

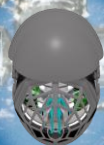
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CALM: COCOON AREA AND LEISURE MODULE

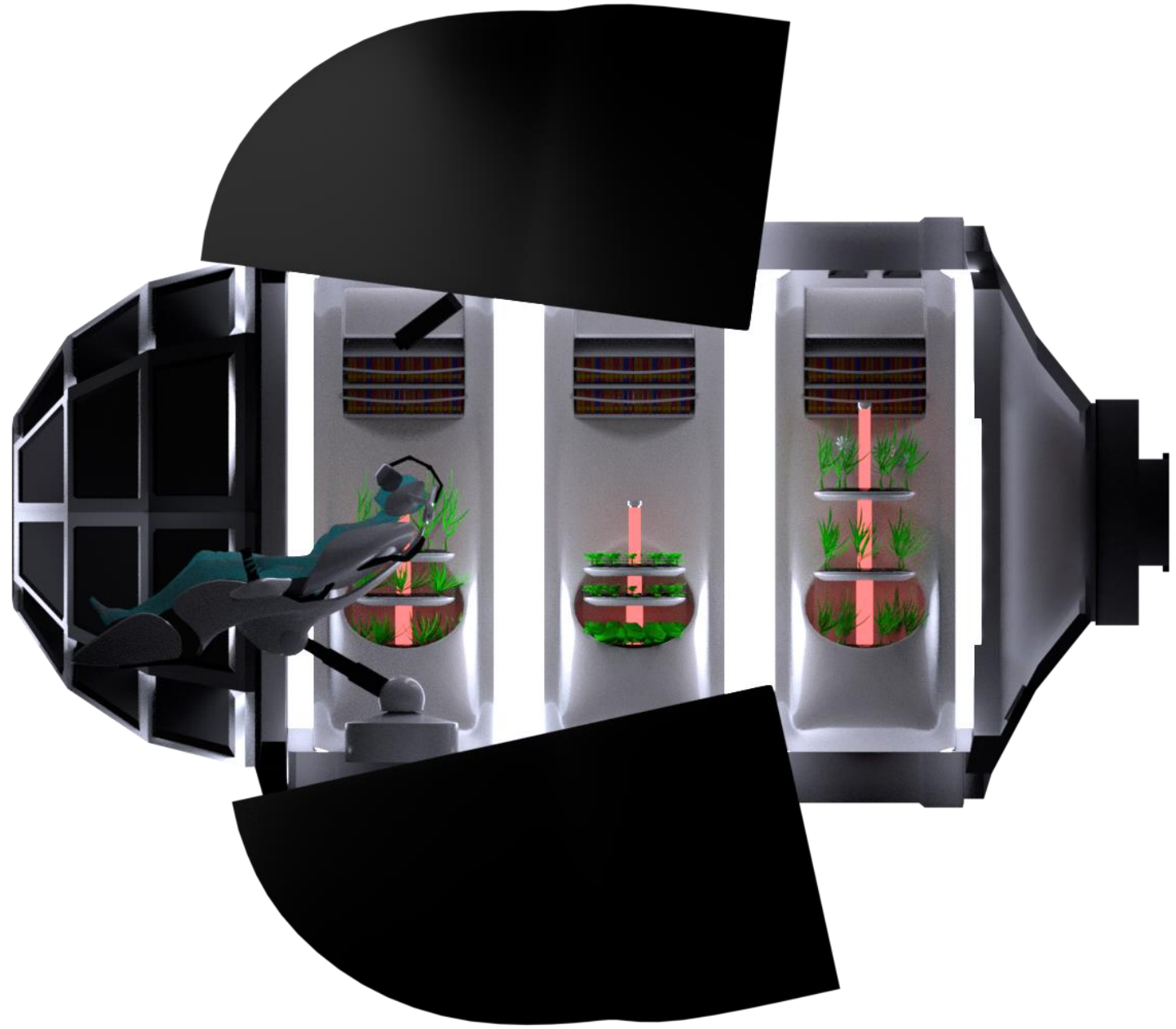
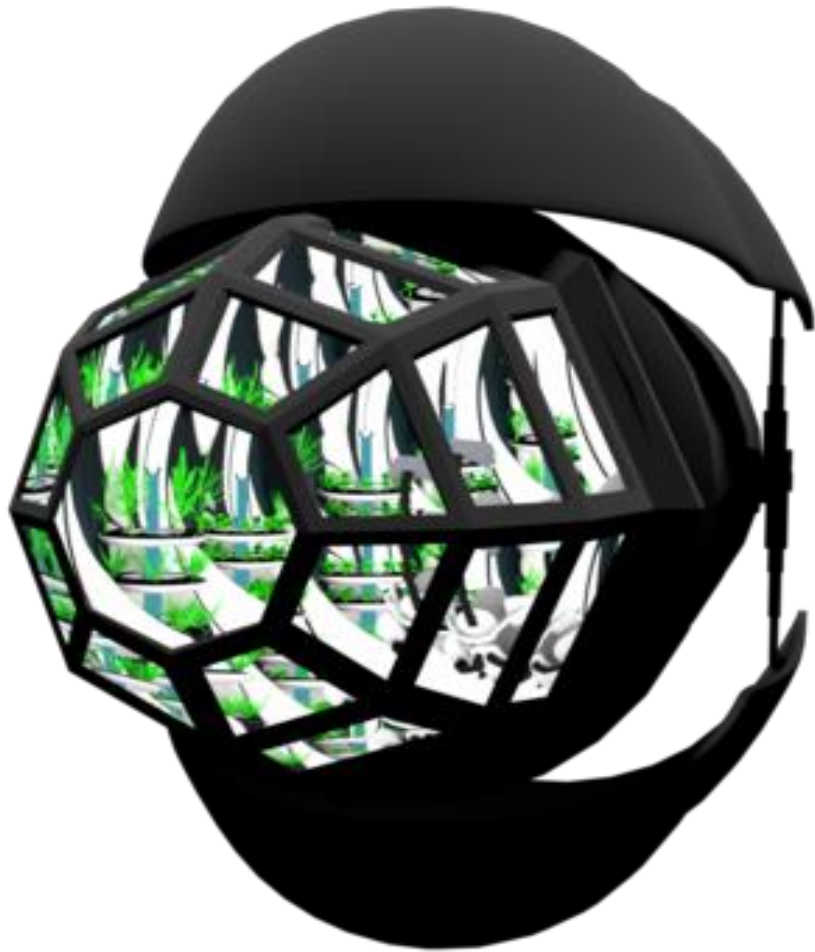
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CALM / OVERVIEW

