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GLOBAL TRENDS IN ON-ORBIT SERVICING, ASSEMBLY, AND MANUFACTURING

Abstract

On-orbit servicing, assembly, and manufacturing (OSAM) is a growing field with many interconnecting technologies, capabilities, regulations, and market applications. Potential activities include but are not limited to active debris removal, the assembly of large telescopes in-orbit, and in-situ resource utilization. However, in order for OSAM to reach a mature state, key component technologies, regulatory frameworks, and market cases must develop. In this paper, we discuss global trends in OSAM activities based on our independent research and interviews with over 50 experts from around the world. We first defined a taxonomy for OSAM to describe what activities are included, then created a database of over 100 global entities engaged in activities related to OSAM. With the data collected, we examined the OSAM activities of many countries including their technological development in OSAM, existing regulatory environments, and motivations for pursuing OSAM capabilities. We mapped partnerships between entities around the world and assessed the technology readiness of different countries interested in engaging in different OSAM activities.

On a global scale, we find that the United States currently has the greatest number of entities working on OSAM and has the highest technology readiness and most mature markets. Of the areas of OSAM we defined, relocation services are the most technologically mature and have the greatest number of entities working towards providing them. Most small entities are working to provide critical component technologies to integrators. Entities working on multiple technologies and OSAM activities view OSAM as a single field in which to invest; maturity in rendezvous and proximity operations, relocation services, and repair services will lead to the development of assembly capabilities, which will subsequently further manufacturing capabilities. While more advanced OSAM activities will require further technological development, the future of OSAM appears reliant upon the maturation of the market cases and availability of funding rather than overcoming substantial technological barriers.