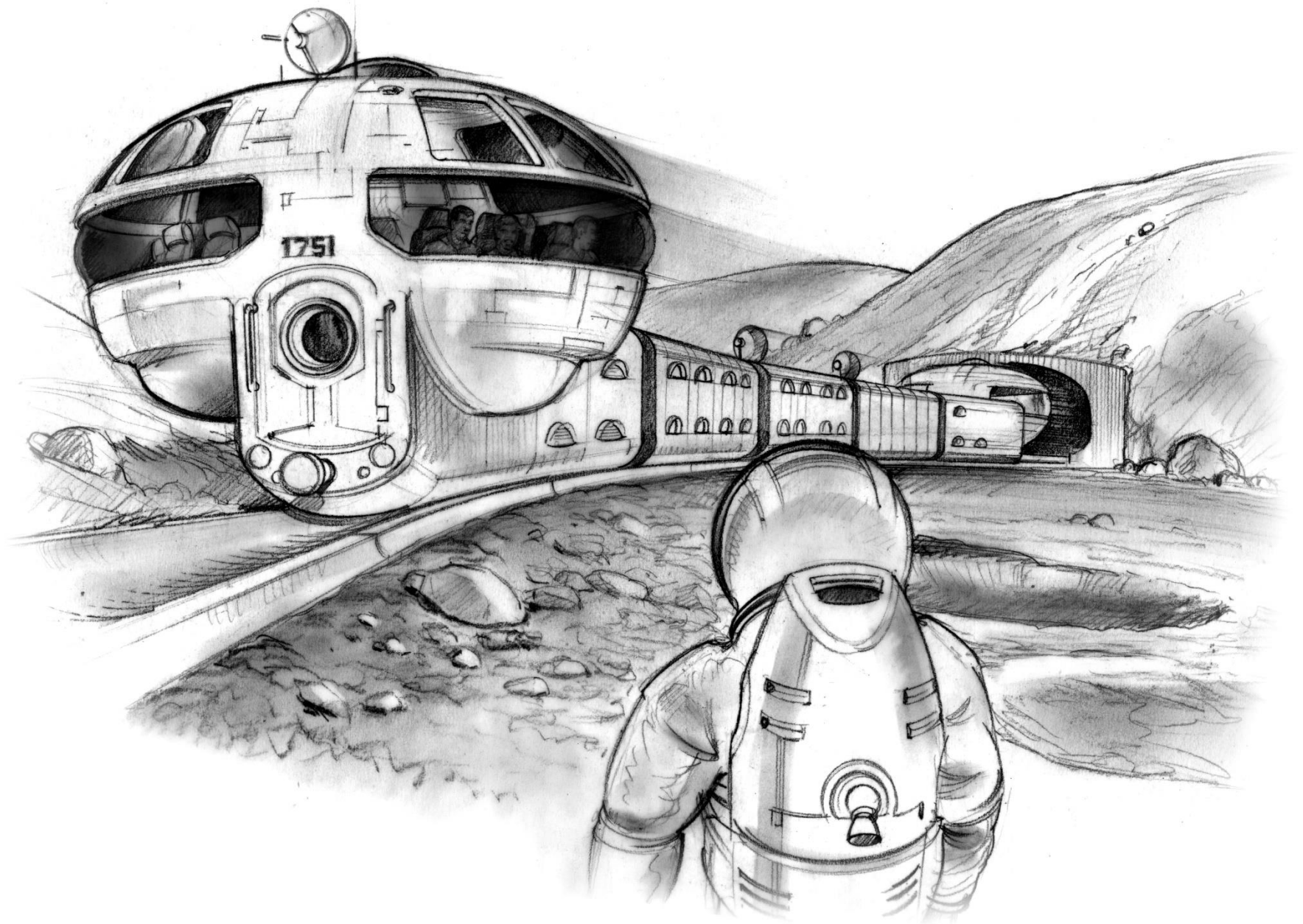
- Go to Moon
- Lunar Orbiting Gateway
- Artemis
 - Land two astronauts at South Polar region
- Build Habitat(not sure...ghost of HR5666)
- Set up and manufacture fuel ?

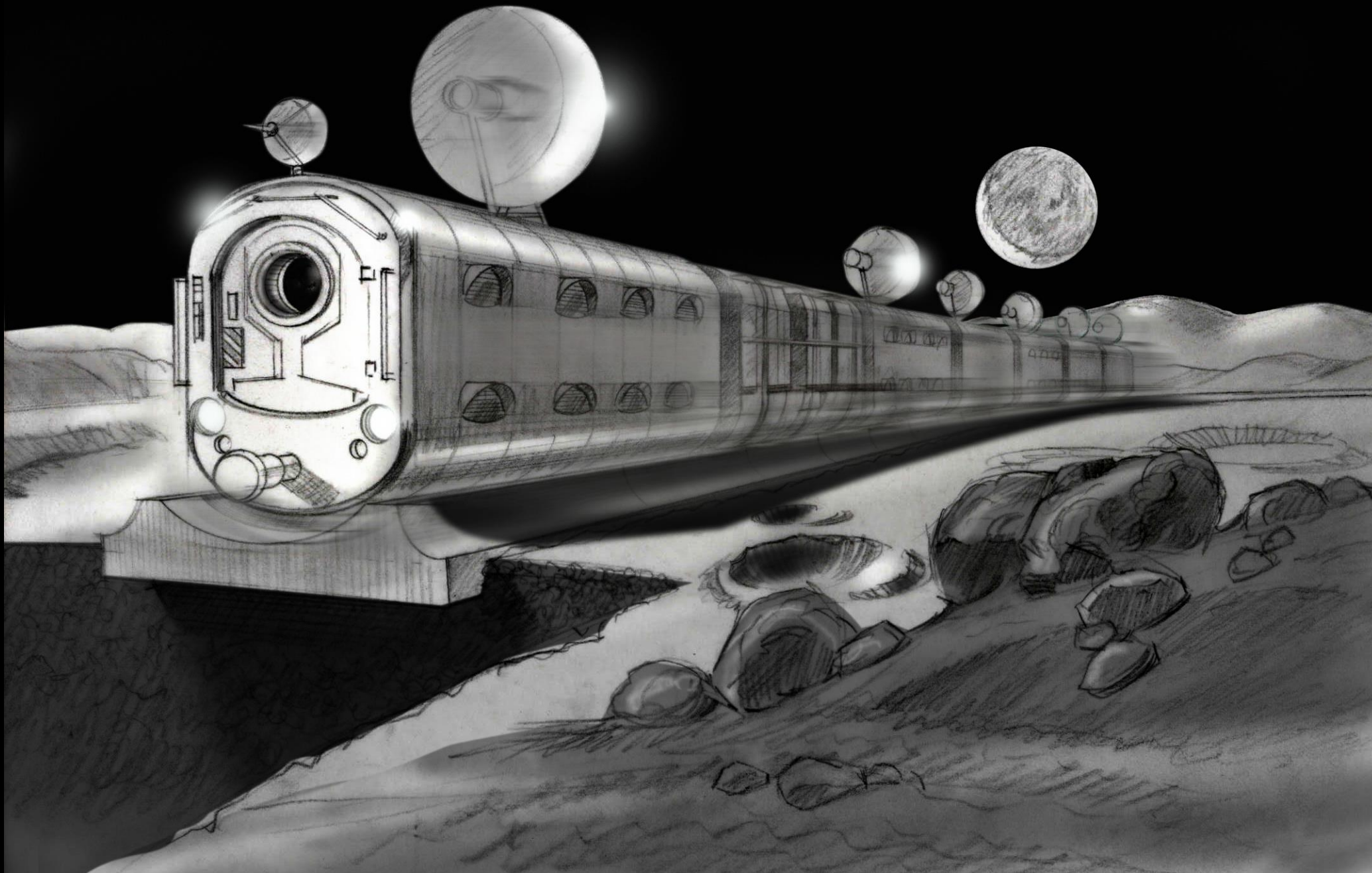
Importance of the Narrative

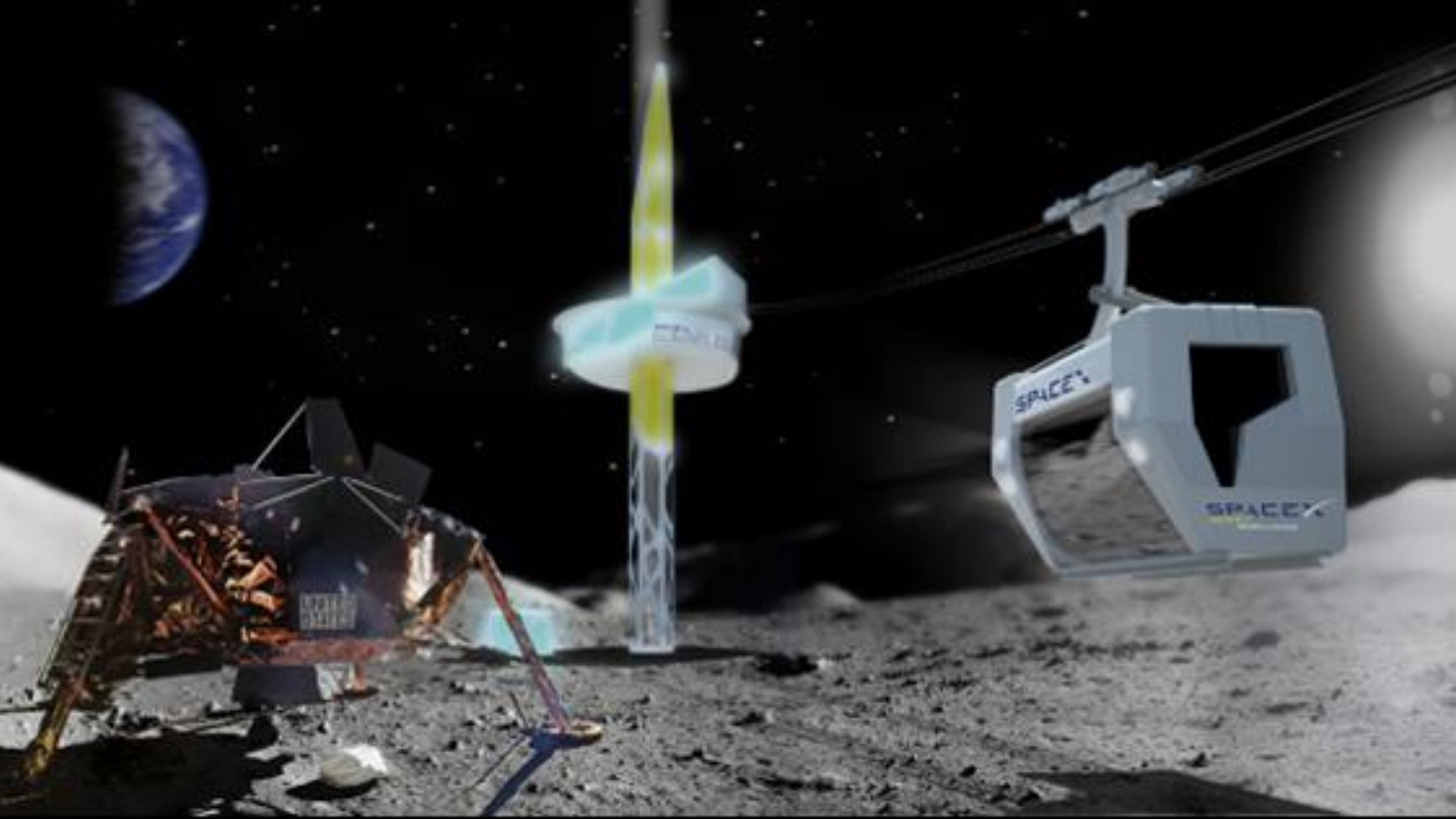
- Current Narrative : Go to Moon and to Mars sustainably
- Are there more compelling narratives that are more exciting and appealing to global public ?
- Storytelling : What we intend to do