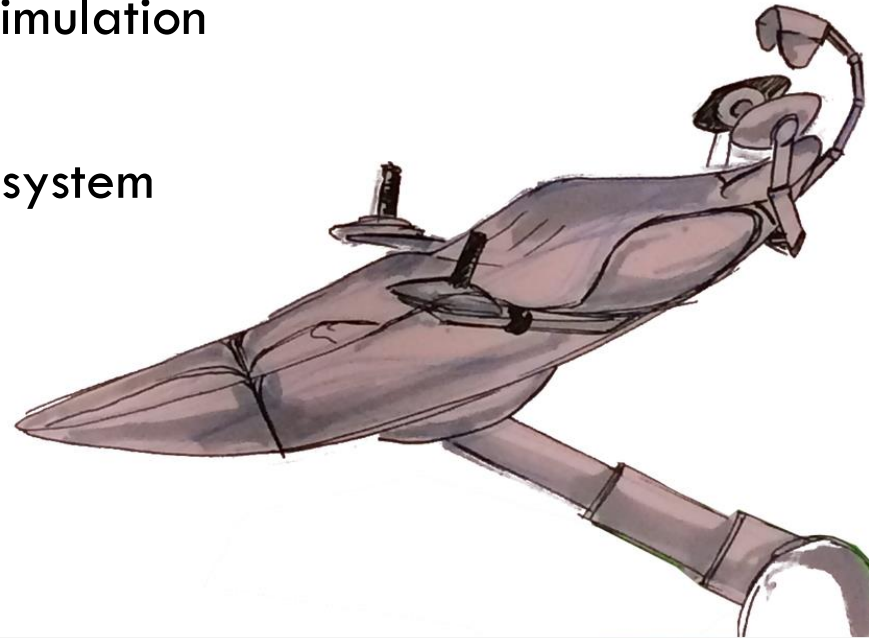
- ❖ ISS is a confined and somewhat harsh environment that induces cumulative stress upon astronauts during long duration spaceflights
- ❖ CALM is a small additional module at the front of ISS, offering astronauts an escape from daily operations
- ❖ The CALM design approach is about creating a multisensory integrated countermeasure
 - Space seat (aka “the throne”)
 - Phototherapy
 - Indoor garden
 - Immersive interaction with home and Earth
 - Noise exposure reduction

