Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
HUBBLE NETWORK INC.	)	File No. SAT-LOA-20260805-00327
	)	
Launch-and-Operational Authority for the Hubble-8 and Hubble-9 Satellites in the Earth Exploration-Satellite Service, Mobile-Satellite Service, and Space Operation Service	))))	Call Sign: ________

APPLICATION

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September 10, 2026

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EXHIBITS

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APPLICATION

Hubble Network Inc. ("Hubble") seeks launch-and-operational authority for two non-geostationary orbit ("NGSO") satellites, Hubble-8 and Hubble-9,[1] to operate in the earth exploration-satellite service ("EESS"), mobile-satellite service ("MSS"), and space operation service ("SOS"). The targeted federal concurrence date is November 9, 2026, and the requested license issue date is May 1, 2027 (with a start date of July 1, 2027).

I. OVERALL DESCRIPTION (47 C.F.R. § 25.114(D)(1))

Attachment A (Technical Annex) describes the Hubble Constellation's technical characteristics. Attachment B (Coordination Spreadsheet) provides the associated orbital, ground-station, and radiofrequency parameters.

A. System and Operations

For space-to-Earth communications, the requested frequencies support an integrated communications architecture. Payload and operational data generated or collected by the Hubble Constellation's satellites will be delivered primarily through SpaceX's optical relay network.[2]

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[1] Hubble-8 and Hubble-9 are collectively the "Hubble Constellation."

[2] Optical communications fall outside ITU and FCC radiofrequency regulation. *See, e.g.*, *TRW, Inc.*, 16 FCC Rcd 14407 ¶ 20 (IB 2001); *Hughes Communications, Inc.*, 16 FCC Rcd 14310 ¶ 16

Data will travel through a scheduled optical link between a Hubble satellite's Mini-Laser terminal and an optical communications terminal aboard a Starlink satellite. Once the link is active, it will support bidirectional IP-based communications between the spacecraft and the Muon Operations Center through Starlink satellites, SpaceX ground stations, and SpaceX points of presence. Muon Space will provide spacecraft ephemeris data to SpaceX so that SpaceX can establish and manage the optical connection.

The Hubble Constellation also has a backup path for space-to-Earth communications. If the optical relay path is unavailable, the satellites may transmit data directly to authorized earth stations using the requested downlink frequencies. This capability allows payload data to reach end users without reliance on the optical relay network.

For Earth-to-space communications, the Hubble Constellation will receive environmental, operational, and spacecraft control information. Each satellite will receive data from authorized Earth-based sensing platforms that measure environmental and physical conditions including temperature, humidity, soil conditions, wildfire indicators, and agricultural conditions. Each satellite also may receive a limited amount of non-environmental data from authorized mobile or transportable fixed devices that measure or report operational conditions including asset location, equipment status, cargo conditions, and personnel safety information. Separate links will carry commands and software uploads.

(IB 2001); *Teledesic LLC*, 14 FCC Rcd 2261 ¶ 14 (IB 1999). The ITU likewise declined to adopt procedures for free-space optical links after the United States concluded that interference would be rare because of their narrow beams and the geometry of space. *See U.S. Contributions Sent To CITEL PCC.II*, FCC at P2!R-1853_i and P2!R-1854_i, https://tinyurl.com/3v8ddene (last updated May 14, 2015); *Final Acts WRC-12*, ITU at 176 (2012), https://tinyl.io/Bhzs. The DoD Laser Clearinghouse requirements do not apply because Hubble's payload is neither a DoD-operated laser nor intentionally directed at DoD assets. *See, e.g.*, U.S. Department of Defense, DoD Instruction 3100.11, Management of Laser Illumination of Objects in Space § 1.1 (Oct. 24, 2016), https://tinyurl.com/chrbvj4v.

Hubble, Muon Space, and SpaceX perform distinct roles within the communications architecture. SpaceX is responsible for the relay infrastructure and operates the Starlink satellites, optical relay network, ground stations, and associated terrestrial facilities under its own regulatory authorizations. Muon Space will manufacture and operate the Hubble Constellation's satellites and interface with the relay network. Hubble will retain ownership of the Hubble Constellation and final authority over operation of its satellites including interference resolution, debris mitigation decisions, and spacecraft or payload shutdown.

B. Requested Services

EESS. The EESS is "a radiocommunication service between earth stations and one or more space stations" that collects "information relating to the characteristics of the Earth and its natural phenomena, including data relating to the state of the environment" or "similar information . . . from airborne or Earth-based platforms."[3] Devices communicating with the Hubble Constellation will function as Earth-based sensing platforms that collect and transmit environmental and physical measurements. The Hubble Constellation's primary operation will be to receive, transport, and deliver those measurements. Accordingly, these operations fall within the EESS definition.

MSS. The MSS is a radiocommunication service between mobile earth stations and one or more space stations and may include feeder links.[4] On a limited basis, mobile or transportable fixed devices may use the Hubble Constellation to transmit non-EESS information.[5] Potential applications include –

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[3] ITU RR No. 1.51.

[4] *Id.* at Nos. 1.25, 1.115.

