National Space Society

Position Paper:

An SPD-3 and NAPA Informed Model for a Safe and Sustainable Space Economy: Six Recommendations

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Abstract

The U.S. Administration's Space Policy Directive-3 (SPD-3) in 2018 called for the Department of Commerce to establish and manage an Open Architecture Data Repository to share publicly releasable Space Situational Awareness data with space entities worldwide and to become responsible for Space Traffic Management. In support of the Directive, the National Academy of Public Administration (NAPA) in August 2020 recommended that the Office of Space Commerce in the Department of Commerce be selected to conduct the expanded Space Situational Awareness and Space Traffic Management mission. The National Space Society (NSS) recommends that adequate funding and authority be given to Commerce for this expansion.

The Soviet Union/Russia, the United States, and China are responsible for the great mass of debris left in orbit from their heritage spacecraft launches. NSS recommends that, in their mutual interest, the United States carry out agreements with Russia and China to clean up the mass they left in orbit. NSS also recommends that the commercial space industry voluntarily take proactive steps to help establish national and international trust funds for orbital debris cleanup and safety maintenance in the orbital bands they plan to use for their satellite constellations and orbital infrastructure. Ideally, such proactive moves by the commercial space industry would be carried out in collaboration with government. Finally, NSS recommends that maritime lessons for limiting liability risk and cost be applied to the space context.

Acronyms

AST: Office of Commercial Space Transportation in DOT/FAA
DFC: U.S. International Development Finance Corporation (formerly OPIC)
DOC: Department of Commerce
DOD: Department of Defense
DOT: Department of Transportation
FAA: Federal Aviation Administration
FCC: Federal Communications Commission
LEO: Low Earth Orbit
NAPA: National Academy of Public Administration
NSS: National Space Society
OADR: Open Architecture Data Repository
OSC: Office of Space Commerce in DOC
P&I Clubs: Protection and Indemnity Clubs
SDA: Space Domain Awareness
SPD-3: Space Policy Directive-3
SSA: Space Situational Awareness
STM: Space Traffic Management

Introduction

A future barrier to a thriving space economy is orbital debris. There are over 2,200 operating satellites in orbit, accompanied by nearly 3000 "dead" uncontrollable satellites adding to the over 8000 tons of orbital debris, mostly in Low Earth Orbit (LEO). Against this backdrop, commercial companies have plans to launch, mostly into LEO, 46,000 more satellites,[1] and on the road to this number SpaceX has recently launched 715 minisatellites towards its goal of providing global Internet service.[2]

To address the need for effective management of space traffic in the face of a surging number of satellite launches and orbital debris objects, the U.S. Administration in 2018 issued Space Policy Directive-3 (SPD-3), calling for the Department of Commerce (DOC) to establish and manage an Open Architecture Data Repository (OADR)[3] to share "publicly releasable"[4] Space Situational Awareness (SSA)[5] data with space stakeholders worldwide. SPD-3 also directed DOC to become responsible for Space Traffic Management (STM).[6]

SPD-3 was followed by the U.S. Federal Communications Commission (FCC) plans in April 2020 to release stricter orbital debris regulations, including those mandating a maneuverability requirement for satellites on orbit above 400 kilometers, indemnification and performance bond requirements, and a severe collision risk assessment for satellite constellations. After an outcry against the proposed regulations by much of the satellite industry and space development advocates, the FCC decided to postpone its vote on the new regulations and extend the time for stakeholder input into the FCC rule-making process.[7]

A major criticism against the proposed FCC rules had to do with the consequence that would flow from the United States imposing stricter regulations unilaterally to mitigate orbital debris growth. Space stakeholders pointed out that stricter regulations by the United States, imposed unilaterally, would result in U.S. companies moving to countries with less restrictive regulations

and other companies not establishing headquarters in the U.S. Additionally, the proposed FCC rules appeared biased against newcomers building LEO constellations relative to existing geosynchronous providers. However, the growing orbital debris problem must be addressed soon, or space stakeholders, including their end-user clients, will suffer service and financial consequences.

