

Overview of the Legal and Policy Challenges with Orbital Debris Removal

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- Active debris removal (ADR) is more than just a technical issue
 - Legal, policy, and economic concerns are deeply imbedded in the concept and will affect mission success
- A *technically feasible* solution may not be a *politically feasible* solution
 - We may need to accept a less optimal technical solution to satisfy the other concerns
- Thinking about active debris removal from a multidisciplinary and international context from the beginning is essential to success
- Goal is for this paper is to highlight major issues that need further research and scholarship

- There is no international consensus on the legal definition of non-functional space debris as separate from functional spacecraft
 - Treaties only define “space objects”
 - This was good in the early days of space activity as it enabled flexibility
 - IADC and UN Debris Mitigation Guidelines have a definition for space debris, but they are not “hard law”
- One state’s space debris might be another’s hibernating “capability”
 - Or still serving some function to some user after primary mission has ended
 - What about classified military payloads that are not claimed/divulged?

- There needs to be general international agreement and transparency on the technical merits for removing objects in general
- There needs to be general international agreement and transparency on which objects are selected for removal
 - Do we focus on removing the large objects? (long-term benefits)
 - Do we focus on removing small objects? (short-term benefits)
 - Within each category, how to we choose which objects to remove?
- Lack of consensus or buy-in could lead to perception that objects are being selected for removal due to political motivation
 - Unduly labeling certain States as “bad actors”
 - Removal mission is cover story for intelligence gathering or sabotage

- The Liability Convention has two different (sometimes overlapping) definitions of who has responsibility for a space object

The term “launching State” means:

- (i) A State which launches or procures the launching of a space object;
- (ii) A State from whose territory or facility a space object is launched;

- Launching State retains jurisdiction and control over all space objects forever (Article XIII of the OST)
 - Current debris population is about 30% American, 30% Russia, and 30% Chinese
 - What about the ~6,000 pieces of tracked debris that are not in the satellite catalog and have no assigned Launching State?

- US military currently maintains the most public and complete catalog, but it is not necessarily accurate nor exhaustive
- US does not have radar coverage over much of Asia, an area where Russia has excellent LEO radar coverage
 - Are there LEO debris objects in the Russian catalog but not in the American one?
- “Classification of Geostationary Objects” compiled annually by ESA/ECOC has additional ~300 debris objects not in public US catalog
 - Uses optical tracking data from European and International Scientific Optical Network (ISON) sensors
- These are discrepancies above and beyond deliberate “omissions”

International Designator	Name of Space Object	State/Organization	Date of Launch	UN Registered	Document of Registration	Document of Decay or Change	Function of Space Object	Remarks
1998-021G	IRIDIUM 68	(for USA)	07/04/1998	No		ST/SG/SER.E/343	-----	Not registered with the United Nations. Mentioned by Russian Federation in ST/SG/SER.E/343
1998-026A	IRIDIUM 69	China	02/05/1998	Yes	ST/SG/SER.E/356		Motorola Iridium system used for telecommunication service.	-----
1998-032A	IRIDIUM 70	USA	17/05/1998	Yes	ST/SG/SER.E/344		Spacecraft engaged in practical applications and uses of space technology such as weather or communications	-----

Note: Information highlighted in green has been obtained from other sources and has not been communicated officially to the United Nations.

- Active debris removal is not an anti-satellite activity
- **However**, some of the same technologies being considered for active debris removal could also be developed for ASAT capabilities
- A State developing and deploying active debris removal technologies without sufficient transparency could be seen as covert ASAT development
- Recent programs have had this transparency / dual-use concern
 - American XSS-11 and X-37B
 - Chinese BX-1 and SJ-12

- Intellectual property rights over space debris
 - Materials science
 - Satellite configuration/design
 - What about objects that are recovered/reused?
- Liability
 - Liability Convention states that damage to persons or property in orbit, Launching State is only liable if fault can be proven
 - 3rd party disturbs a piece of debris, which explodes and later collides with another satellite - who's at fault?
 - Who's liable for a removed debris object that lands on a house?

There needs to be an international demonstration mission for active debris removal

- Increase awareness of the severity of the space sustainability problem and space debris in general for all space actors
- Provide the necessary transparency to help prevent diplomatic and political objections for full ADR operations
- Engage the technical, legal, and policy communities in a multi-disciplinary effort

- Develop legal distinction between functional space objects and non-function space debris
 - “Flotsam and jetsam” salvage law for space?
 - Protocol for Launching States to change legal status of objects?
- Data sharing models to resolve heterogeneous space catalogs
 - Procedures for identifying and fixing errors?
- Develop “best practices” and protocols for ADR operations, especially orbital rendezvous and lasers
- Development of specific transparency and confidence building measures to reduce chances for misperception and mistrust

- Intellectual Property rights
 - Clarification of issues
 - Development of protocols/agreements between Launching State and third party removal entities
 - Ban on characterizing debris objects without approval from Launching State?
- Clarification of liability
 - Mechanism for transferring liability from Launching State to third party removal entity?
- Is only the Launching State for a particular object able to remove it?

- The technical community needs to primarily focus on technical issues
 - Scientific research and modeling to demonstrate need for ADR
 - Engineering and analysis on best technologies and techniques for performing ADR
- However, the technical community also needs to reach out to the legal and policy communities to keep them informed and engaged
 - Increase their awareness of the challenge and potential solutions
 - Stimulate legal and policy discussion on areas that need work/dialog
- ADR needs a ***multidisciplinary approach*** for success

**Thank you for your time.
Questions?**

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