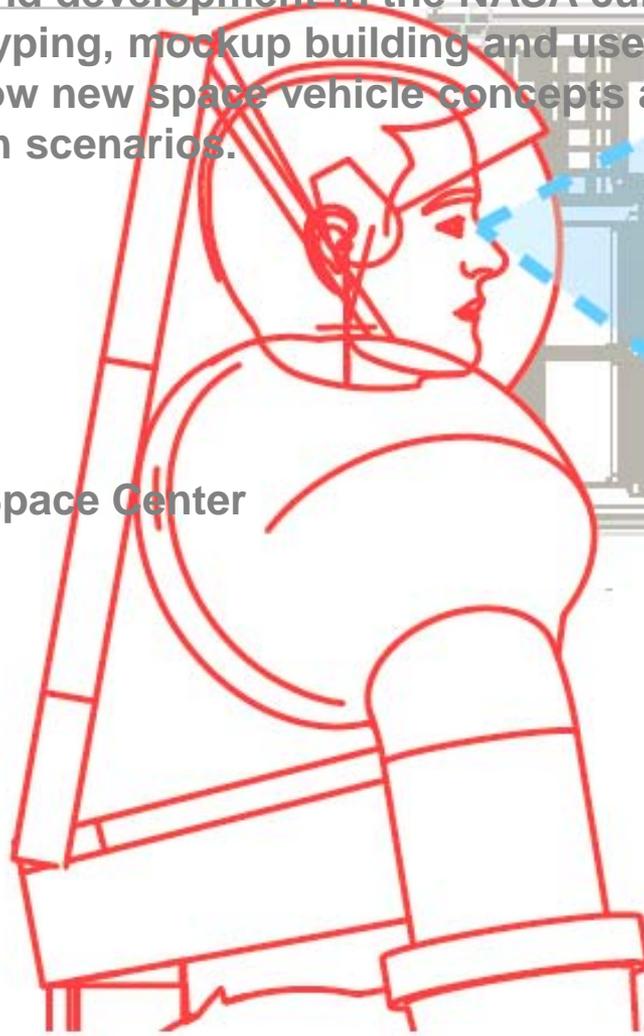


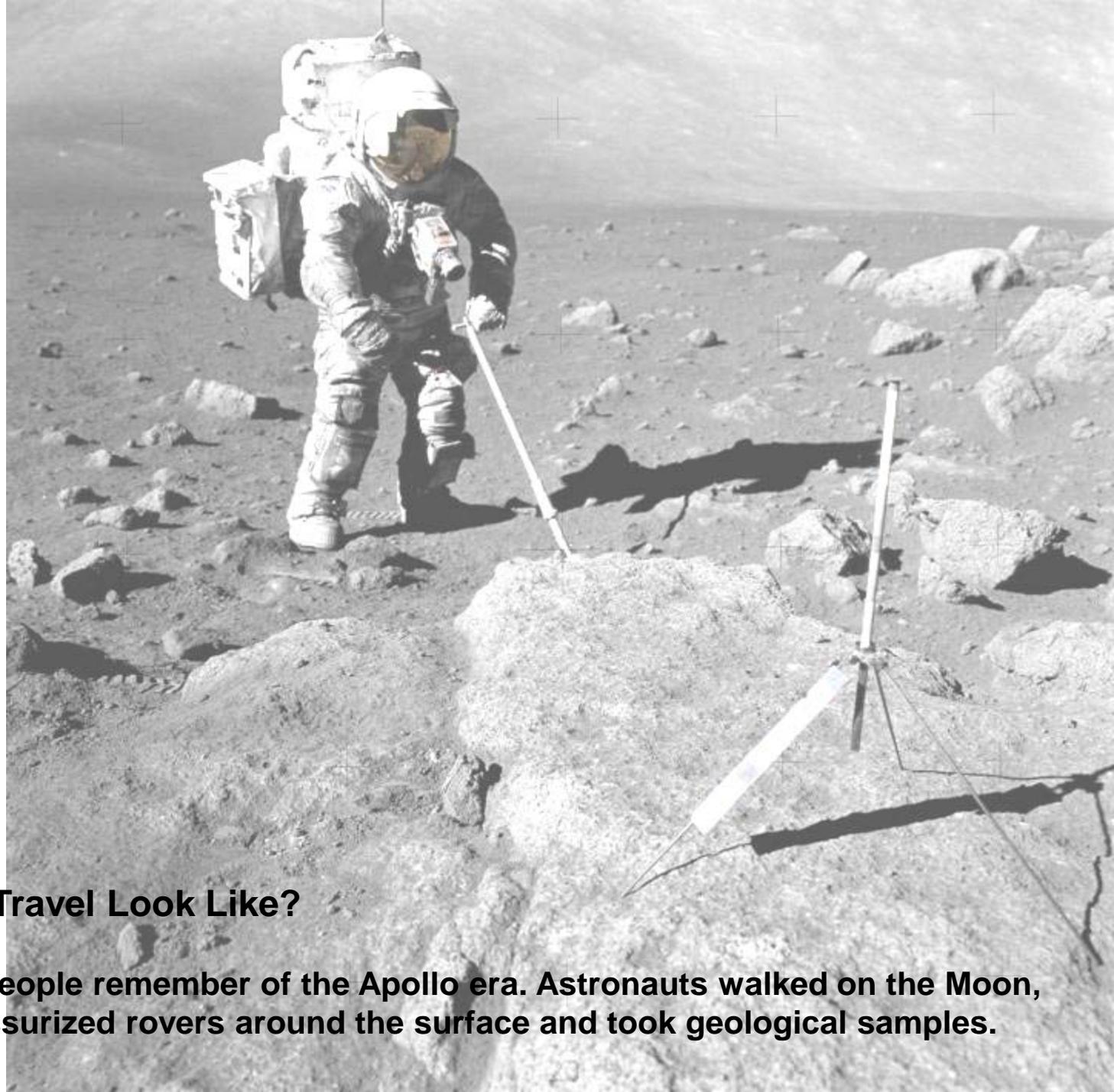
WOODEN SPACESHIPS

Human-Centered Vehicle Design for Space

Presentation will focus on creative human centered design solutions in relation to manned space vehicle design and development in the NASA culture. We will talk about design process, iterative prototyping, mockup building and user testing and evaluation. We will take an inside look at how new space vehicle concepts are developed and designed for real life exploration scenarios.

