

# Rendezvous and Proximity Operations: New Options, New Issues

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- Role of norms for space governance
- Evolution of rendezvous and proximity operations and on-orbit servicing technologies
- Examples of efforts to establish norms for responsible space behavior

- Much of the existing space governance framework is based on norms
  - Example: Freedom of overflight for satellite reconnaissance
    - Launch of Sputnik in 1957 helped set the norm that satellite overflight did not breach territorial sovereignty
    - By mid-1960s, freedom of overflight was a generally accepted norm
    - Was not codified into “hard law” until Outer Space Treaty of 1967
- Norms are likely going to be the main mechanism to address future challenges
  - Far more space actors than ever before, with diverse interests and goals
  - Increasingly challenging to get global consensus on new “hard law”

# Development of OOS and RPO Capabilities

- On-orbit servicing (OOS) and Rendezvous and Proximity Operations (RPO) are key to enabling future of on-orbit activities
- Benefits and challenges
  - Greatly increase the viability of and benefits from space activities
  - Raises a number of diplomatic, legal, safety, operational, and policy challenges that need to be tackled
- OOS and RPO are not new, and are already international
  - 50+ years of experience in doing it with human spaceflight, but increasingly shifting to robotic/autonomous
  - Multiple countries/companies developing and testing RPO capabilities
- How to develop norms and standards to enable cooperative OOS/RPO and mitigate challenges?

# Current Activities in OOS & RPO

## SATELLITE INSPECTION



## LIFE EXTENSION



## SATELLITE REFUELING



## MODULAR SATELLITE ASSEMBLY



## DEORBIT / END OF LIFE SERVICES



And future  
activities and  
applications, which  
would leverage  
technology, norms,  
and standards

Selected examples of active organizations, not intended as complete listing

- The Defense Advanced Research Projects Agency (DARPA) has had a long history with developing cooperative OOS technologies
  - Orbital Express, Robotic Servicing of Geosynchronous Satellites (RSGS)
  - Goal is to develop/demonstrate core technologies, and spin them off to industry
- Establishing norms and standards is essential to creating a vibrant commercial OOS industry
- Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) program is meant to be a forum where industry and other stakeholders can engage to develop standards and norms



## Advanced Technology International (ATI)

- Prime, lead for consortium development



## Secure World Foundation (SWF)

- Lead for outreach and engagement



## University of Southern California Space Engineering Research Center (SERC)

- Conducting research into existing standards and practices



## Space Infrastructure Foundation

- Space-related standards development expertise

- Leverage best practices from government and industry to research, develop, and publish non-binding, voluntary consensus standards (technical and operations) for cooperative OOS and RPO
- These standards would provide the foundation for a new commercial repertoire of robust space-based capabilities and a future in-space economy
- Be open to participation by private sector stakeholders in the satellite servicing community
- Focus on RPO in the first year, and OOS in the second year
- Initially supported by DARPA, CONFERS intends to transition to fully private-sector operations over a period of several years
- Information on membership application process is available on the CONFERS website at: [www.satelliteconfers.org](http://www.satelliteconfers.org)



# SWF Handbook for New Actors in Space

- **Goal:** Create a publication that provides an overview fundamental principles, laws, norms, and best practices for safe, predictable, and responsible activities in space
- **Two specific audiences:**
  - Countries developing space programs and/or having to oversee and regulate their first satellites
  - Universities and start-up companies that are developing/operating satellites



[www.swfound.org/handbook](http://www.swfound.org/handbook)

- Woomera Manual on the International Law of Military Space Operations



Manual on International  
Law Applicable to Military  
Uses of Outer Space

**Questions?**

**Thanks.**

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