Paper ID: 45736
oral

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
New Worlds - Non-Traditional Space Education and Outreach (7)

Author: Dr. Sasha Alexander
Western Sydney University, Australia

Dr. Olga Bannova
University of Houston, United States
Prof.Dr. EunSook Kwon
University of Houston, United States

BUILDING RESILIENCE FOR LONG DURATION SPACE FLIGHT: A MULTIPLE PROJECT STUDY ACROSS MULTIPLE DISCIPLINE AREAS WITH PRIMARY HOSTS AS ARCHITECTURE AND INDUSTRIAL DESIGN TERTIARY PROGRAMS IN USA AND AUSTRALIA.

Abstract

International cooperation on space flight project development starts on earth by way of professional introductions between prospective host organizations and collaborators with major and minor actors. Complex prior projects provide insights and the ongoing foundational knowledge from which new innovations can launch and new ideas can come from both seasoned researchers, and commercial partnerships (NASA, SpaceX), but also fresh minds as the knowledge sets are brought together and interact to form new innovative perspectives. Universities as research test-beds for capturing the imaginations of new professional generations are an exciting environment to focus discipline skills and recalibrate career ambitions and trajectories. Space exploration exemplars as the International Space Station (ISS) provides an example of an enabling platform where cooperative relations in developing, constructing human habitation systems provide evidence that national and international collaborations are core to the development of future missions and lunar habitation. Future long-duration spaceflight and exploration missions will require from the crew to perform at their maximum capacity. Habitation architecture and spacecraft design must respect human needs and requirements and need to be addressed at every stage of the design process: "considering people to be more than an 'element' of the system but its modifier and innovator" (Haeuplik-Meusburger S., Bannova O., 2016). This paper presents the results of a cross disciplinary approach to habitation system development for long-duration flights in relation to sustainable food security; crew health systems; and alternate activities for managing stress triggers in confined environments. A collaborative project follows an approach that is based on a project-oriented strategy. Students from involved universities and programs interact through the project when they have to identify required information and knowledge, analyze it, and synthesize the results in development of prototypes. Such approach to project development enables collaboration from multiple disciplines. Prototyping of proposed designs are based on physiological, neurological, biomechanical, mechatronic, and spatial considerations in maximising cardiovascular health, maintaining muscle strength, and promoting good astronaut emotional health through integrated socialisation on long-duration Mars flights through fit-for-purpose exercise (pastime) equipment. The collaborative project draws from methodologies including design thinking, ergonomic principles, cognitive science, trust and collaboration, and architectural practice in forming teams, research steps, and iterative design processes.