Evan Twyford, NASA Johnson Space Center
Houston, TX





What Did Space Travel Look Like?

The images most people remember of the Apollo era. Astronauts walked on the Moon, drove small unpressurized rovers around the surface and took geological samples.

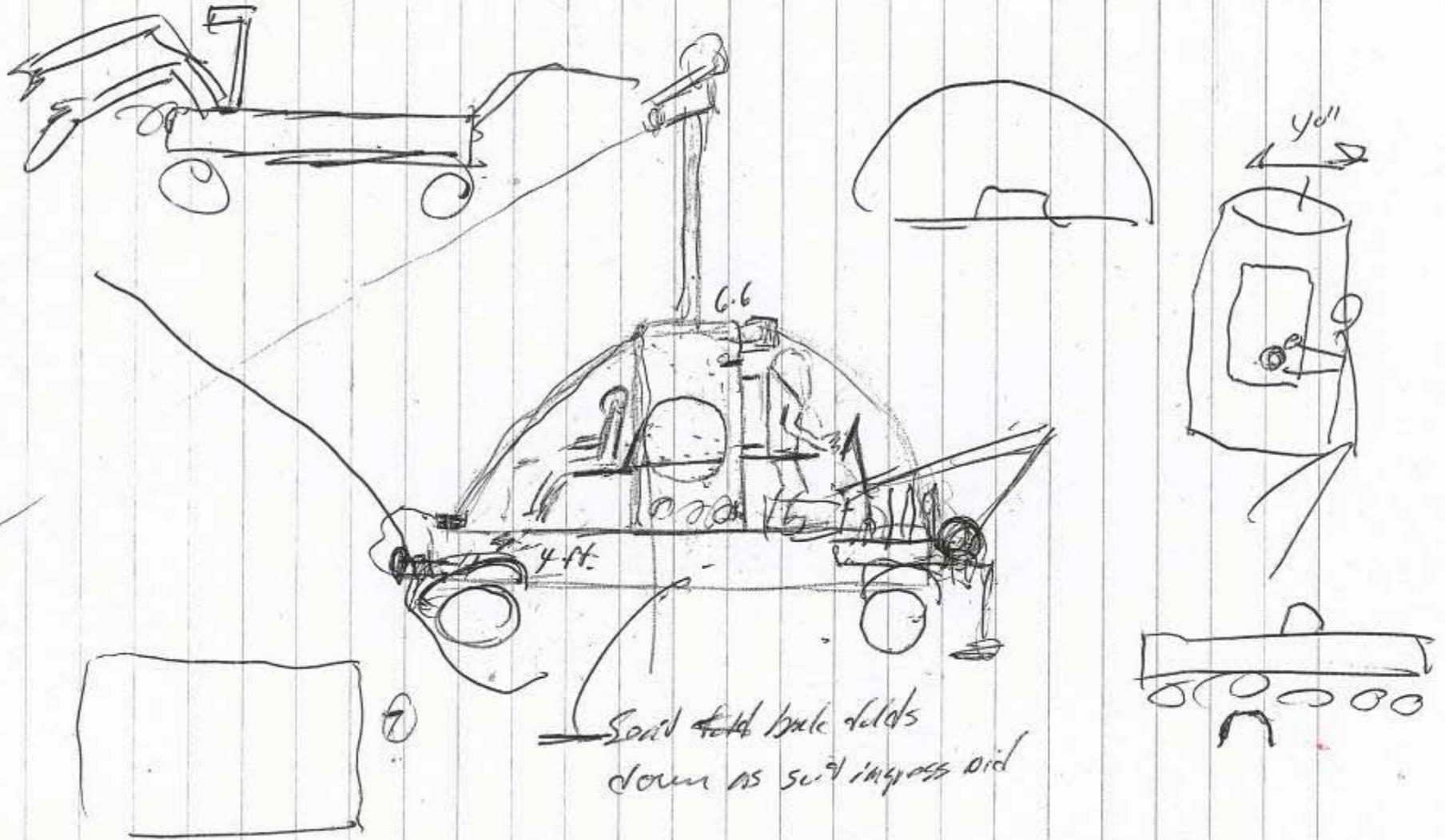


What Will it Look Like?

As we prepare to go back to the Moon and on to Mars, the architecture, the vehicles, the experience will be unlike any trip we have ever taken. We are in a technological era that will allow us to share these experiences with the world.

