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SPACE STATION FREEDOM REDUX: A PROPOSAL TO REARCHITECT THE INTERNATIONAL
SPACE STATION TO SERVE AS A SPACE SOLAR POWER TECHNOLOGY DEVELOPMENT,
DEMONSTRATION, AND DEPLOYMENT PLATFORM

Abstract

The commercialization concepts, business plans, and viability of habitable platforms in Low Earth Orbit (LEO) and beyond critically depend on an evolvable infrastructure. Infrastructure that will provide the necessary utilities and ancillary services to accommodate addressable markets for the International Space Station (ISS) directly and for free-flying spacecraft and their aggregations. Explorations, operations, and applications will drive the demands for the above will be run by novel combinations of government, international partner, non-profit, university-related, and commercial entities.

Orchestrated extraordinary innovative public/private partnerships that leverage existing and evolving space and ground infrastructure, commercial investments, academic and non-profit resources, and intergovernmental agreements to blaze a roadmap to the commercialization of LEO are essential for the cost-effective commercialization of LEO and beyond.

The author postulated in a previous paper (Barnhard, IAC 2019) that these markets are best developed by supporting the evolution of ISS as a Technology Development, Demonstration, and Deployment (TD**3) infrastructure to support the commercialization of LEO and beyond. By facilitating the ISS' ability to serve as LEO commercialization infrastructure that can foster the definition, execution, and accomplishment of a pipeline of TD**3 missions, the synergistic effects can maximize the benefit for other modes of utilization (e.g., science laboratory, operations center, transportation node, etc.).

This paper provides a progress report on the research that identifies and articulates the qualitative and quantitative narratives for TD**3 missions detailing how to stimulate the private demand for commercial LEO services to sustain the long-term LEO addressable markets with primarily non-NASA commercial revenue.

A specific opportunity has been identified to leverage the necessary evolution of the ISS to rearchitect the same as Space Station Freedom Redux to serve as a Space Solar Power Technology Development, Demonstration, and Deployment platform. This paper will articulate the qualitative and quantitative narratives establishing the value proposition and the complement of changes required to make transition technically and economically viable.