Paper ID: 82314
oral
student

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Commercial Human Spaceflight Programmes (2)

Author: Mr. Smit Patel
Airbus Defence & Space, Germany, smeetpatel11@gmail.com

Mr. David Hernando Diaz
Universitat Politecnica de Catalunya (UPC), Spain, davidhrd959@gmail.com
Mrs. Adina Godeanu
ESA - European Space Agency, The Netherlands, godeanuadina96@gmail.com
Mrs. Vivien Simon
Semmelweis University of Health Sciences, Hungary, simon.vivien2002@gmail.com
Mr. Julian Herrmann
Germany, JulianHerrmann1@gmx.de
Ms. Hamda Al-Ali
The University of Manchester, United Kingdom, hamda_alali750@hotmail.com
Ms. Jingyang Wu
Space Generation Advisory Council (SGAC), Sweden, jinwu@kth.se
Mrs. Noemi Delfino
Politecnico di Torino, Italy, noemi.delfino@studenti.polito.it
Ms. Saira O. Williams
Space Generation Advisory Council (SGAC), Costa Rica, roxysairawilliams@spacegeneration.org
Mr. Konrad Kij
Poland, konradkij1@gmail.com
Mr. Martin Zietz
KSat e.V., Germany, zietz@ksat-stuttgart.de
Mr. Benjamin Buchmann
Germany, benjamin.buchmann@me.com

ASTROGATE: A CONCEPTUAL DESIGN STUDY FOR A POST-ISS COMMERCIAL CREWED SPACE STATION

Abstract

The largest space structure ever to be put in space, the International Space Station(ISS), has been revolutionary for research and home to many astronauts. As the ISS is aging quickly and the plans for its retirement are already in motion, the need for a modern, sustainable, and state-of-the-art space station that drives research and prepares humanity to explore further is already rising. To address this need, a conceptual design study resulting in 'AstroGate' was conducted at the "Space Station Design Workshop 2023" by 20 international and interdisciplinary students and young professionals under the guidance of 20+ subject matter experts at the Institute of Space Systems of the University of Stuttgart, Germany.

AstroGate is a comfortable and modular space station with commercial production capabilities for unique products such as high-performance optical fibres, 3D printed organs with high demand on earth, and an expanding large-scale manufacturing facility to enable a new era of space exploration with Mega Components. With the launch of the minimum viable station in 2030, AstroGate will be constructed and launched in stages with its modular approach and fully operational in 2039 with a capacity of hosting

ten astronauts. With a commercial yet innovative approach, AstroGate will have a hybrid life support system, advanced robotic capabilities, an artificial gravity habitation area, and a manufacturing platform for large-scale structures. This capability will help humanity overcome the size and scale of components required to enable missions into the deep unknown beyond our solar system.

This design study includes the design of all sub-systems, including structures, propulsion, life-support, communication, radiation, power, and thermal. Most of the proposed technologies have high technology readiness levels, making the concept highly realisable. A cost estimation for the entire project with the launch plan is prepared considering the existing market. Risks associated with the project and their mitigation strategies are also discussed. A business plan includes commercial use cases, promotion, and collaboration strategies.

Keywords: Space Station, In-Space Manufacturing, Artificial Gravity, post-ISS