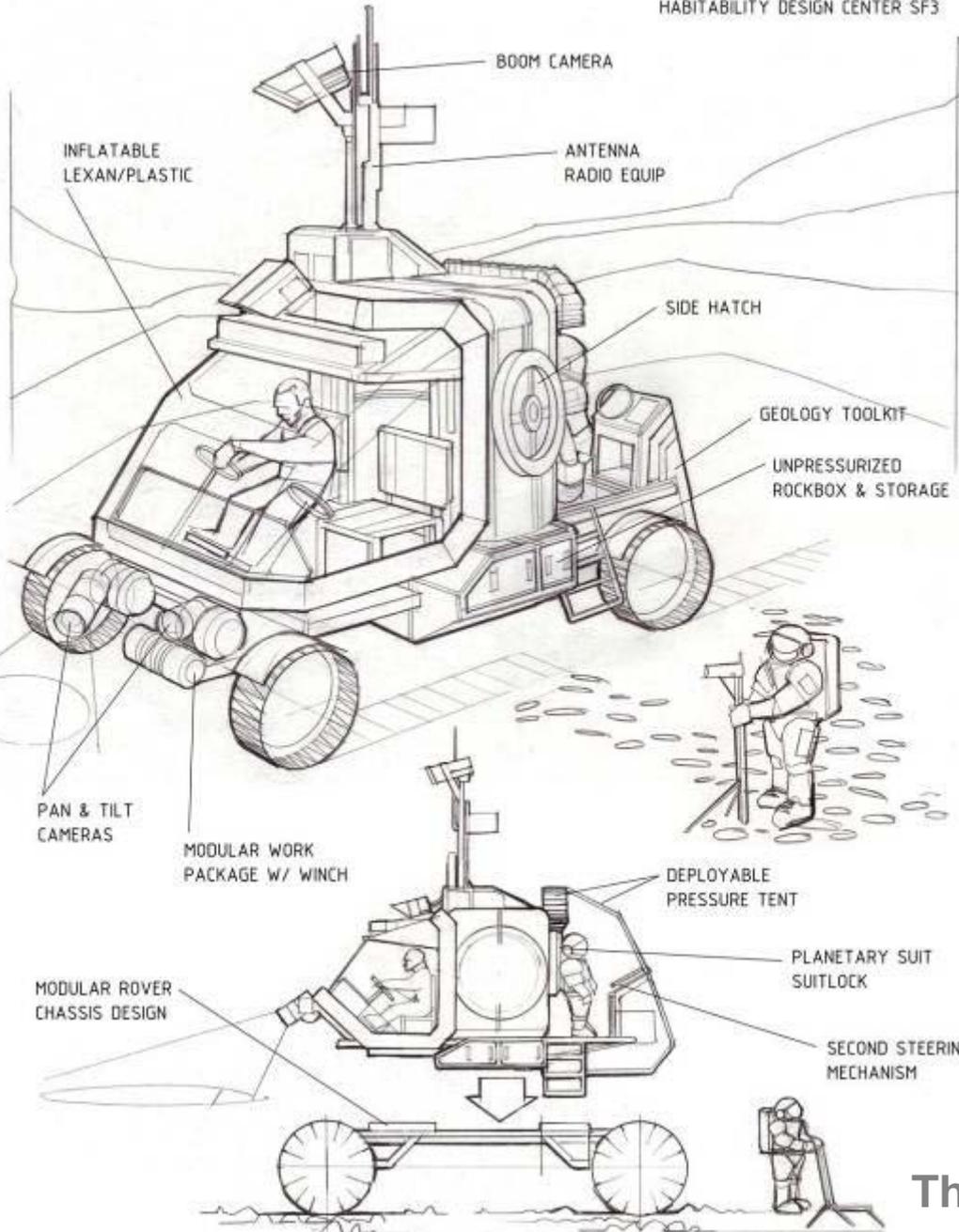
Space Design/ How Does it Start?

An Astronaut comes to you with a sketch of an idea.

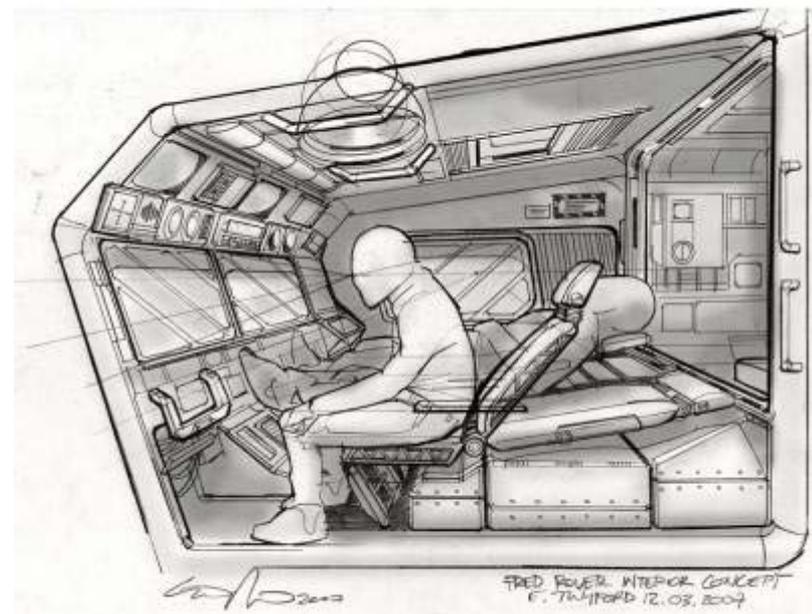
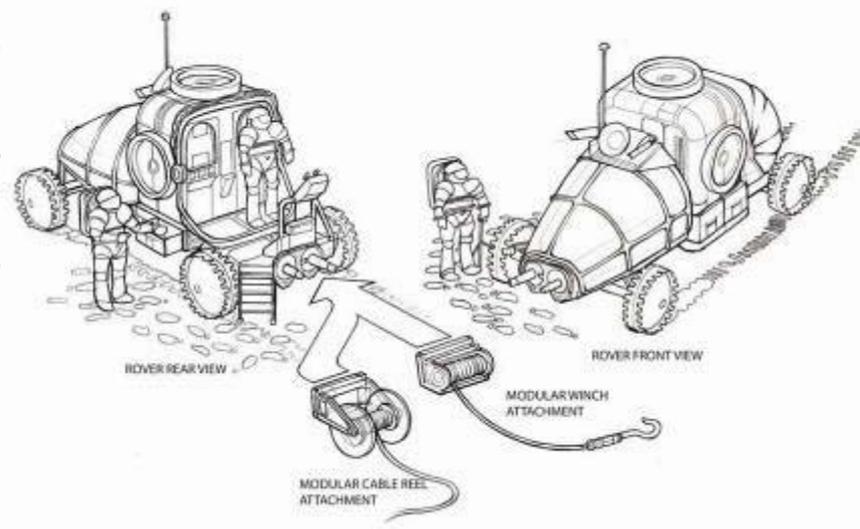


PRESSURIZED SUITLOCK ROVER CONCEPT

HABITABILITY DESIGN CENTER SF3



SUITLOCK ROVER MODULAR WINCH PACKAGE



Then we do some sketches of our own.



