

IAF SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)  
Tools and Technology in Support of Integrated Applications (1)

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MSMO MULTI-SERVICE MISSIONS OPPORTUNITIES

**Abstract**

Multi-Service Mission Opportunities (MSMO) arise from the upstream integration of telecommunication services with different space-based applications, aiming at identifying new end-user services which so far do not exist. What if the reflector of a Synthetic Aperture Radar could also be used for a commercial telecommunication mission? A promising service could emerge for the possible next generation GEO-SAR systems. What if the Star Trackers of a telecommunication satellite had sufficient resolution to track space debris? The space debris environment in GEO, poorly characterized with ground-based observations, could be defined based on in-situ information without the need for a dedicated mission.

Finding new end-user services and enablers are the main challenges of MSMO. Enablers are functions and technologies that allow the share of resources (e.g. platform hosting different payloads, radar signal encoding information, etc.) and new integrated end-user services (e.g.: mobile phones receiving on-board processed satellite data, high computing power, etc.). Based on a first down-selection (trade between added-value, complexity, cost), four different MSMO mission concepts were down-selected from a broad list of identified Multi-Service Mission Opportunities candidates, and further designed in detail with the focus on the integrated functions. These range from large LEO constellations in the SmallSat class to large GEO satellites, integrating Telecommunications, Earth Observation and Space Situational Awareness payloads:

- Low Latency Monitoring and Warnings;
- RFI Monitoring and Warnings;
- Space Debris Cataloguing and Broadcasting in GEO;
- GEO-SAR Imaging Aboard a Telecom Satellite.

This paper will provide an overview of the space, ground and user segment for these four concepts. Some of the key focus is laid on technologies that allow exploiting the same RF signal for different purposes (e.g.: Self-Interference Cancellation, Time Division Multiple Access), on the direct communications from satellite to user (like Lynk constellation, relying in 5G signals), payload and platform solutions as well on the addition of on-board autonomy (AI for operations management and payload data processing).

The added-value with respect to similar downstream services, major technical gaps and regulatory aspects were identified with the aim to propose two concrete mission concepts that could be initiated in a near future.

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