CALM / OVERVIEW



CALM / THE THRONE

- ❖ The throne is an adjustable seat using an embedded vacuum system to maintain the astronaut in a comfortably seated state
- ❖ It includes massage and proprioceptive stimulation capabilities
- ❖ Headrest includes active noise-cancelling system
- ❖ Multiple positions allowing for
 - Earth observation
 - Space observation
 - Gardening
 - Relaxed reading



CALM / LET THERE BE LIGHT

❖ Astronauts can design their preferred color scheme of CALM ambient lighting

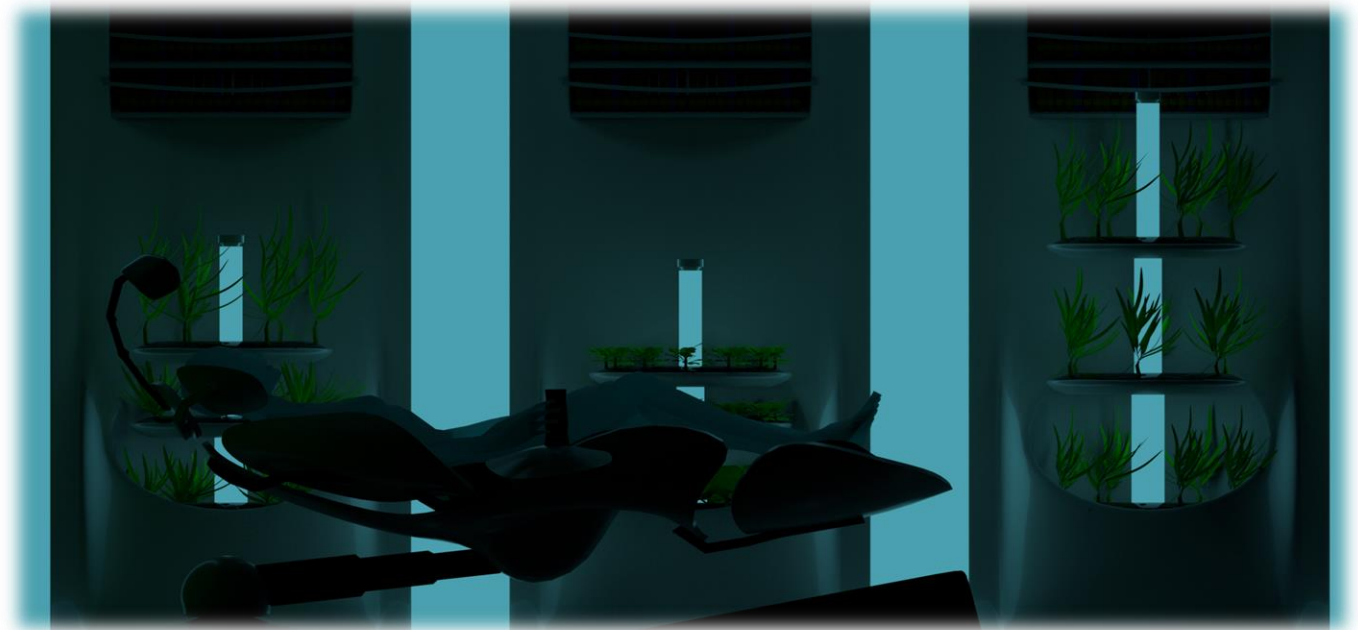
❖ Exposure to full-spectrum light (5800K) has been found effective in