Non-Traditional Design Approaches

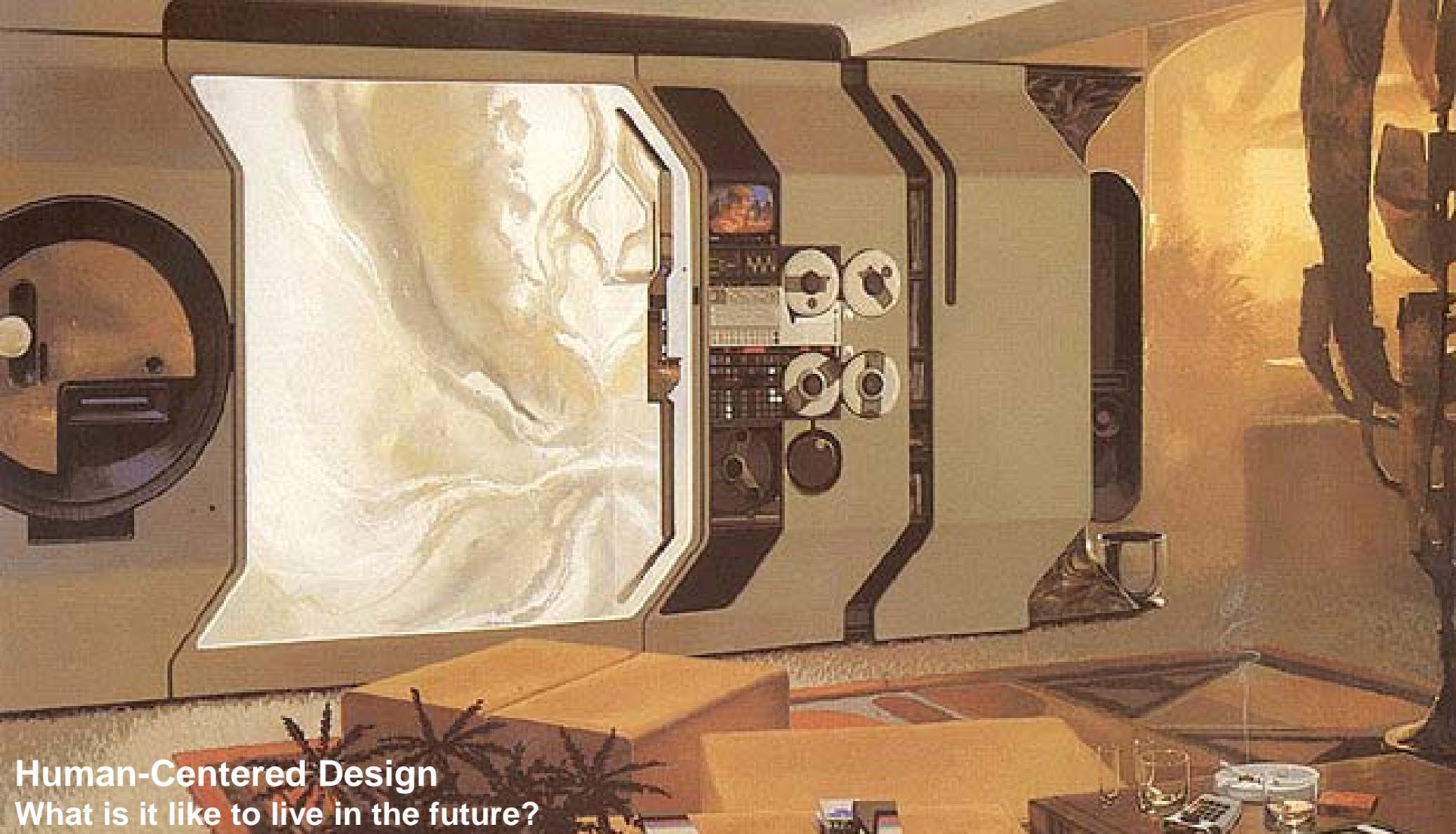
**What does design mean? What does it mean in an engineering culture?
Does everyone have a different definition and approach?**



Human-Centered Design

What is it like to live in a capsule? With only the most basic of human needs fulfilled.





Human-Centered Design
What is it like to live in the future?

