

**Before the
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Washington, D.C. 20230**

Private Remote Sensing Satellite Disposal and)
Debris Mitigation) FR Doc. 2024-05004
)

COMMENTS OF ASTROSCALE U.S. INC.

Astroscale U.S. Inc. (Astroscale U.S.) respectfully submits these comments regarding the National Oceanic and Atmospheric Administration’s (NOAA) Request for Information (RFI) in the above-referenced proceeding.¹ Astroscale U.S. thanks the Commercial Remote Sensing Regulatory Affairs (CRSRA) division of the Office of Space Commerce (OSC) for the opportunity to provide input on targeted regulatory changes and guidance creation needed to close a regulatory gap in assessment of post-mission disposal plans for some systems.

I. Introduction

The exploration and use of outer space is the province of all humankind – and the rate of exploration and use is increasing. In 2020, approximately 1,274 objects were launched into outer space; a marked increase over the 586 launched in 2019.²

Between 2021 and 2023, a total of 6,955 objects were launched.³

This decade will see unprecedented levels of commercial space activity. There will continue to be civil and military programs, but commercial operations will outnumber them by orders of magnitude.⁴ And this new commercial activity challenges existing regulatory assumptions.

II. CRSRA Should Issue a Narrow Rulemaking to Include Post-Mission Disposal Plans, or Other Satisfying Documentation, in Required Application Information.

¹ Request for Information: Private Remote Sensing Satellite Disposal and Debris Mitigation, 89 Fed. Reg. 16730 (Mar. 8, 2024) [*hereinafter* RFI].

² See *Data: Annual Number of Objects Launched Into Space*, OUR WORLD IN DATA, Compiling Data from Off. Outer Space Aff., *Online Index of Objects Launched Into Outer Space*, U.N. (last updated Jan. 4, 2024), <https://ourworldindata.org/grapher/yearly-number-of-objects-launched-into-outer-space>.

³ *Id.*

⁴ See EROS CalVal Center for Excellence, *Chart of Commercial, Government-Civil Satellites Launched*, U.S.G.S. (Feb. 24, 2024), <https://www.usgs.gov/media/images/chart-commercial-government-civil-satellites-launched>.



Per 51 U.S.C. § 60122(b)(4), private remote sensing system licenses must specify the licensee shall make disposition of “any satellites” “in a manner satisfactory to the President” upon termination of operations.⁵ Prior to 2020, enacting regulations required operators to submit post-mission disposal plans to CRSRA in the application stage of the licensing process.⁶ CRSRA would then assess the post-mission disposal plan, including mitigation of orbital debris, for acceptability prior to issuing a license.⁷ In sum, private remote sensing systems had to demonstrate plans for disposal “in a manner satisfactory to the President,” and a license was then conditioned on satisfying those plans.

In the early 2000s, another commercial space regulator – the Federal Communications Commission (FCC) – also began regularly assessing orbital debris mitigation plans for satellites.⁸ The FCC requires applicants to submit information on post-mission disposal plans as an aspect of orbital debris mitigation, and licensees must meet disposal obligations.⁹

In 2020, CRSRA observed that “nearly all” licensed remote sensing systems were also licensed by the FCC for radiofrequency communications.¹⁰ This observation – and inferred assumption the trend would continue – coupled with a desire to avoid duplicative regulation of post-mission disposal resulted in CRSRA removing *assessment* of post-mission disposal from the remote sensing system licensing process.¹¹ CRSRA retained reference to the statutory disposal requirement only in a general license condition.¹²

⁵ 51 U.S.C. § 60122(b)(4) (2024).

⁶ See *Licensing of Private Land Remote-Sensing Space Systems*, 65 Fed. Reg. 46822, 27 (July 31, 2000) (“Applicants are required to provide at the time of application a plan for post-mission disposition of remote sensing satellites.”); *id.* at 46836 (including Appendix 1 to Part 960 § V.C., “The applicant will submit a plan for post-mission disposal of any remote-sensing satellites owned or operated by the applicant.”); *Licensing of Private Remote-Sensing Space Systems*, 52 Fed. Reg. 25966, 72-73 (July 10, 1987) (requiring information on the proposed method of disposition to be included in application materials, and noting agreement to dispose of a platform as a criteria for approval or denial of an application).

⁷ RFI, *supra* note 1, at 16730.

⁸ The FCC interprets “public interest” language in the Communications Act as giving them authority to review and assess orbital debris mitigation plans for “space station” (satellite) applicants. See *Mitigation of Orbital Debris*, Second Report and Order, FCC 04-130 ¶¶ 12-4 (June 21, 2004).