The National Academy of Public Administration (NAPA), after carefully evaluating four candidate U.S. government entities, recommended in August 2020 that the Office of Space Commerce (OSC) in the Department of Commerce be selected to carry out SSA and STM, per Space Policy Directive-3. NAPA also recommended that OSC be elevated to the Office of the Secretary of Commerce, should the Secretary of Commerce deem it appropriate. NAPA requested Congress to enact authorizing legislation "without delay" to ensure that OSC has the requisite authority to promulgate STM regulations for operations that currently fall outside of current licensing and supervision frameworks. Finally, NAPA also requested that Congress provide DOC with appropriate funding and authorities to "assess and employ fee-for-service" to build OSC capacity as needed.[8] Although NAPA recommended that Congress enact authorizing legislation without delay, DOC reportedly believes it already has the authorities necessary to proceed with SSA, at least primarily as a data function, because it already has broad responsibilities for collecting, analyzing, and disseminating data. However, these authorities do not extend to STM, a regulatory function.[9] NSS supports the SPD-3 instructions and NAPA proposals and urges they be implemented as soon as possible via the specific NSS recommendations below.

A. Overcoming Obstacles to Commerce Managing SSA/STM

A broad definition of SSA entails knowing where space objects are, calculating the probability they might collide with each other, and warning satellite operators as deemed necessary. The goal is to enhance the safety, stability, and sustainability of operations in space. STM involves telling satellite operators they must move to avoid such collision, as with air traffic control. No entity has STM authority yet, however.[10]

Much of the SSA data-sharing effort by the Department of Defense (DOD) and connected NASA contractors is devoted to giving conjunction warnings to private companies. DOD reportedly would prefer to concentrate on militarily relevant SSA and offload the responsibility for the "publicly releasable" part to a trusted federal partner.[11] Therefore, the SPD-3 instructions, reinforced by NAPA, for Commerce to take over sharing this portion of the DOD space object catalog addresses the Defense Department preference.

NSS Recommendation 1: Fully Fund DOC/OSC to Manage SSA/STM

To better address space issues with their internal resources, DOC has proposed establishing a Bureau of Space Commerce and elevating the position of the Bureau's Director to an Assistant Secretary for Space Commerce, reporting directly to the Secretary of Commerce. Yet, placing such an SSA/STM responsibility onto DOC encounters a practical obstacle: lack of funding to fulfill the SPD-3 instructions and NAPA requests. OSC's typical budget is $1.8 million, but its FY2021 budget request is for $15 million. With full funding, the Bureau could eventually be able to reorganize and consolidate other DOC space offices,[12] as well as reduce and streamline regulations to create a favorable economic environment for commercial space activities.[13] However, the FY2021 Commerce-Justice-Science appropriations bill that passed the House in July 2020 approved only the $1.8 million, and it specifically rejected the DOC proposal to move OSC to the departmental level.[14]

NSS Recommendation 2: Elevate and Empower OSC

NSS strongly supports by SPD-3 instructions and NAPA proposals to fully fund and empower OSC to manage SSA/STM by elevating OSC to Bureau of Space Commerce, as well as by elevating the Bureau's Director to Assistant Secretary for Space Commerce. NSS believes that carrying out these actions will be a major step in the right direction to facilitate commercial space activity for the United States and like-minded nation states worldwide.

There are, however, beyond NASA and DOC, other space offices housed in the FCC, Department of State, and FAA in the Department of Transportation.[15] Therefore, even if a Bureau of Space Commerce comes into being and receives adequate funding, further increased coordination and possible reorganization among executive space offices would still be needed to adequately address the daunting national and international issues involved with fostering effective SSA, orbital debris mitigation and removal, and STM worldwide.[16]

NSS Recommendation 3: Reduce and Integrate Bureaucracy

There would also be a huge benefit from integrating launch window software and systems from FAA's Office of Commercial Space Transportation (AST) with the OADR. Likewise, standardizing all SSA and STM interfaces would be beneficial. For this reason, close collaboration with AST must be a major goal for any comprehensive reorganization. Moreover, at least a liaison relationship with the new U.S. Space Force[17] must be part of any reorganization of executive space offices. We recommend that the comprehensive reorganization of space offices be carried out simultaneously with the establishment of the Bureau of Space Commerce.

B. Funding Orbital Debris Cleanup, Salvage, and Liability Indemnification

Currently, no comprehensive plan or slate of ready technologies and techniques exist to clean up orbital debris. Moreover, no single national or international entity exists to collect and allocate funds to develop and test such technologies for the sake of safe and secure space operations. Yet the need for such funds will only grow as we face the task of cleaning up orbital debris, safely managing the coming avalanche of new space traffic, and financing public infrastructure and systems in support of private and government activities in space. Our financial situation is simply: pay now—or pay *(much more)* later.