- Increasing immunity defense
- Reducing anxiety and depression
- Assisting synchronization of circadian rhythms

❖ Exposure to blue light (6400K) inhibits

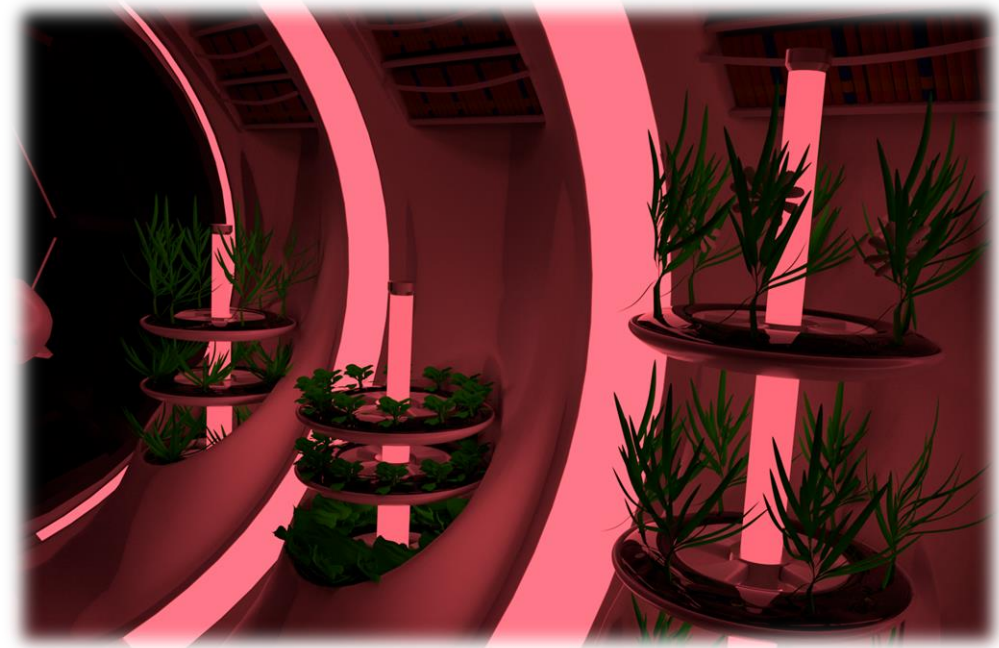
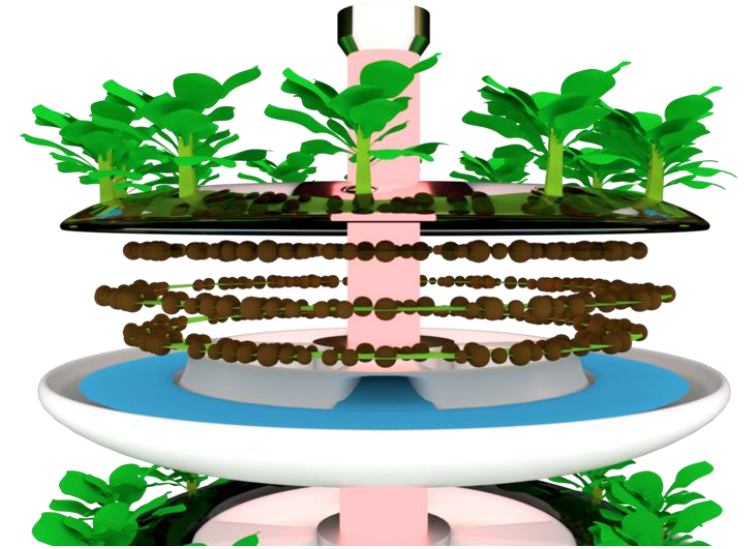
- Increasing awareness and concentration
- Allowing micro-naps

❖ When no astronaut is inside the module, the lights are dedicated to aiding plant growth: a combination of red, blue and green illumination