[5] Fixed Hubble earth stations may support these communications through associated feeder-link operations.

- location and status reports from vehicles, shipping containers, railcars, and mobile equipment;
- cargo-condition information, such as temperature, shock, or tamper alerts;
- equipment-diagnostic and maintenance notifications; and
- safety or emergency messages from portable personnel devices.

These ancillary operations qualify as MSS.

SOS. The SOS concerns spacecraft operations, including space tracking, space telemetry, and space telecommand.[6] Hubble earth stations will transmit commands to the satellites and receive telemetry and spacecraft health information through the requested SOS frequencies. These operations qualify as SOS.

II. FREQUENCY PLAN

Schedule S and Attachment B identify the requested frequency assignments, emission characteristics, service classifications, and associated uplink and downlink operations. The requested center frequencies remain subject to federal coordination and approval. Hubble will coordinate with co-frequency incumbents, particularly U.S. federal agencies, and perform electromagnetic-compatibility analyses as necessary.

III. PUBLIC INTEREST (47 C.F.R. § 25.114(D)(6))

Granting this application would serve the public interest by expanding access to low-cost satellite-enabled internet-of-things ("IoT") connectivity and Earth observation capabilities. The Hubble Constellation will enable users to collect, transport, and use environmental and operational data from remote locations that often lack reliable terrestrial connectivity. These capabilities will support more informed decision-making across agriculture, infrastructure, energy, logistics, and public safety applications.

[6] ITU RR No. 1.23.

The Hubble Constellation aims to be the world's first global network to provide simple, cost-effective, and battery-efficient IoT connectivity through widely available commercial devices. Hubble's Endpoint technology allows low-power devices to communicate directly with the satellite network through a software-based approach without proprietary modems, specialized hardware, or custom chipsets. By uploading Hubble's firmware to compatible devices, users can obtain global connectivity and deploy remote sensing and monitoring applications without hardware modifications. Representative applications include wildfire detection, energy-grid monitoring, agricultural sensing, environmental monitoring, and cold-chain tracking. This approach reduces deployment costs, lowers infrastructure requirements, and expands access to satellite-enabled IoT services in remote locations.

Accordingly, grant of this application would promote innovation and expand access to satellite-enabled IoT services. Hubble therefore respectfully requests authorization of these satellites, including receive-only Hubble payloads.

IV. CONCLUSION

The proposed operations support Hubble's next-generation connectivity technology. Authorizing the requested satellites would help promote these necessary initiatives and serve the public interest.

Respectfully submitted,

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ATTACHMENT A (TECHNICAL ANNEX)

This attachment offers supplemental technical details regarding the Hubble Constellation because the attached Form 312, Schedule S requires further clarification.

I. ITU FILINGS AND COST RECOVERY (47 C.F.R. § 25.111)

When issuing launch-and-operational authority, the Commission submits advance publication information and/or coordination request filings to the International Telecommunication Union ("ITU").[1] In concert with this application, Hubble will submit the necessary ITU filings and unconditionally accepts all associated cost-recovery responsibilities.

II. FREQUENCY PLAN AND IN-BAND AND ADJACENT-BAND SHARING CONSIDERATIONS (47 C.F.R. § 25.114(C)(7))

Hubble-8 and Hubble-9 will use radiofrequency spectrum for Earth-to-space and space-to-Earth, as summarized in the Schedule S and Attachment B (Coordination Spreadsheet), and use optical spectrum for space-to-space links.

A. 2025-2110 MHz

Hubble will satisfy the 47 C.F.R. § 25.204 equivalent isotropically radiated power limit by transmitting only above 5° elevation angle and ensuring that its earth station partners license and, as necessary, coordinate to protect authorized services.

B. 2482.049750-2482.831 MHz

Hubble is shifting its operations from 2482.710675-2483.424 MHz to 2482.049750-2482.831 MHz. The revised frequencies remain within the same guard band and provide additional separation from 2483.5 MHz to further protect adjacent-band operations from out-of-band emissions. This limited shift does not alter any of the technical or regulatory considerations underlying the Commission's prior conclusion that such operations may be conducted on a non-interference, non-protected basis.

Hubble will satisfy the applicable Hubble-1 to 7 licensed conditions to protect authorized services and applications. Specifically, Hubble will receive signals on an unprotected basis only from Part 15-compliant, FCC-certified devices covered by a Part 25 earth station license and will receive signals originating outside the United States and its territories only with authorization from the relevant administration and after providing that authorization to the Commission.

[1] *See* 47 C.F.R. § 25.111.

