Solving the Problem of Space Debris: A Normative Approach to Space Debris Governance

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Space debris is a monster of a problem. The tens of thousands of pieces of debris that can currently be tracked—and the hundreds of thousands that cannot—run the risk of contact with operational satellites. And when debris travels at speeds up to 17,500 miles per hour, "contact" can be catastrophic—even when the debris is as small as a paint chip or a screw. The physics of space make the spread of orbital debris into an intense and unpredictable problem. Every space actor would have to cooperate to solve the problem, and any one actor could by themselves make the problem much worse.

Setting aside for the moment the significant technical challenges involved in mitigating and removing orbital debris, a serious question remains from a policy standpoint: How do we get a world of complex and often competing space actors to work towards the common goal of ending the problem of space debris? This is not rocket science: It is harder.

Space debris poses unique challenges for every aspect of policy and strategy, stretching across a wide range of policy perspectives. It is worth taking a moment to acknowledge how each facet illuminates the problem differently. Diplomatically, there is the daunting task of bringing together all nation-states, and increasingly non-state actors like commercial space companies and international organizations, to not only believe in the goals of solving the space debris problem but also to establish common language, practices, and processes that achieve those goals. From an information perspective, common ground can be hard to find when technology changes rapidly and different actors have conflicting terminological and technical understandings.[1] When it comes to space situational awareness and tracking debris, the limited and highly technical nature of available data means that people may be looking at very different pictures and using different means of interpreting the data. Militarily, debris poses a security risk because it can collide with highly sensitive military and national security satellites. So, some approaches to reducing debris will involve significant security-focused discussions that go beyond debates about issues of safety and sustainability. Finally, there are clear economic obstacles to solving the debris problem. Debris mitigation and removal will require substantial time, money, and effort without necessarily providing any immediate economic benefit.[2] The benefits of limiting or reducing debris can be found in the long-term reduction of risks to space activities and prevention of costly collisions, but the question remains of how to balance incentives to motivate different entities and actors to take deliberate action in the short term with the long term in mind.

Because this problem is so multi-faceted and involves such a diverse group of stakeholders, the future of space debris governance may need to go beyond the notion of a single organizing international body or a single set of rules. An alternate approach, or approaches, to space debris

governance is the development of international space norms: generally agreed-upon acceptable or unacceptable behaviors. Since all space actors can affect and be affected by debris, the normative approach focuses on developing buy-in and commitment to responsible space behaviors. In my paper "Building Normentum: A Framework for Space Norm Development," I explore key decision points that need to be addressed to build general international agreement on responsible space behaviors.[3] Each decision point—ranging from the domestic coordination of norm proposals to the selection of what kinds of diplomatic mechanisms could establish international buy-in—provides numerous options for norm development. And each option has trade-offs that could maximize or minimize certain factors in the success or failure of a potential norm.

How could norms be developed to tackle the problem of space debris? One existing effort demonstrates the trade-offs of certain decisions: The United Nations (UN) Committee on Peaceful Uses of Outer Space (COPUOS) Orbital Debris Mitigation Guidelines. The Guidelines were adopted by the UN General Assembly in 2007 and include numerous voluntary best practices aimed at limiting the generation of new long-lived debris.[4] The path to developing this norm involved NASA leadership and National Security Council adoption of a set of U.S. standards, initial international discussions through a small multilateral committee of civil space agencies, and the establishment of international commitment through a diplomatic process focusing on broad, voluntary inclusion. Although the inclusive nature of these guidelines helped to address the issues of establishing common language and reaching as many space actors as possible, global implementation has been limited because there are not any specific incentives or enforcement mechanisms in the voluntary document.

So, what's next? There are an increasing number of norm efforts for space debris across a wide range of paths.

One approach is the possibility of a ban or prohibition on kinetic anti-satellite (ASAT) tests, which produce enormous amounts of debris. In 2007, the People's Republic of China destroyed one of its own defunct weather satellites and created over 3,000 pieces of debris. At the time, numerous countries unilaterally condemned the test, demonstrating the potential for a norm against debris-producing ASAT tests simply through popular criticism. In recent years, there has been a more concerted push to coordinate and codify a norm against these tests. When the UN passed a resolution in 2020 calling for perspectives on responsible, irresponsible, and threatening space behavior, over two-thirds of the responding countries called for a restriction or ban on debris-producing ASAT tests.[5] This push got even stronger after the Russian Federation created 1,500 pieces of debris from an ASAT test in November 2021. Commercial companies, non-governmental organizations, and a host of countries condemned the test. U.S. Deputy Secretary of Defense Kathleen Hicks built on the condemnation and called for all nations to refrain from ASAT testing that creates debris.[6] This high level of policymaker and senior leader interest indicates that there could be discussions and negotiations in the near feature aimed at cutting off this particular human source of debris.