The Ultimate Train Ride – The 345 Pole to Pole Lunar MagLev

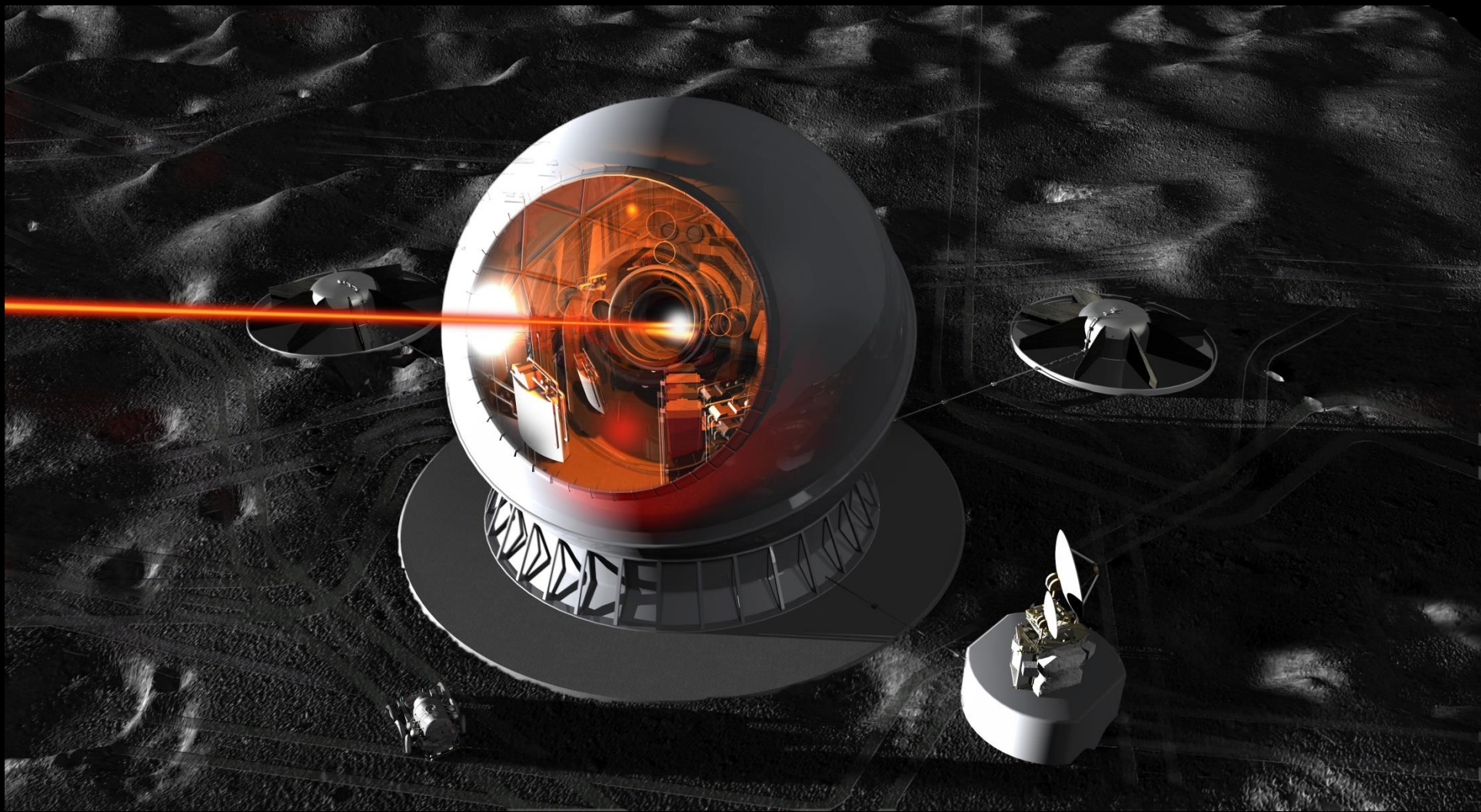




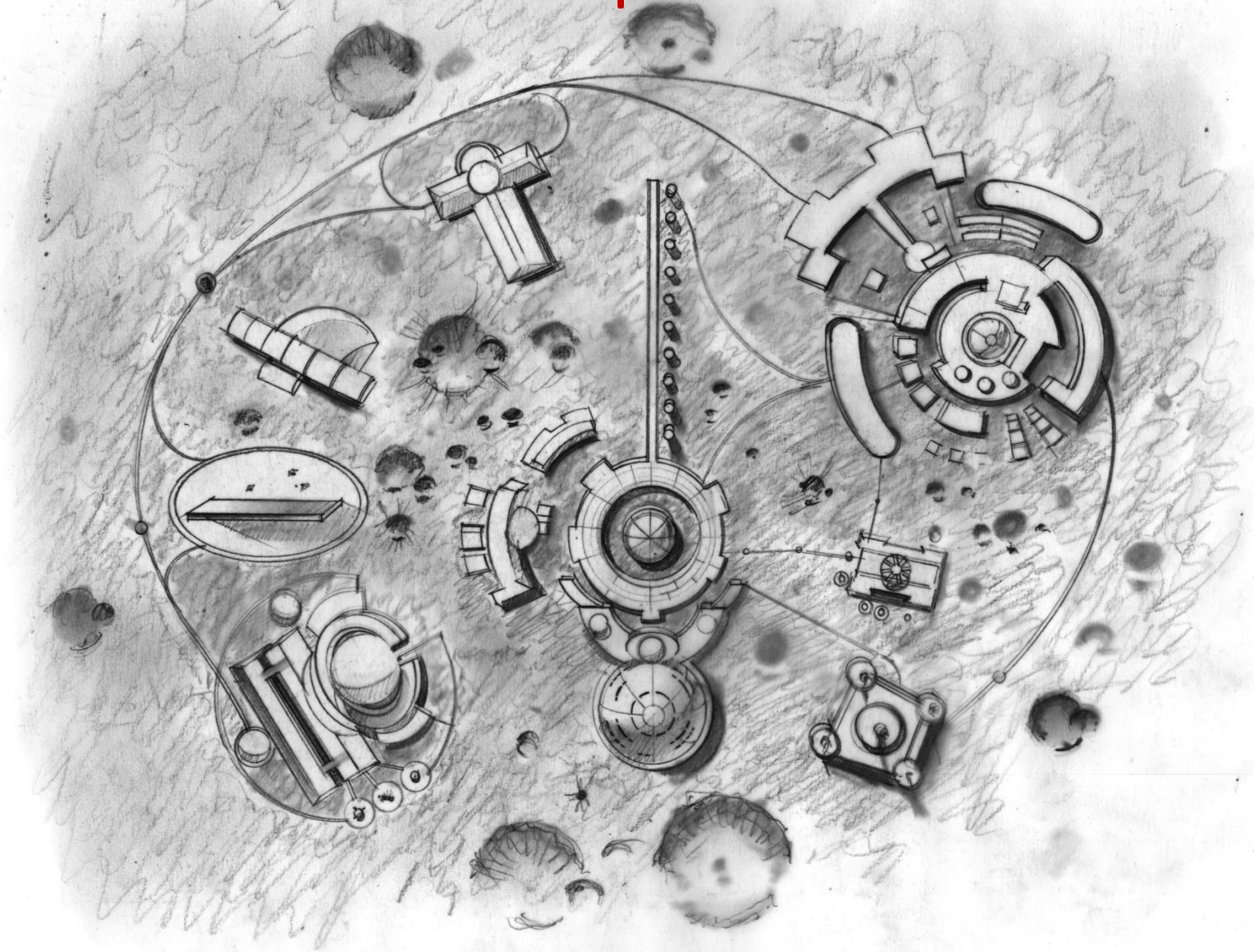


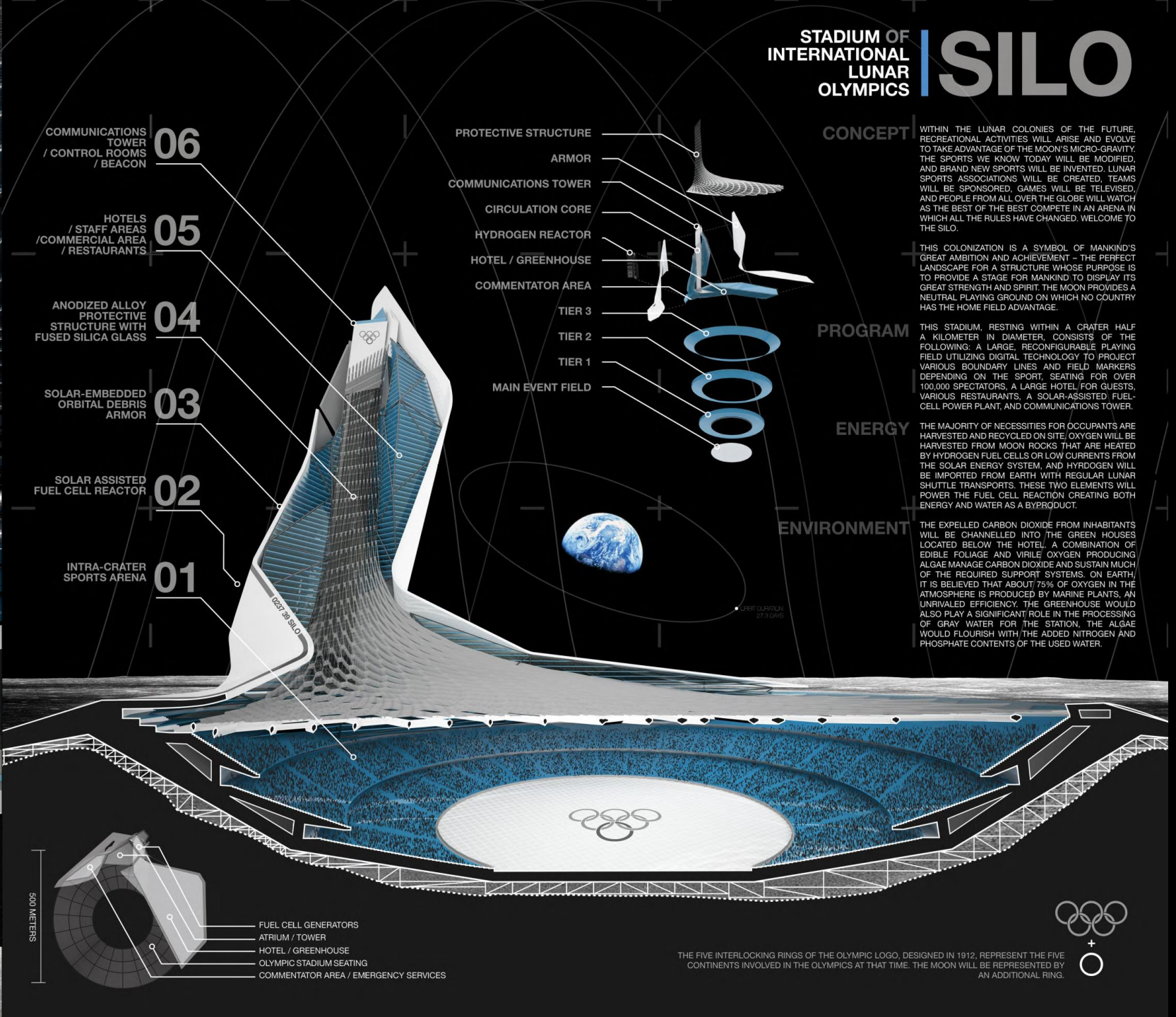
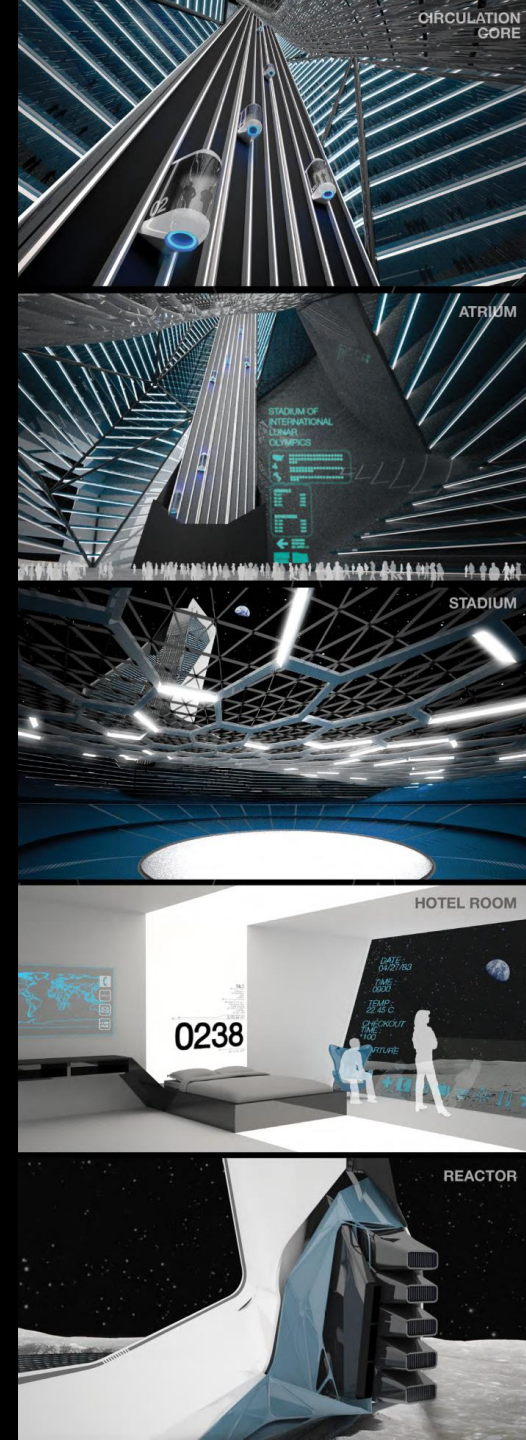


