

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

Application of Space Logistics, LLC) File No. SAT-LOA- _____
for Authority to Launch and Operate a Mission)
Extension Vehicle)

**APPLICATION FOR AUTHORITY TO LAUNCH AND OPERATE A
MISSION EXTENSION VEHICLE**

Space Logistics, LLC (“Space Logistics”), a wholly-owned subsidiary of Northrop Grumman Innovation Systems, Inc. (“NGIS”), formerly Orbital ATK, Inc., hereby applies for authority to launch and operate the MEV-2 spacecraft. MEV-2 is a mission extension vehicle (“MEV”), which has the capability to service multiple in-orbit satellites in geosynchronous orbit (“GSO”) by cooperatively docking with the satellites and performing the station keeping and attitude control functions for the satellites as a combined vehicle stack (“CVS”). For MEV-2’s initial mission, Space Logistics has contracted with Intelsat Satellite LLC (“Intelsat”) to provide life extension service to the Intelsat 1002 (“IS-1002”) spacecraft, the client vehicle (“CV”), at its current orbital location, 1° W longitude. Space Logistics and Intelsat will operate the satellites as a CVS with Space Logistics using the MEV to perform all station keeping and attitude control of the CVS under the direction of Intelsat.

As Space Logistics approaches the completion of the Intelsat contract, the company will seek approval to relocate MEV-2 and perform services for another GSO satellite. The MEV-2 is able to perform several types of services including the following:

- Inclination reduction;
- Long-term station keeping and attitude control of customer satellites;
- Relocation of customer satellites to different GSO orbital slots or to different orbits;

- Relocation of customer satellites into the graveyard orbit; and
- Performance of cooperative inspections of customer satellites.

MEV-2 will be the second commercial spacecraft of its kind,¹ and its success will continue to open new markets and create new opportunities.² By enhancing in-orbit flexibility and end-of-life options for GSO satellite operators, Space Logistics will be able to assist those operators in maximizing the value of their in-orbit assets and allow them to better respond to customer demand. Similar to MEV-1, Space Logistics will conduct the operations of MEV-2 at all times in a responsible, transparent, and cooperative manner, consistent with the rules of the Federal Communications Commission (“FCC”) and U.S. treaty obligations, as discussed herein.³ For these reasons, Space Logistics submits that grant of the application is in the public interest.

I. BACKGROUND AND SYSTEM DESCRIPTION

NGIS is a global leader in the manufacturing and operations of commercial, civil, and U.S. national security satellites and launch systems. For decades, NGIS has built spacecraft busses for a variety of missions, including geosynchronous orbit, medium-Earth orbit, low-Earth orbit, and interplanetary missions.⁴ NGIS’s proposed mission extension services, beginning with MEV-1, are an outgrowth of NGIS’s experiences and pioneering efforts in the provision of space services.

¹ MEV-1, which was successfully launched into orbit on October 9, 2019, is the first such spacecraft.

² See *Orbital ATK Receives Order for Second In-Orbit Satellite Servicing Vehicle*, NGIS, <https://news.northropgrumman.com/news/releases/orbital-atk-receives-order-for-second-in-orbit-satellite-servicing-vehicle> (last visited Oct. 4, 2019).

³ Space Logistics has a license from National Oceanic and Atmospheric Administration (“NOAA”) that authorizes MEV-2’s imaging operations, which are necessary for its mission.

⁴ See *Spacecraft Buses*, NGIS, <https://www.northropgrumman.com/Capabilities/SpacecraftBuses/Pages/default.aspx> (last visited Oct. 4, 2019).

MEV-2, which is nearly identical in design to MEV-1, is based on NGIS's GEOStar bus, which is used to provide broadcasting satellite service, fixed satellite service, and other applications.⁵ NGIS has built and flown more than 30 GEOStar-2 satellites and three GEOStar-3 satellites, as well as many more civil and national security satellites for the U.S. government.

The GEOStar-2 is a fully redundant, flight-proven spacecraft bus designed for GSO missions.⁶ The bus is designed specifically for the 1,000 to 5,550 watt payload class and provides a low- to medium-power platform. NGIS's first application of the GEOStar-2 bus design, N-STAR c, was successfully launched in July 2002 on the Ariane rocket.

