

SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)  
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Author: Mr. François Bulens  
International Space University (ISU), Belgium, fbulens@gmail.com

USING SMALL SATELLITES TO INCREASINGLY BUILD ON-ORBIT SERVICING CAPABILITIES:  
STARTING FROM PROXIMITY & FLY-BY OPERATIONS TO DE-ORBITING AND FURTHER**Abstract**

Most of current projects in On-Orbit Servicing aims for satellite life extension either when the design of the serviced satellite is adapted to servicing or not. For non-cooperatively designed satellites, proposed design end-up with the servicing satellite being the same size than the serviced satellites, hence the same total mission cost. In the case of cooperatively design satellites, multiple servicing leads to very complex missions and total risk of the mission increases dramatically.

If one plans to use small satellites for On-Orbit Servicing, their low cost and fast development enables also evolution through different missions and possibility for technology demonstrators from one mission to the next. On the other hand, these small satellites have limited capabilities but they could fulfill missions in proximity and fly-by operations such as initial deployment verification, health monitoring and visual validation for insurance investigation. If integrated to a space situational awareness (SSA) system, they could give visual or radar localization of debris and provide an alternative to ground based systems.

This paper investigates in an interdisciplinary fashion the technical, economic, political and legal feasibility of such proximity and fly-by missions. On the technical side, it investigates the current capabilities of small satellites to fulfill these missions. On the economic side, it investigates the possibility of keeping this kind of project under low budget and fast development (ex: 50 millions and 2 years). It also investigates the different economic possibilities to fund this missions: governmental, commercial or PPP schemes.

Finally on the political and legal side, this paper investigate issues that arises while gathering critical information like optical verification of other satellites. It also investigates how this kind of satellites could fit in systems for space situation awareness (SSA). Finally this paper proposes follow up if this kind of missions will be carried consecutively. This could then be a possibility to demonstrate technology for the next step of On-Orbit Servicing, de-orbiting. At the end of life of the servicing satellite, it would do a rendezvous with the serviced satellite to be de-orbited and they would do a joint reentry. The low cost and fast development of small satellites would here be a critical advantage for technology demonstrators. The possible commercial benefits for this kind of capability will also be investigated (ex: satellites of the Iridium constellation).