Planetary Defense from the Moon



Lunar UN Summit Hq. & Humanities Nexus



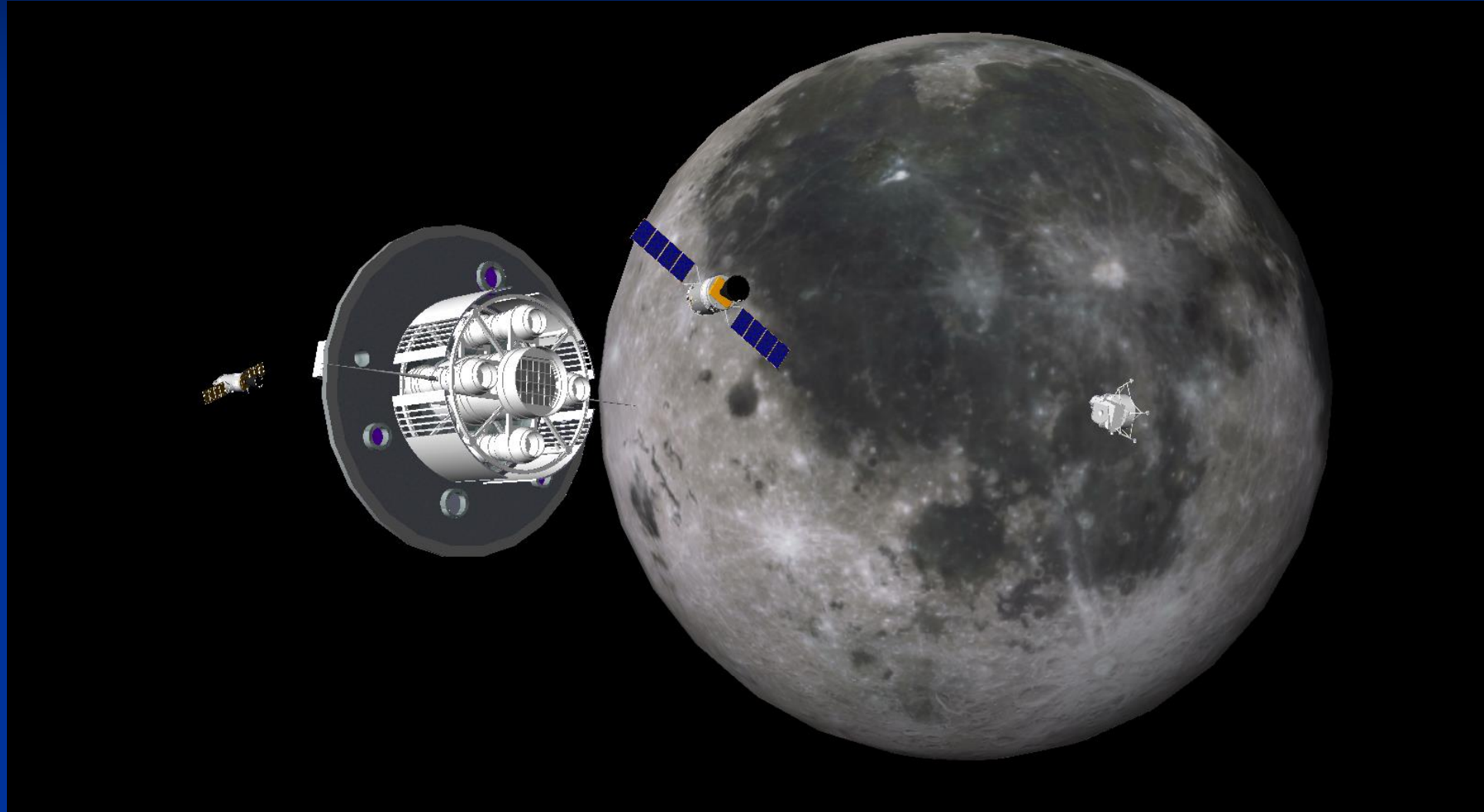




The Site of the Humanity Archives



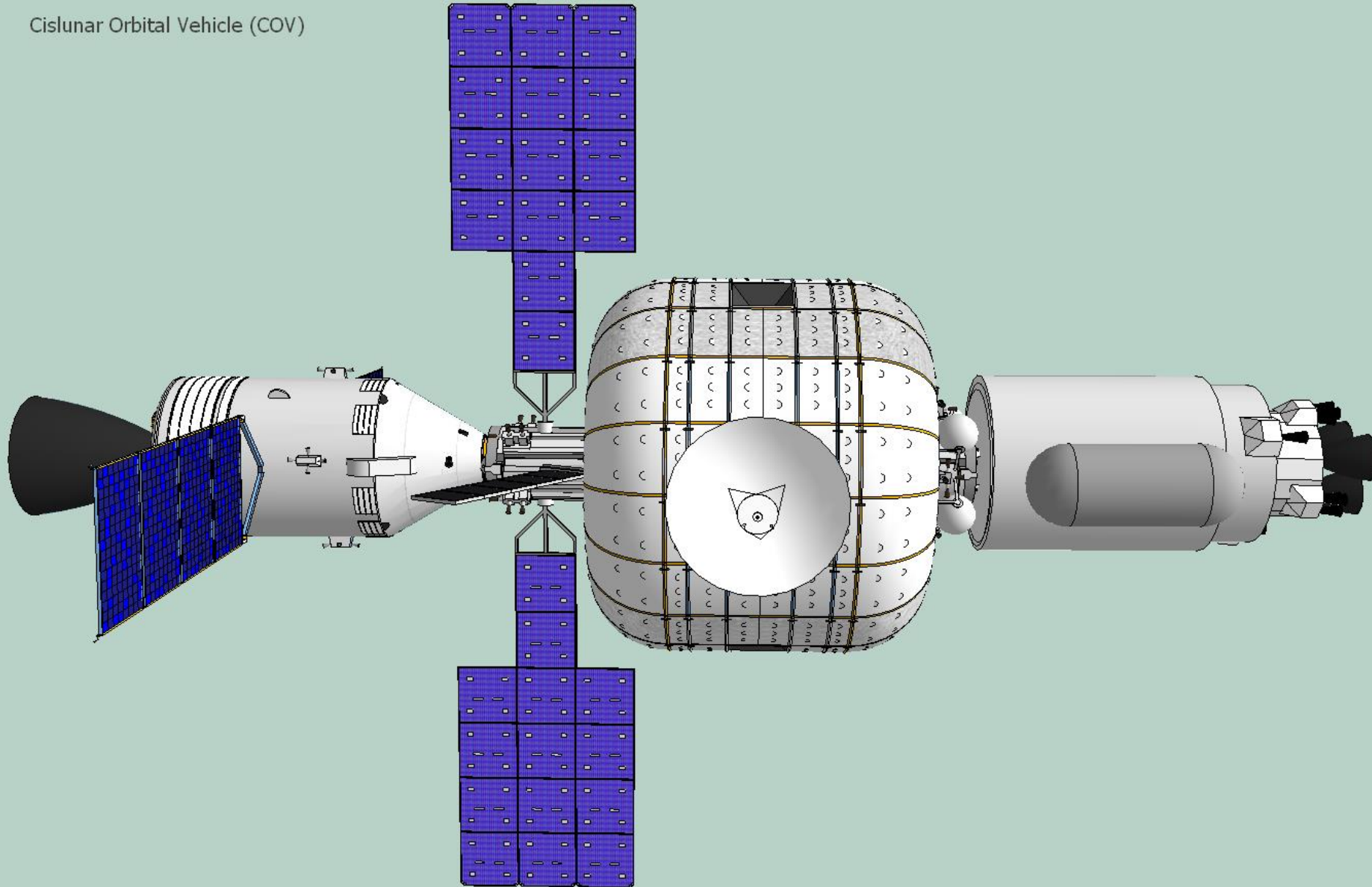
Concept – Lunar Transit Lounge (LTL)





Concept – COV exterior design

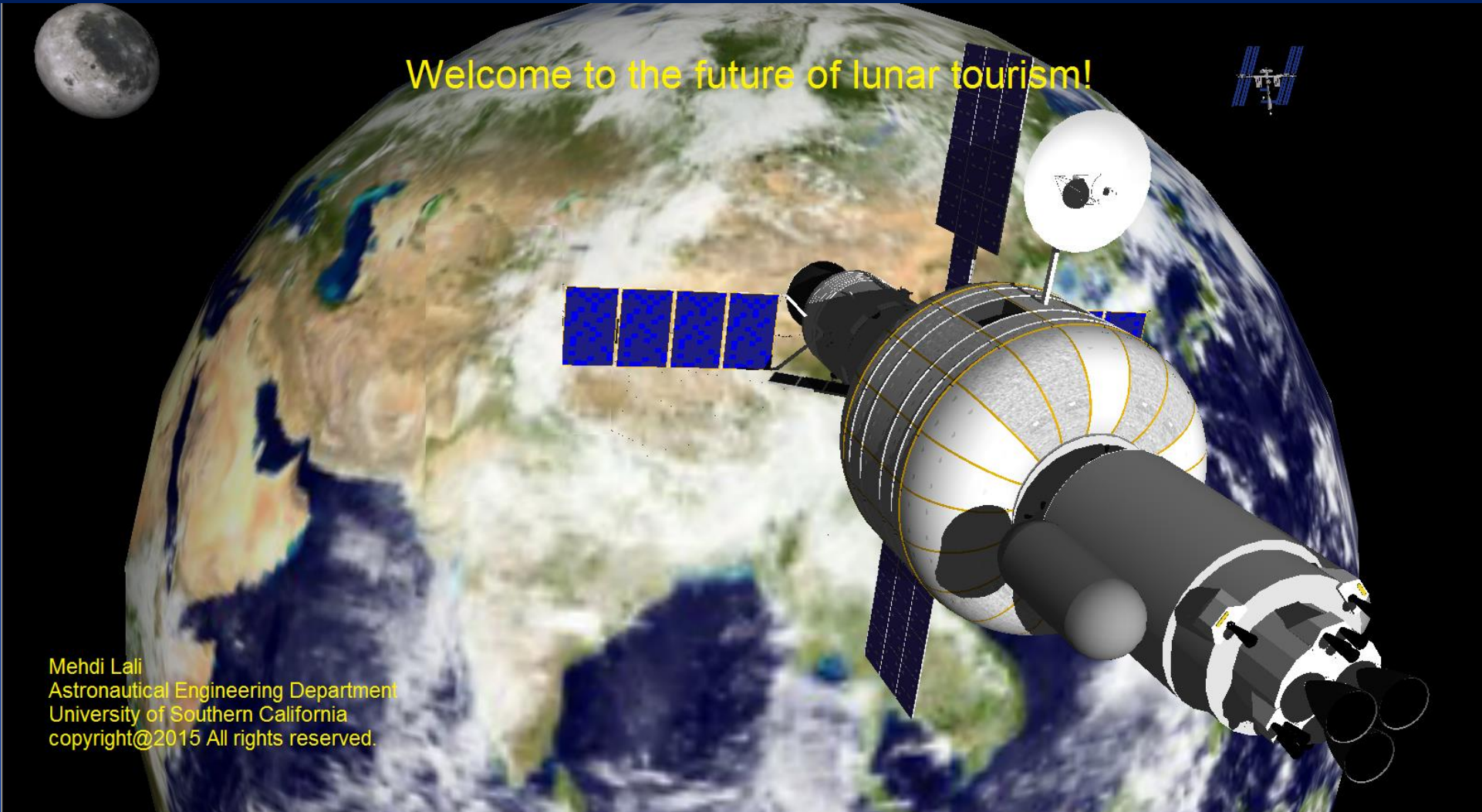
Cislunar Orbital Vehicle (COV)

