The :envihab -

Linking Biomedical Research and Technological Innovation for Astronauts Health

:envihab – Part of DLR’s Institute of Aerospace Medicine

- Space Life Science - Improving Health Span in Space and on Earth
  - Investigating environmental Influences on Human Health
  - Focused on Nervous system and behavior, Musculoskeletal system, Metabolism, Cardiovascular system
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  - Investigating environmental Influences on Human Health
  - Focused on Nervous system and behavior, Musculoskeletal system, Metabolism, Cardiovascular system
- Strong partner in cooperative research projects:
  - Cutting-edge methods and technologies (Short Arm Human Centrifuge e.g.)
  - Unique scientific expertise (Bed Rest Studies; Sleep and Performance Studies; Astronauts health etc.)
- Integrated ground based program with simulation and experiments
:envihab – Unique Medical Research Facility

• :envihab (from the words ‘Environment’ and ‘Habitat’)
• operated by the Institute for Aerospace Medicine at the German Space Center since 2013
• State of the Art Space Analog (https://www.nasa.gov/analogs/):
  • play a significant role in problem solving for spaceflight research
  • Countermeasures can be tested in analogs before implementing them in space
  • Ground-based analog studies are completed more quickly and less expensively
• Modeling environmental health influences with different models (e.g. Deconditioning; Hypoxia; Noise)
:envihab – Modular Construction

M1 Short-Arm Human Centrifuge
M2 Physiology Lab and Baro Lab
M3 Living- and Simulation Area
M4 PET-MRI
M5 Psychology Lab
M6 Biology Lab
M7 Infrastructure
M8 Forum
Improving Health Span in Space and on Earth: envihab – Linking biomedical research and technological innovation for Astronaut health

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Improving Health Span in Space and on Earth
:envihab - Well-defined Experimental Conditions

- Various experiment settings possible
  - e.g. Atmospheric Conditioning (VaPER); Reduction of ambient pressure to 300 mbar
- Temperature and Humidity adjustable
- Confinement
- High standard research facility with innovative and state-of-the-art equipment
- Studies with up to twelve test subjects under highly controlled conditions and with variable duration
- Highly standardized -6° head down tilt (HDT) during 30/60 days bedrest studies at :envihab (NASA/ESA) – VaPER-BR-Study with 0.5% ambient CO₂
:envihab – Direct Return of ESA-Astronauts
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Since 2014 Institute of Aerospace Medicine supports postflight activities of ESA Astronauts - Direct Return

- Supporting ESA/EAC with all important facilities in a few meters distance
  - European Astronaut Center,
  - Institute of Aerospace Medicine including Flight Medicine Clinic,
  - :envihab

- Pre- and postflight examinations can be performed at the same site with identical equipment and staff
Direct Return – Hosting of ESA-Astronauts in :envihab

- Astronauts, crew surgeon and operational staff can be accommodated
- Crew quarters are fully access-controlled
  - Infection control
  - Astronaut privacy
- Advantage of noise-reduced Modul as crew quarter
- In door-to-door distance to ESA-Control Team
- Fully supported by DLR Staff
MED B: Clinical Data Collection (CDC) for ESA-Astronauts

- Direct after the arrival in the :envihab electrocardiogram and blood draw are performed

- Because of Space Associated Neuro-ocular Syndrome (SANS) many eye examinations are performed, in some cases the same as on the ISS

- Also stress electrocardiogram and dermatological examinations are conducted
Outlook

- Expecting ESA-Astronaut Alexander Gerst for his second Direct Return in :envihab in December 2018

- NASA-/ESA collaboration with DLR: Long term Bed Rest Study with Artificial Gravity as countermeasure in 2019 (AGBRESA-Study)
Acknowledgement

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Thank you for your attention!

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