



Promoting Cooperative Solutions for Space Sustainability

Opportunities for Industry-Led Norms of Behavior in On Orbit Servicing

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- Secure World Foundation ***is a private operating foundation*** that promotes cooperative solutions for space sustainability
- Why **space sustainability**? Increasing reliance on space assets coupled with potentially destabilizing trends
- **Our mission:** SWF works with governments, industry, international organizations and civil society to develop and promote ideas and actions for international collaboration that achieve the secure, sustainable, and peaceful uses of outer space for the socioeconomic and environmental benefits to Earth

OOS CONTEXT

Overview of the need for normative efforts in OOS

- On-orbit servicing (OOS) is part of the future of on-orbit activities that might make a positive contribution to space sustainability
- It also raises a number of diplomatic, legal, safety, operational, and policy challenges that need to be tackled
- Rendezvous and Proximity Operations – more than just OOS
 - 50+ years of experience in doing it with human spaceflight, but increasingly shifting to robotic/autonomous
 - Multiple countries/companies developing and testing “dual-use” RPO capabilities
- SWF held a series of international workshops in 2012 and 2013 to featuring dialog on these issues
 - Held in different regions around the world
 - Bring in perspectives and viewpoints from all stakeholders
 - Open, non-governmental in nature

Legal/Policy Gaps and Uncertainties

Policy Framework	Operations Principles	Customer Relationships
<ul style="list-style-type: none"> • Identification of specific domestic licensing authority for supervision of ADR/OOS • No civil agency with “traffic management” and on-orbit safety responsibility/authority • Regulatory phasing/timing with technology/market developments 	<ul style="list-style-type: none"> • Liability, safety, and transparency • Dual-use implications of technology 	<ul style="list-style-type: none"> • ITAR & export control implications • Government role both as [potential] customer and as source of technology development

AN INTRODUCTION TO NORMS

What are norms? Why are we talking about them?

What are “Norms”?

- **Sociology:** informal understandings that govern the behavior of members of a society
- **International relations:** Standard of appropriate behavior for actors with a given identity

Osaka



Historically –
stand on right,
walk on left

Tokyo



Historically –
stand on left,
walk on right

Norms in Space Governance

- 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
 - “Congested, contested, competitive”
 - Far more space actors than ever before, with diverse interests and goals
 - Increasingly challenging to get global consensus on new “hard law”