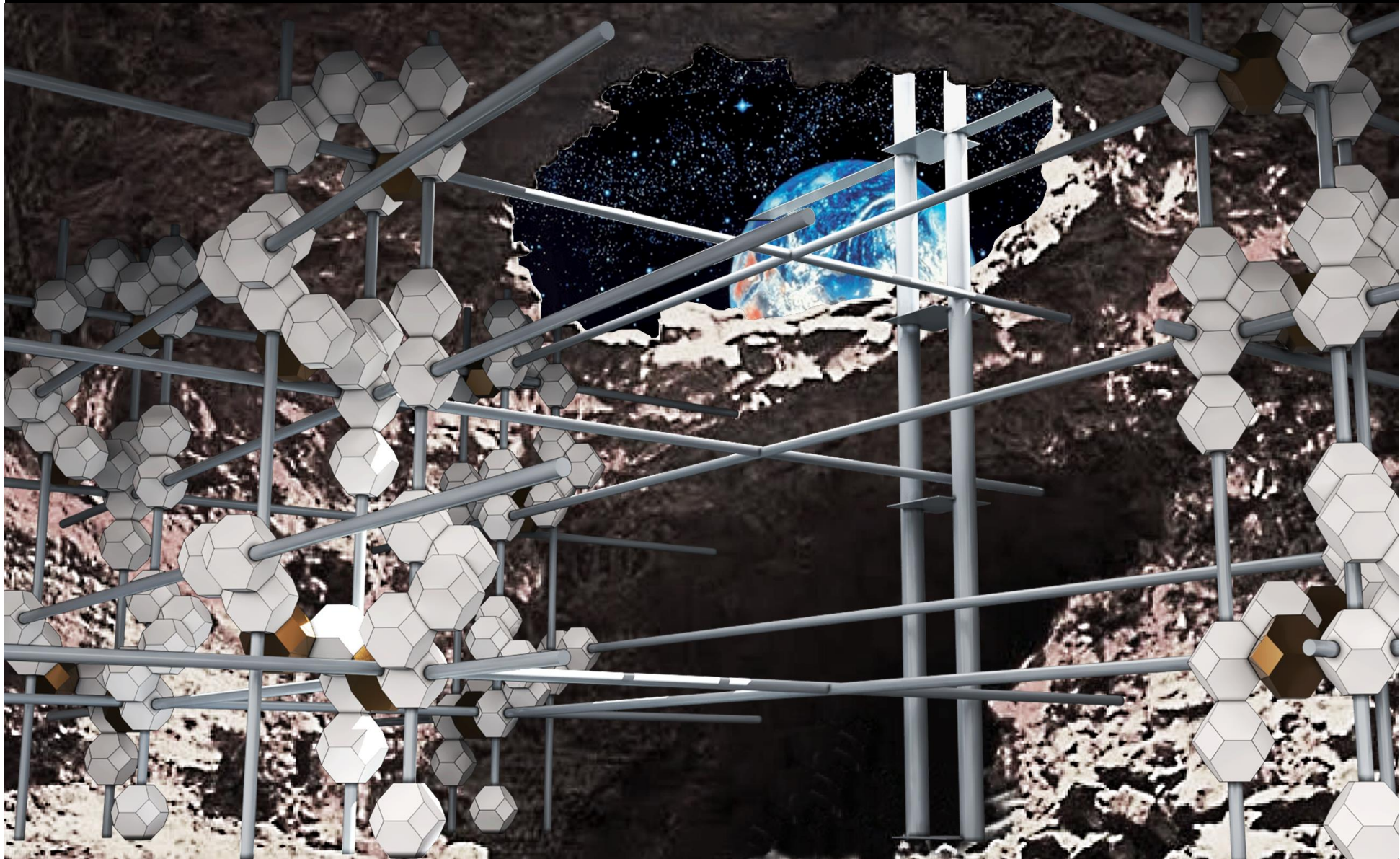




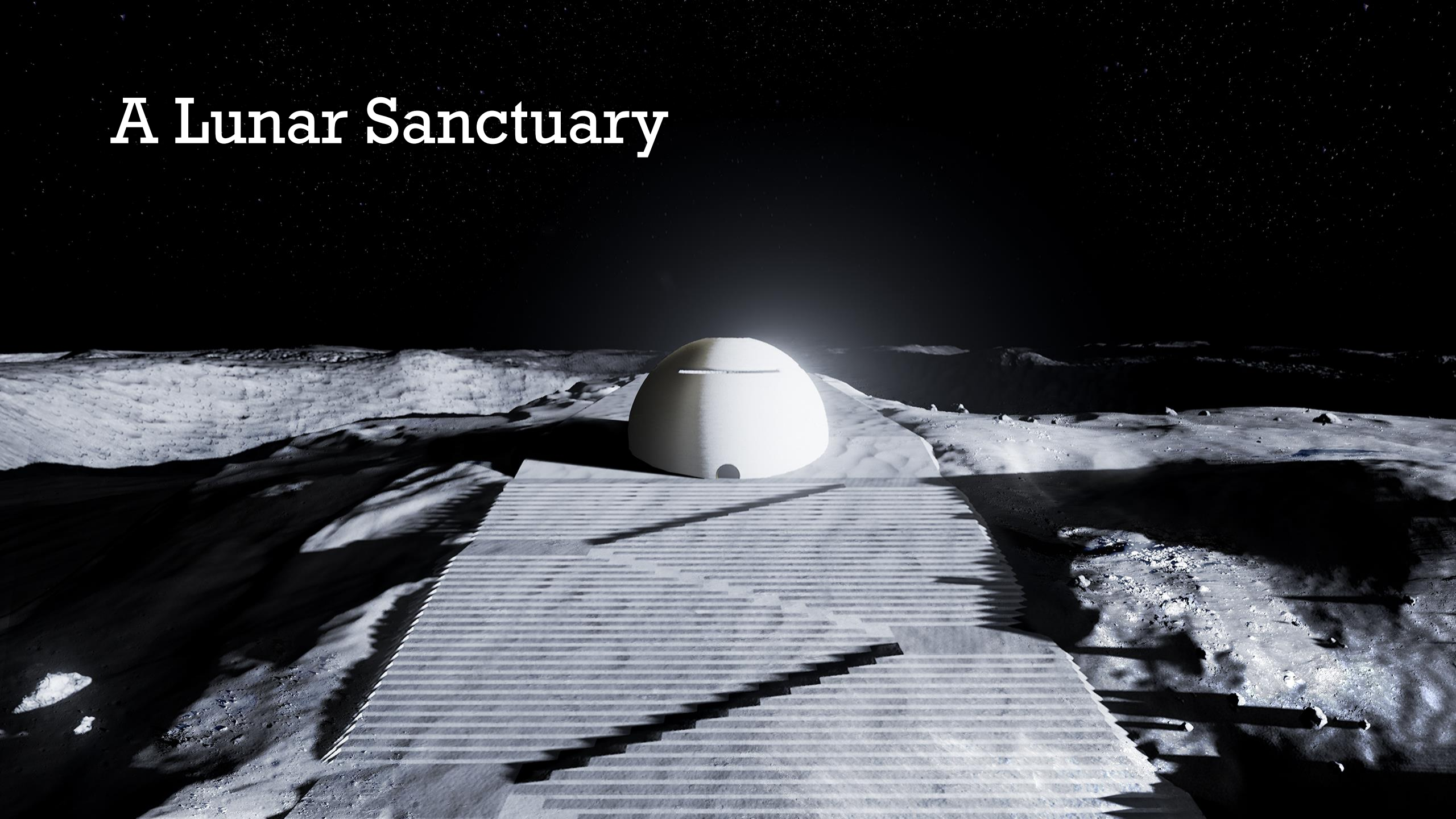
Welcome to the future of lunar tourism!

Mehdi Lali
Astronautical Engineering Department
University of Southern California
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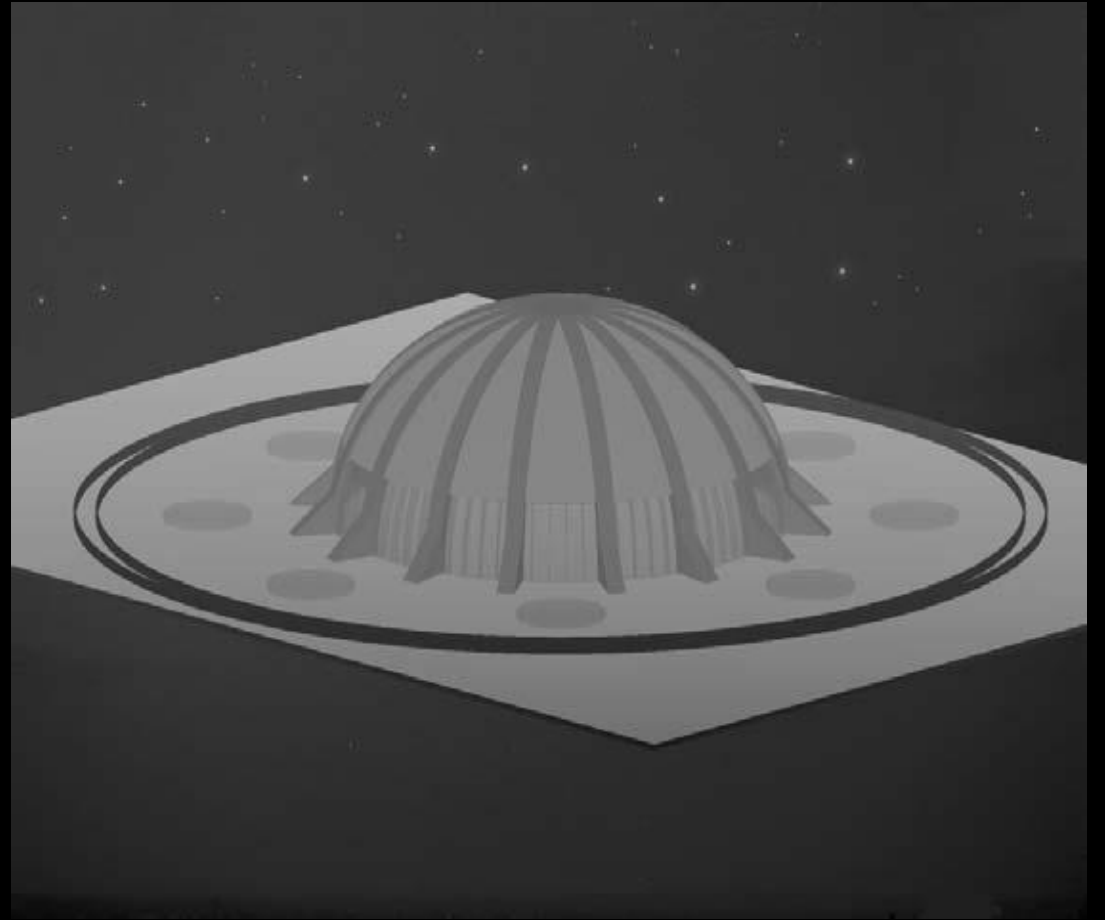
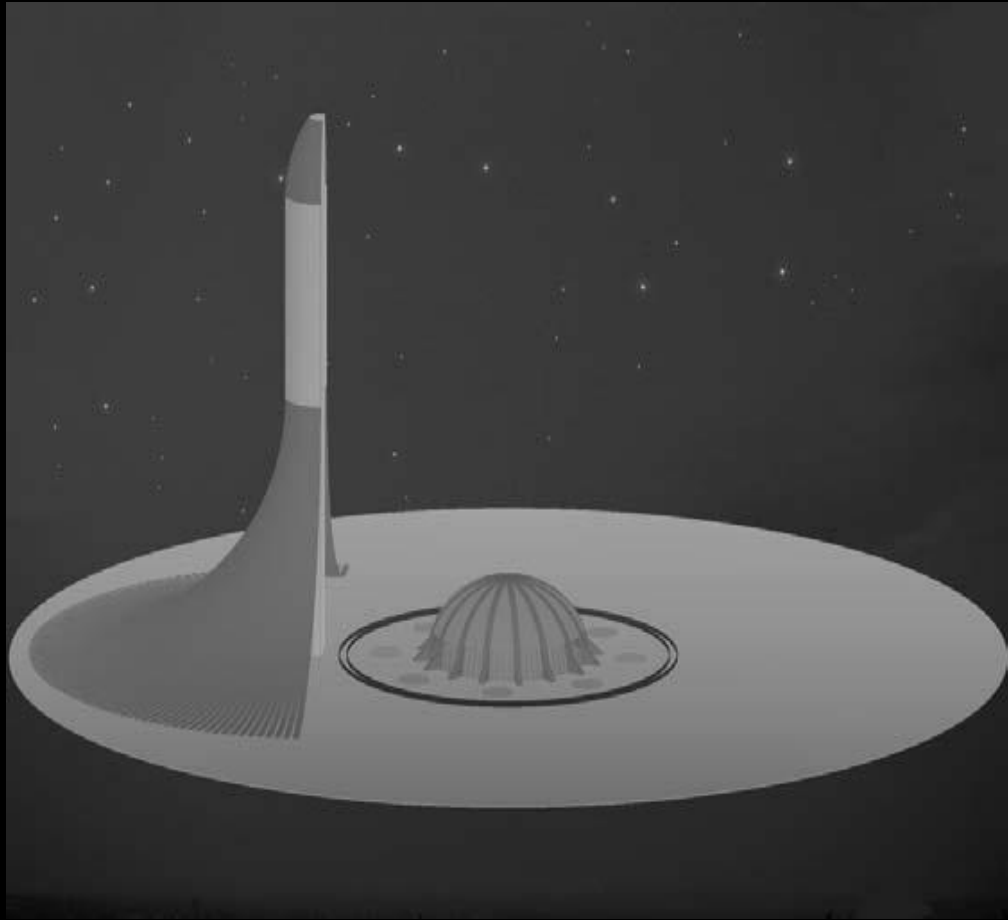