The GEOStar-3 satellite platform represents an evolutionary growth of NGIS's GEOStar-2 platform, providing an expansion of the flight-proven GEOStar-2 product line.⁷ Enhancements include an increase in battery capacity and solar array power, enabling GEOStar-3 to provide up to 8,000 watts of power to the payload at end-of-life. The larger solar arrays and additional battery capacity retain the 100 percent successful flight heritage of the 36-volt regulated power bus. The GEOStar-3 bus structure's mass-carrying capability and propellant tank accommodation enable optimal use of launch vehicle performance and can include tandem launch missions that use heritage bi-propellant apogee engines to ensure fast and reliable orbit raising. For heavier missions involving the GEOStar-3 bus, a flight-proven electric propulsion system replaces the heritage improved electrothermal hydrazine thrusters for station-keeping operations.

⁵ *See id.*

⁶ *See GEOStar-2 and -3*, NGIS, <https://www.northropgrumman.com/Capabilities/GEOStar2-3/Pages/default.aspx> (last visited Oct. 4, 2019).

⁷ *See GEOStar™ -3 Bus*, NGIS, https://www.northropgrumman.com/Capabilities/GEOStar2-3/Documents/GEOStar-3_Factsheet.pdf (last visited Oct. 4, 2019).

NGIS is also a leader in the emerging space logistics market. NGIS is one of only two companies in the world providing commercial cargo resupply services to the International Space Station (“ISS”) for the National Aeronautics and Space Administration (“NASA”). In support of those missions, NGIS developed the Antares launch vehicle and the Cygnus advanced maneuvering spacecraft, which performs rendezvous and proximity operations and berthing maneuvers to provide supplies to the ISS.⁸ Since 2013, NGIS has built and flown twelve Cygnus spacecraft to the ISS.⁹

The MEV is based on the GEOSTar bus structure and avionics architecture, and the rendezvous, proximity operations, and docking (“RPOD”) subsystem is derived from the Cygnus spacecraft. The architecture includes fully cross-strapped and redundant avionics and a structure designed for dual launch. Other design features include 10-kilowatt end-of-life solar array power, a dual C-band and Ku-band flexible frequency communications system, and a hydrazine propulsion system as well as an electric propulsion system. The RPOD subsystem uses optical, infra-red, and LIDAR-based sensing systems.¹⁰

⁸ See *Antares*, NGIS, <https://www.northropgrumman.com/Capabilities/Antares/Pages/default.aspx> (last visited Oct. 4, 2019); *Commercial Resupply Services*, NGIS, <https://www.northropgrumman.com/Capabilities/CRS/Pages/default.aspx> (last visited Oct. 4, 2019).

⁹ See *Cygnus NG-12 arrives at ISS with increased science capability*, NASA, <https://www.nasaspaceflight.com/2019/11/cygnus-ng-12-iss-increased-science-capability/> (last visited Nov. 12, 2019).

¹⁰ LIDAR means light detection and ranging. See *What is LIDAR?*, NOAA, <https://oceanservice.noaa.gov/facts/lidar.html> (last visited Oct. 4, 2019).

A. Space Segment

MEV-2 has a 15-year design life and sufficient fuel to enable more than 15 years of operations while docked with a typical 2000 kg GSO communications satellite.¹¹ MEV-2's RPOD systems are designed for several dockings and undockings during the life span of the MEV, allowing it to service multiple GSO satellites.

As discussed in more detail in the Technical Appendix, MEV-2 will only have telemetry, tracking, and command ("TT&C") communications capability, which can operate in the C-band frequencies (5925 – 6425 MHz (uplink) and 3700 – 4200 (downlink)) and/or the Ku-band frequencies (13750 – 14500 MHz (uplink) and 11450 – 12250 MHz (downlink)) depending on the specific mission needs.¹² This ability to operate in two common satellite frequency bands, along with the ability to select the specific frequency within the band while in orbit, enhances the spacecraft's flexibility to serve different in-orbit satellites by operating within the customer's licensed and coordinated frequency band or, otherwise, on a non-interference basis.

