THE FUTURE OF SPACE EXPLORATION

A journey to Mars

THIS IS MARS.

4th planet from the Sun

THINGS YOU WANT TO KNOW ABOUT MARS

1. Has the largest planetary volcano in the Solar system - Olympus Mons

2. Your weight on Mars is a third that on Earth

3. It is rusting!

TELL ME MORE!!!

4. Spirit & Opportunity launched in 2007, Opportunity is still operational.

5. It has seasons just like Earth

6. Can Mars host life? there is a slight possibility yes!

WHY MARS?

why not any other planet?

BECAUSE…

- Distance -

- Size -

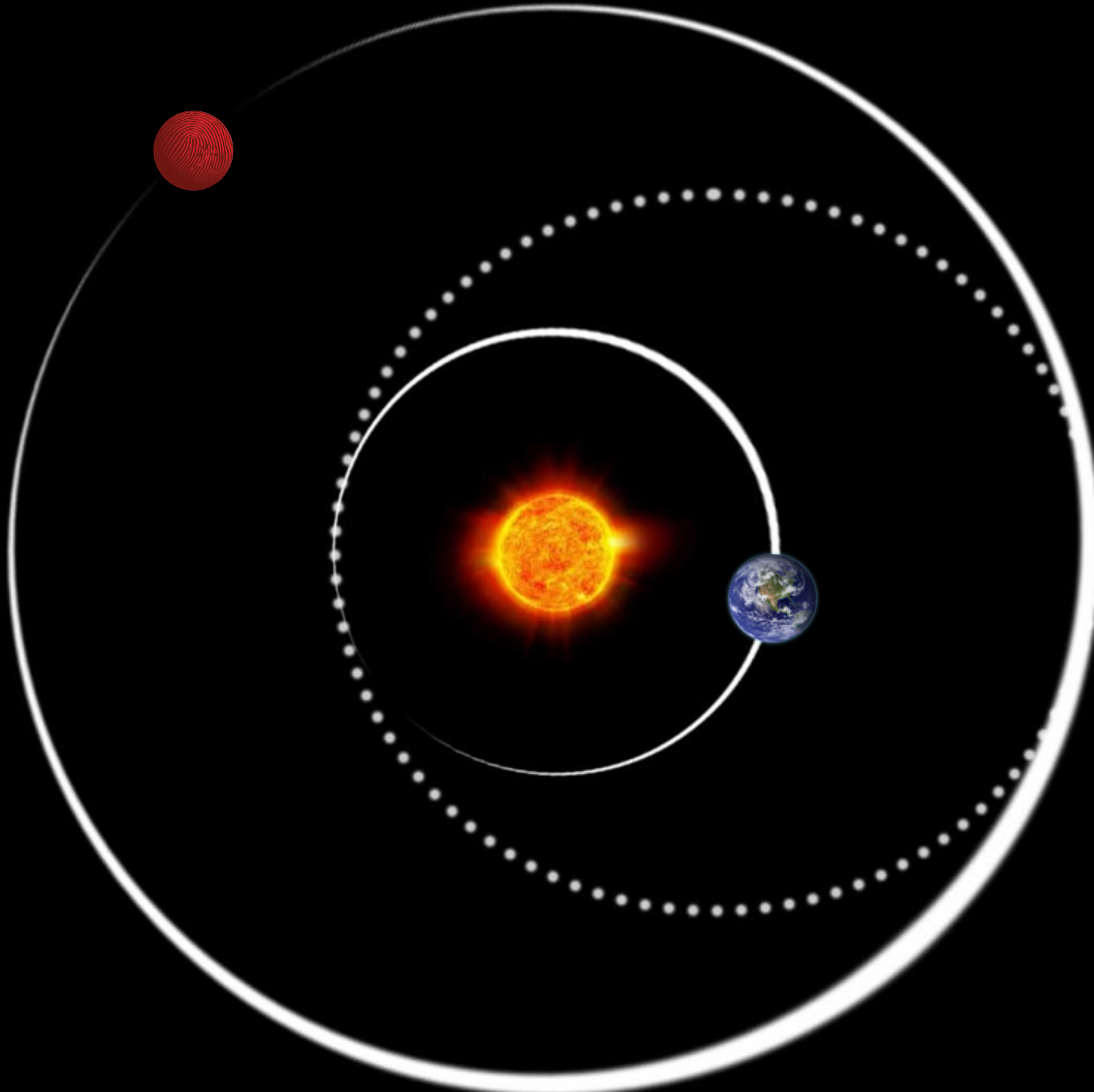
- Habitable zone -

- Water?!? -

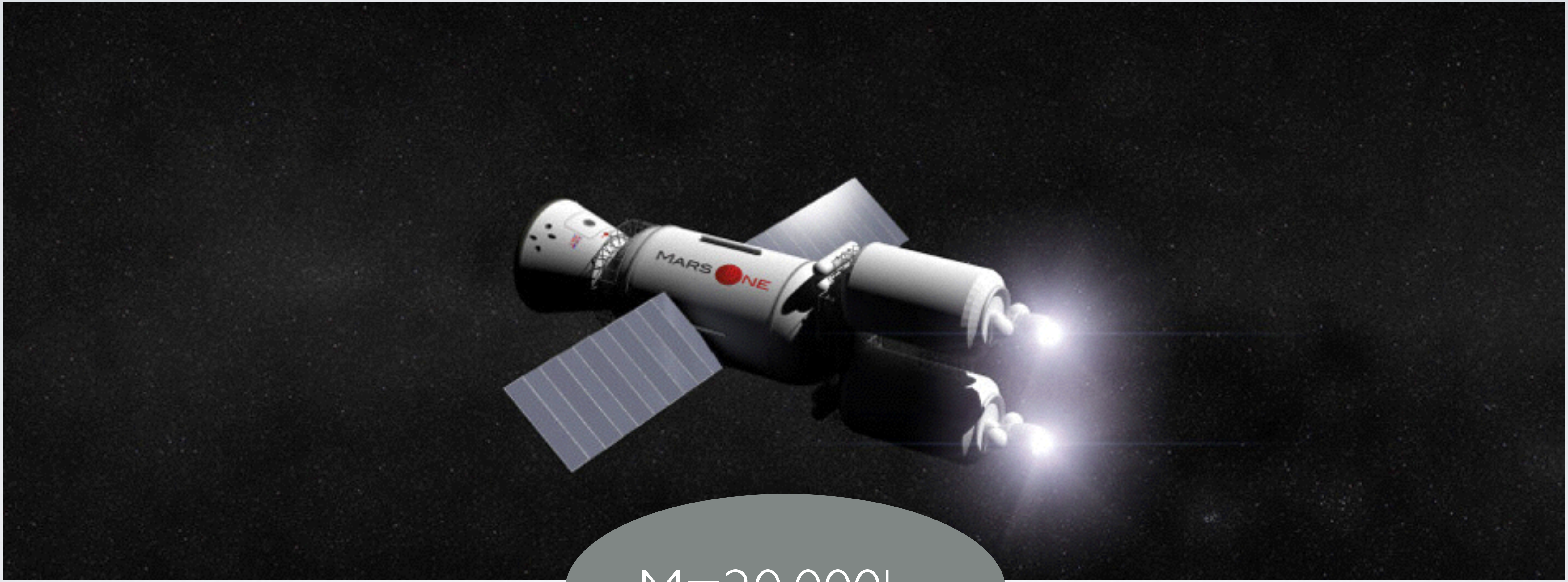
MARS ONE

Mars One

- Mars Human exploration programme.
- Financed by the public.
- Pushing the boundaries of technology
- Mars colonisation 2025



