

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems (1)

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IOSHEX - COMMERCIAL IN-ORBIT SERVICING HYBRID SYSTEM FOR LEO

Abstract

In-orbit servicing as a commercial activity is still a subject of the future space market. Many forecasts exist on the volume of this potential market, going as high as a total worth of \$6.2 billion by 2030 (In-Orbit Servicing Space Situational Awareness Markets, 4th Edition, NSR, 2021). Although, as of today, no mission of in-orbit servicing with commercial purpose has been performed. This is the reason why, to attack this not yet born market in an economically successful way, many different approaches shall be explored.

SAB sees in the recovery of satellites effected by critical failures the most relevant opportunity to develop a winning business model. Focusing on LEO, in fact, a life extension service for a satellite at its end-of-life is relevant only for big institutional satellites. For small commercial spacecraft the owners always prefer to replace them with new ones, equipped with more recent technologies. At the same time, the very steep increasing of the LEO population (due mainly to the growth in popularity of large constellations) will statistically bring up the number of critical failures that verify. In terms of numbers of possible customers that this approach brings, predictions show that up to 17000 smallsats are likely to be launched between 2021 and 2030 with a cadence of 1700 a year (Satellites to be Built Launched, 24th edition, Euroconsult, 2021). The trend of failures in history shows that, between the years of 2000 to 2016, 43% of all small satellites mission failed or partially failed (Small-Satellite Mission Failure Rate, Stephen A. Jacklin, NASA, 2018). Combining this data to 17000 satellites launched until 2030, it can be easily seen that the number of possible targets for servicing mission is high enough for this approach to be a potential success.

To support this concept, in 2020 SAB started the development of a ‘motorized’ SSMS Dispenser. The SSMS Dispenser is the hardware developed by SAB, with the purpose to optimize multiple small satellite missions on VEGA and VEGA-C. IOSHEX (In-Orbit Servicing HEXagonal module) design is based on the SSMS HEX-module and it is developed to be a hybrid payload adapter/spacecraft. Thanks to this double functionality, the launch capacity for IOSHEX and related mission operations are already included in the baseline services already being provided by the Launcher Provider. Moreover, its shape is well suited to support the SAB vision of a modular object that can be integrated with different IOS equipment in a case-to-case format, to perform an extensive variety of missions. In this frame, SAB is investigating on the topics of Active Debris Removal (ADR), Cooperative Attitude and Orbit Control System (AOCS) takeover, Assembly, Refurbishment, Manufacturing, Refuelling and Recycling.