B. Ground Segment

The Mission Operations Center ("MOC") for MEV-2 will be located in NGIS's Dulles, Virginia facilities. The MOC will provide monitoring and control and on-call engineering support around the clock and include a team of full-time engineering support staff.

¹¹ See *Space Logistics Services*, NGIS, <https://www.northropgrumman.com/Capabilities/SpaceLogistics/Pages/default.aspx> (last visited Oct. 4, 2019).

¹² Such TT&C capability will include the transmission of imaging and other data to support RPOD operations. See Technical Appendix at Sections 3.1.1, 4.1, and 11.4. Space Logistics is providing technical information for both frequency bands, consistent with FCC precedent. See, e.g., Letter to Daniel C.H. Mah, Regulatory Counsel, SES, from Robert G. Nelson, Chief, Satellite Division, International Bureau, FCC, 25 FCC Rcd. 2112 (Mar. 2, 2010).

During orbit raising and drift, MEV-2 will be supported by a network of ground stations operating in the C-band frequencies and Ku-band frequencies. At its operating location, the MEV-2 will be supported by a network of ground stations using frequencies authorized and coordinated for the CV, as discussed below. Although Space Logistics and Intelsat will use the same ground stations to communicate with the two satellites, there will be separate data paths for the communications to the respective MOCs.

II. AUTHORITY REQUESTED FOR MEV-2

By this application, Space Logistics requests FCC authority to launch and operate MEV-2.¹³ The requested authority includes post-launch operations of MEV-2 as it: (i) is deployed from the launch vehicle; engages in orbit-raising maneuvers and conducts various post-launch system verification tests; and moves through the geosynchronous transfer orbit (“GTO”); (ii) performs RPOD operations with IS-1002 at 1° W longitude; (iii) operates at that location as a CVS for an expected five years; and (iv) undocks from IS-1002 after completion of the mission extension mission.

MEV-2 is expected to be launched by an Ariane rocket in the second quarter of 2020. After deployment into the GTO, Space Logistics will communicate with MEV-2 for TT&C using the C-band frequencies to configure the MEV and perform initial checkout, including conducting a number of in-orbit tests in both the C-band and Ku-band frequencies, with ground stations authorized to communicate with MEV-2. All such operations and testing in the GTO will be coordinated with potentially affected GSO satellite operators.

¹³ Consistent with 47 C.F.R. § 25.113(f), Space Logistics has commenced construction of MEV-2 at its own risk.

After completion of these tests, MEV-2 will perform its orbit-raising from the initial GTO to the GSO arc. MEV-2 will use its RPOD system to reliably and safely rendezvous and dock with IS-1002 at 1° W.¹⁴ Transmissions during orbit raising and RPOD will be coordinated with potentially affected GSO satellite operators.

After successfully completing the RPOD with IS-1002,¹⁵ MEV-2 will perform all station-keeping and attitude-control functions for the CVS, and IS-1002 will not engage in any station-keeping or attitude-control maneuvers. IS-1002 will continue to communicate satellite health and telemetry data on its authorized TT&C frequencies and as coordinated between the parties. Intelsat will continue to operate the IS-1002 communications payloads and manage the satellite's other subsystems.

Space Logistics anticipates that MEV-2 will operate as a CVS with IS-1002 for at least five years. After completion of that service, MEV-2 will undock from the IS-1002, leaving IS-1002 to be re-purposed or decommissioned by Intelsat. Prior to the expiration of its contractual arrangement with Intelsat, Space Logistics will seek FCC approval, as well as any other applicable regulatory approvals, to relocate MEV-2 and perform its next mission.¹⁶

¹⁴ See *infra* Section IV.

¹⁵ MEV-2 will not have power or data interfaces with IS-1002, or any CV with which it has docked, and the docking system will be the only physical connection between MEV-2 and IS-1002.

¹⁶ If the client satellite operator for future missions is foreign-licensed, then the Commission and foreign administrators may need to exchange letters of understanding regarding the operations of the CVS, consistent with the Commission's practice regarding the use of shared orbital assets. See, e.g., Stamp Grant, Intelsat License LLC, File No. SAT-A/O-20091208-00141, Call Sign S2801 (granted Jun. 4, 2012); *PanAmSat Licensee Corp.*, Order and Authorization, 18 FCC Rcd. 19680, 19685-88 (Sat. Div. 2003).

