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THE :ENVIHAB – LINKING BIOMEDICAL RESEARCH AND TECHNOLOGICAL INNOVATION
FOR ASTRONAUT HEALTH

Abstract

The DLR Institute of Aerospace Medicine has longtime experience in supporting human spaceflights. Ever since contributing to the Spacelab Program, the Institute has supported the psychological and medical astronaut selection, training, and mission operations. The program is flanked by state-of-the-art ground based biological, medical, and psychological research. The :envihab, derived from the words environment and habitat, is a unique medical research facility operated by the DLR Institute of Aerospace Medicine. Within its eight modules, :envihab houses multi-purpose laboratories and specialized equipment for life science research. Furthermore, :envihab features a high-end research ward accommodating study participants in bedrest studies and sleep investigations among others. The module comprises 12 individual rooms and can be conditioned using normobaric hypoxia or hypercapnia. :envihab offers a fully equipped human short-arm centrifuge equipped with a robotic-controlled ultrasonography device for examinations of cardiovascular parameters during exposure to centrifugation. The 3 Tesla PET-MRI allows for sophisticated structural, functional, and molecular imaging. The Biology Lab consists of four microbiology laboratory rooms, one of them is an ISO class 8 clean room. A large hypobaric chamber is suitable for hypobaric hypoxia, normobaric hypoxia, and hypercapnia studies. Finally, advanced cardiovascular, musculoskeletal, metabolic, ophthalmological, and psychological testing as well as highly

controlled dietary support make :envihab a worldwide unique human research facility. Meanwhile, several mechanism-oriented sleep studies as well as bed rest studies up to 60 days have been successfully completed. The Institute supports postflight activities of ESA astronauts – the so-called “Direct Return”. Astronauts, crew surgeon and operational staff can be accommodated. The Crew Quarters are access-controlled for infection control and astronaut privacy. All medical post-flight examinations required according to the Medical Standards for Crewmembers can be performed at the adjacent DLR Flight Medicine Clinic. Pre- and post-flight examinations and measurements can be performed at the same site with the same equipment and the same staff, thus, limiting variability. Similarly, post-flight experiments are conducted by DLR scientists within :envihab. In November 2014, Alexander Gerst was the first astronaut to directly return to Cologne, followed by Andreas Mogensen (Sept. 2015), Timothy Peake (June 2016) and Thomas Pesquet (June 2017). We expect ISS commander Alexander Gerst as the next astronaut hosted at :envihab in 2018.