

Overview of CONFERS and the Development of Standards for Satellite Servicing

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CONFERS Objectives



- Independent, self-sustaining industry forum to advocate and promote on-orbit satellite maintenance, servicing, and rendezvous operations
- Collaborate to research, develop, and publish voluntary, consensus technical and safety standards
- Engage with governments on policy and oversight of satellite servicing activities
- Open to participation by private sector stakeholders in the international satellite servicing community
- Initially supported by DARPA, CONFERS intends to transition to full private-sector funding over a period of several years

CONFERS: A Holistic Approach To Standards

Interfaces and Designs

- Engineering and design to increase the safety, viability, and interoperability of satellite servicing

Operational Practices

- Behavior of satellite servicing and RPO activities

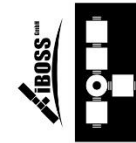
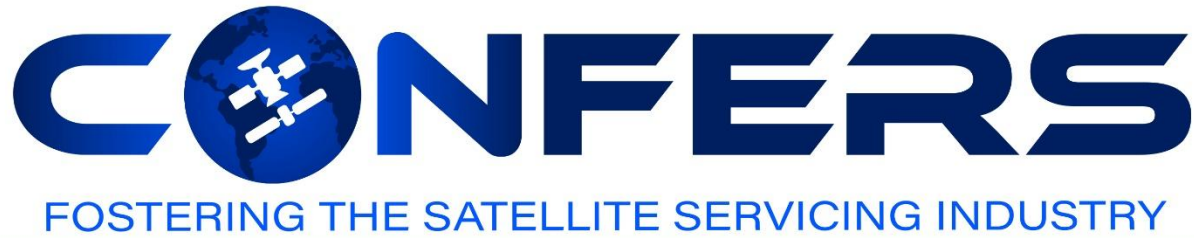
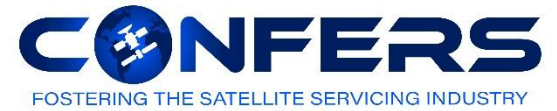
Data Exchange and Sharing

- Information sharing between servicing companies, clients, and governments

Transparency

- Mechanisms to reduce misperceptions and clarify intent about the dual-use activities

Current Members



CONFERS Organization



- Executive Committee
 - Six elected representatives from CONFERS members
 - Two statutory representatives from the Secretariat (Advanced Technology International and Secure World Foundation)
- Executive Director
 - Dr. Brian Weeden, Secure World Foundation
- Technical Working Group
- Policy Working Group
- Lexicon Working Group

CONFERS Activities



- Workshops for our members and international government subject matter experts
 - May 2018 (Los Angeles, CA)
 - July 2018 (Washington, DC)
 - Oct 2018 (Bremen, Germany)
 - April 2019 (Colorado Springs, CO)
 - May 2019 (Washington, DC)
 - June 2019 (London, UK)
 - Sept 2019 (Washington, DC)
 - March 2020 (Virtual)
 - May 2020 (Virtual)
 - July 21-22, 2020 (Virtual)
- Global Satellite Servicing Forum
 - Nov 2018 (Washington, DC)
 - Oct 2019 (Washington, DC)
 - Oct 28-29, 2020 (Virtual)

CONFERS Products



- [Guiding Principles](#) (published 7 Nov 2018)
 - Top-level principles that guide commercial RPO/OOS
- [Design & Operational Practices](#) (updated 1 Oct 2019)
 - Recommended steps commercial servicers & clients can take to improve safety & transparency
- [OOS Mission Phases](#) (published 1 Oct 2019)
 - Breakdown of the phases applicable to all RPO/OOS missions
 - Baseline for discussing risks and future practices/standards to mitigate those risks
- [Lexicon of Terms](#)

