Paper ID: 48927
student

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Cooperative and Robotic Space Systems (6)

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ON-ORBIT SERVICING ONTOLOGY APPLIED TO RECOMMENDED STANDARDS FOR SATELLITES IN EARTH ORBIT

Abstract

The Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) is an industry-led initiative with initial seed funding provided by the Defense Advanced Research Projects Agency (DARPA) that aims to leverage best practices from government and industry to research, develop, and publish non-binding, consensus-derived technical and operations standards for OOS and RPO. As part of the CONFERS effort, the University of Southern California's (USC) Space Engineering Research Center (SERC) conducted initial research into existing RPO methodologies and practices through literature review and interviews with practitioners. Following this first year of analytical input focused on RPO, the second year's activities have focused further into the full extent of attributes for satellite servicing and in-space docking (referred to as On Orbit Servicing or OOS). USC's focus is to develop an overall ontology of functions and attributes related to all aspects of technical elements and techniques required for past/current/anticipated OOS missions. A database was created that allowed various key elements to be broken down into quantifiable data within common categories. Following the ontology creation, working with the Space Infrastructure Foundation (SIF) a review of existing standards in space and other industries were analyzed, and compared for possible matches. This standards gap analysis focused primarily from the end of the RPO maneuver to the point of physical contact or action between two spacecraft. These comparisons were then used to recommend where gaps in standards exist and where it might be most beneficial to create new ones, enabling spacecraft of various shapes and sizes to safely execute various OOS operations, and spur the industry between customers and providers. The field of space servicing is a rapidly growing field, with governments and numerous private entities developing robotic systems for mission extension vehicles and satellite repair. With an increased number of servicing missions forthcoming, a system of guidelines and standards on how to effectively and safely design on-orbit servicing activities is a next natural step to enable the expansion of this burgeoning industry.