CALM: COCOON AREA AND LEISURE MODULE

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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

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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

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.
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 CO\(_2\) 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
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... )
THANK YOU