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IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
In-Space Transportation Solutions and Space Logistics (8)

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IDENTIFICATION OF TECHNOLOGICAL GAPS IN SPACE, MOBILITY, AND LOGISTICS

Abstract

Space Systems Command (SSC) is forming the Space Mobility and Logistics (SML) program within the Assured Access to Space (AATS) organization to develop a range of capabilities including refuelling, mission life extension, servicing, repairs, space tugs for orbital transfer, and orbital debris remediation. SSC is exploring the use of commercial capabilities to maneuver and service its constellation of satellites in GEO or LEO, including adjusting a satellites' inclination, refuelling satellites to extend their mission life, and maneuvering assets at their end of life to graveyard orbits. Example of early in-space operations are the Hubble Telescope servicing operations and the manufacturing, assembly, and operations of the International Space Station. DARPA managed the Orbital Express missions that flew in 2007, which were to conduct satellite servicing and demonstrate technologies such as rendezvous, proximity operations and station keeping, capture, docking, fluid transfer, and Orbit Replaceable Unit (ORU) transfer. While most of the technology already exists at some level, there are technological gaps that require further investments. The SML commercial market has exploded with more than a hundred startups and established companies developing in-space capabilities. The United States Government is also actively and strategically investing into the U.S. Air Force Research Lab (AFRL) and the Defense Innovation Unit (DIU) to improve the technology readiness level. AATS is partnering with AFWERX and SpaceWERX on their targeted investments through their Orbital Prime contract. Further, AATS provided funding to the commercial sector to develop a refueler prototype compatible with satellites in-space to carry and transfer hydrazine to its client spacecraft. NASA is funding the OSAM-1 demonstration mission, which will provide autonomous and real-time navigation system to rendezvous safely with its client, and exercising dexterous robotic arms, propellant transfer system, and multifunctional servicing tools. These emerging capabilities are not currently required by any USSF program or space vehicle but may be beneficial to future military warfighting operations or as potential requirements for consideration in developing new space programs. This paper will provide the identification of technological gaps to enable SSC in-space operations. A coordinated roadmap can then be assembled to execute future research and development, conduct terrestrial testing simulating space environments, and conduct targeted space experiments and prototypes. The end goal is to operationalize these capabilities within the next 10 years.