NSS Recommendation 4: Governments Clean Up Their Heritage Orbital Debris

In no case must the new commercial satellite providers be burdened with removing orbital debris that resulted from years of government carelessness. NSS recommends that the United States negotiate orbital debris cleanup agreements with the other two governments responsible for the bulk of orbital debris mass, i.e. Russia and China. Doing so in collaboration with private contractors could spur valuable research and development for other space activities and create a cadre of highly skilled operators. Liability waiver and apportionment agreements must be a part of such international agreements.

NSS Recommendation 5: Private Sector Raises Funds to Clear Commercial Debris and Maintain Clean and Safe the Orbital Bands They Use

As space commerce and commercial satellite constellations expand, funds will be needed to pay for orbital debris cleanup of dead or disabled satellites before they collide with other spacecraft. Moreover, funds will also be needed to maintain orbital bands clean and safe via enhancements to SSA and STM in the direct interest of the space private sector.[18] Commercial companies could proactively charge small fees to satellite service end-users as a first step for accruing national and international trust funds.

In the interest of both the government and private sector, public-private cost sharing arrangements and agreements could follow for cleanup, salvage, and orbital maintenance operations employing private contractors. Moreover, capital formation for cleanup and associated infrastructure could be enhanced by leveraging the U.S. International Development Finance Corporation (DFC) to help the private sector finance the required space infrastructure projects beneficial to space commerce. Space, after all, is just another developing market where high risks of operations and immature commercial markets make many private investment business models difficult to close.

NSS therefore recommends proactive fundraising by the space private sector to deal with commercial spacecraft debris and orbital band maintenance, including via enhancements to SSA

and STM. NSS also recommends that such proactive fundraising and disbursement efforts be carried out in collaboration with government, including with the DFC.

NSS Recommendation 6: Learn from the Maritime Context How to Contain Liability Costs

Removing and salvaging orbital debris will necessarily involve liability risk for public and private operators, even if mitigated by the liberal use of liability waivers and apportionment agreements. As noted above, the FCC has recommended indemnification and performance bond requirements to address liability risk. However, *NSS recommends looking to the maritime context for a possible better way to expand affordable liability indemnification, especially when it comes to facilitating cleanup by private contractors.*

In the face of expensive and limited liability insurance, seafaring stakeholders formed and today contribute to Protection and Indemnity (P&I) Clubs that are tapped to pay liability costs only as needed. The result is less expensive protection for stakeholders than with traditional insurance companies. Space P&I Clubs composed of owners, private contractors, governments, and other space stakeholders need to work within an international system wherein it is less expensive and dangerous to remove debris than to let it persist. Under an NSS proposed system, State Parties to the Outer Space Treaty would have to agree to transfer registration and thus jurisdiction, control, and liability connected to derelict space objects to a Space Salvage Entity for the orbital debris cleanup system to work effectively. Risk liability would be apportioned by agreement between the operator, the Space Salvage Entity, and the relevant State Party or Parties of the operator(s) conducting the deorbiting or salvage. In designing the liability apportionment agreement, partial liability protection for the private operator would help to incentivize the deorbiting or salvaging operation.[19]

Conclusion

NAPA's findings independently validate that DOC's Office of Space Commerce, if fully empowered with adequate funding and authorities, would be the best civil entity to lead and manage the commercial and international SSA/STM mission to ensure a safe and sustainable space environment in support of a thriving U.S. and global space economy.

NSS recommends that Congress and the Administration carry to fruition the SPD-3 instructions and NAPA proposals as soon as possible. NSS further recommends that government collaborate with commercial space companies to establish a national trust fund to pay private companies to remove and salvage orbital debris and collaborate with like-minded countries to establish an international trust fund for the same purpose. Finally, NSS recommends that maritime lessons for mitigating liability risk and loss be applied to the space context.

Notes and References

[1] Reesman, Rebecca with Michael P. Gleason, Layla Bryant, and Colleen Stover of the Aerospace Corporation, "Slash the Trash: Incentivizing Deorbit," April 2020, https://aerospace.org/sites/default/files/2020-04/Reesman_SlashTheTrash_20200422.pdf.

[2] Clark, Stephen, *Spaceflight Now*, 3 September 2020, https://spaceflightnow.com/2020/09/03/spacex-launches-more-starlink-satellites-beta-testing-well-underway/.