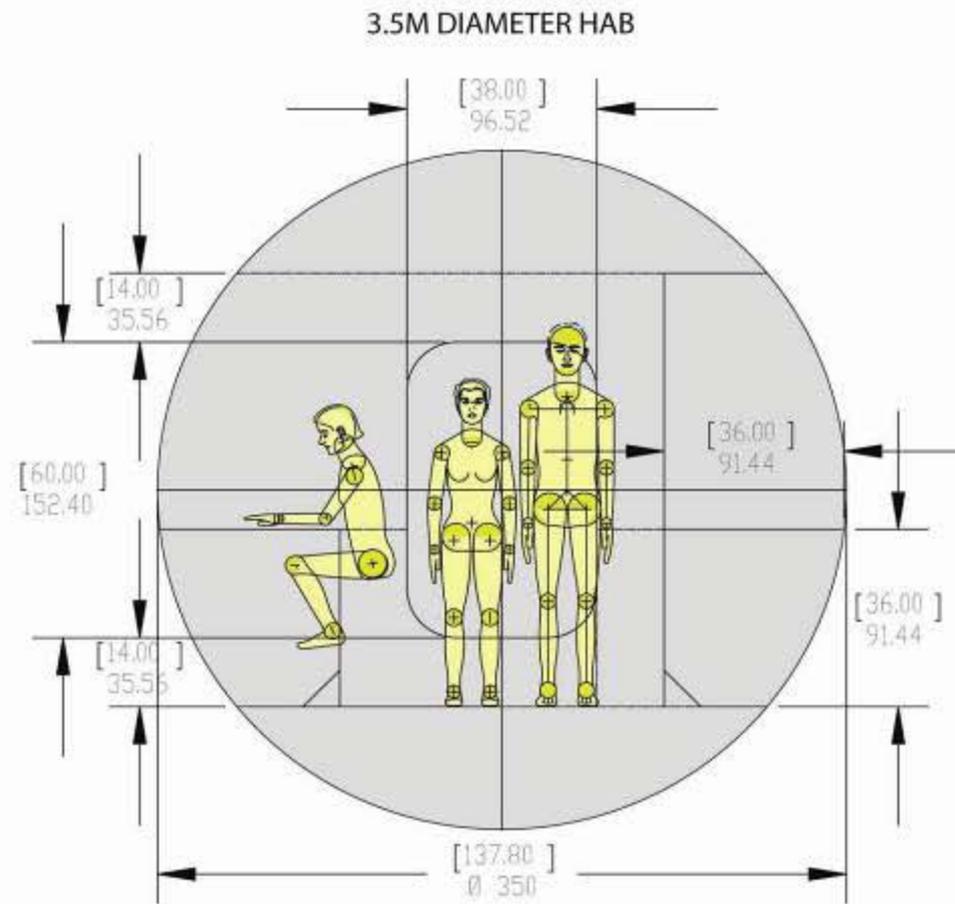
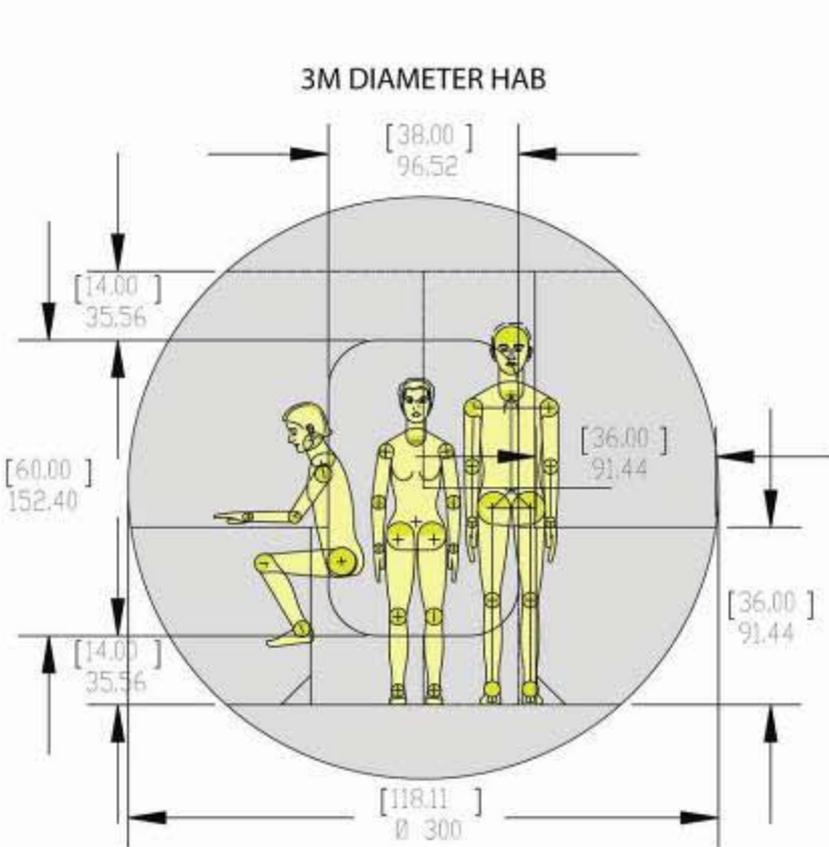




Real World and Conceptual Inspirations

***Nagakin* Capsule Tower. Capsule hotels. Archigram “Clothing for living in-or if it wasn't for my Suitaloon I would have to buy a house.” Where do we draw the line between architecture and vehicle? How is habitable volume tied to your mission duration?**