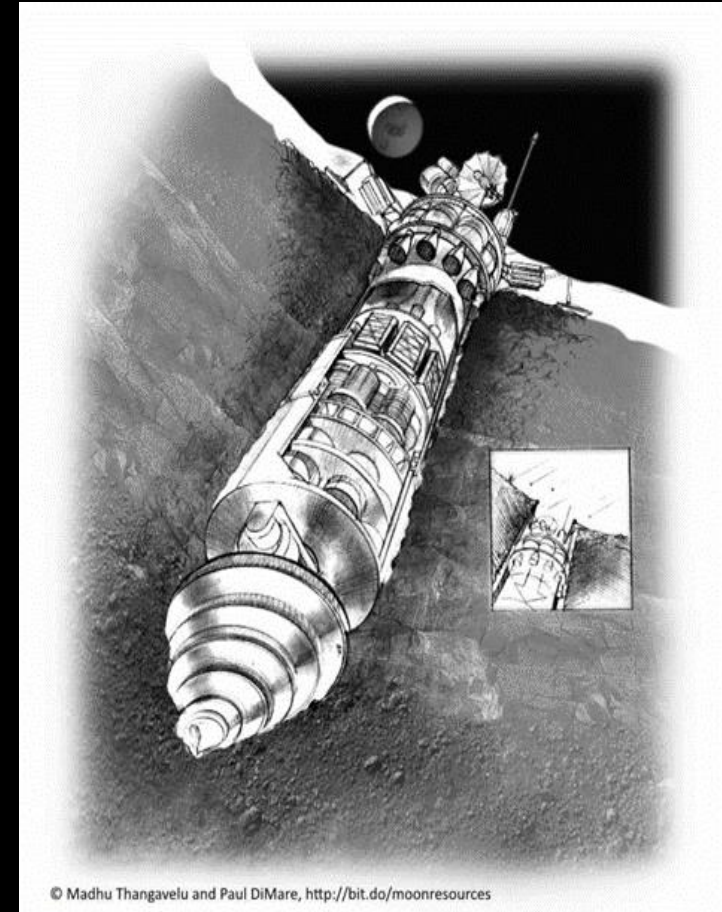
A Lunar Sanctuary



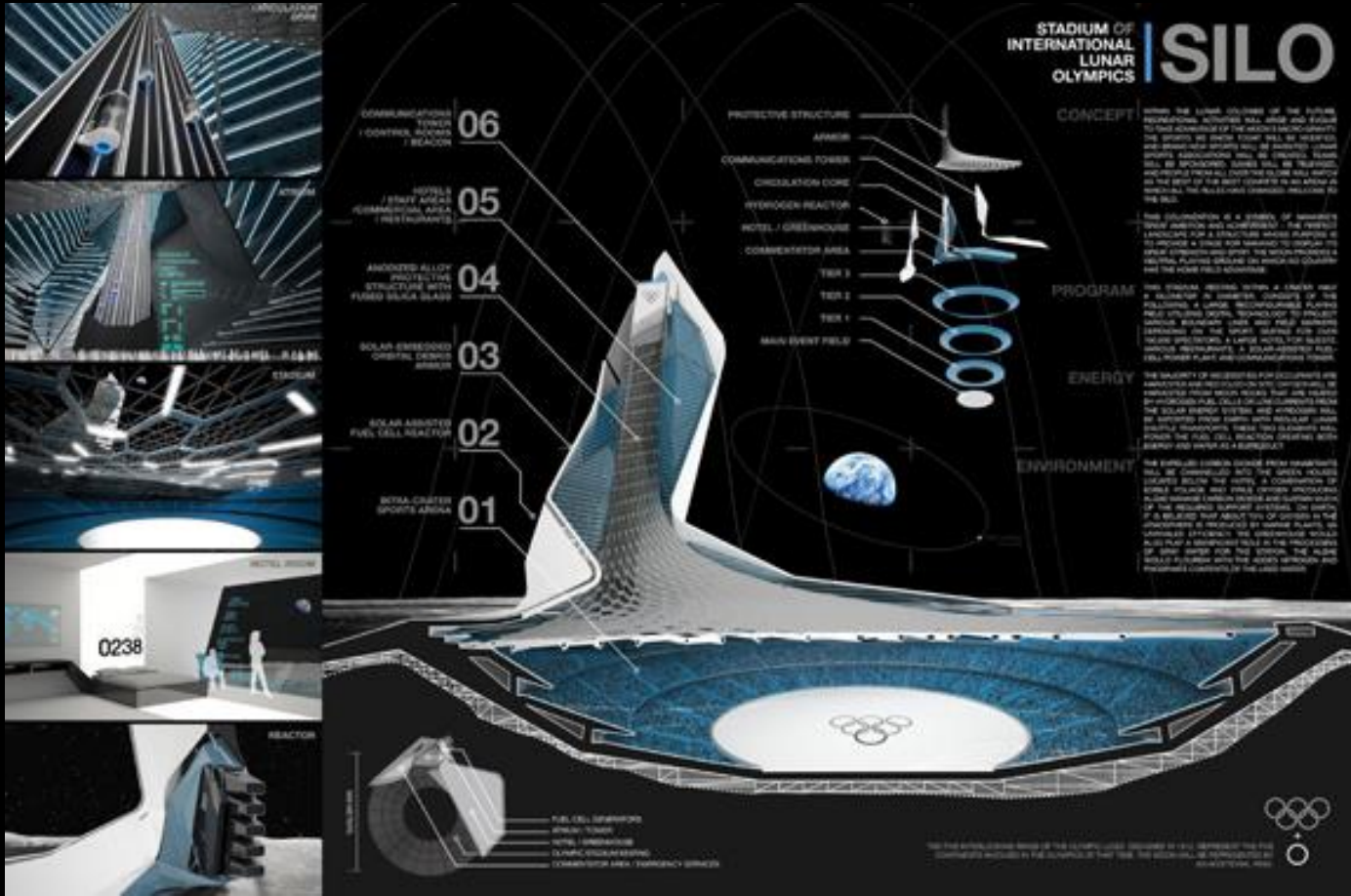
Mosque on the Moon



Lunar UN Summit Hq., & Cultural Center



Lunar Olympics



Earth-Looking Telescope on Our Moon





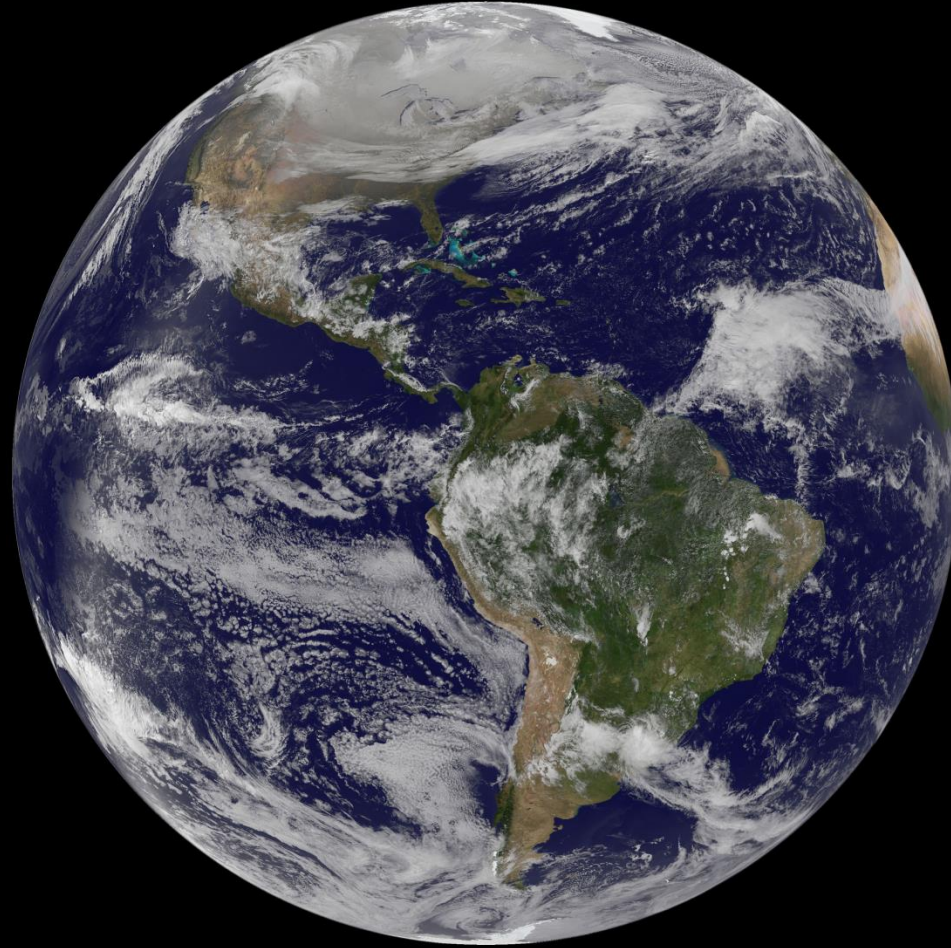
What is Possible for our Species



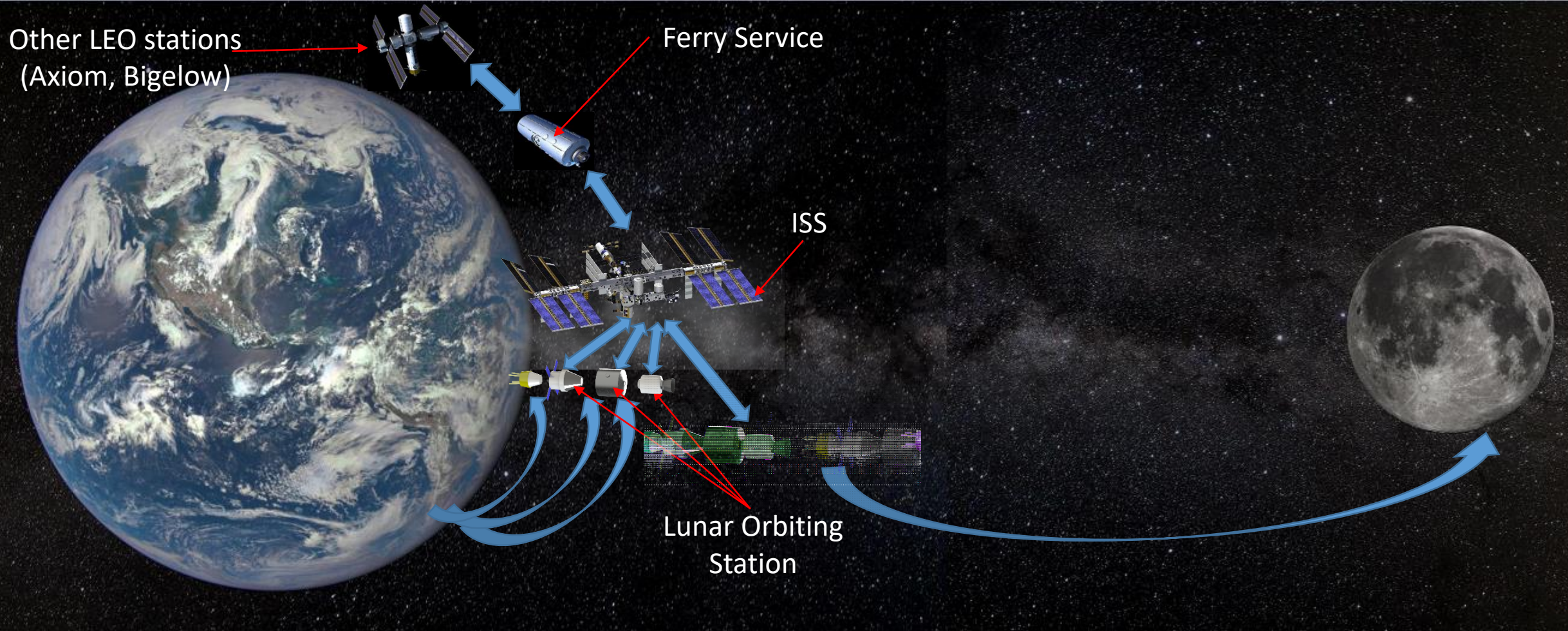


Thank You

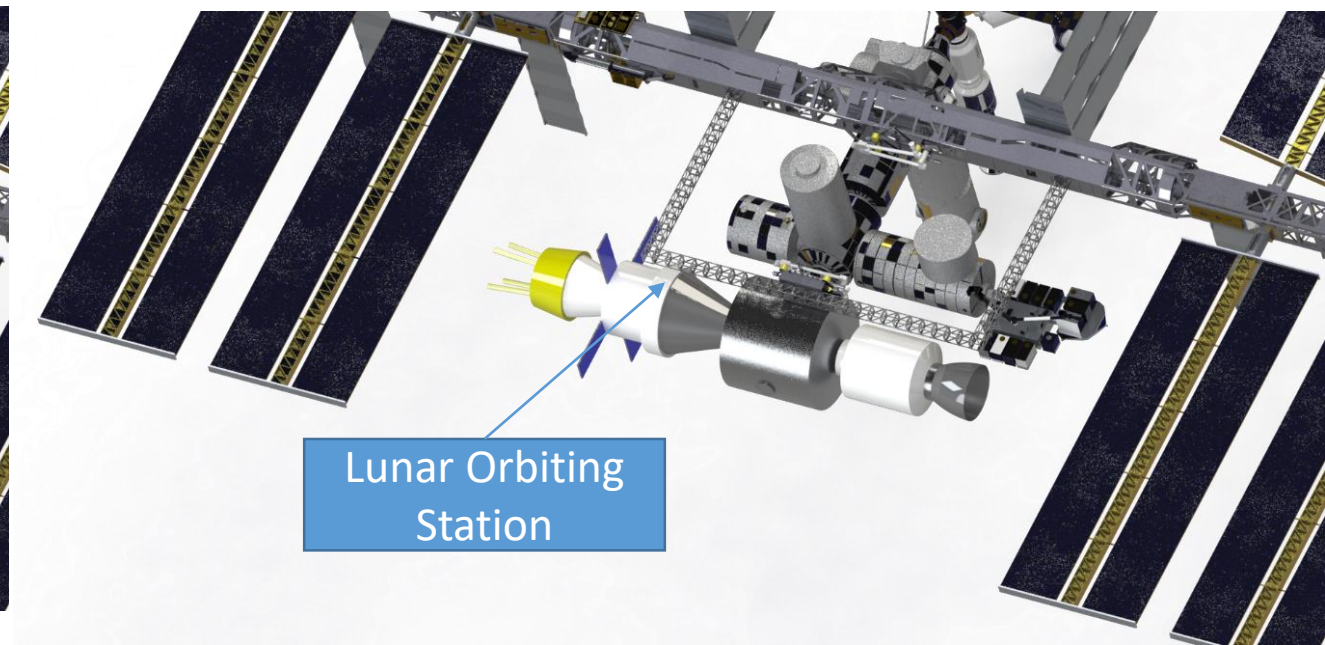
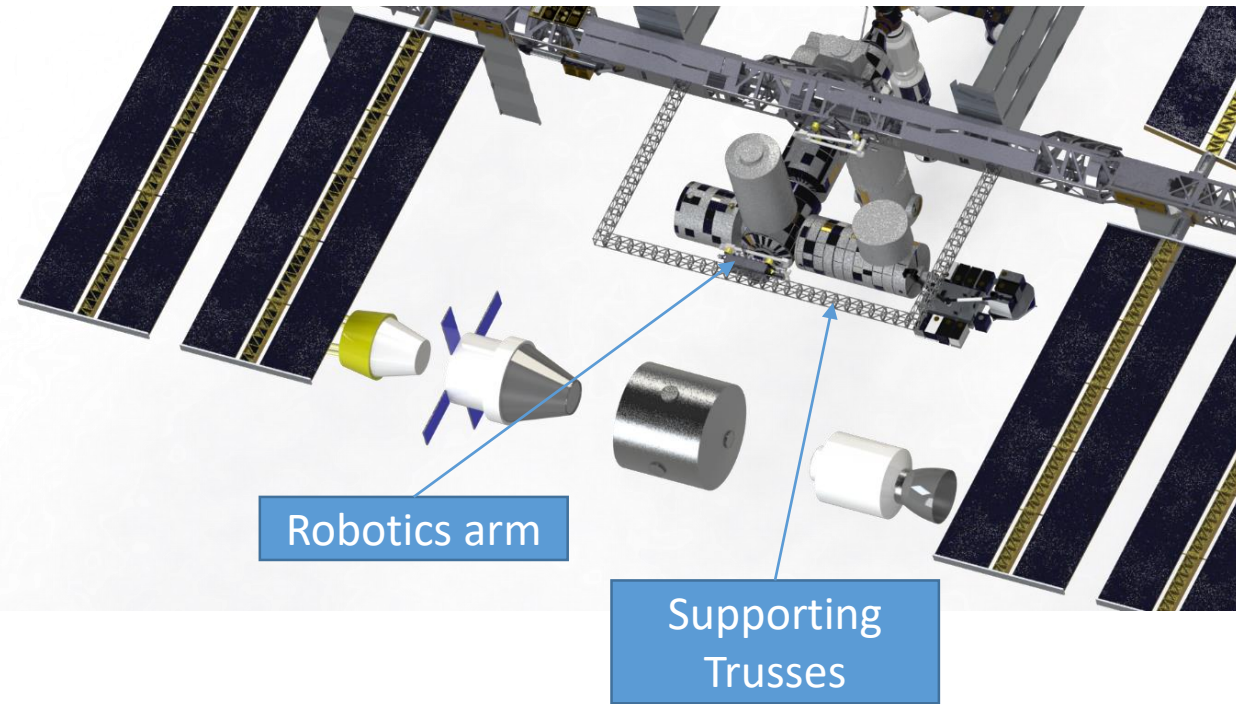
NOAA GOES 13 150107 1445 UTC NASA GSFC GOES Project



LEO - Commercial and International Cooperation



Concept: ISS Assembly Depot



- Supporting trusses will be served as a mounting platform for any robotics arms. In addition, they will support astronauts' movement and allow them to have full access to the Lunar Orbiting Station for assembly and inspection.