III. WAIVER REQUESTS

The Commission may waive any of its rules if there is “good cause” to do so.¹⁷ In general, waiver is appropriate if: (1) special circumstances warrant a deviation from the general rule; and (2) such deviation would better serve the public interest than would strict adherence to the rule. Generally, the Commission will grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest. Space Logistics submits that good cause exists to waive the following rules and allow Intelsat to prolong the operational capabilities of IS-1002.¹⁸

A. Bond Requirement and Milestone Requirements

Space Logistics requests waiver of the FCC’s bond requirement¹⁹ and satellite construction milestone requirements.²⁰ As the Bureau previously concluded with respect to MEV-1,²¹ no “new” spectrum is effectively being requested for use by an MEV because the CVS will operate on frequencies already authorized by an existing satellite.²² Thus, here there can be no risk or threat of spectrum warehousing by MEV-2, the prevention of which is the underlying purpose of the bond requirement and milestone requirement.²³ Moreover, requiring Space

¹⁷ See 47 C.F.R. § 1.3; *Northeast Cellular Tel. Co. v. FCC*, 897 F.2d 1164 (D.C. Cir. 1990); *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

¹⁸ See *infra* Section IV (discussing the public interest benefits).

¹⁹ 47 C.F.R. § 25.165(a).

²⁰ 47 C.F.R. § 25.164.

²¹ See Stamp Grant, File Nos. SAT-LOA-20170224-00021, SAT-AMD-20190207-00008, ¶ 11 (granted Jun. 20, 2019).

²² Space Logistics and Intelsat also will have coordinated the use of the TT&C frequencies as between MEV-2 and IS-1002.

²³ See, e.g., *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Further Notice of Proposed Rulemaking, 29 FCC Rcd. 12116, 12123-24 ¶ 19 (2014) (“2014

Logistics to divert resources from the deployment of MEV-2 when there can be no spectrum warehousing concerns is counter to the Commission's stated policy goals and efforts to revise its bond requirement "to encourage the rapid deployment of new spacecraft and the optimal utilization of scarce orbital and spectrum resources."²⁴

B. Requested Frequencies

Space Logistics believes that this application for use of a subset of the IS-1002 C-band and/or Ku-band frequencies by MEV-2 for TT&C can be processed without waiver of the Commission's rules.²⁵ The CVS will effectively replace IS-1002, which of course is already authorized to operate in those frequencies at 1° W.²⁶ MEV-2 will coordinate with Intelsat and operate on a subset of the frequencies authorized to and coordinated for IS-1002 at that location. Thus, the use of frequencies pursuant to this application is not mutually exclusive with and will not cause harmful interference to IS-1002. As stated above, Space Logistics accepts that its license will be conditioned on a requirement to operate within frequencies and technical parameters authorized to IS-1002 at 1° W.

For the same reasons, the operations of MEV-2 on the requested frequencies do not violate the FCC's two-degree spacing requirement.²⁷ Nonetheless, to the extent necessary, Space Logistics requests waiver of any Commission rules, including the U.S. Table of Frequency

Satellite Services NPRM"); see also *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Second Report and Order, 30 FCC Rcd. 14713, 14735 ¶ 53 (2015) ("*2015 Satellite Services Order*").

²⁴ *2015 Satellite Services Order* at 14735 ¶ 53.

²⁵ See 47 C.F.R. §§ 25.112, 25.155, 25.158.

²⁶ See Technical Appendix, at § 9.1.

²⁷ See 47 C.F.R. §§ 25.114(d)(7), 25.140(a).

Allocations, 47 C.F.R. § 2.106, necessary to process Space Logistics' application for use of the C-band and Ku-band frequencies for TT&C at the same location as IS-1002 and as identified in this application.

