

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Interactive Presentations - IAF SPACE SYSTEMS SYMPOSIUM (IPB)

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MEGASAT: FEASIBILITY OF A MODULAR AND EXPANDABLE GEOSTATIONARY PLATFORM
FOR OPTIMIZING GEO-SLOT ALLOCATIONS.

Abstract

The satellite communication market is currently experiencing significant growth, prompting an increasing number of enterprises to target the Geostationary Orbit (GEO) for their telecommunication services. This orbit offers the unique advantage of covering approximately one-third of the Earth's surface with a single satellite. However, this expansion faces a critical bottleneck due to the finite slots available in GEO. The scarcity of orbital positions forces companies to invest heavily in securing a slot, exacerbating challenges related to lifetime and reliability.

Currently satellites must design all the subsystems from scratch leading to higher costs and shorter lifetime as well as having more requirements in terms of fuel from launch to the end of life. The novel architecture that we propose is an infrastructure that allows for sharing resources to multiple users, providing multiple services including power supply, station keeping, thermal management, and data transmission. This requires the development of a network of facilities such as cables and heat pipes, thus extending the satellite's lifetime to the potential clients that dock to the main infrastructure.

The infrastructure will face several technical challenges, including in-orbit assembly, scalability, and loads, flexibility and vibration of large structures. To ensure those issues are addressed, a CAD model was developed, and FEM analysis performed to compute the forces and vibration that may cause the structure fail. Moreover, an analysis has been done to study the assembly and manoeuvrability performances. Modularity is an important technical challenge of the design, given the size of the structure, and will lead the way to an increase of the size of the structure and of the number of docked satellites. This paper addresses all these challenges and studies the feasibility of the structure from the technical point of view, going deep into the details of the features of it through the approaches mentioned.

The objective of this paper is to present the concept of this platform in detail, demonstrating the viability of the new concept by analysing and addressing the key challenges discussed above. The solutions presented to overcome these technical challenges are key enablers for an innovative approach to satellite communication making space more accessible to companies.