

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

In the Matter of	)	
	)	
Space Innovation;	)	IB Docket No. 22-271
	)	
Facilitating Capabilities for In-space Servicing, Assembly, and Manufacturing	)	IB Docket No. 22-272
	)	
	)	

**REPLY COMMENTS OF THE  
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION**

The National Telecommunications and Information Administration (NTIA), on behalf of the Executive Branch and consistent with its responsibility to ensure that the views of the Executive Branch are effectively presented to the Federal Communications Commission (FCC),<sup>1</sup> provides these reply comments in response to the Commission’s Notice of Inquiry (NOI) on the spectrum access needs of planned and future In-space Servicing, Assembly, and Manufacturing (ISAM) operations. As NTIA noted in its initial comments, NTIA is working with federal agencies to identify opportunities for both commercial industry and federal agencies<sup>2</sup> to benefit from ISAM services.<sup>3</sup> These reply comments provide additional perspective on the path forward for meeting the spectrum needs of this emerging industry. Stable and predictable spectrum

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<sup>1</sup> 47 U.S.C. § 902(b)(2)(J).

<sup>2</sup> Federal agencies will not only be customers of commercial ISAM services but operate their own ISAM missions/capabilities. The Defense Advanced Research Projects Agency (DARPA) has already launched two ISAM related demonstration missions: the Orbital Express servicing demonstration in 2007 and the currently on-orbit OrbWeaver manufacturing demonstration. DARPA also has the Robotic Servicing of Geosynchronous Satellites (RSGS) demonstration on schedule for launch in 2024 (<https://www.darpa.mil/about-us/timeline/orbital-express>). NASA selected companies to build ground-based prototypes of machines that can additively manufacture items in orbit with a variety of materials (<https://spacenews.com/tethers-unlimited-expands-to-fulfill-additive-manufacturing-orders/>). NASA’s Double Asteroid Redirection Test (DART) to support planetary protection successfully moved the orbit of an asteroid in a September 2022 collision with an asteroid (<https://dart.jhuapl.edu/>). NASA and other agencies may also be called on to support orbital debris clean-up and mitigation.

<sup>3</sup> Comments of NTIA (November 28, 2022), available at <https://www.ntia.gov/fcc-filing/2022/ntia-comments-space-servicing-assembly-and-manufacturing-isam-operations>.

access to the development of new space-based services will be critical. NTIA believes some ISAM needs can be met in the near-term within current spectrum allocations and through the use of existing and planned commercial services. Other types of access will require study and could involve changes to domestic and international allocations, radio service definitions, or both. Regardless, NTIA is committed to promoting the development of ISAM.

## I.

Based on NTIA's understanding, ISAM operations focused on servicing activities (which were of most immediate interest to commenters) are generally characterized by large peaks in spectrum demand for relatively short periods of time, such as during rendezvous, proximity operations, or docking. This spike in spectrum demand can be based on the need to downlink significant video data and to provide robust real-time command and control.<sup>4</sup> Between these peaks, the spectrum needs of such ISAM operations tend to be minimal, largely focused on routine telemetry and station keeping.

Other ISAM mission profiles such as assembly or manufacturing may have differing spectrum requirement profiles. Such missions could have far longer durations of moderate to high spectrum demand to allow close monitoring and control of assembly or manufacturing operations. The level of autonomous operations these mission profiles use will present another factor that will influence the degree of spectrum needed, especially after development and testing phases are complete. As companies or federal agencies begin to develop in-orbit assembly and manufacturing capabilities, the FCC, NTIA, and the international community will need to address these requirements as they progress to maturity.

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<sup>4</sup> Some ISAM companies have indicated that they expect over time that automated operations are likely to reduce their need for ground-based control, with a corresponding reduction in spectrum access requirements. *See* Comments of Starfish Space at 5; Comments of Astroscale at 16.

Identifying dedicated spectrum for current variable and high-peak-demand operations is challenging given the many competing demands for spectrum access. The challenge will be even greater for future assembly and manufacturing activities whose requirements are hard to predict and that the current record at the Commission does not address. But for near-term mission profiles, ISAM operators can meet their spectrum access needs through existing services and through rules that would allow them to continue developing their technology solutions. Meanwhile, some operators advocate for the use of unlicensed spectrum for certain functions that are suitable for low power operations over a short distance, including for rendezvous and proximity operations (RPO).<sup>5</sup>

One of the more straightforward opportunities for ISAM spectrum access is for ISAM missions servicing Fixed Satellite Service (FSS) or Mobile Satellite Service (MSS) satellites. Those missions can use the same spectrum used by the “client” satellite. This was the case with SpaceLogistics’ Mission Extension Vehicle-1 (MEV-1) when it docked with the Intelsat 901 satellite in February 2020 as part of a life-extension mission.<sup>6</sup>

Another opportunity to use existing spectrum allocations for ISAM servicing missions may present itself in connection with the use of relay satellites. ISAM operators may be able to use inter-satellite links (ISLs) using spectrum allocated to the inter-satellite service (ISS), or for space-to-space direction use within FSS or MSS allocations, to relay communications between the ISAM missions and their control station via other existing satellites that have their own uplink and downlink assignments. These relay satellites may be assigned spectrum in either the MSS or FSS bands and may operate in geostationary orbit (GEO) or non-geostationary orbit

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<sup>5</sup> Comments of Atomos at 5.