⁹ See 47 C.F.R. § 25.114(d)(14)(iv) (2024) (requiring a statement detailing post-mission disposal plans from applicants); *id.* § 25.283 (end-of-life disposal requirements for authorized space stations); see also *Space Innovation & Mitigation of Orbital Debris in the New Space Age*, Second Report and Order, FCC 22-74 (Sept. 30, 2022) (adopting end-of-life disposal requirements specific to low-Earth orbit missions).

¹⁰ RFI, *supra* note 1, at 16731.

¹¹ RFI, *supra* note 1, at 16730; 15 C.F.R. § 960 at Appendix A (application materials to be submitted, not including post-mission disposal information); 15 C.F.R. § 960.7(a) (“Based on the Secretary’s review of the *application*, the Secretary must determine whether the applicant will comply with the requirements of...the license.”)(emphasis added).

¹² 15 C.F.R. § 960.8(d).

As it turns out, commercial space operator innovation is not limited to technologies; they also pursue innovative means of securing necessary regulatory authorizations. The RFI refers to these systems as “multinational remote sensing systems,”¹³ and they challenge CRSRA’s assumption from 2020. A multinational remote sensing system may be operated from a mission control center in the U.S., falling under CRSRA jurisdiction, but use only foreign radiofrequency solutions and thereby avoid FCC jurisdiction and assessment of disposal issues.¹⁴ Practically, therefore, existing regulations create a void where the U.S. may authorize operations of a satellite without ever assessing whether the operator can comply with post-mission disposal requirements. This void exposes the U.S. to potential liability and is counter to the public interest.¹⁵

CRSRA should issue a narrow rulemaking to address the void in assessment of post-mission disposal plans for multinational sensing systems. Specifically, CRSRA should modify 15 C.F.R. Part 960, Appendix A, to include a requirement for applicants to submit a post-mission disposal plan *or other satisfying documentation*. CRSRA may then use the submissions to assess an operator’s capability to “make disposition...in a manner satisfactory to the President” under existing 15 C.F.R. § 960.7(a). Overall, a minimal regulatory tweak to Appendix A will enable CRSRA to assess post-mission disposal plans and determine their acceptability when necessary and prior to issuing a license.

III. Correspondingly, CRSRA Should Issue Guidance Specifying Both Acceptable Evidence of Demonstrated Compliance or Disposal Information to Be Submitted.

The rising number of multinational remote sensing space systems invalidates CRSRA’s assumption that licensees are also licensed by the FCC. However, the intent behind removing disposal plan assessment – to avoid duplicative regulation – is still valid.

A. To Avoid Duplicative Regulation, CRSRA Should Continue to Defer to External Evidence of Acceptable Post-Mission Disposal.

Astroscale U.S. proposes that CRSRA promulgate a narrow rulemaking requiring applicants to submit either post-mission disposal information for assessment or other satisfying documentation, and additionally, to simultaneously create guidance on what information is

¹³ RFI, *supra* note 1, at 16730.

¹⁴ See 51 U.S.C. § 60122(a); 15 C.F.R. § 960.2 (defining jurisdiction over private remote sensing space systems); see also 47 U.S.C. § 152(a); 47 C.F.R. § 25.102(a) (a broad statement that “no person” shall use or operate communications equipment without FCC authorization). Note that the FCC does not have a clear regulatory provision or guidance stating when jurisdiction over satellites attaches.

¹⁵ See *Licensing of Private Remote Sensing Space Systems*, 85 Fed. Reg. 30790, 30799 (May 20, 2020) (acknowledging potential U.S. Government liability for damage caused by licensees under the Convention on International Liability for Damage Caused by Space Objects); *Licensing of Private Land Remote-Sensing Space Systems*, 71 Fed. Reg. 24474, 24477 (Apr. 25, 2006) (noting that, per the Outer Space Treaty of 1967, the United States would be strictly liable for U.S. private entity actions in outer space); Comments of Prof. Joanna Irene Gabrynowicz, Emerita, *Licensing of Private Remote Sensing Space Systems*, Proposed Rule, Docket No. NOAA-NESDIS-2018-0058 at 2 (remarking that the U.S. Government, and ultimately the U.S. taxpayer, would be responsible for reparation arising from licensee space activities).



required. For example, a modified 15 C.F.R. Part 960, Appendix A, could include the following provision:

- (x) The applicant will submit either a plan for post-mission disposal of any remote-sensing satellites owned or operated by the applicant, or other satisfying documentation described in guidance from the Secretary.

