Memorandum

September 2022

Orbital Debris Policy Program Summary

The NSS envisions an orbital environment founded upon long-term sustainability. Efforts to address the issue of orbital debris has been a focus of our policy and advocacy work. Orbital debris jeopardizes the safety of spacecraft and crew, the functioning of space systems, and the viability of human activity in Earth's orbit. The space industry is critical infrastructure and satellites are crucial to everyday life. Important space-based applications include: weather forecasting; climate change research; resource monitoring to support agriculture, forestry, and fishing; GPS navigation; astronomy and physics research (e.g. James Webb Space Telescope); telecommunications (e.g. internet, cellphone, television, radio, etc.); network resiliency and redundancy; and the future development of space mining, manufacturing, and transportation.

Orbital debris has already reached critical mass. Collisional cascading (i.e. the Kessler Syndrome) will eventually happen even if no more objects are launched into orbit. Thus, both mitigation AND remediation are necessary. Creating a sustainable orbital environment requires a comprehensive approach that effectively uses Space Situational Awareness (SSA), Space Traffic Management (STM) (i.e. norms of responsible behavior), Mitigation, Remediation, and On-Orbit Recycling.

The NSS supports the U.S. Government's National Orbital Debris Implementation Plan, Orbital Debris Mitigation Standard Practices, and Space Policy Directive-3. The U.S. Government should continue to increase interagency collaboration in its orbital debris management. It should act in a leadership role, coordinating and directing the commercial sector's efforts in SSA, mitigation, remediation, and recycling. Likewise, it should outsource research and development, operations, and other space-related activity to the commercial sector where possible. It is also important to foster innovation by providing funding and other resources to these companies and projects. NGOs, including NSS, can further help with technical research, policy development, cost-benefit analysis, and the creation of standards and best practices.

1. SSA
    - 4.1 Track And Characterize Small Debris
        - Promote increased detection/tracking and characterization of debris less than 2 cm in LEO. Further develop ground-based sensors and in-situ measurement tools. Improve SSA data processing, sharing, filtering, and modeling. Integrate government and commercial debris catalogs.
    - 4.2 Elevate and Further Fund The Office of Space Commerce (OSC)
        - Elevate the Department of Commerce OSC to the Office of the Secretary of Commerce. And eventually a Bureau of Space Commerce needs to be established. The bureau director will be the Assistant Secretary for Space Commerce, reporting directly to the Secretary of Commerce. In tandem to these organizational shifts OSC should be appropriated adequate funding of over $90 million to hire professional staff and create new SSA and STM initiatives.

2. STM
   - 3.1 Ban Destructive Anti-Satellite (ASAT) Weapons Testing
     - Strongly condemn all destructive ASAT tests, such as when Russia destroyed its old Cosmos 1408 satellite in November 2021. There have been 16 destructive ASAT tests, mostly by Russia, but also conducted by the U.S., China, and India. These tests generate significant debris in LEO. Support the U.S. Government's self-imposed ban on destructive, direct-ascent ASAT missile testing.
   - 3.2 Codify Satellite Standardization Requirements
     - Advocate for FCC-based satellite design standardization rules for demisability, maneuverability, and tracking. Specifically, such rules should include: (a) propulsion maneuverability requirements above 400km and "design for demise" requirements below 400km; (b) unique telemetry or tracking marker requirements for all satellites (e.g. broadcast beacons, radio-frequency transponder tags, corner reflectors, dipoles, on-board GPS receivers, visual fiducials, etc.), which is already standard in maritime and aviation; and (c) pre-installed capture interfaces requirements for all satellites, such as docking plates or grapple fixtures.
   - 3.3 Develop STM Standard Practices
     - Facilitate STM standards based on guidelines and best practices used by the U.S. Government and commercial space operators. Generate mandatory shared rules for in-space operations covering deconfliction, safety, right-of-way, and collision avoidance. These STM rules should be unified and codified.

3. MITIGATION
   - 5.1 Reform Post-Mission Disposal (PMD) Rules
     - Advocate for updating the current FCC PMD regime and the U.S. Government Orbital Debris Mitigation Standard Practices. Contribute valuable input and make sure new PMD and mitigation rules reflect the crucial ongoing FCC rulemaking proceedings. These proceedings include the following: Mitigation of Orbital Debris in the New Space Age (IB Docket No. 18-313); Facilitating Capabilities for In-Space Servicing, Assembly, and Manufacturing (IB Docket No. 22-272); and Space Innovation (IB Docket No. 22-271). Shorten the 25-year PMD requirement to at most the satellite's operational life plus five years. Reassess whether deorbiting and "graveyarding" rules are strict enough, including atmospheric reentry standard practices and appropriate disposal orbits.

4. REMEDIATION
   - 2.1 Target Large Debris Objects In ADR
     - Steer remediation efforts toward the development of ADR technologies and techniques for large debris objects. For example, the decommissioned, NASA-launched Quick Scatterometer Earth satellite weighs 2,000 pounds, has batteries that cannot be disconnected, and is in a highly populated Low-Earth Orbit (LEO). Large derelict satellites and rocket bodies should be prioritized in ADR. The NSS supports using comprehensive trade studies for debris remediation to guide investments and research & development. It urges the U.S. Government to use the study to create a debris index that characterizes risk to supplement the cost-benefit

analysis in remediation efforts. The index of claimed and registered orbital debris would be ranked based on relevant factors, such as mission risk, cost, complexity, and profitability; debris mass and tumbling properties; and the benefits to the stability of the orbital environment.

- 2.2 Pass the Orbital Sustainability Act of 2022 (ORBITS Act)
    - Support and lobby for the ORBITS Act. Urge Congress to pass this bipartisan bill as soon as possible. If passed, the ORBITS Act would direct NASA, the OSC, and the National Space Council to publish an unclassified list of orbital debris that poses the greatest immediate risk to in-space operations and spacecraft. It also establishes a NASA Remediation Demonstration Program to make multiple competitive awards for phased technology development followed by future ADR missions.

5. *ON-ORBIT RECYCLING
    - 1.1 Enable On-Orbit Recycling
        - Lead on-orbit recycling efforts by creating the required legal infrastructure and policy frameworks. On-orbit recycling is the ideal form of post-mission disposal and Active Debris Removal (ADR). It is critical to the long-term sustainability of the space environment. The future of the space industry will be shaped by a culture of in-space servicing, assembly, and manufacturing that mirrors the automobile industry where about 95% of today's cars are recycled. An example of an existing capability is Astroscale, Nano Racks, CisLunar Industries, and Neumann Space working together to turn debris into metal rods and then into ion thrusters capable of electric propulsion.