TRANSIT VEHICLE



M=20,000kg

800kg Food

700kg oxygen

3000L water

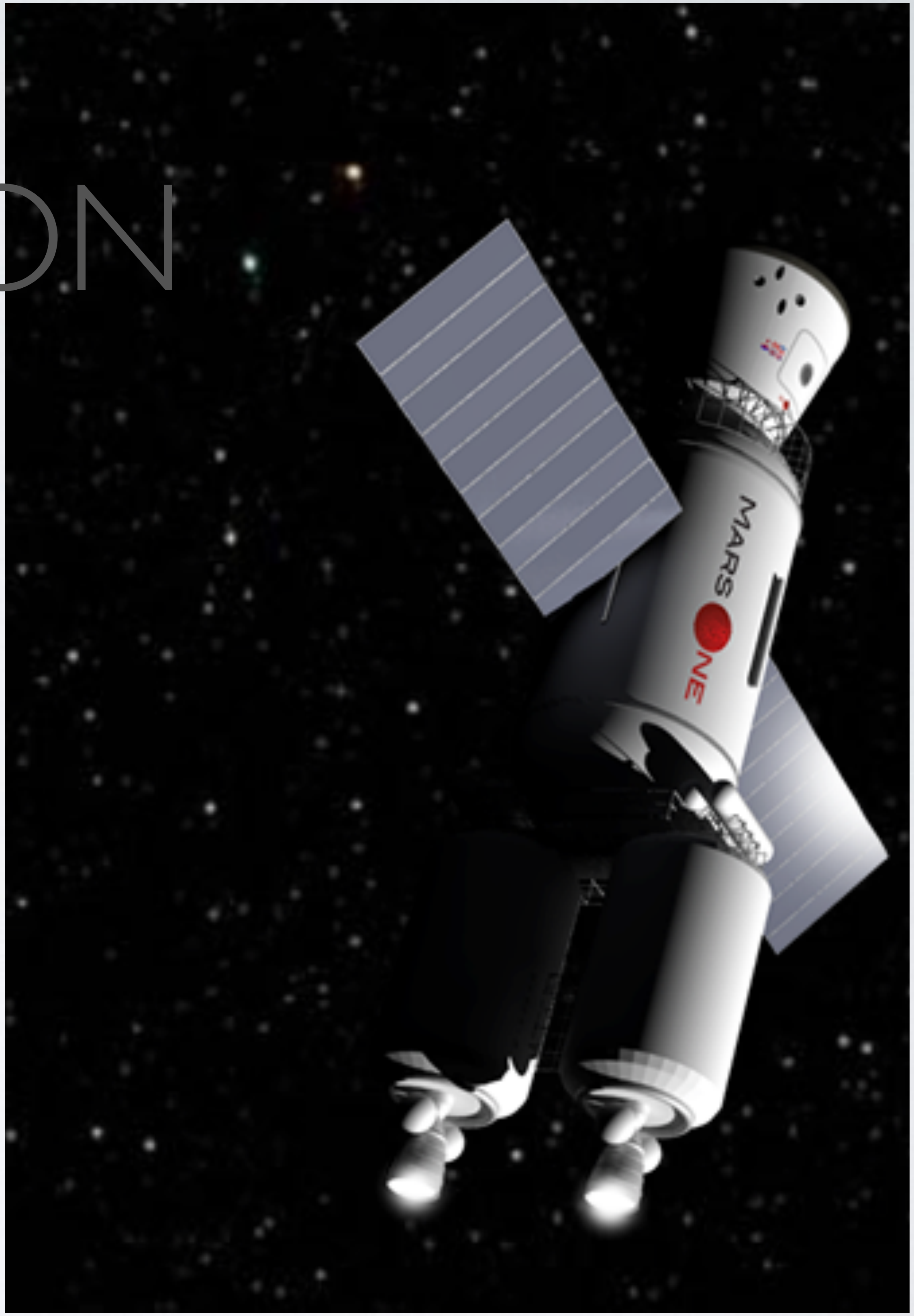
