

## IAF SPACE SYSTEMS SYMPOSIUM (D1)

Lessons Learned in Space Systems: Achievements, Challenges, Best Practices, Standards. (5)

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USING HISTORICAL PRACTICES TO DEVELOP SAFETY STANDARDS FOR COOPERATIVE  
ON-ORBIT RENDEZVOUS AND PROXIMITY OPERATIONS**Abstract**

Cooperative on-orbit satellite servicing (OOS) and rendezvous and proximity operations (RPO) have the potential to foster the next economic revolution in space. The ability to approach, inspect, grasp, manipulate, modify, repair, refuel, integrate, and build completely new platforms and spacecraft on orbit would enable new business models, innovation, and opportunities in space. However, the lack of clear, widely accepted technical and safety standards for responsible performance of OOS and RPO involving commercial satellites remains a major obstacle to satellite servicing becoming a major industry and could lead to mishaps that would put long-term sustainability of space itself at risk. 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) 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 Space Engineering Research Lab (SERC) conducted initial research into existing RPO methodologies and practices through literature review and interviews with practitioners. This paper provides the results of the first year's analysis in RPO methodologies via a database of flight executed RPO methodologies from past missions (manned and unmanned). Based on the analysis, the paper provides initial recommendations to improve safety for cooperative RPO and methods to allow for safety and risk to be scale-able for any size satellite/spacecraft. The analysis is meant to enable new innovations in technologies and techniques related to RPO for any size or caliber of spacecraft, and to present general observations on how RPO actions translate to the larger context of "servicing". The paper also discusses follow-on research that will expand to include attributes from "first contact" to docking, and actions that constitute the current suite of satellite servicing activities.