Policy solutions to the debris issue do not,

however, all stem from negotiations between the leaders of different countries. Emerging space companies have driven some efforts, and other efforts rely more on direct cooperation between space actors rather than a top-down diplomatic drive. For example, private sector companies and institutions are collaborating in the Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) to create technical and operations standards for activities like on-orbit servicing and rendezvous and proximity operations. Although these activities are not exclusively debris-focused, the avoidance of collisions and prevention of orbital debris generation are a key pillar of the CONFERS mission and definition of responsible operations.[7] Another bottom-up approach is to promote the removal of debris through contracts on removal operations between commercial and state satellite operators that address issues like ownership, liability, and responsible practices on a case-by-case basis.[8] The U.S. Space Force's Orbital Prime program marks an early step in this approach, offering awards of $250,000 in Phase 1 and $1.5 million in Phase 2 for teams from industry, academia, and research institutions to develop new technologies and concepts for active debris removal.[9] These types of programs are an opportunity not just to develop new technologies, but also to test out new policies, principles, and terminologies that make debris mitigation and removal more achievable.

The problem of new and existing space debris is complex and has no single policy or governance solution. It will take a combination of policies and efforts to reduce the threat over time. The several examples highlighted above are just a small sampling from what a tapestry of norm efforts might look like. Some space debris mitigation and removal norms may be driven by commercial satellite operators and others by heads of state or international organizations. Some will start with a small group of like-minded actors and others might start with an expansive call for contributions. Some solutions may have the backing of international law, while others might be merely suggestions. In order to account for the myriad challenges faced when developing policy solutions for orbital debris, space actors will need to pursue all of these paths.

Endnotes

1. Sabrina Pagano and John A. Stevenson, "NSI Concept Paper: How Disagreement Over Space Terms Can Create Barriers to Transparency in the Space Domain," NSI (2018), https://apps.dtic.mil/sti/pdfs/AD1066723.pdf.

2. For a more in-depth discussion on the incentives related to debris-reduction activities, such as de-orbiting satellites after end-of-life, see, Rebecca Reesman, Michael P. Gleason, Layla Bryant, and Colleen Stover, "Slash the Trash: Incentivizing Deorbit," The Aerospace Corporation Center for Space Policy and Strategy (April 2020): p. 2, https://aerospace.org/sites/default/files/2020- 04/Reesman_SlashTheTrash_20200422.pdf.

3. Robin Dickey, "Building Normentum: A Framework for Space Norm Development," The Aerospace Corporation Center for Space Policy and Strategy (July 2021), https://csps.aerospace.org/sites/default/files/2021-07/Dickey_BuildingNormentum_20210706.pdf.

4. "Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space," United Nations Office for Outer Space Affairs (2010), https://www.unoosa.org/pdf/publications/st_space_49 E.pdf.

5. "Report of the Secretary General on reducing space threats through norms, rules and principles of responsible behaviors (2021)," United Nations (Accessed May 13, 2021), https://www.un.org/disarmament/topics/outerspacesg-report-outer-space-2021/.

6. Jeff Foust, "Space Council condemns 'irresponsible' Russian ASAT test," Space News (December 1, 2021), https://spacenews.com/space-council-condemns-irresponsible-russian-asat-test/.

7. "Guiding Principles for Commercial Rendezvous and Proximity Operations (RPO) and On-Orbit Servicing (OOS)," The Consortium for Execution of Rendezvous and Proximity Operations (October 2021), https://www.satelliteconfers.org/wp-content/uploads/2021/11/CONFERS-Guiding-Principles_Revised-Oct-21.pdf.

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9. Sandra Erwin, "Space Force wants to help fund technologies to recycle, reuse, or remove space debris," Space News (January 5, 2022), https://spacenews.com/space-force-wants-to-help-fund-technologies-to-recycle-reuse-or-remove-space-debris/.