COLONISATION

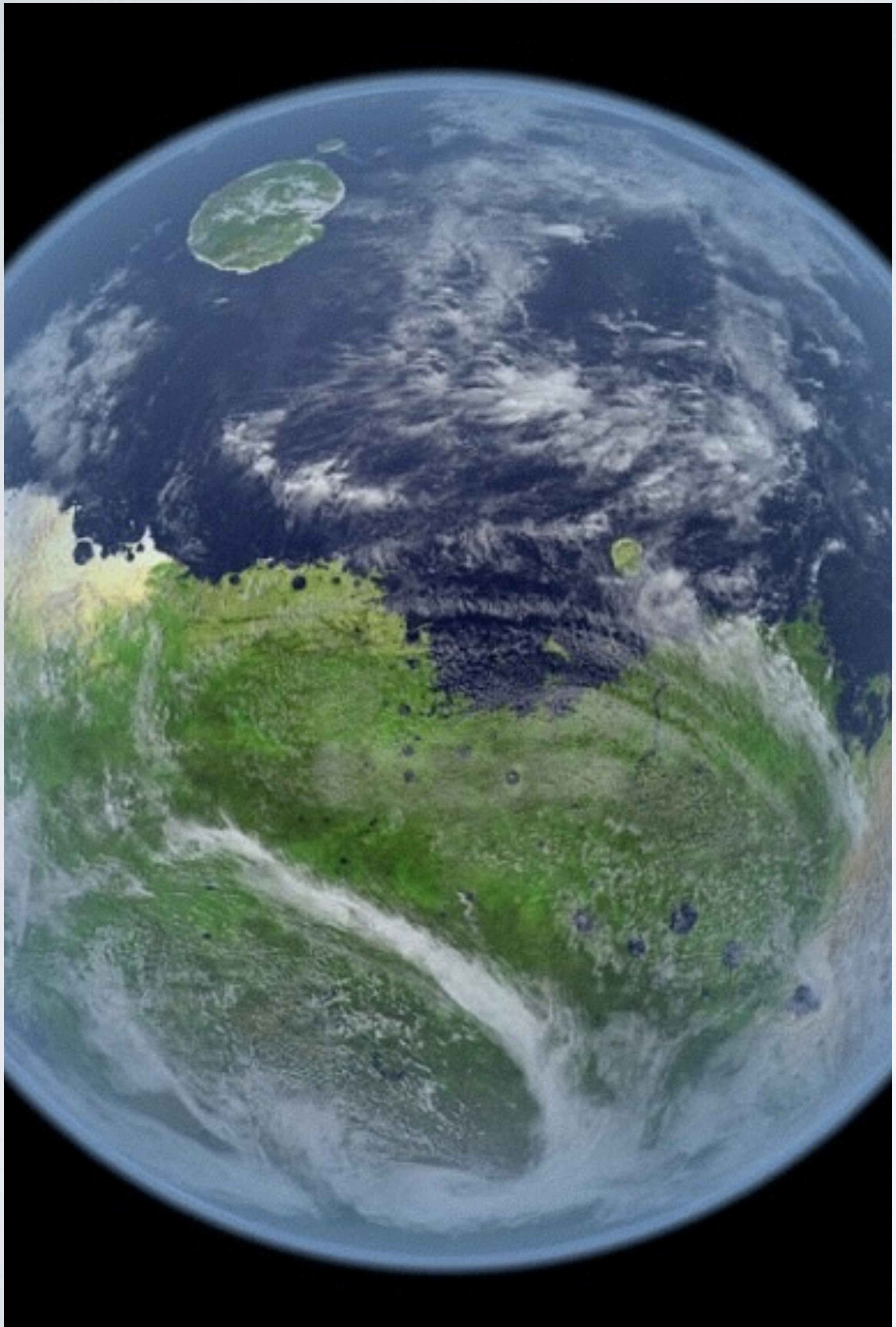
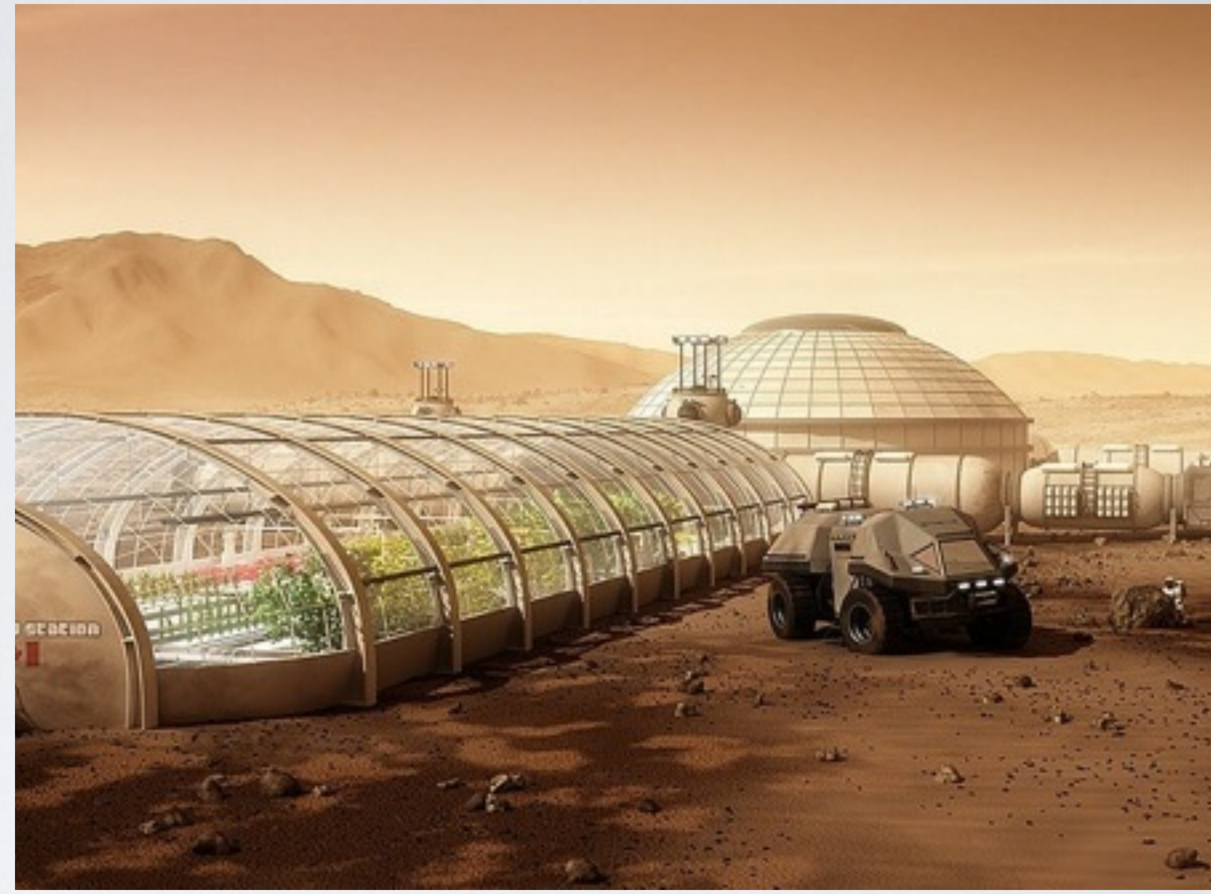
- 4 people -