 - Trusses can be extended for larger build (e.g., Mars Expedition Vehicle)

More Options for Lunar Orbiting Command Module



ORION MPCV (NASA)	
Диаметр	.. 5,02 м
Длина	.. 3,3 м
Объем	.. 19,56 м³
Масса	.. 8,9 т

8.95 м³



CST-100 (NASA)	
Диаметр	.. 4,56 м
Длина	.. 3,14 м
Объем	.. ? м³
Масса	.. ? т



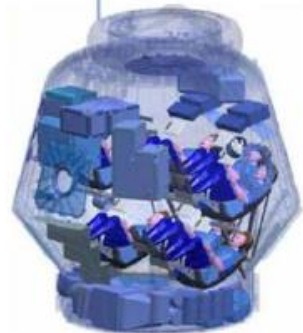
ГТК НП (Roscosmos)	
Диаметр	.. 4,42 м
Длина	.. 3,9 м
Объем	.. 17 м³
Масса	.. ? т

6.5
8.0



SPX DRAGON (NASA)	
Диаметр	.. 3,81 м
Длина	.. 3,2 м
Объем	.. 10 м³
Масса	.. > 4,8 т

< 10 м³



ISRO ORBITAL (INDIA)	
Диаметр	.. 3,1 м
Длина	.. ? м
Объем	.. ? м³
Масса	.. ~ 3 т



ШЭНЬЧЖОУ (CHINA)	
Диаметр	.. 2,52 м
Длина	.. 2,5 м
Объем	.. 6 м³
Масса	.. 3,24 т

4.0
5.0

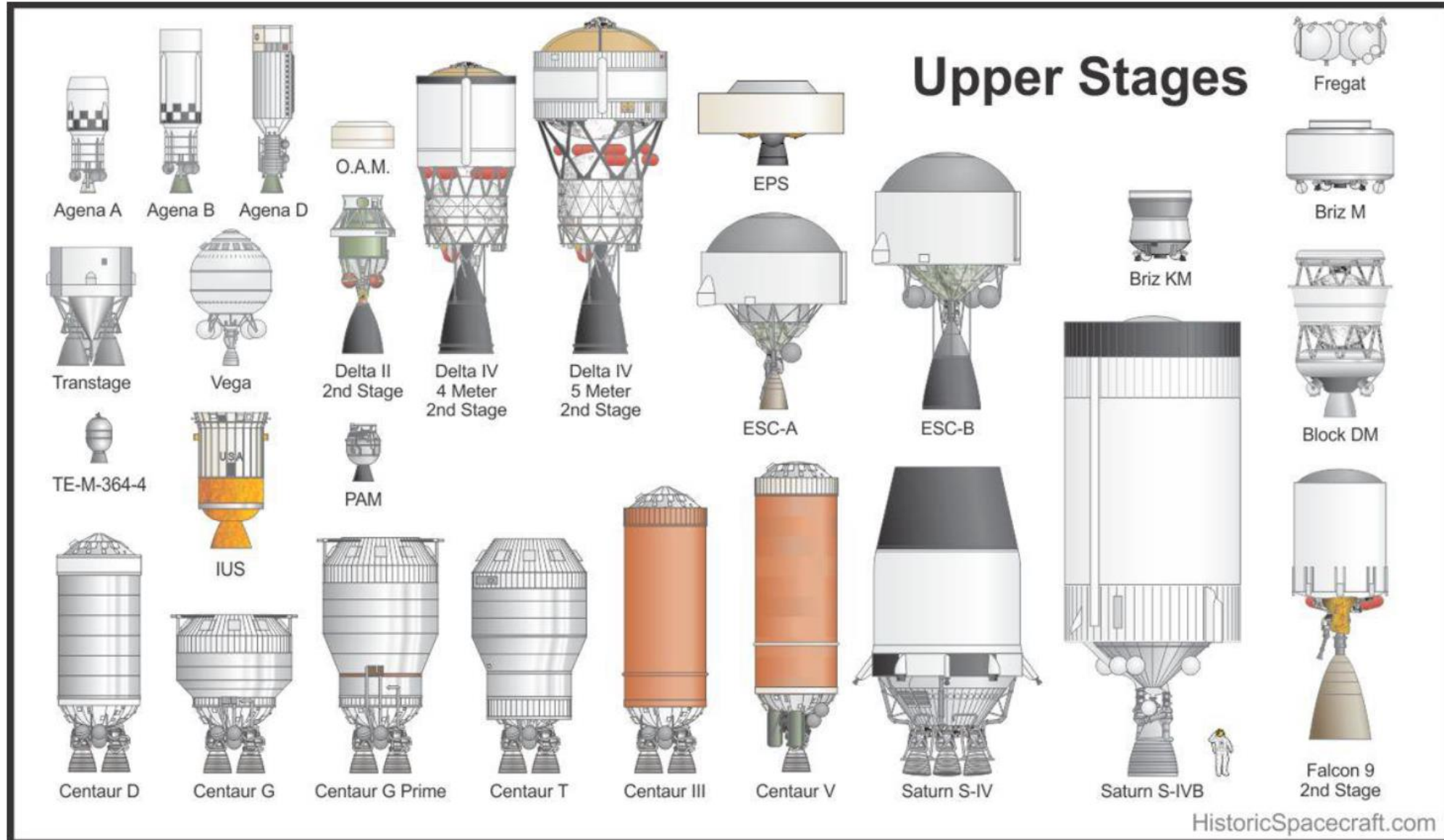


СОЮЗ-ТМА (Roscosmos)	
Диаметр	.. 2,17 м
Длина	.. 2,24 м
Объем	.. 3,5 м³
Масса	.. 2,95 т