C. C-band Filing Freeze

To the extent necessary, Space Logistics requests waiver of the Commission's public notice placing a filing freeze on C-band space station applications.²⁸ The purpose of the filing freeze is to "preserve the landscape of authorized operations in the 3.7-4.2 GHz band pending Commission action as part of its ongoing inquiry in the *Mid-band Proceeding*."²⁹ As an initial matter, MEV-2, as part of the CVS, is effectively a replacement satellite for IS-1002 and, as such, is exempt from the filing freeze.³⁰

In any event, except for the temporary period after deployment of the satellite and before operations as part of the CVS at 1° W, Space Logistics is requesting only that MEV-2 operate under the C-band rights authorized for use by IS-1002, as coordinated with Intelsat.³¹ MEV-2 also will be operating under the IS-1002 ITU filings. Accordingly, MEV-2 will not have any spectrum rights that would upset the current C-band landscape that the filing freeze is intended to preserve, and waiver of the filing freeze is appropriate.³²

²⁸ See Notification of Temporary Filing Freeze on New Fixed-Satellite Service Space Station Applications in the 3.7-4.2 GHz band, 83 Fed. Reg. 40155 (Aug. 14, 2018) ("FSS Filing Freeze Notice").

²⁹ See *id.*

³⁰ See *id.* ("The freeze does not apply ... to applications for replacement space stations.").

³¹ Space Logistics understands that the proposed operations will need to conform to the outcome of the pending C-band proceeding.

³² See FSS Filing Freeze Notice.

D. Schedule S

Space Logistics clarifies certain of its responses to the Schedule S and, to the extent necessary, requests a limited waiver of the Commission's rules, which requires certain information to be provided in the Schedule S.³³

- The Schedule S requests channel width and center frequency information for each transmit and receive channel. As discussed in more detail in the Technical Appendix, the MEV-2 TT&C system is tunable in increments of 100 kHz. Accordingly, providing this information would require thousands of entries and would be burdensome. Instead, Space Logistics has provided a representative sample in the Schedule S using the center of the C-band and Ku-band frequencies for each data mode.³⁴
- In response to the Schedule S questions requiring minimum and maximum saturation flux density for the command beams, Space logistics entered “-1” and “0,” respectively, because the program would not permit completion of the Schedule S without entries in those fields. The provision of this information is not applicable to command beams, and MEV-2 has no other receiving beams.³⁵
- The polarization for the Ku-band beams is switchable. However, the Schedule S form would not permit an entry in that field, and accordingly, there is no response.

Further, strict application of the rules here is unnecessary to serve the purposes of the rules, which is to ensure that the Commission has all the relevant information to evaluate the application. Because Space Logistics has provided all relevant information in the Narrative, Technical Appendix, and Schedule S, waiver of these Schedule S requirements is appropriate.³⁶

³³ See 47 C.F.R. § 25.114(c).

³⁴ See Technical Appendix at Section 4.1.

³⁵ See 47 C.F.R. § 25.114(c)(v).

³⁶ See 47 C.F.R. § 1.3; *see, e.g.*, Stamp Grant, ViaSat, Inc., File No. SAT-LOI-20140204-00013 (granted Jun. 18, 2014) (waiving Schedule S requirements because they were found to be unnecessary for the space station application).

IV. PUBLIC INTEREST

Grant of this application will serve the public interest by extending the service life of the IS-1002 satellite and ensuring continuity of service to customers, including maintaining largely uninterrupted service throughout the RPOD process.³⁷ MEV-2's life-extending ability makes efficient use of resources and maximizes the value of investments by satellite operators. Further, the use of an MEV generally allows operators to better manage in-orbit satellite assets and increases flexibility with respect to the timing of construction of new replacement satellites. The Commission has consistently recognized the "huge costs of building and operating satellite space stations" and has historically adopted policies that enhance the value of those investments.³⁸ Moreover, grant of this application will facilitate the continued development of innovative technologies, help maintain U.S. leadership in the satellite industry, and support the growth of U.S. jobs.

Importantly, the proposed mission, including docking at the GSO arc, would be safe and reliable. Space Logistics, through its parent company and its operation of the Cygnus spacecraft, has extensive experience with in-orbit servicing missions.³⁹ Operationally, Space Logistics uses experienced personnel and organizations for manufacturing, integration, testing, and operations. The MEV-2 design itself is firmly based on flight-proven equipment with extensive heritage, as

³⁷ See, e.g., *Amendment of the Commission's Space Station Licensing Rules & Policies*, 18 FCC Rcd. 12507, 12519 ¶ 8 n.16 (2003) ("2003 Space Station Order") ("Commission policy favors continuity of service.") (citing *Loral Spacecom Corp.*, Memorandum Opinion and Order, 16 FCC Rcd. 12490, 12490 ¶ 1 (Int'l Bur., Sat. and Rad. Div., 1995)); *2015 Satellite Service Order* at 14878, Appendix C (listing "ensuring continuity of service" among the objectives of its rule revisions).