The phrase “other satisfying documentation” is included to acknowledge instances where an applicant’s post-mission disposal plans have already been assessed and approved, and CRSRA does not need to conduct a duplicative assessment. For instance, guidance should confirm that if an applicant holds an FCC license, an FCC grant may be submitted to evidence acceptable post-mission disposal plans and CRSRA will not conduct further review. Additionally, beyond recognizing FCC licenses as a substitute means of compliance, guidance could contemplate foreign authorizations that CRSRA considers as evidence of acceptable post-mission disposal.¹⁶

Overall, a regulatory modification to enable CRSRA to require and assess post-mission disposal plans should also sanction substitute showings of demonstrated compliance, to be specified in simultaneously created guidance.¹⁷

B. CRSRA Guidance Should Align Permitted Methods of Disposal and Required Post-Mission Disposal Information with Other U.S. Agencies.

Astroscale U.S. supports CRSRA issuing a narrow rulemaking to address the void in assessing post-mission disposal plans, accompanied by guidance on what information should be submitted. As discussed above, the guidance should define substitute documentation – such as an FCC license – that an applicant may submit demonstrating an assessed and approved post-mission disposal plan. However, in the event that an applicant does need to submit a post-mission disposal plan for assessment, Astroscale U.S. urges CRSRA to align required information and submissions with other U.S. regulators.

i. CRSRA Should Permit Four Methods of Post-Mission Disposal.

Within the RFI, CRSRA asks whether previously-approved disposal methods – including atmospheric re-entry, maneuvering to a storage orbit, or direct retrieval – should still be considered.¹⁸ Astroscale U.S. supports CRSRA retaining the three previously-authorized methods of disposal, and notes CRSRA may want to add an additional method to the list.

¹⁶ RFI, *supra* note 1, at 16731 (noting multinational remote sensing systems “may have disposal and orbital debris mitigation plans approved by foreign radiofrequency authorities.”).

¹⁷ While Astroscale does not address them here, CRSRA should be mindful of the following issues when creating guidance: (1) Does an applicant need to demonstrate they hold an FCC grant, or, that a space station application is processing before the FCC? (2) What demonstrations, if any, does a remote sensing system applicant need to submit if they are a hosted payload, and do no control the operations of the satellite itself?

¹⁸ RFI, *supra* note 1, at 16731.



Recently, the FAA opened a rulemaking to address orbital debris mitigation for launch vehicle upper stages.¹⁹ The FAA NPRM proposed permitting various methods of disposal, all of which are derived from the U.S. Government Orbital Debris Mitigation Standard Practices (ODMSP).²⁰ One method included in the FAA NPRM that is not mentioned by CRSRA is disposal through heliocentric (Earth-escape) orbit. Astroscale U.S. is hesitant to conclude that a remote sensing space system would be disposed of through heliocentric orbit.²¹ Nonetheless, CRSRA should consider adding heliocentric orbit as an acceptable method of post-mission disposal, as this would align with both the ODMSP and potential FAA regulations.²²

ii. Aligned Regulation of Post-Mission Disposal Plans Minimizes Duplication While Leveraging Existing Tools.

Additionally, CRSRA asks what standards or best practices to reference when determining what documentation to require for assessing post-mission disposal plans.²³ In the spirit of not reinventing the wheel, CRSRA should reference the ODMSP, along with NASA's Debris Assessment Software (DAS) and other commercial space regulations when crafting the process for post-mission disposal assessments.

First, Astroscale U.S. supports CRSRA referencing the government-applicable standard, the ODMSP, as a standards floor for acceptable post-mission disposal.²⁴ As has been noted in FCC rulemaking dockets, the ODMSP are a valuable foundation upon which to build.²⁵ CRSRA should additionally look to other commercial space regulators to align post-mission disposal regulations. For example, CRSRA should match the FCC regulations and require a 5-year post-mission disposal for low-Earth orbit missions; a more rigorous timeframe than the ODMSP requires for government missions, but appropriate when contemplating the comparable magnitude of commercial space operations.²⁶

¹⁹ Mitigation Methods for Launch Vehicle Upper Stages on the Creation of Orbital Debris, 88 Fed. Reg. 65835 (Sept. 26, 2023) [*hereinafter* FAA NPRM].

²⁰ *Id.*, at 65847.

²¹ The FAA notes that heliocentric escape is "prohibitively costly for operators not already planning inter-planetary missions." *Id.*, at 65849.