CONFERS Principles



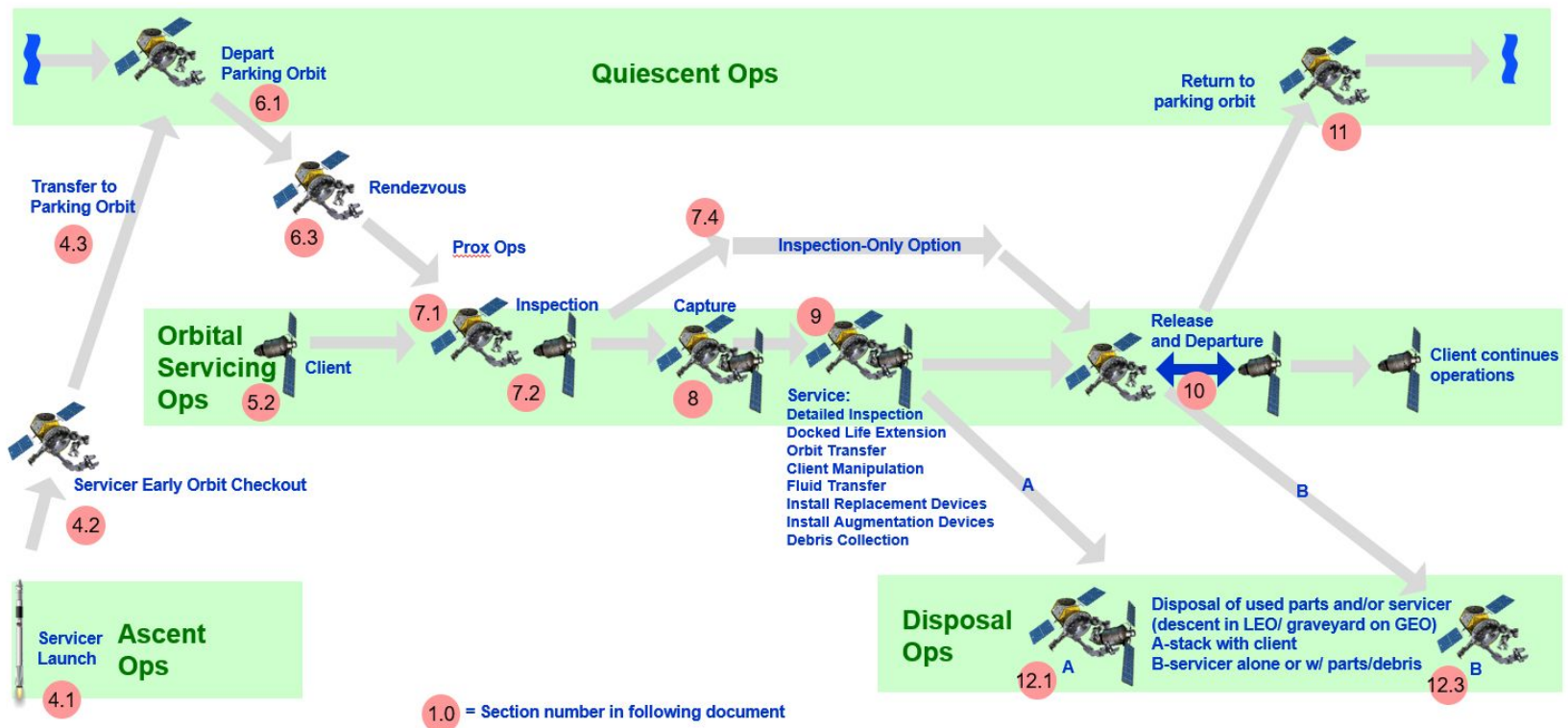
- Consensual Operations
- Compliance with Relevant Laws and Regulations
- Responsible Operations
- Transparent Operations

CONFERS Practices

1. Design Servicer vehicles and operations for mission success by taking into account a layered risk mitigation and operational safety approach across the following layers:
 - 1.1. Spacecraft hardware
 - 1.2. Spacecraft software
 - 1.3. Ground segment
 - 1.4. Mission operations
 - 1.5. Security
2. Design future satellites, both servicer and potential client vehicles, to facilitate safe and effective satellite servicing
3. Share information, to the extent permissible, on resolution of spacecraft anomalies.
4. Promote the long-term sustainability of space