- 200,000 applicants -

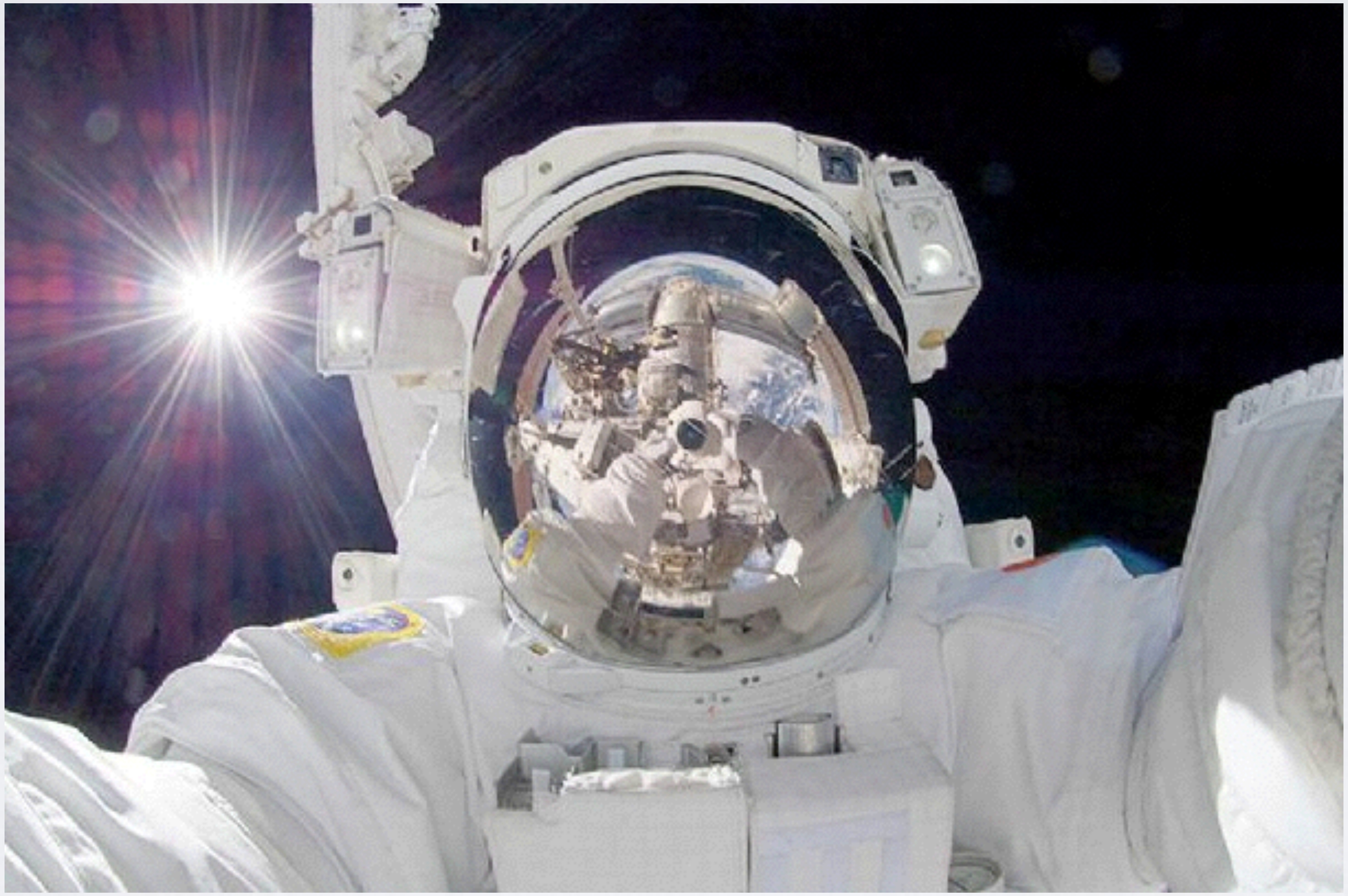
- 104 different countries -

- One way journey -