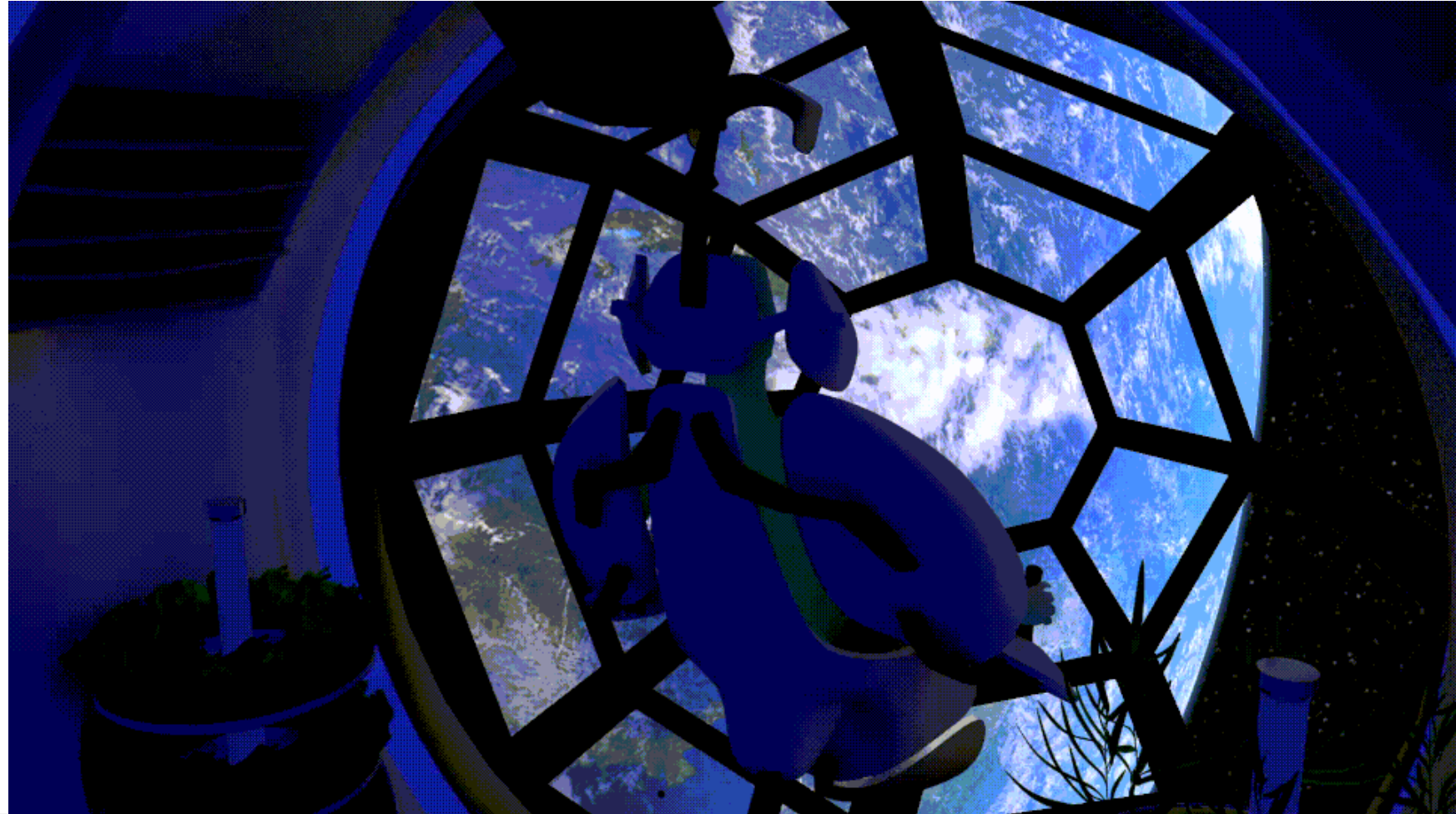
CALM / TAKE A BREATH

- ❖ Flowers and plants bring colors and smells aboard ISS
- ❖ Gardening is known to relieve stress and will benefit the astronaut's relaxation and happiness
- ❖ Plants absorb air pollutants and CO₂ while providing fresh food and herbs
- ❖ Compost made from organic human waste will be used
- ❖ The ISS garden offers a peaceful reading place during astronauts' spare time