²² It would be inadvisable to create a regulatory assumption that no private remote sensing space systems would complete interplanetary missions and not desire heliocentric orbits for disposal.

²³ RFI, *supra* note 1, at 16731.

²⁴ U.S. Orbital Debris Mitigation Standard Practices § 4 (Nov. 2019), https://orbitaldebris.jsc.nasa.gov/library/usg_orbital_debris_mitigation_standard_practices_november_2019.pdf.

²⁵ See *Mitigation of Orbital Debris in the New Space Age*, Report and Order & Further Notice of Proposed Rulemaking, FCC 20-54 at ¶ 19 (Apr. 24, 2020) [*hereinafter* FCC 2020 Orbital Debris Rule].

²⁶ See *Space Innovation & Mitigation of Orbital Debris in the New Space Age*, Second Report and Order, FCC 22-74 ¶ 16 (Sept. 30, 2022). Astroscale U.S., and other commenters, have also suggested that the FAA incorporate a 5-year post-mission disposal deadline for low-Earth orbit operations in their new regulations. See Comments of Astroscale U.S., Inc., *Mitigation Methods for Launch Vehicle Upper Stages on the Creation of Orbital Debris*, Notice of Proposed Rulemaking, RIN 2120-AK81 (Dec. 26, 2023).

Creating post-mission disposal plan requirements from existing standards and regulation will also minimize burden on industry. There are publicly-accessible tools, like NASA’s DAS, that applicants may use to generate, test, and refine post-mission disposal plans.²⁷ Additionally, Astroscale U.S. also notes the FCC has released guidance on preparing orbital debris mitigation plans, including post-mission disposal, which CRSRA and industry could leverage.²⁸ The FCC guidance directs inclusion of a narrative on disposal plans, including fuel reserved for disposal, orbit of disposal or rationale for disposal method chosen, and probability of success of the chosen disposal method, among others.²⁹

IV. The New Civil SSA Capability – TraCSS – May Be Used to Verify Compliance with Post-Mission Disposal License Conditions.

Assessing a proposed post-mission disposal plan is a part of disposing systems in an acceptable manner and minimizing creation of space debris. However, a comprehensive system of risk management also requires enforcement.³⁰

CRSRA asks for recommended methods to verify that an operator has complied with the license requirement to make disposition of satellites.³¹ Astroscale U.S. urges CRSRA to consider how the new civil space situational awareness (SSA) capability being developed within the Office of Space Commerce could be leveraged to monitor and ensure appropriate disposition of satellites.

V. Conclusion

To summarize, CRSRA should issue a narrow rulemaking to address the void in assessing post-mission disposal plans, accompanied by guidance on what information to submit. Guidance should first highlight information CRSRA will accept as proof of approved post-mission disposal plans, such as an FCC license. For applications needing review of post-mission disposal plans, guidance should additionally specify what information to submit, and Astroscale U.S. recommends aligning with the information required by the FCC. Finally, CRSRA may consider how TraCSS could be leveraged to monitor and enforce compliance with post-mission disposal requirements.

²⁷ See FCC 2020 Orbital Debris Rule, *supra* note 25, at ¶ 90 (directing applicants planning to use atmospheric reentry for post-mission disposal to use DAS or a higher fidelity assessment tool to specify disposal time).

²⁸ *FCC Orbital Debris Mitigation (ODM) Checklist*, FCC (last updated Feb. 2024), <https://www.fcc.gov/sites/default/files/ODM%20Plan%20Checklist%20-%20Streamlined%20Small%20Space%20Stations.pdf>.

²⁹ Astroscale U.S. notes that the FCC has a different targeted probability of success of disposal for large systems. *Id.* Industry-led best practices such as the Space Safety Coalition Best Practices for Space Operations also endorse varying target probabilities of post-mission disposal depending on system design. See Space Safety Coalition, *Best Practices for the Sustainability of Space Operations*, Version 2.35 § 5 (Nov. 2023), <https://spacesafety.org/best-practices/>.

³⁰ See, e.g., Letter from Charity Weeden, Vice President of Global Space Policy, Astroscale U.S. Inc., to Marlene Dortch, Secretary, FCC, IB Docket No. 18-313 (filed Apr. 29, 2021) (presenting the need for a comprehensive system of risk management to quantify risk, cap risk, and monitor and enforce compliance).

³¹ RFI, *supra* note 1, at 16731.



Astroscale U.S. thanks CRSRA for their consideration of these inputs, and for the incredible work that has been done to-date to support commercial space operators and continued space innovation.

Respectfully submitted,

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