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New Business Models for Space Exploration (14)
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EMERGENCE OF LEO-TO-GEO COMMERCIAL IN-SPACE SERVICES: IMPLICATIONS FOR FUTURE BEO EXPLORATION AND ECONOMIC DEVELOPMENT

Abstract

The exploration and development of economic resources beyond Earth orbit (BEO) remains a natural, fundamental, and compelling interest to all of humanity. This paper offers a systematic new business model for space exploration, which focuses initially on transforming and increasing the efficiency of low Earth orbit (LEO) to geostationary orbit (LTG) capabilities. The current NASA approach to examining and characterizing the emerging LTG commercial in-space servicing industry will be discussed within the framework of a proposed strategy. Direct support for the emergence of "commercial" Earth-to-orbit industry capabilities in international space station transportation services (such as, commercial orbital transportation services, commercial resupply services, and commercial crew development) is currently front and foremost on NASA's near-term agenda along with space launch system and multi-purpose crew vehicle development. This new trend in addition to external social, economic, and political factors suggest that the requirement for strong government-industry partnerships to sustain mutually beneficial public and private interests in in-space infrastructure development will probably grow and become a necessity. Over the next two decades, these interests are expected to expand and incorporate industry sectors focused on the provision of commercial space services ranging from satellite servicing; to orbital debris removal and mitigation; orbital transportation and transfer; propellant transfer and depot/storage; and on-orbit assembly, etc. NASA has a charter to explore space, remotely as with probes or robots, and with humans. Challenges and difficulties will increase as NASA goes from accessing, building, and living in LEO, to exploring BEO. While NASA's budget resources have varied over time, NASA's budget and purchasing power since 1970 has stayed relatively close to where it is today, adjusting for inflation. Accomplishing increasing challenges and destinations in space exploration within total budget resources that do not increase, requires that some part of the growing content become increasingly cheaper, safer, routine and increasingly removed from the resource requirements picture. Most foreign agencies and U.S. commercial entities have interests that complement or align with the NASA charter. A US commercial space sector, of launch systems, LEO infrastructure such as space stations, and LTG infrastructure such as future satellite servicing and propellant tanker or depot systems must have increasing economic demand, industry revenue, and capabilities. As commercial capabilities evolve and the customer base broadens, the potential for lower cost human space exploration is expected to increase.