CALM / THE APERTURE BAY

- ❖ Half-spherical window opening at the front of the station offers a breathtaking view of both Earth and space
- ❖ The CALM aperture gives astronauts the ultimate perspective of ISS as mankind's outpost in space



CALM / HOME LANDING

- ❖ Astronauts can receive a 360° live or recorded video stream taken from Earth, bridging the gap between them and the rest of mankind
 - At home with family and friends
 - Exploring familiar or wild landscape
 - Experiencing cultural events: exhibition, concerts
- ❖ Video is displayed through an immersive virtual reality headset or back projected on the half-spherical bay with a retractable cover



CONCLUSION / KEEP CALM

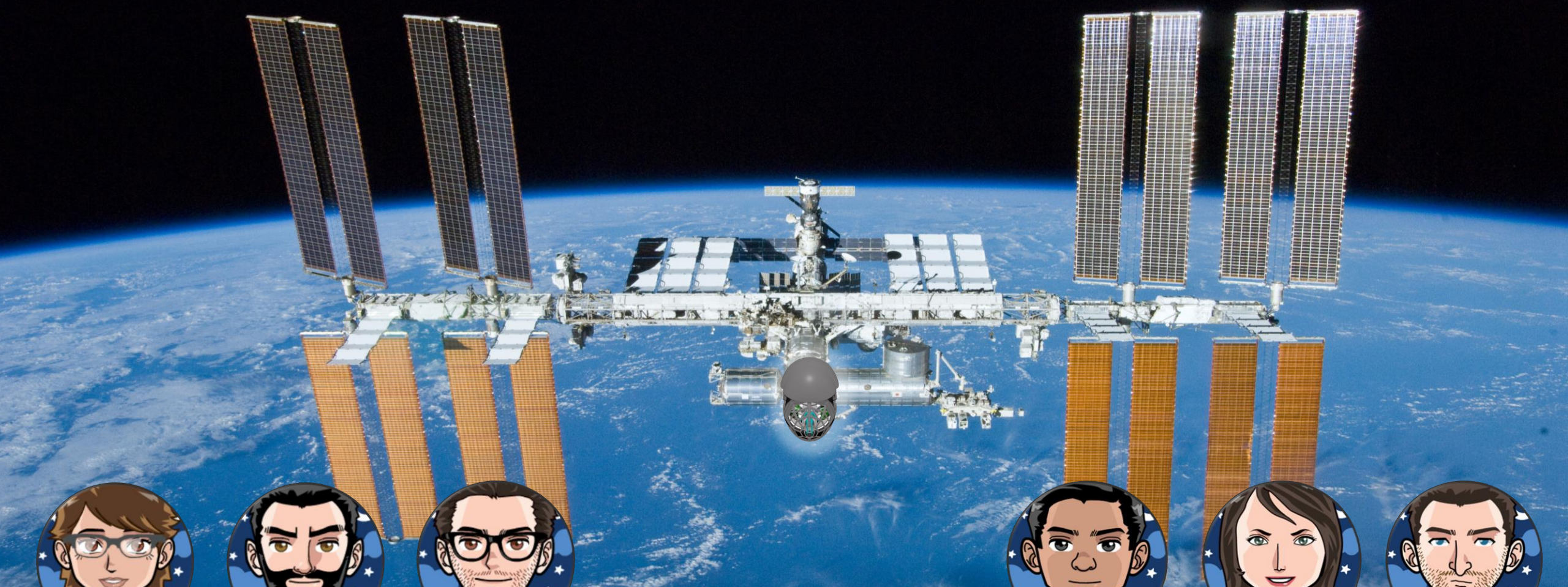
❖ CALM addresses human health and performance issues in confined environments

- Countermeasure against anxiety, boredom, and isolation are needed for remote workplaces (submarines, military bases, mining sites)
- But also for traditional workplaces: company quiet rooms boost alertness and productivity

❖ The pathway to Mars begins with the International Space Station

- ISS as a test bench for new concepts designed to improve crew members' well being, as well as performance and concentration.
- The CALM concept aims at being a credible approach, but technological bottlenecks are still to be addressed (space debris, open air harvesting, power and water consumption, etc...)





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THANK YOU

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