Paper ID: 50549
student

IAF MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Sciences on board ISS and beyond (6)

Author: Ms. Christine Joseph
Massachusetts Institute of Technology (MIT), United States

Dr. Danielle Wood
Massachusetts Institute of Technology (MIT), United States

ANALYSIS OF THE MICROGRAVITY RESEARCH ECOSYSTEM AND MARKET DRIVERS OF ACCESSIBILITY

Abstract

For decades, the International Space Station (ISS) has operated as a bastion of international cooperation and a unique testbed for microgravity research. Beyond enabling insights into human physiology in space, the ISS has served as a microgravity platform for numerous science experiments. In recent years, private industry has also been affiliating with NASA and international partners to offer transportation, logistics management and payload demands. The ISS U.S. National Laboratory has developed a diverse portfolio of private, public, international and outreach projects.

As the costs of flying projects to the ISS decrease, the barriers limiting non-traditional partners from accessing the ISS as a platform also decrease. However, the ISS in its current form cannot be sustained forever and current hardware will eventually reach the end of its lifetime. As NASA looks towards commercialization of the low Earth orbit (LEO) space and the development of a cislunar station, concrete plans for shifting the public private relationship of the ISS are unclear. Companies such as Axiom Space, Bigelow Aerospace and NanoRacks have already proposed or begun testing of commercial space station modules. China has announced plans for a permanent habitable space station and Japan has approved plans to join the U.S. in development of a cislunar station. With the consistent need to continue microgravity research – from governments and private industry – understanding the socio-technical and policy issues that affect the marketplace for future microgravity platforms is essential to maintaining an accessible and sustainable space economy.

Through case study research, the author conducted interviews with industry experts and organizational representatives and reviewed publicly available data about microgravity research platforms. This paper examines the stakeholders, needs, objectives, system functions and forms for the ISS and microgravity research platforms now and in the future. Particular attention is paid towards the market dynamics affecting the administrative and economic barriers to entry for emerging space nations and non traditional spaceflight participants. Current and future proposals, operations, and governance structures are investigated and mapped within a new framework measuring dimensions of accessibility. Accessibility is defined based on whether new proposals for microgravity operations increase economic openness or administrative openness.