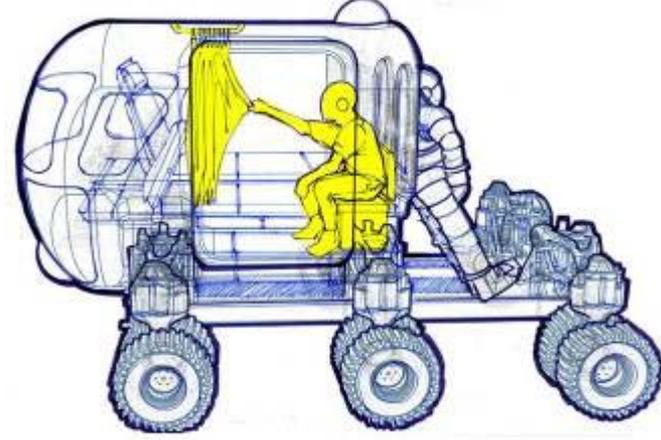
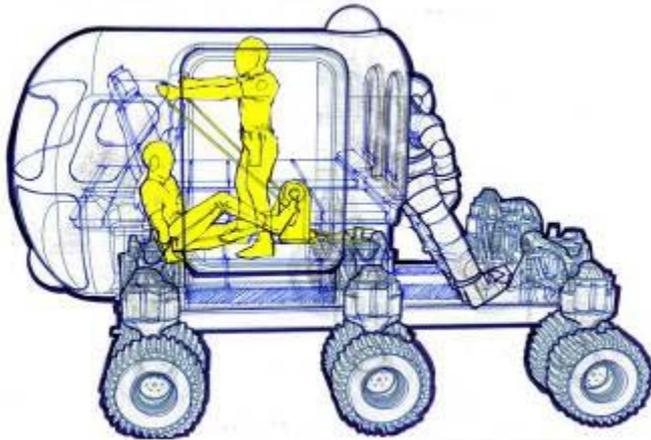
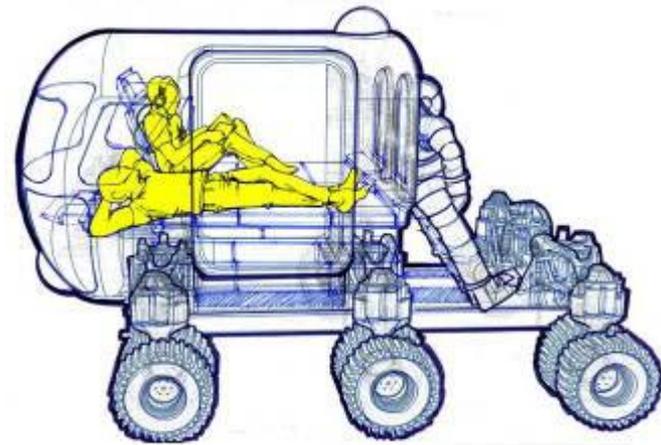
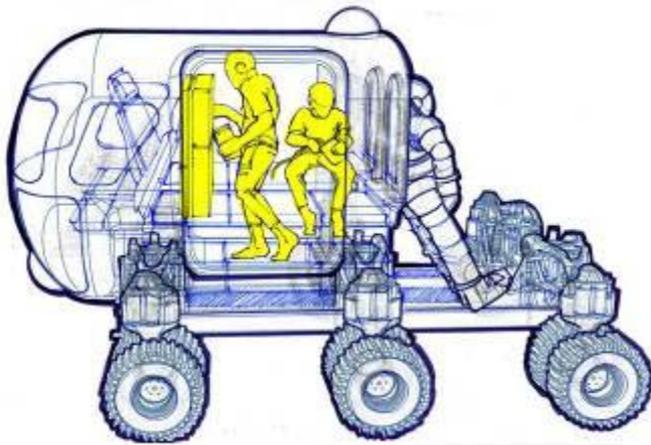




Designing to the 95th Percentile

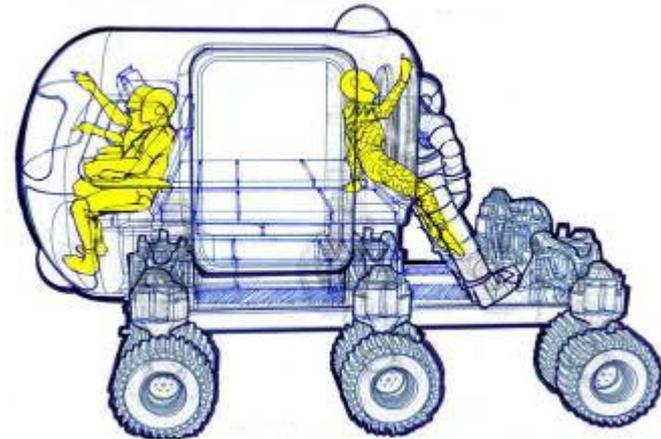
Human factors standards, architectural standards and NASA standards provide a starting point to look at dimensions like counter heights, aisle widths and seat dimensions.





Designing Your Space

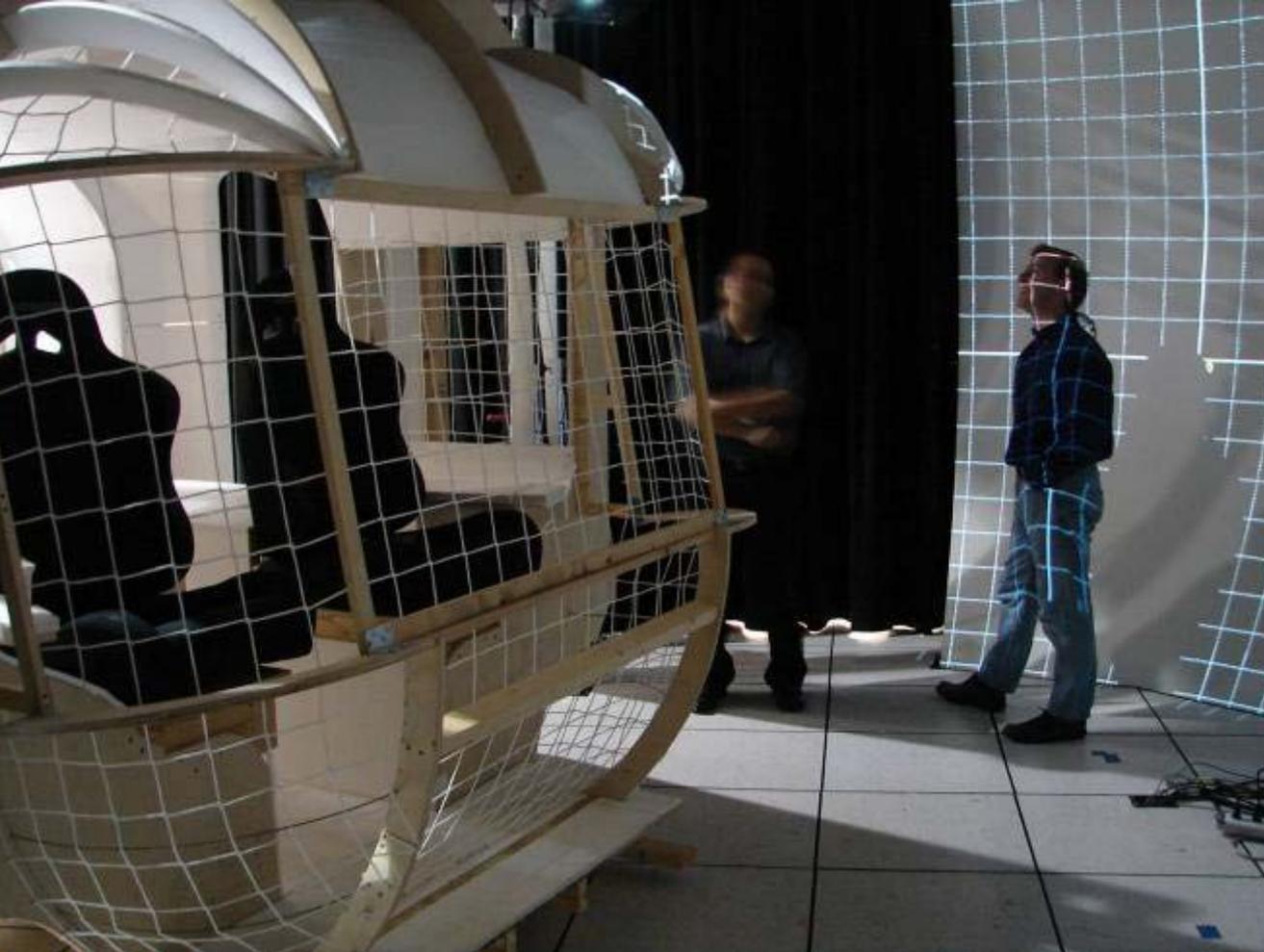
Design your space appropriately for mission duration, and around the basic human functions and postures that must be accommodated.





