BUSINESS INNOVATION SYMPOSIUM (E6)
New Space and New Science (3)

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APPLYING INSIGHTS OF GAME THEORY TO THE MICROGRAVITY UTILIZATION MARKET

Abstract

It is commonly assumed that microgravity environments are utilized only for space-based applications. However, microgravity platforms have been used for science and industrial applications long before a national space program was conceived. This paper will discuss microgravity platforms and their utilization as they are available now, explore technology that will grant access to longer durations of weightlessness, and further identify the community of users of these technologies in order to better understand the overall microgravity utilization market.

The Emerging Space Industry Leaders (ESIL) workshop series is an ongoing effort supported by the FAA Center of Excellence for Commercial Space Transportation established to foster ongoing discussion and analysis of various segments of the commercial space industry. This paper is the result of the fourth workshop held in Louisville, Colorado which set out to accomplish the following objectives:

1.Develop an understanding of the current microgravity utilization industry and identify any trends in users and applications.

2.Evaluate the microgravity utilization market through the application of Game Theory and the PARTS market model.

3.Identify favorable applications of microgravity platforms and outline key areas for beneficial partnerships in industry.

To accomplish these objectives, this paper will provide an overview of the multiple platforms currently available for research and development to the scientific and industrial communities. Each platform varies in many factors that affect the research that can be done, such as quality of microgravity, cost of the platform, and others that must be taken into consideration when analyzing the utilization market. The paper will discuss currently available platforms such as drop towers, parabolic aircraft, suborbital, orbital platforms.

Characterization of the microgravity utilization industry was done using a realization of game theory, the PARTS model, developed by Brandenburger and Nalebuff. While not analyzed mathematically, the PARTS model of game theory was used to identify the major factors governing the development and utilization of the microgravity market. From this analysis, two strategies were recommended. The first is to address the current existing misperceptions of the industry, which are inhibiting the market from growing. This strategy requires cooperation by the current suppliers, payload integrators and funding agencies. The second strategy focuses on creating new perceptions to stimulate market growth and does

not require cooperation between entities. These strategies and implementation recommendations will be discussed further in the paper.