COMMUNICATION



RISKS INVOLVED

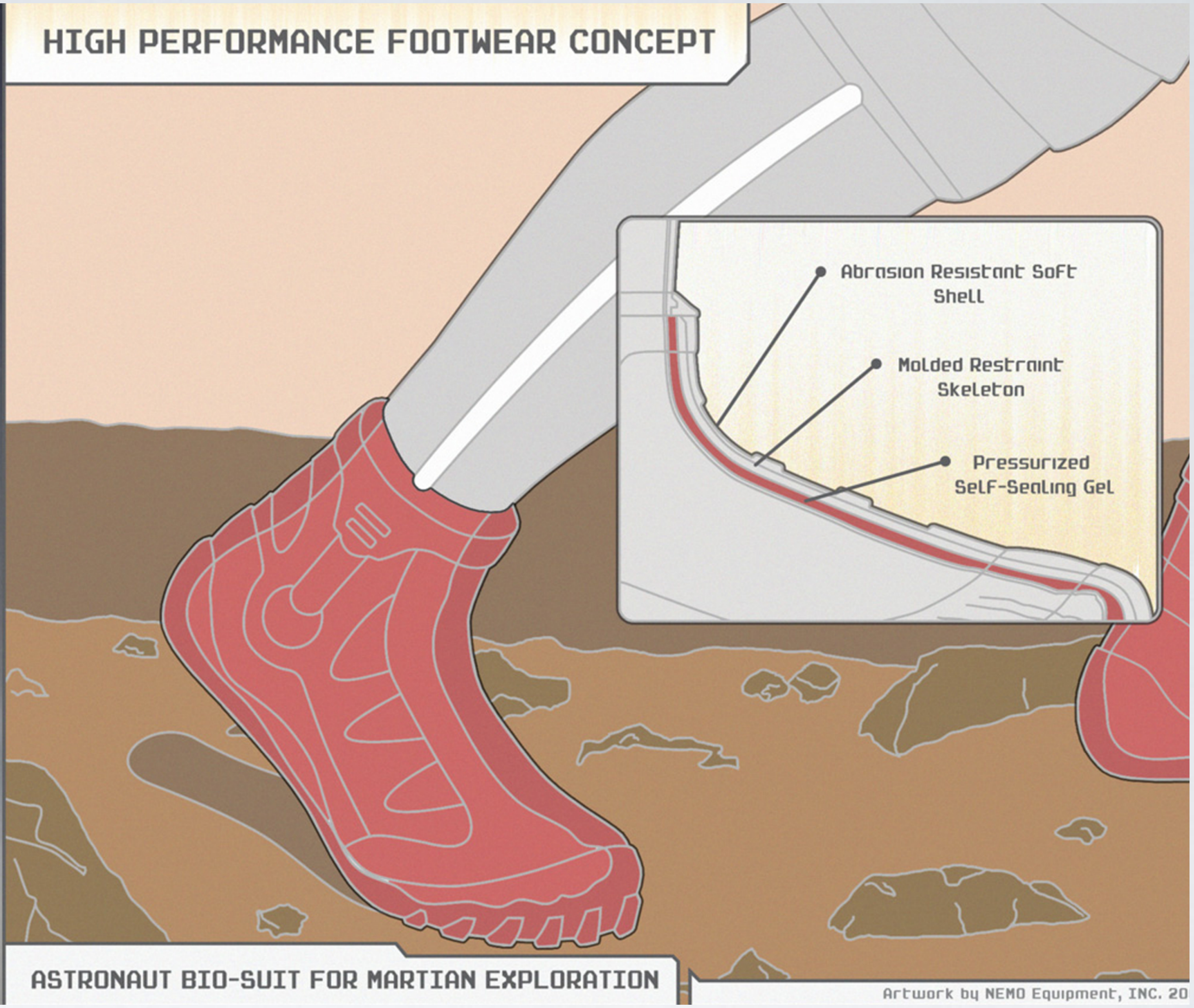
why shouldn't we go to mars?

IT'S FREEZING COLD!