The Wooden Spaceship

This is what its all about for us. The full-scale prototype will prove more useful and educational that paper and trade studies in many ways. This is a first step that allows everyone to experience the space in the same way.



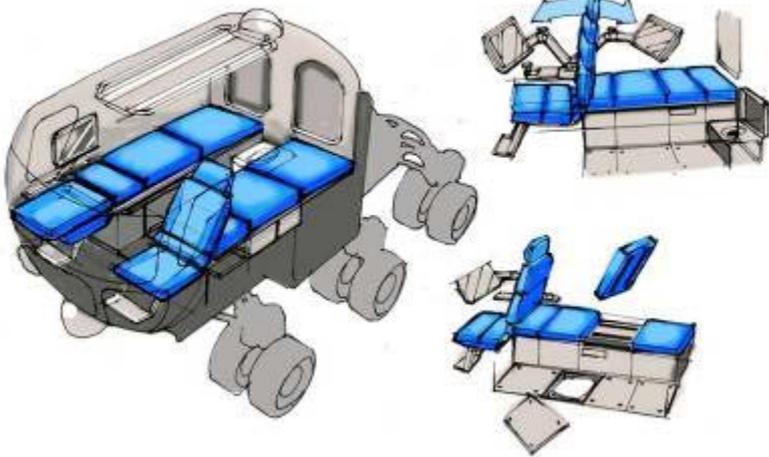
The Window Study

Quantifying qualitative data. A vehicle in a projection dome. User testing and usability studies allow design decisions to be made in a quantifiable way.





Mid-Fidelity Mockup Assembly



Interior Finish

Light colors and smooth easy-to-clean materials and surfaces. All interior components were installed, assembled and fitted by hand.