³⁸ *Loral Spacecom* at 12492 ¶ 7; see also *2003 Space Station Order* at 12509-10 ¶ 7.

³⁹ See *supra* Section I.

discussed above, and all manufacturing will be subject to industry standard requirements review and verification, including extensive ground testing and demonstrations.

For example, Space Logistics conducts a thorough compatibility verification and validation for each CV. As part of the analysis, Space Logistics coordinates closely with the client satellite operator and the CV manufacturer to ensure compatibility, including by analyzing the following aspects of the CV and CVS during and after the RPOD process:

- mass and physical properties;
- attitude control capabilities;
- power and thermal interactions;
- electrical systems;
- thruster plume impingement;
- mechanical loads and structural interaction;
- communications frequencies;
- electromagnetic interference and electrostatic discharge (“ESD”) interactions;⁴⁰ and
- management of any pre-existing anomalies.

Additionally, as explained in the Technical Appendix, Space Logistics has established a Systems Safety Program Plan, Safety Review Process, and Flight Safety Data Package that detail exact procedures for addressing potential hazards associated with the RPOD process.⁴¹ And Space Logistics will soon demonstrate the validity of all of these safety measures in conducting the docking associated with the MEV-1 mission.⁴²

⁴⁰ See also, e.g., Letter from Tony Lin, Counsel for Space Logistics, to Jose Albuquerque, Chief, Satellite Division, FCC, IBFS File No. SAT-LOA-20170224-00021 (Apr. 19, 2017) (responding to inquiries regarding ESD); Letter from Tony Lin, Counsel for Space Logistics, to Marlene H. Dortch, Secretary, FCC, IBFS File No. SAT-LOA-20170224-00021 (Oct. 12, 2017) (providing an ESD white paper).

⁴¹ See Technical Appendix at 18-26.

⁴² Space Logistics in an abundance of caution proposed and received authorization to conduct its first RPOD maneuver between MEV-1 and IS-901 in the GSO graveyard orbit, and that maneuver is expected to be completed in Q1 2020. See Application, File Nos. SAT-LOA-20170224-00021, at 6-7 (filed Feb. 24, 2017). Such caution is unnecessary for future missions,

In the provision of the proposed MEV services, Space Logistics is committed to acting responsibly, transparently, and cooperatively. As part of the development of the MEV program, Space Logistics has communicated with all relevant government agencies, including the Department of State, NASA, NOAA, the National Security Council, the White House Office of Science and Technology Policy, the Federal Aviation Administration, and the FCC, to ensure that each such agency has full knowledge about the MEV program and has had opportunity to provide feedback.⁴³ In all instances, Space Logistics has received positive support from these government entities to proceed with the MEV program. Moreover, for the operational lifetime of MEV-2, Space Logistics and its relevant customer satellite operators will continue to work closely with these agencies to ensure they are aware of and understand MEV-2's plans and activities.⁴⁴

All of Space Logistics' missions and activities will be conducted cooperatively with the operator of the CV and pursuant to commercial arrangements. To be clear, there will be no uncoordinated near approaches to other known resident space objects. All resolvable imaging

including this MEV-2 mission. Moreover, conducting the RPOD process at the GSO graveyard orbit would require Intelsat to halt service to its customers for weeks, which would likely result in loss of customers and is not a viable business option. Further, by docking at the GSO arc, both MEV-2 and IS-1002 are further able to conserve propellant, increasing the mission lifetime of each satellite and enhancing the sustainability of space.

⁴³ Further, NGIS engaged NASA through a Collaboration for Commercial Space Capabilities Space Act Agreement to review the mission and receive lessons learned and advice regarding the RPOD concept of operations and systems. *See Commercial Space Transportation*, NASA, <https://www.nasa.gov/content/collaborations-for-commercial-space-capabilities-ccsc> (last updated Sept. 14, 2019); *NASA Space Act Agreements*, NASA (Nov. 19, 2012), <https://www.nasa.gov/open/space-act.html>.