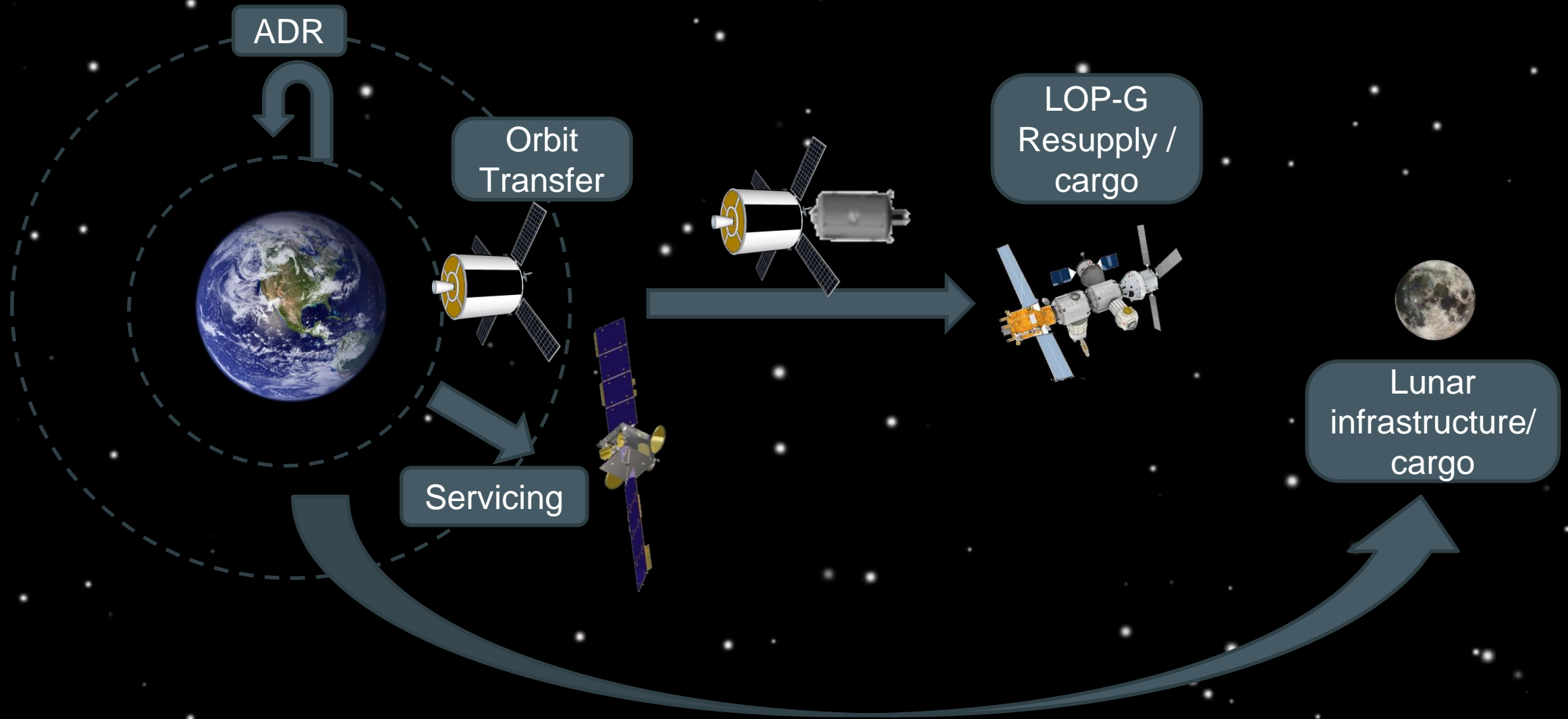
2.5 м³



More Options for Upper Stage

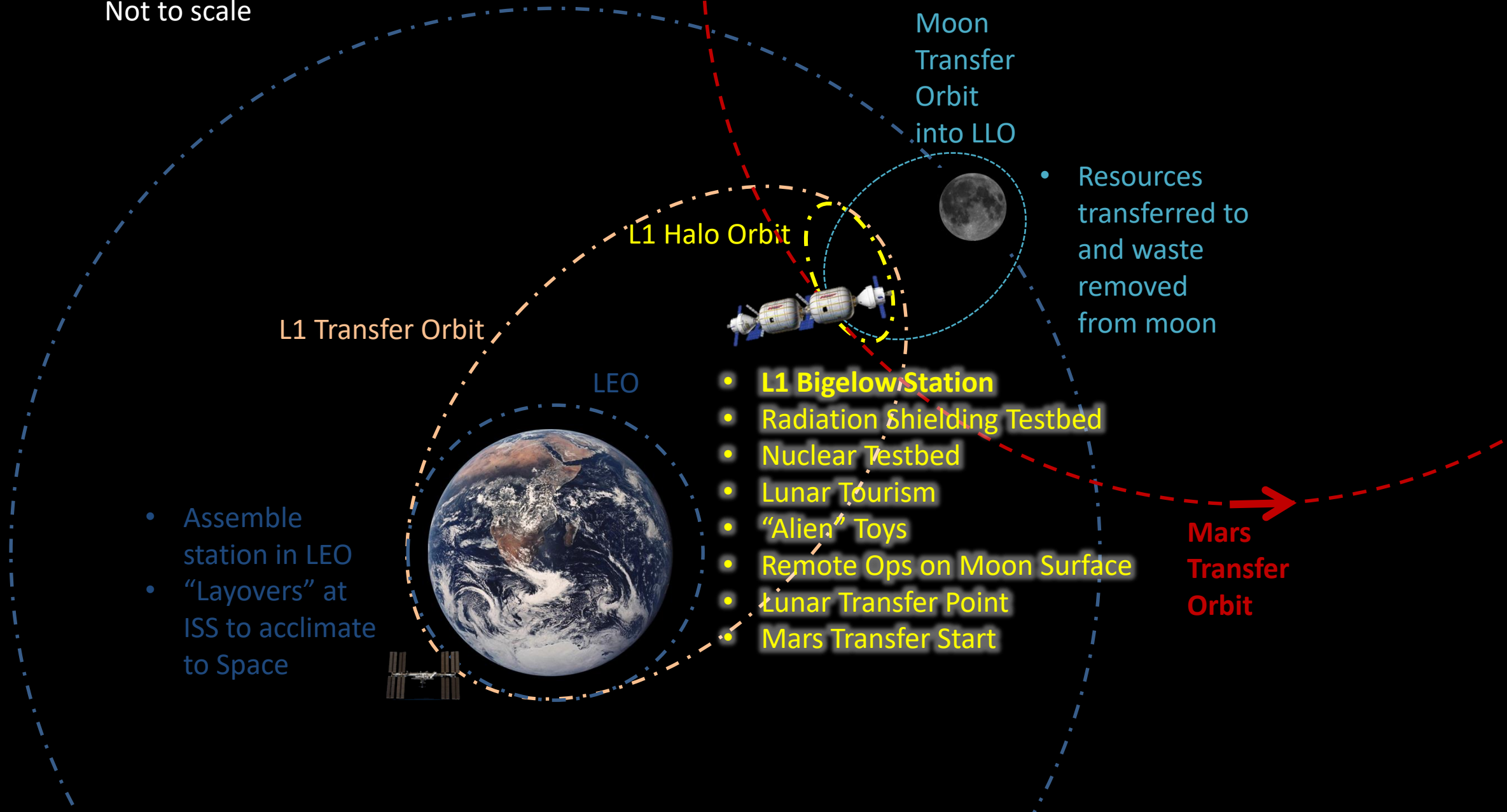


Applications

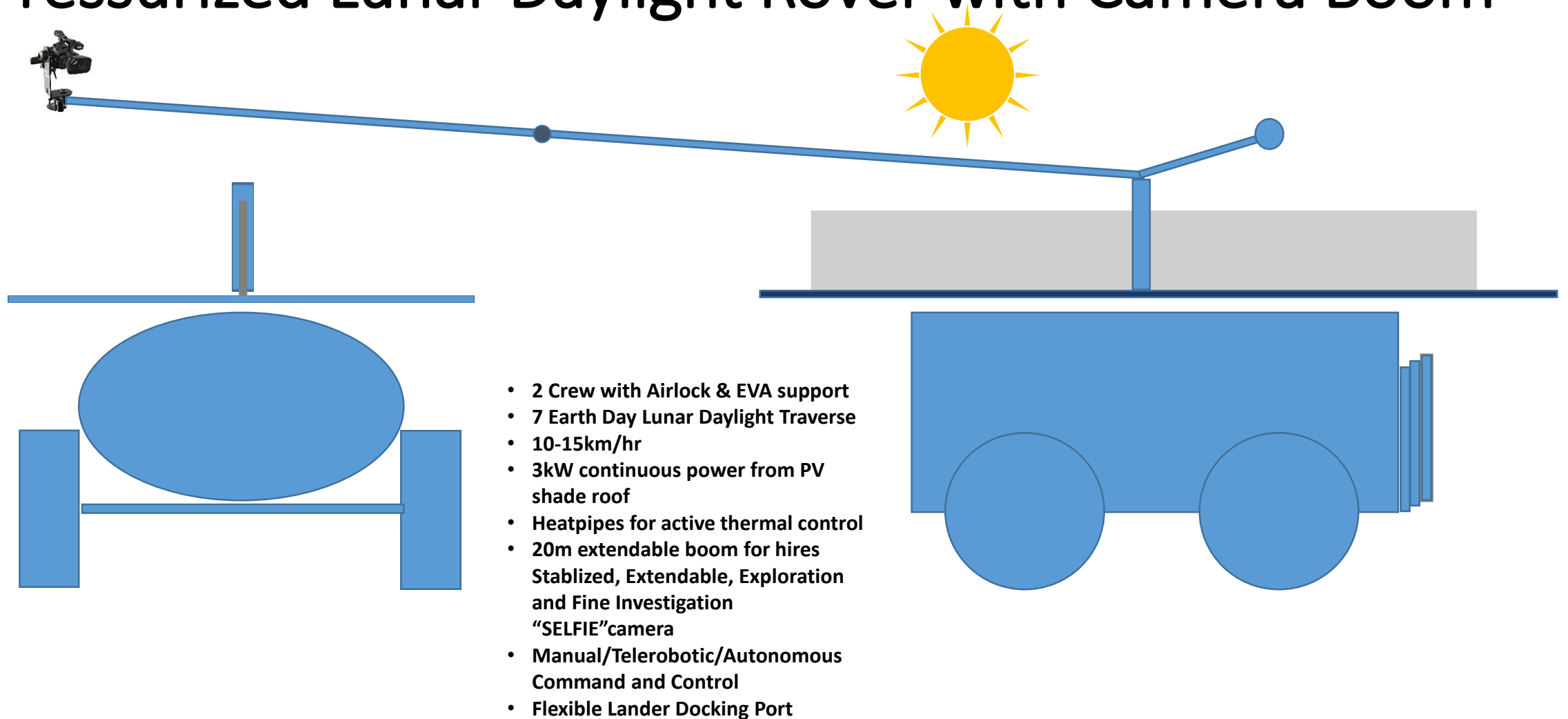


Cislunar Infrastructure 2022-2030

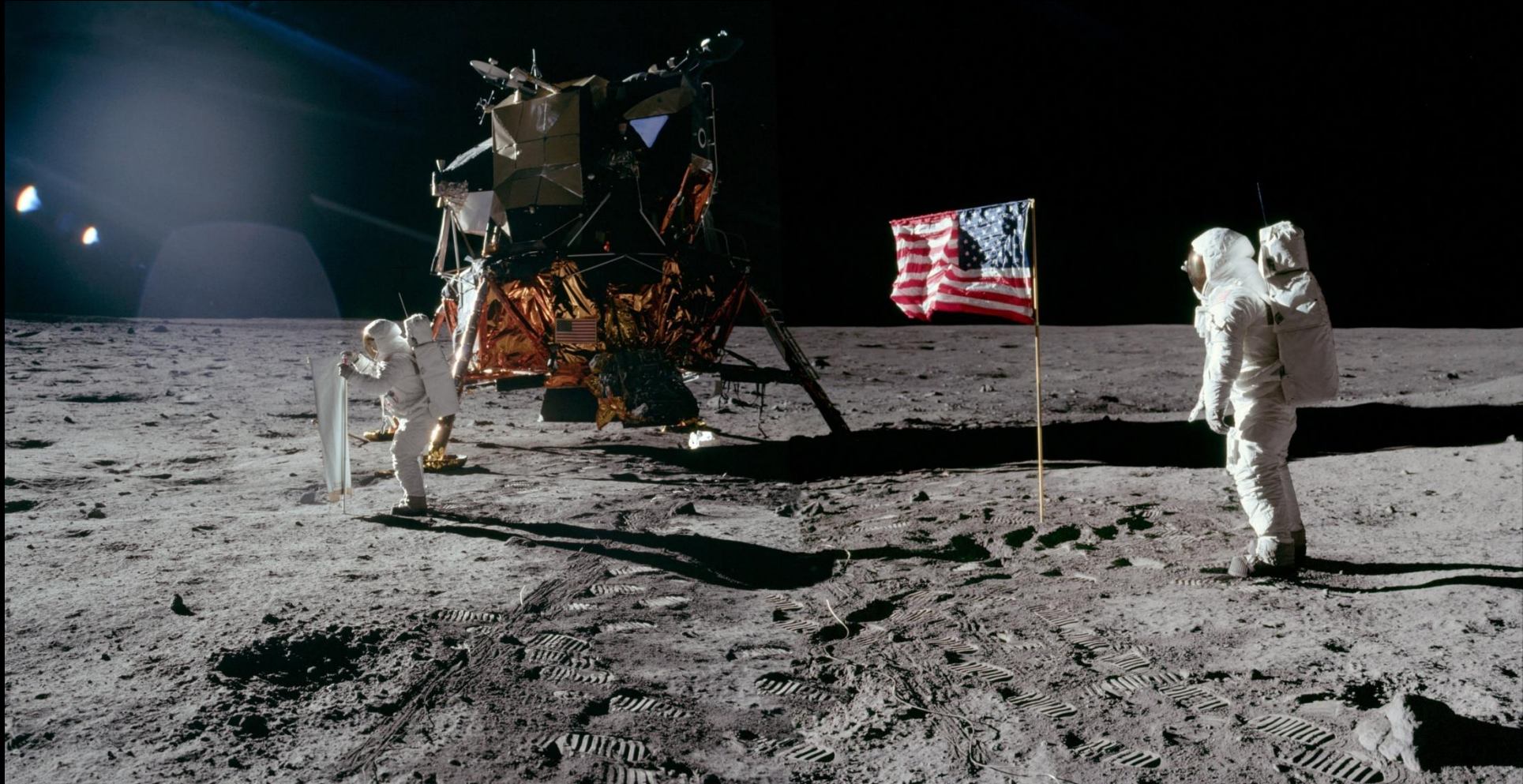
Not to scale



Schematic of Pressurized Lunar Daylight Rover with Camera Boom



Apollo Era- Nostalgia

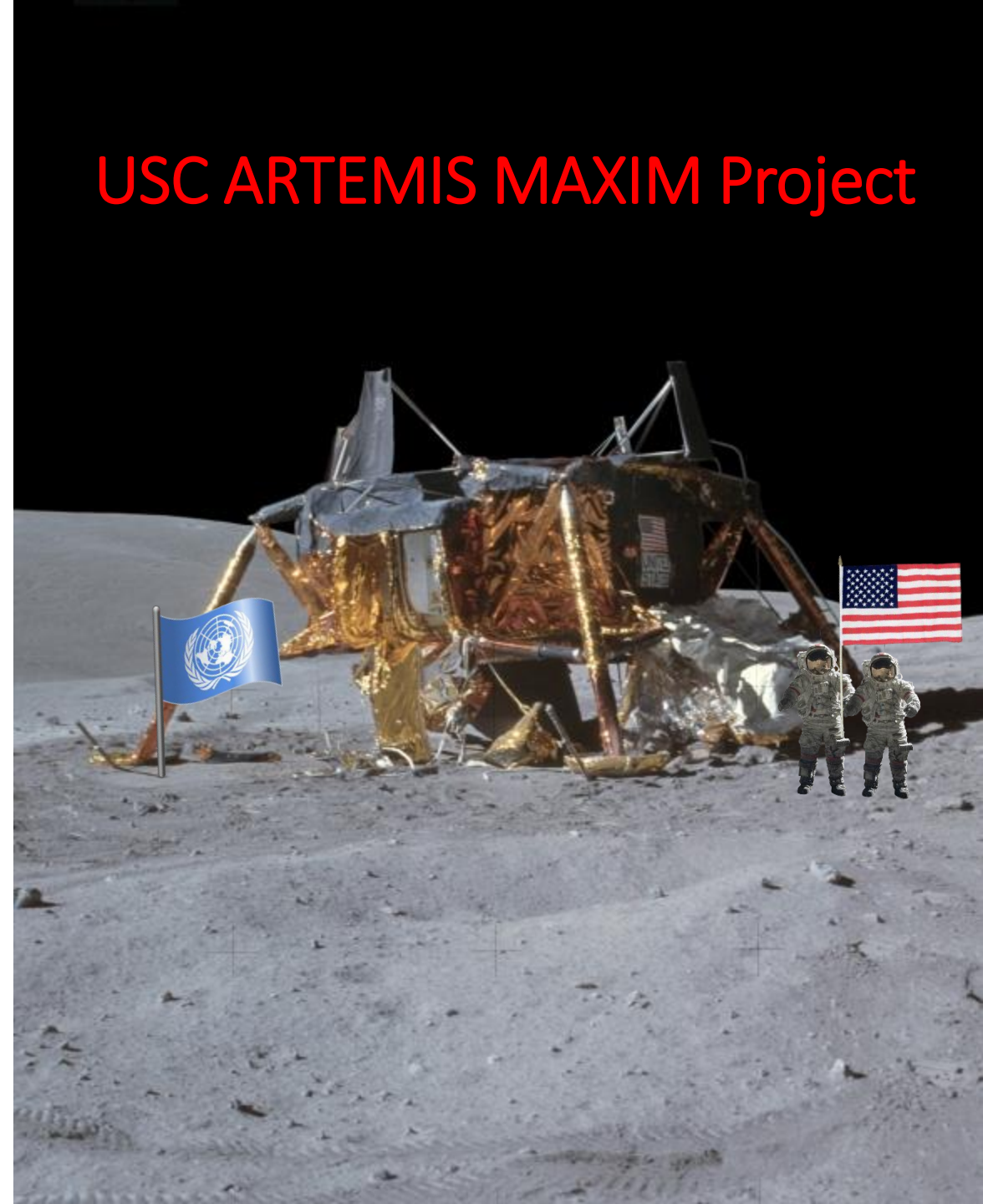


Apollo11, Sea of Tranquility, 20 July 1969, frames A11-40-5872 and A11-40-5874 : Buzz Aldrin is shown deploying the Solar Wind Collector and saluting the U.S. Flag

NASA ARTEMIS Project

- Land a Woman and a Man
- on the Moon by 2024
- Use SPD# 1-4 &
- Artemis Accords &
- New Era of Deep Space Exploration
- as guide
- Commercial
