MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Processes onboard the International Space Station and Beyond (7)

Author: Mr. Sanket Nayak
Earth2Orbit, LLC, India

Dr. Susmita Mohanty
Earth2Orbit, LLC, India
Mr. Amaresh Kollipara
Earth2Orbit, LLC, United States

FEASIBILITY STUDY: ADAPTING INDIA'S RETRIEVABLE CAPSULE INTO A COMMERCIAL MICROGRAVITY PLATFORM

Abstract

Earth2Orbit (E2O) is India's first private space company with an international market focus. In 2009, E2O commissioned a study to assess the technical feasibility and economic viability of adapting the retrievable capsule that India is developing for its human spaceflight program into a commercial microgravity free flier platform. The Indian Space Research Organization (ISRO) tested the first Space Capsule Recovery Experiment (SRE) in 2007 and is scheduled to conduct the second test in 2010. A summer intern from the International Space University (ISU) conducted the study. Project oversight and mentorship was provided by E2O and ISRO's commercial arm Antrix. This paper is an abridged version of the feasibility study report.

The paper begins with a comparative overview of existing microgravity platforms such as drop towers, parabolic flights, sounding rockets, and the International Space Station (ISS). It identifies a need for affordable access to research platforms with customizable in-orbit time and good microgravity levels. The paper summarizes the technical aspects of the first SRE mission and SRE payloads such as the Iso-Thermal Heat Furnace (IHF) and Bio-Mimetic Reactor (BMR).

The paper highlights the emergence of a niche market using case studies such as the Russian FOTON capsule, SpaceX Dragon Lab, the European Space Agency's (ESA) GoSpace initiative, and NASA Ames Research Center's small satellite based experiments. It presents an overview of the orbital microgravity research landscape using a geographic distribution graph. The paper presents a costing and pricing model that assesses the economic viability of the idea. It concludes with the recommendations that economic viability can be achieved by ensuring (a) at least one annual fully commercial launch with large payload capacity (e.g. the Polar Satellite Launch Vehicle PSLV-XL with a payload capacity of 1884 kilograms), (b) efficient payload aggregation and clustering, (c) aggressive marketing.