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NEW HORIZONS FOR EXPLORATION VIA FLEXIBLE CONCEPTS BASED ON BUILDING
BLOCKS USING THE STANDARDIZED ISSI (INTELLIGENT SPACE SYSTEM INTERFACE)
MODULAR COUPLING KIT BY IBOSS

Abstract

Exploration - a motor of humankind and a long-term driver of space - has evolved as a one of the future core areas for the global space arena with challenges and opportunities regarding technology, systems, missions, operations and business alike. And, NewSpace will drive this with new space approaches. Space exploration missions and business span over manifold themes across the solar system and beyond, involving robotics, habitats, manufacturing, resource exploitation and more. Large space structures, logistics and warehousing will become common space infrastructure elements.

Cost and flexibility will become key to allow for adjustments and repurposing, staged approaches, etc. and economy of scale effects as routine operations suggest. The upswing of innovative and commercial NewSpace ventures and general space industry trends suggest a move toward higher lot sizes of systems, subsystems and components, thus, series production, the industrialization of space respectively. At large, these developments and concepts will benefit from cooperative design and plug-and-play (PnP) principles, which in turn are centered around standardized interfaces per se - as well as modularity as enabling system philosophy. With On-Orbit Assembly (OOA), On-Orbit Servicing (OOS), On-Orbit Manufacturing (OOM), Active Debris Removal (ADR) and In-Space Recycling (ISR) or other supporting services.

Modular concepts and standardization of space infrastructure elements have been investigated for decades and are now gradually becoming a reality as the CubeSat revolution has shown in a first step. Standard interfaces are considered instrumental enablers for new dimensions of flexibility and entirely new space systems, operations and business. New standards are intended to provide the foundation for a new commercial repertoire of robust space-based capabilities and a future in-space economy. Hence, OSAM (On-Orbit Servicing, Assembly and Manufacturing) will become a driver of future space infrastructure design, operations and business.

This paper elaborates on the iSSI (intelligent space system interface), a fully modular interface coupling kit by iBOSS, and, yet the most advanced and mature multi-functional and multi-purpose potential future space system interface standard candidate. Modularity by design is the main differentiator providing a variety of functionalities and enabling manifold applications. The iSSI modular coupling kit by iBOSS meets a broad range of requirements, simply by adding modules to the baseline interface, and thus without variants of its unit. Core is the patented intelligent space system interface iSSI, the fastest (coupling), the most compact and the lightest solution of its kind and industry series-manufactured solution to date. The iSSI technology, its specialties and specs will be presented, followed by selected applications

and use cases and associated benefits in the context of ongoing activities with industry and agencies in different continents. Finally, enhancing capabilities and effects regarding flexibility, design, architecture and operations will be sketched based on advanced concepts for e.g. improved AIT, lunar landers, space payload management, orbital logistics and more.

The authors and partners involved have longstanding experiences, background and visibility in the global commercial space arena with involvement in multiple innovative new business endeavors comprising dedicated expertise in space commercialization and innovation, new business creation and finance, international partnerships, commercial prototyping and series manufacturing.