<sup>6</sup> Comments of Intelsat License LLC at 5.

(NGSO). The relay service could be provided by either existing or new satellites and facilities, or some combination of the two.<sup>7</sup>

Work is also underway to bolster ISS operations internationally. The 2023 World Radiocommunication Conference (WRC-23) is considering technical and regulatory actions, including potential new allocations for ISS in the Ka- and Ku-bands allocated to the FSS under Agenda Item 1.17.<sup>8</sup> The preliminary sharing studies indicate that with appropriate technical and regulatory provisions, satellite-to-satellite operations in the Ka- and Ku-bands would not, under most circumstances, interfere with FSS or MSS (GEO or non-GEO) operations.<sup>9</sup> These studies are ongoing within the ITU and look promising, though consensus has not been reached on several aspects of this work.

The use of optical links is another option under development. One planned satellite constellation purpose-built for enabling communications between ISAM craft and Earth ground stations is exploring the use of optical links<sup>10</sup> as are other ISAM providers.<sup>11</sup> Optical links could provide a non-radiofrequency spectrum-based approach to transmitting large quantities of data.

## II.

Other avenues for meeting ISAM requirements may require additional coordination or study. NTIA recognizes that some ISAM operators are interested in using allocations to the Space Operation Service (SOS) for certain mission phases.<sup>12</sup> However, as many commenters

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<sup>7</sup> Comments of Atomos at 4-5, Comments of Rogue Space at 6, Comments of Aerospace at 24 (noting that use of relay satellites shares similarities with ISS use of NASA's TDRSS), Comments of OrbitFab at 21.

<sup>8</sup> See [https://www.fcc.gov/sites/default/files/wrc-23\\_agenda.pdf](https://www.fcc.gov/sites/default/files/wrc-23_agenda.pdf).

<sup>9</sup> See Document 4A/TEMP/288 (Rev.1), Annex 24 to Document 4A/856-E (7 October 2022), [https://www.itu.int/dms\\_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0856!N24!MSW-E.docx](https://www.itu.int/dms_ties/itu-r/md/19/wp4a/c/R19-WP4A-C-0856!N24!MSW-E.docx).

<sup>10</sup> <https://kepler.space/>.

<sup>11</sup> See e.g., Comments of Astroscale at 13-14.

<sup>12</sup> Comments of Aerospace at 12, Comments of Astroscale at 25, Comments of Lockheed at 5, Comments of Orbit Fab at 20, Comments of Turion at 4.

pointed out, the largest SOS allocations at 2025-2110 MHz and 2200-2290 MHz are only allocated for Federal use or for commercial use limited to launch in the United States. As NTIA noted in September 2021, these two bands “are heavily used today and require extensive coordination even among federal users.”<sup>13</sup>

The Space Research Service (SRS) is an appropriate service category for missions involving scientific or technical research. This allocation could support early demonstration programs.

The Earth-Exploration Satellite Service (EESS) definition does not fit ISAM operations. One commenter noted that EESS is not a true match for either Telemetry, Tracking, and Command (TT&C) or non-TT&C ISAM spectrum use.<sup>14</sup> EESS is intended for Earth-centric sensing, and not aligned with imaging artificial resident space objects or performing inspection services as being considered by ISAM operators.<sup>15</sup>

### III.

NTIA is encouraged by the work being done by ISAM providers to further commercialize space and is committed to working through regulatory barriers that would limit the potential of this nascent market. NTIA staff have conducted information exchanges with several providers, and these have proved helpful in furthering NTIA’s understanding of the diverse requirements of the ISAM provider community. As new spectrum allocations, rules, and regulations are being considered, NTIA will continue to work with the FCC and other Federal

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<sup>13</sup> Comments of NTIA, ET Docket No 13-115, at 3-4 (September 1, 2021), *available at* [https://www.ntia.doc.gov/sites/default/files/publications/ntia\\_comments\\_to\\_fcc\\_in\\_et\\_dkt\\_no\\_13-115\\_space\\_launches\\_09-01-2021\\_0.pdf](https://www.ntia.doc.gov/sites/default/files/publications/ntia_comments_to_fcc_in_et_dkt_no_13-115_space_launches_09-01-2021_0.pdf).

<sup>14</sup> Comments of Aerospace at 20.

<sup>15</sup> Comments of CONFERS at 6-7.

agencies to develop viable solutions supporting evolving ISAM requirements and incumbent and future Federal operations.

Respectfully submitted,



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November 21, 2023