

18th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND  
DEVELOPMENT (D3)Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Technologies  
(2B)

Author: Mr. Pablo Lopez Negro

Thales Alenia Space France, 100 Boulevard du Midi, 06150 Cannes la Bocca, France, France

Ms. Sabrina Andiappane

Thales Alenia Space – France, France

Dr. Pierre Letier

Space Applications Services, Belgium

Prof. Xiu-Tian Yan

University of Strathclyde, United Kingdom

## AN OVERVIEW OF THE SPACE SERVICING REQUIREMENTS IN A SUSTAINABLE SPACE AGE

**Abstract**

In recent years we have witnessed a proliferation of newcomers to the space industry. Stimulated by the advancement of technology, the reduction of launch costs and an ever increasing demand for new services on Earth; private initiatives have flourished in a market typically driven by international institutions and national agencies. This explosion of new activities has disrupted a conventionally slow-evolving industry, breaking the typical market and technology barriers that in past decades had limited the space industry to a few players worldwide.

The democratization of the access to space is leading up to two different approaches that will compete in the coming years. Cheaper launch services could be seen as an opportunity to deploy more satellites with production in large series forming constellations of potentially disposable satellites. Conversely, easier and more economic access to space could provide an incentive to finally implement on-orbit servicing, extending satellites' life-time and performances; beginning a new era of sustainable exploitation of resources in orbit.

Although discussed through decades, on-orbit servicing is not yet a viable alternative that is requested on commercial missions. Excluding the missions to the International Space Station, servicing has only been a matter of a few sporadic highlights (example: replacement of Hubble optics by the Space Shuttle). Among other difficulties, orbit servicing has traditionally suffered from a chicken-egg problem: most satellites on orbit are not designed to support orbit servicing, making operations complex and with low added value to the spacecraft owner; as a result, not enough effort is put into the development of the servicer vehicles, which remain exotic and expensive adventures.

However, the evolution of technologies combined to cheaper and more flexible access to space open interesting opportunities to finally see on-orbit servicing deployed on a usual basis on commercial and institutional missions. In this context, MOSAR (MODular Spacecraft Assembly and Reconfiguration) project pursues the development of key technologies to sustain future space missions by designing:

- Common robotic building blocks, improving autonomy during critical phases such as on-orbit servicing.
- Robotic manipulator to support on-orbit operations such as module assembly or replacement.
- Elaboration of a concept for modular spacecraft, proposing design standards in terms of modules shapes, functions and interfaces.

MOSAR ambition is to lead the way into a new paradigm of space missions based on mission re-configuration, on-orbit maintenance and life-extension services; all oriented towards a more sustainable utilization of resources in space.