

## IAF SPACE HABITATS COMMITTEE (SHC)

### 1. Introduction

The IAF Space Habitats Committee (SHC) aims, in collaboration with other IAF committees and symposia, to foster the importance of building an international and interdisciplinary understanding of the issues and stakes raised by future space habitats (e.g., settlements on celestial bodies and orbital infrastructures).

### 2. Latest Developments

SHC's participation in, and hosting of, several initiatives (including cross-committee activities, publications and a yearly online workshop) highlighted some of the latest developments in the field. The SHC yearly webinar, held in January since 2021, has been especially helpful to identify new areas of research and development, as well as encouraging new collaborations among new and current members. Curated this year by Manuela Aguzzi and Sunny Narayanan, the event gave an opportunity to prospective and current members to present their work and discuss common interests, which mainly included diversity, safety, and aesthetics-related issues. More specifically, the multidisciplinary field of space habitats has been actively addressing the following habitability demands: providing sustainable food supplies (e.g. greenhouses); dealing with space weather and protecting the crew during long-term space travel (e.g. radiation shielding options); offering aesthetically appealing designs; preparing the next generation of architects, designers and researchers in the field (for example, through a design charrette, a new Executive MBA in space architecture, etc.); developing sustainable and effective structures on the Moon (e.g. ISRU, regolith); and supporting future diverse crews (e.g. providing para-astronaut- and gender-friendly equipment and facilities). Furthermore, different habitability scenarios were discussed for upcoming crewed Moon missions including: underground habitats (using lava tubes), orbital structures, inflatable structures, etc. A central requirement for future space

habitats is that they will have to be more evolvable and adaptive than ever.

### 3. Breakthroughs

Current commercial space activities include extended commercial uses of the International Space Station, development of critical technical components (such as commercial EVA suits), and the validation of Boeing's CST-100 Starliner whose crewed flight test is now expected in July 2023. While the commercial industry (e.g. SpaceX, Axiom) continues preparing for space expeditions, many SHC members have on-going projects developing new technologies and techniques for future space habitats. Among many others, this includes a multi-disciplinary study investigating how pavement elements from lunar regolith can be laser sintered into infrastructures (e.g., roads and launch pads), research on mission and system requirements to allow compatibility and modularity of future infrastructures through standardization, further development of a ground test demonstrator for the EDEN ISS Mobile Test Facility (MTF) greenhouse for integration with ESA's LUNA facility, and a research study on the intersection of Space and Biotech using 3D printing human organs in microgravity for economic, social, and equitable innovation benefits.

### 4. Action plan for the year

Like every year, the SHC will pursue both of its yearly initiative, in addition to IAC and Spring Meetings related activities: our *yearly article* highlighting updates from SHC members' activities in ROOM magazine (other online platforms are considered for additional publications by Committee members), and our January webinar featuring presentations by current and prospective members. The next editions of these initiatives will be the second for the ROOM publication and the third iteration for the webinar. Every year, both are curated by a rotating team of SHC members.

In terms of its organization and good-practice implementation, the SHC will continue developing its shared database using Google Drive, which already includes the following resources for our committee members: membership applications, members' contact info, archive of past session drafts and proposals, space habitats roadmap, thematic bibliography (in progress), promotional material, future activities collaborative document, and focussed task forces for the development of ongoing and new projects.

With the upcoming IAC 2023 in Baku, SHC will continue its cooperation with various IAF symposia and technical committees, including the symposia E5 "Space and

Society" and D3 on "Building blocks for future space exploration and development" through joint technical sessions (E5.1, D3.2A). In addition to human spaceflight-related technical sessions managed by committee members who are also part of the Human Spaceflight Committee, the SHC will continue hosting its new technical session implemented in the program of IAC 2022 and included in IAC 2023: E5.6, "Simulating space habitats". The abstract selection at the Spring Meetings in March 2023 has shown a wide interest for these sessions and the selected abstracts promise to foster stimulating discussions.