⁴⁴ Space Logistics also will work closely with Intelsat and the launch vehicle manufacturer to establish detailed mission operations plans and procedures. As discussed in the Technical Appendix, the Space Logistics and Intelsat MOCs will be connected for safety of flight coordination. *See* Technical Appendix at Sections 3.2, 11.1, and 11.4.

will be restricted per a NOAA remote sensing license and limited to the CV. For the avoidance of doubt, Space Logistics will cease transmissions and/or disengage from IS-1002 or any CV with which MEV-2 is docked to comply with any U.S. statute or Commission regulation or order, including but not limited to any direction under Section 706(c) of the Communications Act of 1934, as amended.⁴⁵

Grant of the application would be consistent with U.S. obligations pursuant to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.⁴⁶ The activities of MEV-2 will be authorized by the FCC and subject to the FCC's continuous supervision.⁴⁷ As demonstrated in the Technical Appendix, Space Logistics has taken actions to minimize the risk of potential orbital debris and will operate in a responsible, transparent, and cooperative manner to ensure that MEV-2 will not cause harmful interference to the spacefaring activities of other administrations.⁴⁸

⁴⁵ See 47 U.S.C. § 606(c).

⁴⁶ See United Nations, Office for Outer Space Affairs, 2222(XXI) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Dec. 19, 1966), <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html>.

⁴⁷ *Id.* at Article VI (“The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.”). FCC licensing for satellites covers the full mission cycle from construction, through deployment by launch, to end-of-life disposal. Each RPOD or any other major modification to the MEV-2 would require public notice and FCC approval. Similarly, Space Logistics will need to notify NOAA for each RPOD.

⁴⁸ *Id.* at Article IX (stating a State Party shall pursue studies of space and conduct exploration “so as to avoid ... harmful contamination;” a State Party should not engage in an activity that “would cause potentially harmful interference with activities of other State Parties” without appropriate consultation).

V. INTERNATIONAL TELECOMMUNICATION UNION (“ITU”) COMPLIANCE

At its operational orbit, MEV-2 will operate under the ITU filing(s) of the IS-1002.

Accordingly, no new ITU filings are required for the proposed operations of MEV-2 under this application.

Space Logistics will submit any ITU filings for the future operations of MEV-2 at other customer satellite locations, if needed, at the appropriate time. In that regard, Space Logistics is aware that processing fees are currently charged by the ITU for satellite filings and that Commission applicants are responsible for any and all fees charged by the ITU.⁴⁹ Space Logistics is aware of and unconditionally accepts this requirement and responsibility to pay any ITU cost recovery fees associated with any ITU filings that the Commission may make on behalf of Space Logistics for MEV-2 in the future.⁵⁰

⁴⁹ See *Implementation of ITU Cost Recovery Charges for Satellite Network Filings*, Public Notice, DA 01-2435 (Oct. 19, 2001).

⁵⁰ See Attachment 1 (providing a signed ITU cost recovery letter).

VI. CONCLUSION

Based on the foregoing, Space Logistics respectfully requests that the Commission grant the request for authority to launch and operate the MEV-2 spacecraft.

Respectfully submitted,

/s/ Joseph Anderson

Joseph Anderson
Vice President, Operations & Business
Development
Space Logistics, LLC

December 10, 2019

Exhibit A

FCC Form 312, Response to Question 34

Section 310(b)(4) of the Communications Act of 1934, as amended, establishes certain limitations on indirect foreign ownership and voting of certain common carrier and broadcast licensees. By definition, these limitations do not apply to the non-broadcast, non-common carrier operations of Space Logistics proposed in this application.

Exhibit B

FCC Form 312, Response to Question 37

Northrop Grumman Corporation, the ultimate parent of Space Logistics, LLC (“Space Logistics”), has not been convicted of a felony. Northrop Grumman Corporation is a publicly traded company, not directly or indirectly controlled by any other party.