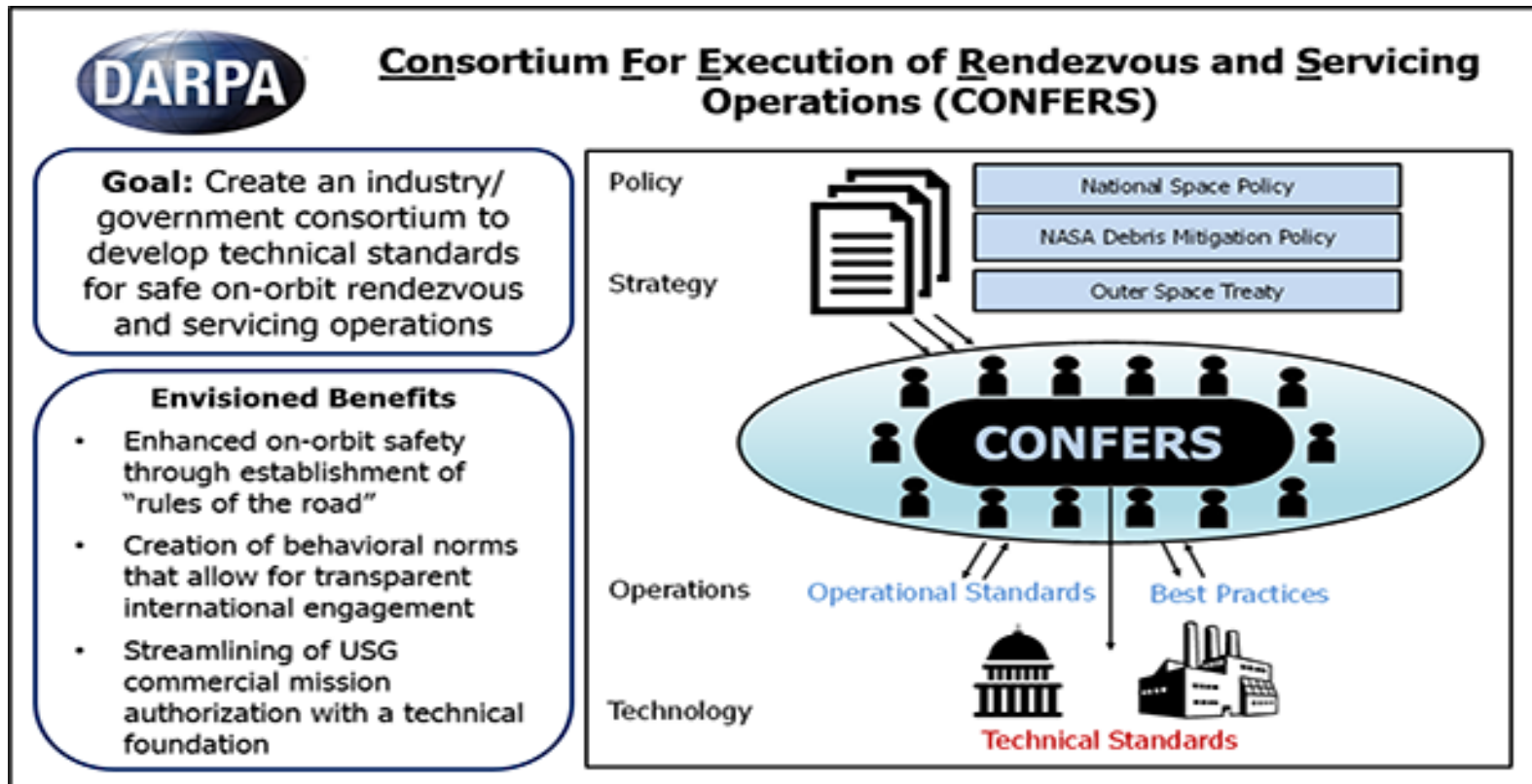
Impetus for Norms in the Private Sector

- Over the next decade, the private sector will become the dominant player in space (18,000+ satellites planned for launch)
- Incentives for satellite operators to set norms/behaviors w/out waiting for governments to act
 - Increase the sustainability of their own business models
 - Allay concerns that “darkening the skies” will create havoc for existing users
 - Preempt the need for government regulation (or at least inform it)
- Ties into broader Corporate Social Responsibility movement
 - Businesses value in social good beyond just bottom line
 - Socially responsible practices that reinforce business models

OPPORTUNITIES

Opportunities for industry-led norms of behavior in OOS

Consortium For Execution of Rendezvous and Servicing Operations (CONFERS)



Source: DARPA, <https://www.darpa.mil/news-events/2016-11-29>

Adjacency – Active Debris Removal

- OOS technical and operations concepts are closely related to Active Debris Removal and Satellite End-of-Life Services concepts
- SWF Workshop convened at April 2017 European Conference on Space Debris
- Principles for Transparency in Operations
 - 1) Statement of Intent
 - 2) Ownership and Permission
 - 3) Public Tech. Description
 - 4) Public High-level CONOPS
 - 5) Info Sharing Operator/Service Provider

To what extent do these same principles of transparency apply to OOS? How do the OOS and ADR service provider communities interact as norms and standards are developed?

Adjacency – Space Situational Awareness

- As OOS/RPO activities develop need to think about role of improved space situational awareness (SSA) info and resources as a key enabling factor
- The role of SSA in OOS includes:
 - Key information to inform and enable operations
 - Monitoring OOS operations to ensure safety and transparency
 - Providing confidence in OOS activities and outcomes

Building links to sources of SSA data (public and private) and developing interfaces between SSA service providers, OOS providers, and OOS customers is a critical element of emerging best practices for OOS.

Conclusion – Towards A Holistic Approach

Interfaces and Designs

- Specific engineering factors/approach to increase the safety and viability of satellite servicing
 - **Standards**

Operational Practices

- Behavior of satellite servicing and RPO activities
 - **Norms of behavior**
 - **Best practice document**

Data Exchange and Sharing

- Information sharing between servicing companies, clients, and governments.
 - **Standards**
 - **SSA Improvements**

Transparency and Confidence Building Measures

- Mechanisms to reduce misperceptions and concerns about the dual-use nature .
 - **Norms and Standards**
 - **Public Information and Discussion**
 - **SSA Information**

For related reference see: Barnhart, D., Sullivan, B., Hill, L., Fowler, E., Hoag, L., Mook, M., Chappie, S., Kennedy, T., Kelm, B., and Vincent, K., "Phoenix Program Status 2013", AIAA Space 2013 Conference, AIAA 2013-5341.