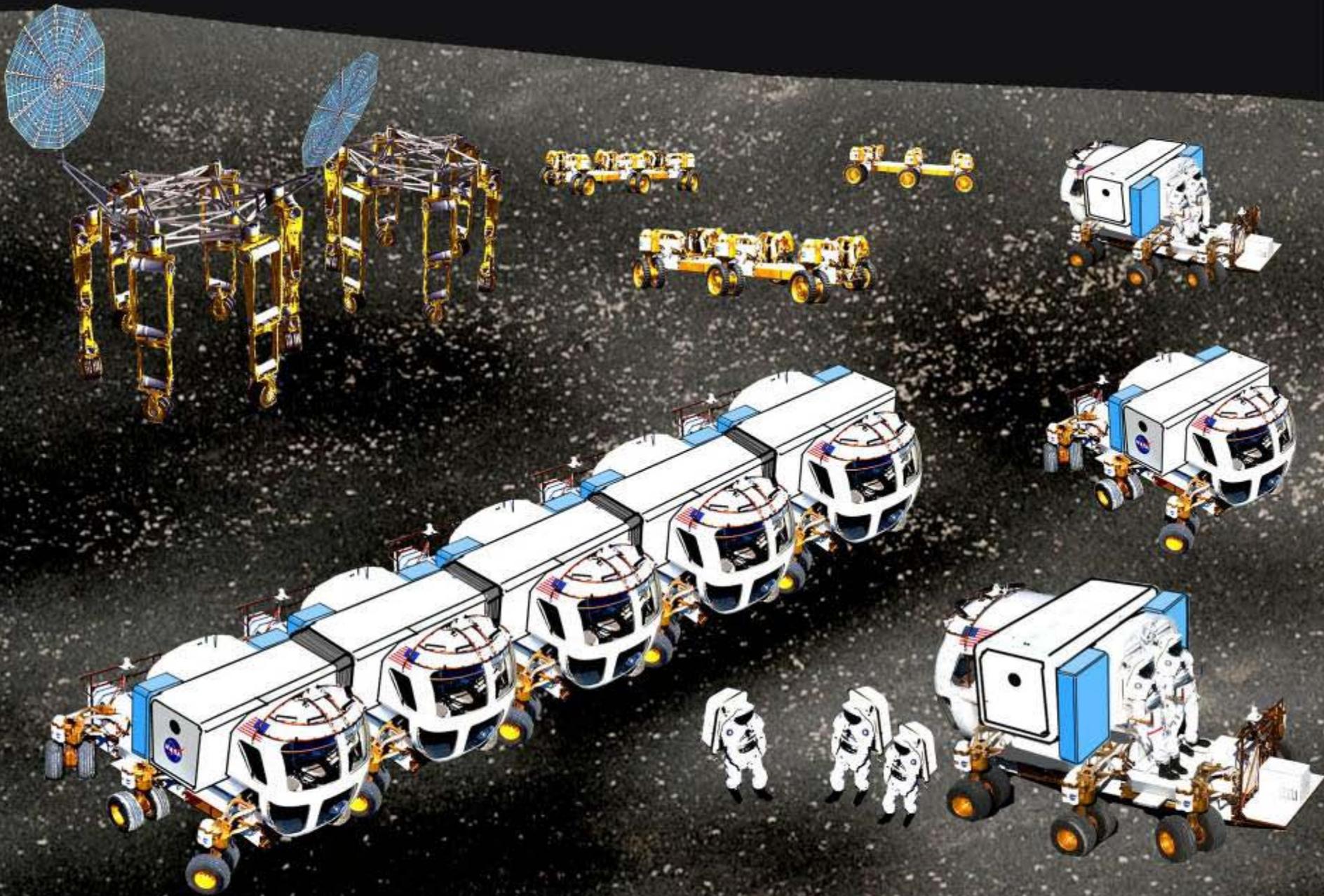




Finished Rover Interior



Suitport Operation

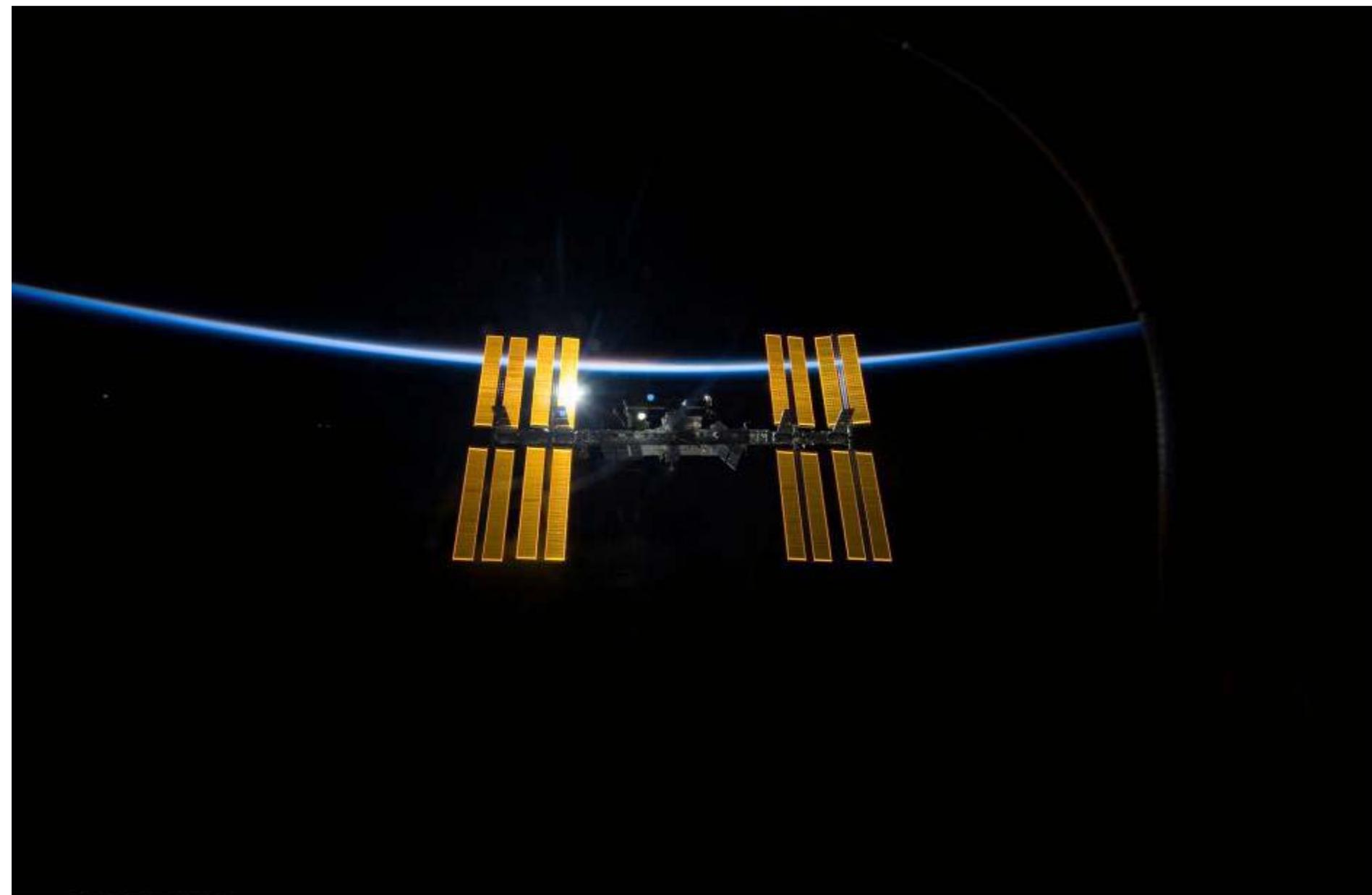


A Lunar Outpost Scenario Concept





Sunrise breaks for the International Space Station, in this artist's rendering.



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