For transparency, we note that we are aware that certain entities acquired by Northrop Grumman Corporation (or a wholly owned subsidiary or a predecessor entity) were convicted of felonies many years ago and prior to being acquired as a subsidiary. We also note that another subsidiary of Northrop Grumman Corporation that is a sister entity to Space Logistics had prior convictions, but those were more than twenty-five years ago. None of these entities will be a parent of or control Space Logistics.

Exhibit C

FCC Form 312, Response to Question 40

The following are the Officers of Space Logistics, LLC (“Space Logistics”):

Officers

Richard N. Osborne	Secretary
Steve Romant	Assistant Treasurer
Cheryl Stuckey	Assistant Treasurer
Phillip Tan	Treasurer
Tom Wilson	President
Talha A. Zobair	Vice President, Tax

The address of Space Logistics is:

45101 Warp Drive
Dulles, VA 20166

There are no directors of Space Logistics. Space Logistics is wholly owned by Orbital Sciences Corporation, which is the 100% shareholder of Space Logistics, LLC. Orbital Sciences Corporation is a wholly owned subsidiary of Northrop Grumman Innovation Systems Inc. (“NGIS”), which is a Delaware corporation. NGIS is a wholly-owned subsidiary of Northrop Grumman Corporation (“Northrop Grumman”), a publicly held company. The ownership of Northrop Grumman is widely dispersed and based on information filed by State Street Bank and Trust Company, a publicly held investment management corporation (“State Street”). State Street owns shares comprising approximately 10.2% of the outstanding common stock of Northrop Grumman Corporation as of December 31, 2018.

The following are the executive officers of Northrop Grumman:

Ann M. Addison, Corporate Vice President and Chief Human Resources and Administrative Officer
Patrick Antkowiak, Corporate Vice President, Strategy and Technology Officer
Kenneth L. Bedingfield, Corporate Vice President and Chief Financial Officer
Mark A. Caylor, Corporate Vice President and President, Mission Systems
Sheila C. Cheston, Corporate Vice President and General Counsel
Michael A. Hardesty, Corporate Vice President, Controller and Chief Accounting Officer
Christopher T. Jones, Corporate Vice President and President, Technology Services
Lesley A. Kalan, Corporate Vice President Government Relations Officer
Blake E. Larson, Corporate Vice President & President, Innovation Systems
Jennifer C McGarey, Corporate Vice President and Secretary
Stephen C. Movius, Corporate Vice President and Treasurer
Janis G. Pamiljans, Corporate Vice President and President, Aerospace Systems

David T. Perry, Corporate Vice President and Chief Global Business Development Officer
Shawn N. Purvis, Corporate Vice President and President, Enterprise Services Officer
Lucy C. Ryan, Corporate Vice President, Communications
Kathy J. Warden, Chairman, CEO and President

The following are the directors of NGIS:

Marianne C. Brown
Donald E. Felsing
Ann M. Fudge
Bruce S. Gordon
William H. Hernandez
Madeleine Kleiner
Karl J. Krapek
Gary Roughead
Thomas M. Schoewe
James S. Turley
Kathy J. Warden
Mark A. Welsh, III

The address for the principal executive officers and directors of Northrop Grumman:

2980 Fairview Park Drive
Falls Church, VA 22042

ATTACHMENT 1

ITU Cost Recovery Letter

DECLARATION

I, Joseph Anderson, hereby declare the following:

Space Logistics, LLC (“Space Logistics”) is aware that as a result of actions taken at the International Telecommunication Union’s 1998 Plenipotentiary Conference, and further modified by the ITU Council in subsequent years, processing fees will now be charged by the ITU for satellite network filings. As a consequence, Commission applicants are responsible for any and all fees charged by the ITU. Space Logistics hereby states that it is aware of this requirement and unconditionally accepts all cost recovery responsibilities associated with the ITU filings for the MEV-2 satellite network. Please address all correspondence related to the MEV-2 satellite network to the following point of contact:

Point of Contact Name: Joseph Anderson

Organization Name: Space Logistics, LLC

Address: 45101 Warp Drive
Dulles, Virginia 20166

E-Mail: joseph.anderson@ngc.com

Telephone Number: 703-406-5000

Sincerely,

/s/Joseph Anderson

Joseph Anderson
Vice President, Operations &
Business Development
Space Logistics, LLC

December 10, 2019