[3] A "data repository" can consist of a set of databases, spreadsheets, and even text files. An OADR for space objects and related SSA information would be a non-proprietary, shared data repository, allowing all predetermined users, including those in competition with one another, to add or update data and sources of space domain information to increase the repository's functionality, capacity, flexibility, interoperability, and sustainability.

[4] "Publicly releasable" implies that the data will not go to DOC until it is "sanitized" by DOD and the U.S. Intelligence Community to filter out sensitive national security information.

[5] We define **Space Situational Awareness (SSA)** comprehensively as the knowledge and characterization of all aspects of space, with special emphasis on the detection, cataloguing, and orbit prediction of objects orbiting the Earth and other celestial bodies, such as the Moon. SSA is an effort to provide information to avoid collisions between orbiting satellites and debris, provide safe reentries, detect on-orbit explosions, assist missions at launch, deployment, and end-of-life, plus reduce the cost of space access. **Space Domain Awareness (SDA)** is defined by an Air Force Space Command memo as the "identification, characterization, and understanding of any factor, passive or active, associated with the space domain that could affect space operations and thereby impact the security, safety, economy or environment of our nation." See Erwin, Sandra, "Air Force: SSA is no more; it's 'Space Domain Awareness'," *SpaceNews*, 14 November 2019, https://spacenews.com/air-force-ssa-is-no-more-its-space-domain-awareness/.

[6] "Space Policy Directive-3, National Space Traffic Management Policy,"18 June 2018, https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/.

[7] Henry, Caleb, "FCC punts controversial space debris rules for extra study," *SpaceNews*, 23 April 2020, https://spacenews.com/fcc-punts-controversial-space-debris-rules-for-extra-study/.

[8] https://www.napawash.org/studies/academy-studies/united-states-department-of-commerce-office-of-space-commerce.

[9] Smith, Marcia, "NAPA Endorses Office of Space Commerce for Space Traffic Management Role," 20 August 2020, https://spacepolicyonline.com/news/napa-endorses-office-of-space-commerce-for-space-traffic-management-role/.

[10] Smith, Marcia, "NAPA Endorses Office of Space Commerce for Space Traffic Management Role," 20 August 2020, https://spacepolicyonline.com/news/napa-endorses-office-of-space-commerce-for-space-traffic-management-role/.

[11] Remarks by NASA Administer Jim Bridenstine during his keynote address at the "Arizona State University Congressional Conference: Space Innovation" on August 20, 2018.

[12] Other space offices are housed in the National Telecommunications and Information Administration (NTIA) and NOAA's Commercial Remote Sensing Regulatory Office (CRSRA)

[13] Foust, Jeff. "New Office of Space Commerce director to focus on advocacy and regulatory issues," *SpaceNews*, 23 August 2018, https://spacenews.com/new-office-of-space-commerce-director-to-focus-on-advocacy-and-regulatory-issues/.

[14] Smith, Marcia, "NAPA Endorses Office of Space Commerce for Space Traffic Management Role," 20 August 2020, https://spacepolicyonline.com/news/napa-endorses-office-of-space-commerce-for-space-traffic-management-role/.

[15] For an overview of federal space offices, see "United States Space Guard: A New Civil Entity to Protect Persons and Property per Space Policy Directive-3," NSS Position Paper, August 2018, http://space.nss.org/media/NSS-Position-Paper-Space-Guard-2018.pdf.

[16] "United States Space Guard: A New Civil Entity to Protect Persons and Property per Space Policy Directive-3," NSS Position Paper, August 2018, http://space.nss.org/media/NSS-Position-Paper-Space-Guard-2018.pdf.

[17] https://www.spaceforce.mil/.

[18] Although most commercial satellites are currently in Geosynchronous Orbit, most of the coming wave of new commercial satellites will be launched to Low Earth Orbit, where most of the orbital debris currently resides and where the most acute traffic management issues will also arise.

[19] "Space Debris Removal, Salvage, and Use: Maritime Lessons," NSS Position Paper, October 2019, https://space.nss.org/wp-content/uploads/NSS-Position-Paper-Space-Debris-Removal-2019.pdf.

About the National Space Society (NSS): NSS is an independent non-profit educational membership organization dedicated to the creation of a spacefaring civilization. NSS is widely acknowledged as the preeminent citizen's voice on space, with over 50 chapters in the United States and around the world. The Society publishes *Ad Astra* magazine, an award-winning periodical chronicling the most important developments in space. To learn more, visit space.nss.org.