- International
- Sustainable

USC ARTEMIS MAXIM Project





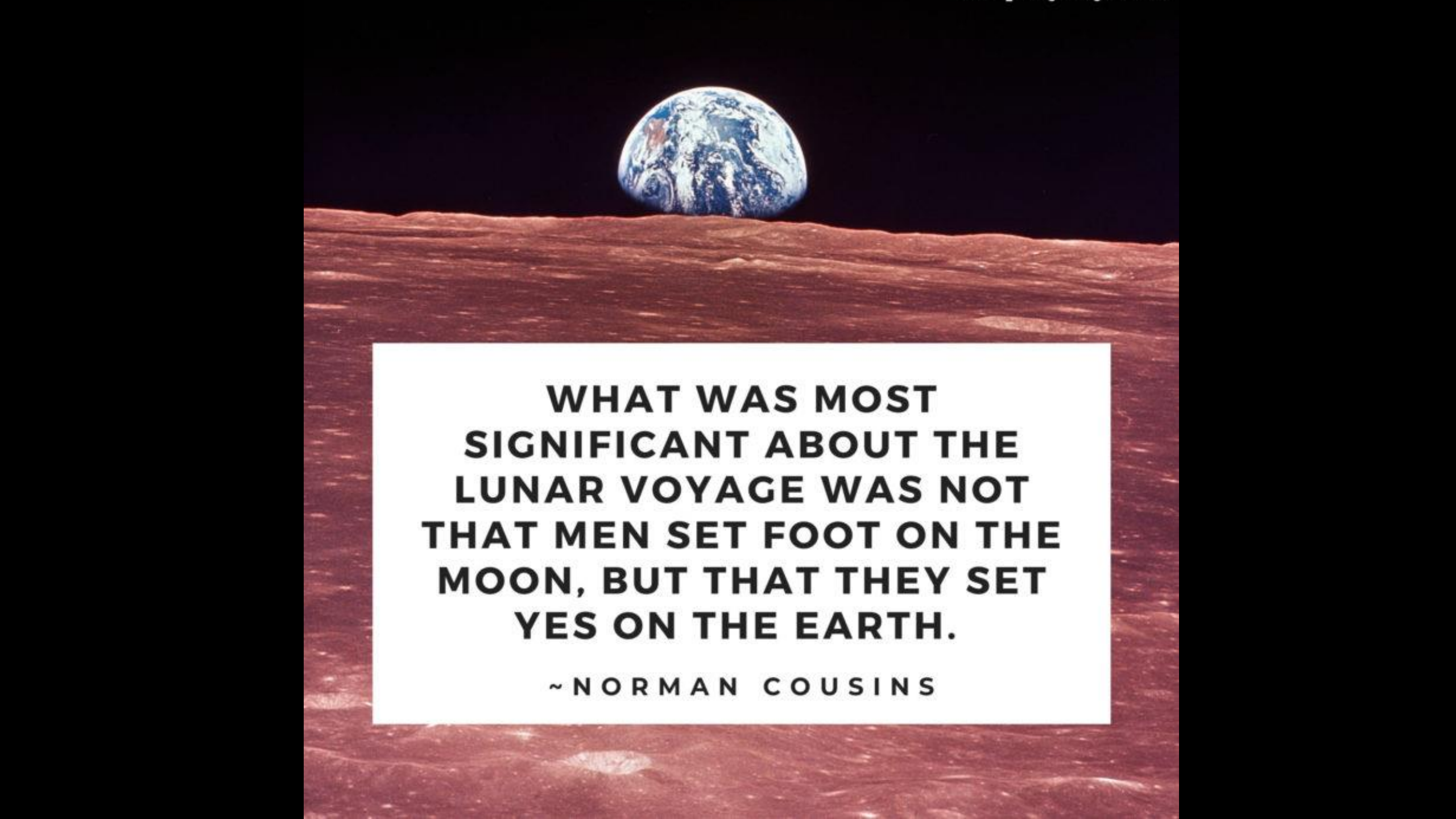
Culture Grows Where History Flows



We live by the Golden Rule. Those
who have the gold make the rules.

Buzzie Bavasi

NASA via Congress,
Since Inception,
Has the Gold....

A photograph of the Earth rising over the horizon of the Moon. The Earth is a bright blue and white sphere, partially obscured by the dark, reddish-brown, cratered surface of the Moon. The sky is a deep black. The text is centered in a white rectangular box.

**WHAT WAS MOST
SIGNIFICANT ABOUT THE
LUNAR VOYAGE WAS NOT
THAT MEN SET FOOT ON THE
MOON, BUT THAT THEY SET
YES ON THE EARTH.**

~ NORMAN COUSINS

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