Mars: -60°C, Earth: 15°C

RADIATION

Mars: 200mSy, Earth: 3mSy



LOW PRESSURE

Mars: 600Pa, Earth: 100,000Pa

IAC-14-A5.2.7

AN INDEPENDENT ASSESSMENT OF THE TECHNICAL FEASIBILITY OF THE MARS ONE MISSION PLAN

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In mid-2012, the Mars One program was announced, aiming to build the first human settlement on the surface of Mars. Following a series of precursor missions to develop and deploy key technologies, the first crewed mission would depart Earth in 2024, sending four people on a one-way journey to the surface of Mars. Additional four-person crews would be sent to Mars at every subsequent launch opportunity to further support and expand the Martian colony. While this program has been received with great fanfare, very little has been published in the technical literature on this mission architecture. As the Mars One mission plan represents a dramatic departure from more conservative exploration approaches, there are many uncertainties in the mission design. The establishment of a colony on Mars will rely on in-situ resource utilization (ISRU) and life support technologies that are more capable than the current state of the art. Moreover, resupply logistics and sparing will play a large role in the proposed colony, though the magnitude and behavior of these two effects is not well understood. In light of this, we develop a Mars settlement analysis tool that integrates a habitat simulation with an ISRU sizing model and a sparing analysis. A logistics model is utilized to predict the required number of launchers and provide a preliminary estimate of a portion of the program cost. We leverage this tool to perform an independent assessment of the technical feasibility of the Mars One mission architecture. Our assessment revealed a number of insights into architecture decisions for establishing a colony on the Martian surface. If crops are used as the sole food source, they will produce unsafe oxygen levels in the habitat. Furthermore, the ISRU system mass estimate is 8% of the mass of the resources it would produce over a two year period. That being said, the ISRU technology required to produce nitrogen, oxygen, and water on the surface of Mars is at a relatively low Technology Readiness Level (TRL), so such findings are preliminary at best. A spare parts analysis revealed that spare parts quickly come to dominate resupply mass as the settlement grows: after 130 months on the Martian surface, spare parts compose 62% of the mass brought from Earth to the Martian surface. The space logistics analysis revealed that, for the best scenario considered, establishing the first crew for a Mars settlement will require approximately 15 Falcon Heavy launchers and require $4.5 billion in funding, and these numbers will grow with additional crews. It is important to note that these numbers are derived only when considering the launch of life support and ISRU systems with spare parts. To capture a more realistic estimate of mission cost, future work should consider development and operations costs, as well as the integration of other key mission elements, such as communications and power systems. Technology development towards improving the reliability of life support systems, the TRL of ISRU systems, and the capability of Mars in-situ manufacturing will have a significant impact on reducing the mass and cost of Mars settlement architectures.

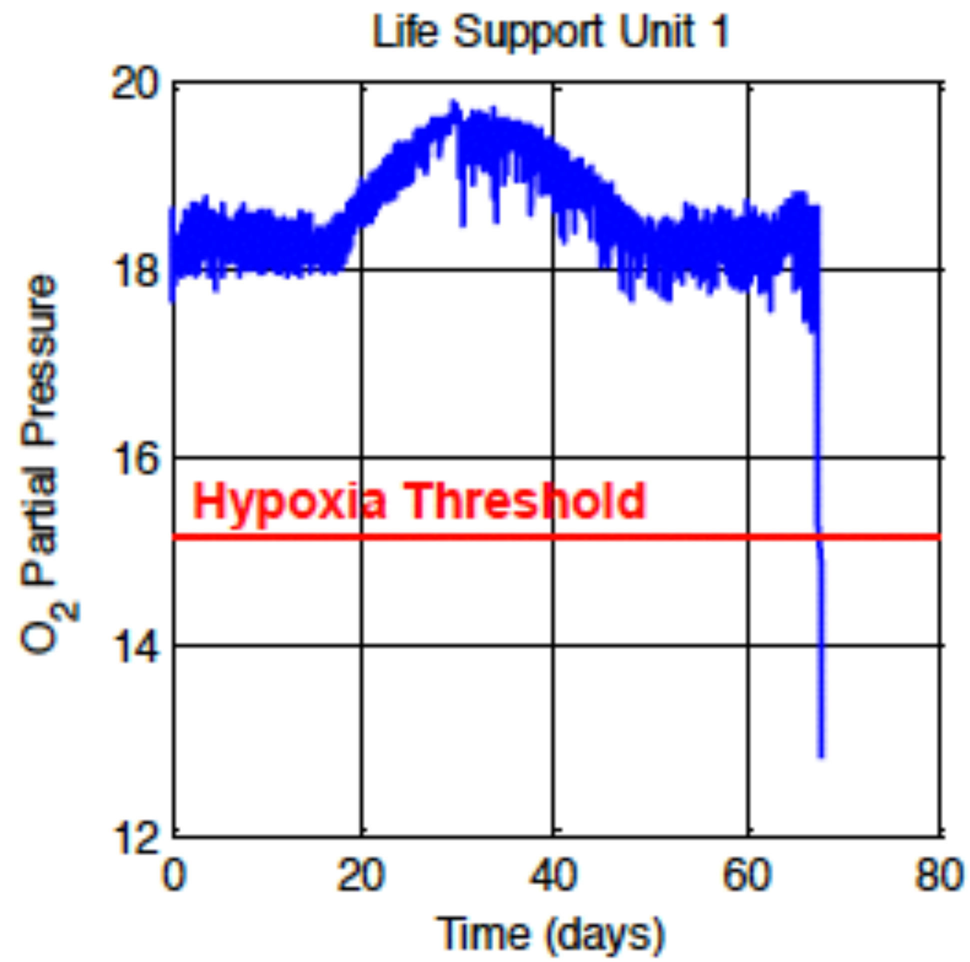


Fig. 8: Life Support Unit O2 Partial Pressure

At the same time, the habitat would be put into a state of high fire risk due to the oxygen molar fraction exceeding the 30% safety threshold, as indicated in Figure 9.