OOS Mission Phases and Mitigating Risks

On Orbit Servicing (OOS) Mission Functional Diagram



CONFERS Lexicon

Term	Definition
Berth (verb)	Attachment of a Servicer Spacecraft to a Client Space Object via a fixed mount on the Servicer, typically achieved by a robotic arm that captures the Client Satellite and repositions it to establish a mechanical interface to the Servicer.
Berthing (verb)	When an incoming servicing spacecraft is grappled by a robotic device (arm) and its mechanical interface mechanism is placed in close proximity of the Client Space Object mechanical interface mechanism.
Berthing Mechanism (noun)	A mechanism executing a connection process, consisting of coarse alignment and fine alignment and then structural attachment.
Capture (verb)	The act of establishing a mechanical connection between two space objects.
Client	An entity procuring the service.
Client Space Object	The space object being serviced by the servicer spacecraft.
Docking (verb)	When a servicing spacecraft's GNC actuators are used to execute a controlled contacting trajectory to a Client Space Object in such a manner so as to align and mesh the mechanical interface mechanisms.
Docking Mechanism (noun)	A mechanism executing soft capture, followed by a load attenuation phase, and then the hard docked position which establishes a mechanical connection between the servicing spacecraft and the Client Space Object.
Inspection	Sensing of a space object that requires rendezvous and/or proximity operations.
On-Orbit Assembly	On-orbit activities to physically put together objects.
On-Orbit Servicing	On-orbit activities by a servicer spacecraft which requires rendezvous and/or proximity operations.
Proximity Operations	Series of orbital maneuvers executed to place and maintain a spacecraft in the vicinity of another space object on a relative planned path for a specific time duration to accomplish mission objectives.
Relocation	Changing the orbit of the client space object.
Rendezvous	Process wherein two space objects (artificial or natural body) are intentionally brought close together through a series of orbital maneuvers at a planned time and place.

CONFERS/ISO Collaboration



- Importance of developing an international standard on satellite servicing
 - Chose ISO TC 20/SC 14/WG3 as initial forum for international consensus on top-level standard
 - Likely to see additional complementary efforts from ISO or other regional/national standards organizations
- CONFERS submitted new work item proposal in April 2019
 - Based on CONFERS Principles and Practices
 - Approved by WG3 in July 2019
- ISO Draft Standard 24330
 - Currently being revised by experts from Brazil, France, Germany, Japan, Russia, Ukraine, UK, US
 - Anticipated vote to move to Committee Draft Stage in August 2020
 - Potential publication in spring 2021

International Outreach



- **2018**

- Mention during SWF statement at UN COPUOS STSC
- Presentation at the Global Space and Technology Convention, Singapore
- Embassy briefing in Washington, DC (US State Dept)
- CONFERS Workshop in Bremen (Airbus)
- IAC Booth, technical paper, and panel discussion
- International partners briefing in Washington, DC (US State Dept)

- **2019**

- Technical presentation at UN COPUOS STSC
- Presentation at International Symposium on Ensuring Stable Use of Outer Space, Tokyo, Japan
- Participation in the ISO TC20/SC14 meetings in London, UK, and St. Petersburg, Russia
- Panel and booth at the UK Space Conference in Wales
- IAC booth, technical paper, and panel discussion

- **2020**

- CONFERS Workshop in Brussels, Belgium (European Commission)
- Presentation at the Japan Space Forum Symposium in Tokyo, Japan

Industry Perspective

- CONFERS is serving an important role
 - Brings the OOS industry together to discuss and develop best practices and standards
 - Serves as unified public voice on policy and regulatory issues
- Top Industry Issues
 - No restrictions on Non-Earth Imaging (NEI)
 - Timely and transparent licensing process for RPO
 - Include servicing and refueling in the tradespace for every government spacecraft and architecture
 - Develop and implement a coherent space traffic management system
 - Salvage/resource utilization rights

Future Topics

- More thorough list of potential risks & recommended mitigations across the RPO/OOS mission phases
 - On track for publication in Oct 2020
- Communication protocols
 - Servicer to client
 - Servicer to third parties in the area
 - Servicer to public?
- Standardized interfaces?
 - Connection? Power? Data?
 - Docking plate?

Participate in CONFERS



- **Private Sector Entities**

- Industry, academic research institutions, nonprofit and not-for-profit organizations can join as formal members
- Direct and material interest in satellite servicing and standards development
- Three membership tiers and annual dues
 - Sustaining (\$2,500)
 - Contributing (\$1,000)
 - Observer (\$500)

- **Governments**

- Cannot be formal members, but can participate in CONFERS activities
- Provide RPO and OOS subject matter experts to participate in CONFERS technical working group and workshops
- Provide technical feedback to ISO draft standard 24330
- Engage CONFERS leadership with national space policymakers to explore role of standards in national policies and regulations

Contact Info



- Information on membership application process is available on the CONFERS website at: www.satelliteconfers.org
- Contact Information:
 - Technical/Standards questions: Dr. Brian Weeden (bweeden@swfound.org)
 - Membership/Administrative: Mr. Rick Nobbs (rick.nobbs@ati.org)