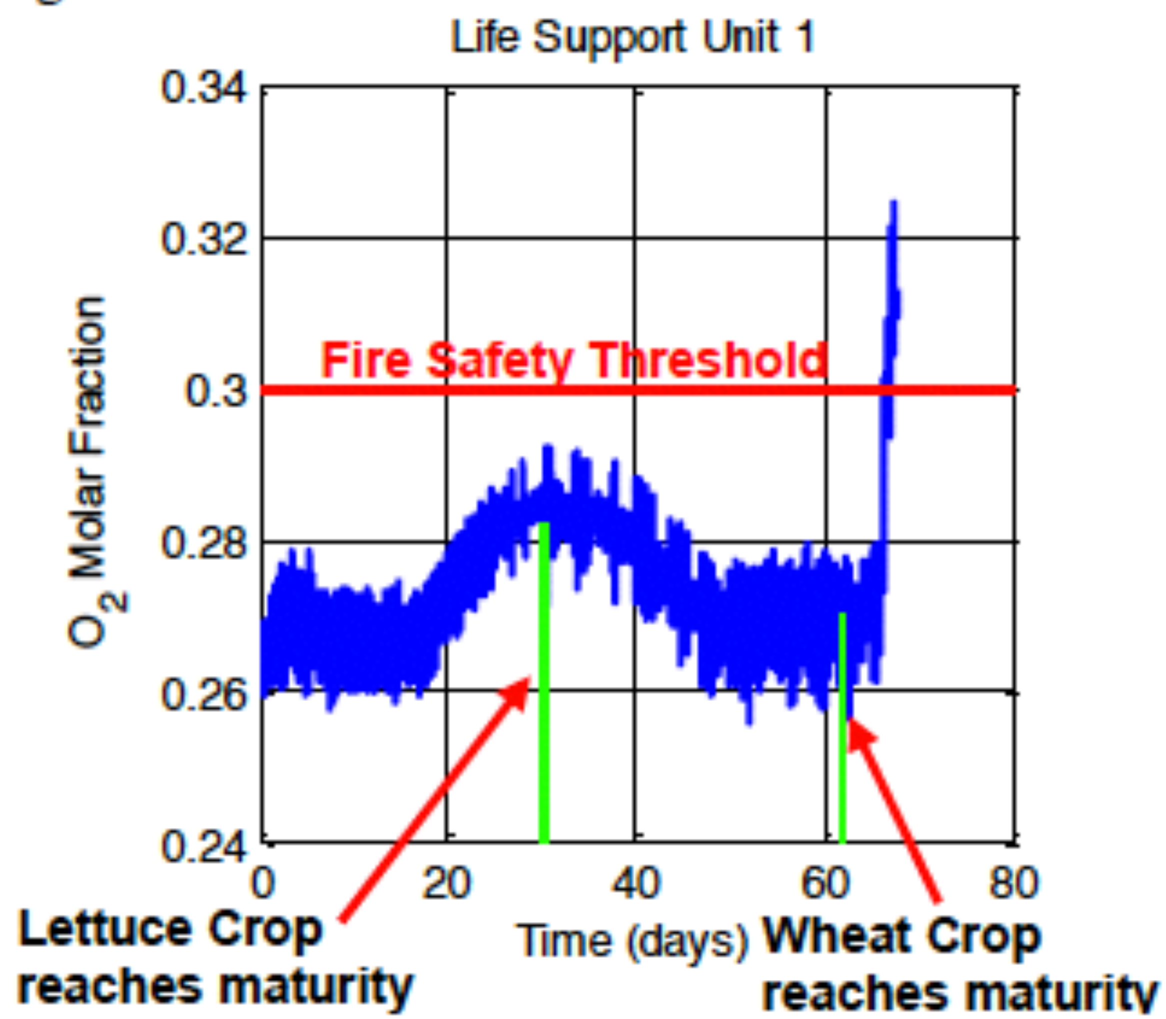
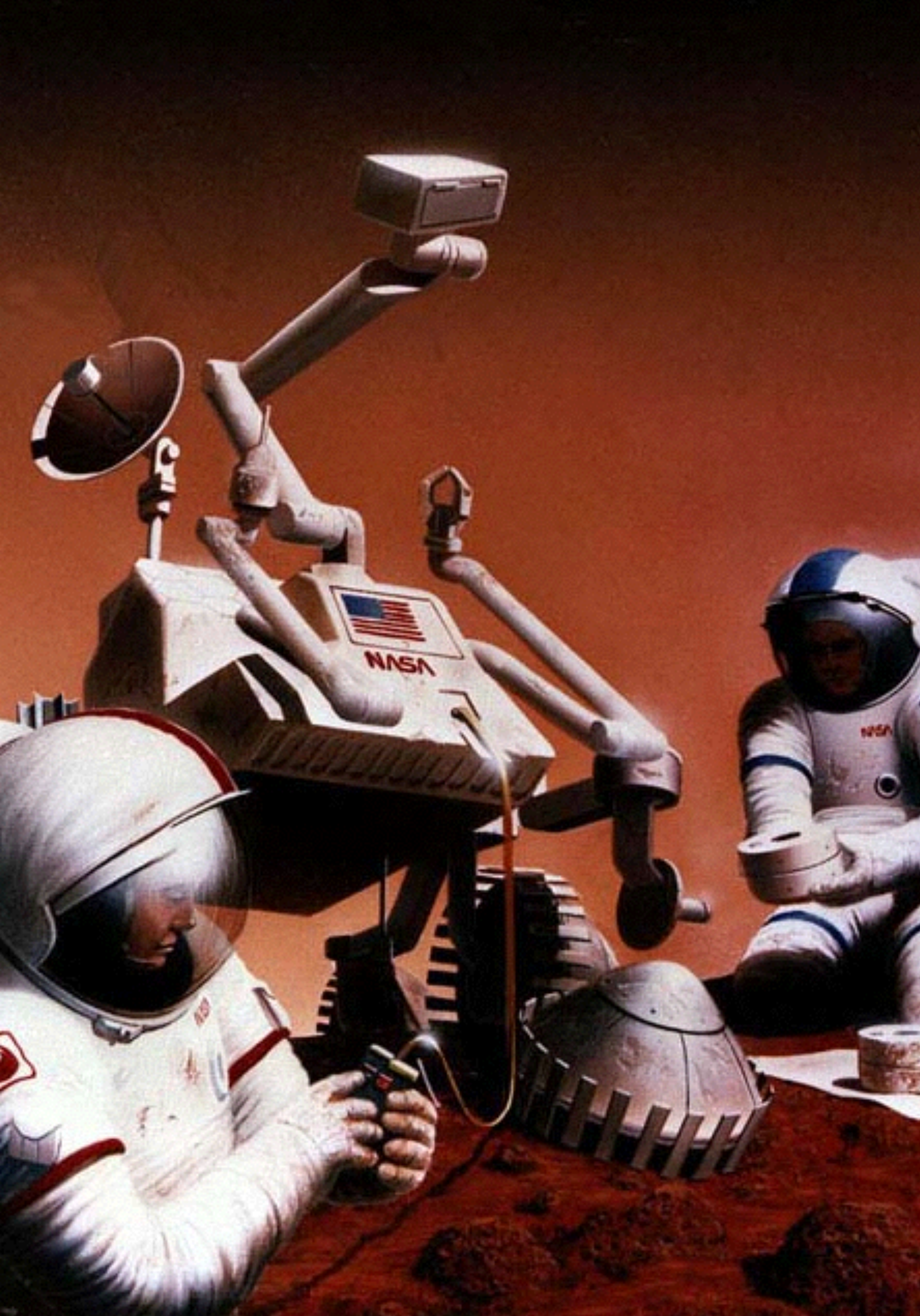


Fig. 9: Life Support Unit O2 Molar Fraction


NASA

Sol 3528
Before
Sol 3540
After


OTHER PROGRAMS

- Spacex (10yrs)
- NASA (2030's)
- CNSA (2030's)
- Mars Initiative (???)
- Inspiration Mars (2018)
- MDRS
- mars500

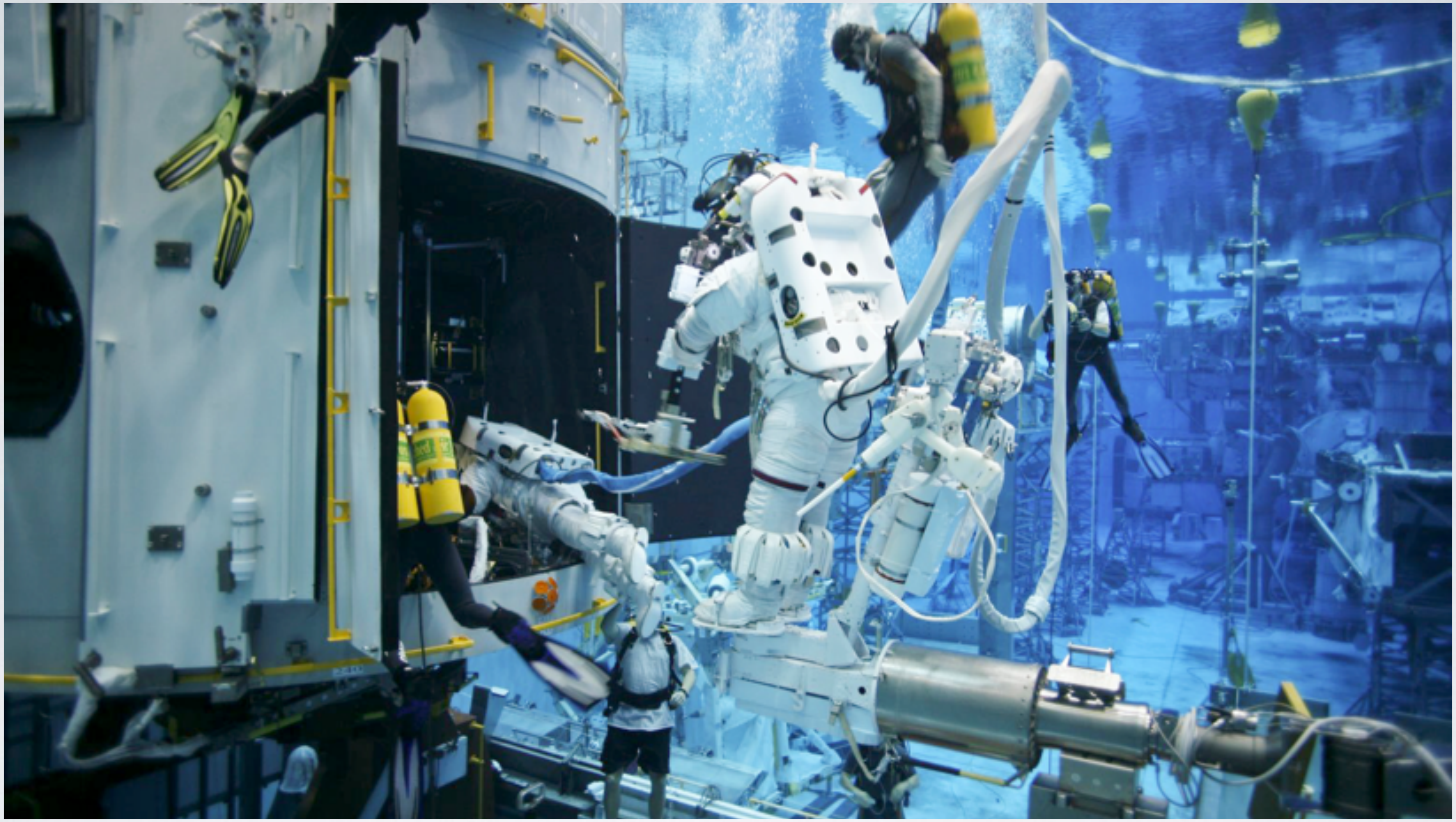
THE FUTURE OF SPACE

- £80m funding -

- UK space hub -

- Astronaut Tim Peake -

"Britain can help build a moon base and send a manned mission to Mars" - MP David Willets



NEXT STEPS

What more will I have to do?

TO PREPARE FOR SPACE

Technical training

Personal training

Group training

Thanks for listening