C. 8025-8400 MHz

Hubble will satisfy the ITU Radio Regulations ("RR") No. 22.5 power flux-density ("PFD") limit to protect GSO service,[2] ITU RR No. 21.16 (Table 21-4) PFD limits to protect terrestrial service,[3] and Recommendation ITU-R SA.1157 to protect the space research service (deep space).[4]

D. 2025-2110 MHz and 8025-8400 MHz

Hubble's operations in the 2025-2110 MHz (Earth-to-space) and 8025-8400 MHz (space-to-Earth) bands will not cause harmful interference to current and future operational U.S. federal systems operating pursuant to primary federal allocations. Hubble will coordinate through mutual exchange of system information, to the extent possible consistent with national security requirements, in good faith, and on an ongoing basis, with potentially affected U.S. federal systems to ensure protection of operational U.S. federal systems. In all cases, Hubble will provide all necessary system information and technical parameters to the affected federal entities to allow those entities to conduct their required interference analysis. Hubble will maintain sufficient information to timely investigate and resolve documented instances of harmful interference and make available such information to affected federal entities upon request. Hubble will adjust its operations to accommodate future operational U.S. federal systems and aggregate effects into U.S. federal systems. Upon receiving a documented report of harmful interference from an affected U.S. federal system, Hubble will immediately cease the operation causing the harmful interference until the issue is resolved and coordination with the affected federal entity is complete.

Hubble will also complete coordination with potentially affected federal agencies and services engaged in national security or safety-of-life services, through mutual exchange of system information to the extent possible consistent with national security requirements, prior to operating in the 2025-2110 MHz (Earth-to-space) and 8025-8400 MHz (space-to-Earth) bands, which are allocated on a primary basis to federal services or are adjacent to primary federal allocations. Hubble will notify the Commission within 30 days after completion of coordination, with a copy to the National Telecommunications and Information Administration ("NTIA") and the relevant federal entity. Notification will be submitted to the FCC's International Communications Filing System. Two weeks prior to the start of any operations in such bands, Hubble will provide contact information for a 24/7 point of contact for the resolution of any harmful interference to contacts provided by the NTIA.

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[2] ITU RR No. 22.5 imposes a PFD limit of -174 dB/m^2/4 kHz at the geostationary orbit arc. The TCD1 and TCD2 beams' PFD levels are -193.4 dB/m^2/4 kHz at the geostationary orbit arc. The HSD5 beam's PFD level is -179.7 dB/m^2/4 kHz at the geostationary orbit arc.

[3] *See* Schedule S.

[4] *See* Attachment B (Coordination Spreadsheet).

III. REPRESENTATIVE ANTENNA GAIN CONTOUR PLOTS (47 C.F.R. § 25.114(C)(4)(VI))

For all space-to-Earth and Earth-to-space bands, the Schedule S includes representative antenna gain contour plots at 620 km (the highest possible operational altitude representing the broadest possible contour).[5]

IV. ORBITAL DEBRIS MITIGATION PLAN (47 C.F.R. § 25.114(D)(14))

Consistent with the FCC's Part 25 rules, this orbital debris mitigation plan ("ODMP") addresses orbital dwell time, collision risk, and human casualty risk, among other related considerations, for the Hubble-8 and Hubble-9 spacecraft (collectively, "the spacecraft").[6] Hubble (via Muon Space) used NASA's Debris Assessment Software ("DAS") version 3.2.6.

A. Satellite and Orbital Parameters

Hubble expects to launch the two identical spacecraft no earlier than July 1, 2027 onboard the SpaceX Transporter-21 mission. Figure A-1 and Table A-1 show the spacecraft's characteristics.

Figure A-1: Hubble-8 and Hubble-9

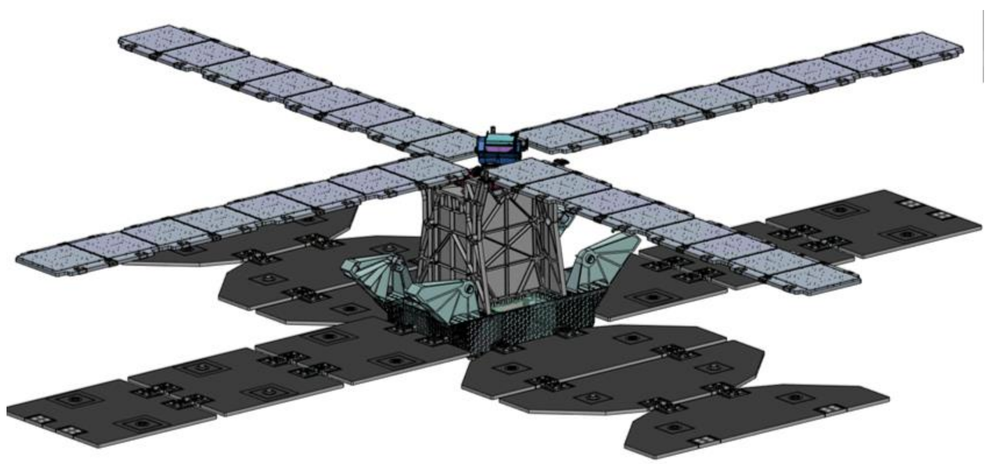


Table A-1: Satellite Area and Mass Parameters

Wet Mass (kg)	590
Dry Mass (kg)	570
Stowed Dimensions (m)	3 x 1.2 x 1.7
Deployed Dimensions (m)	7.8 x 8 x 1.7

[5] Where the gain contour does not intersect the Earth, the contour is not shown in those figures.

[6] Hubble has contracted spacecraft manufacturing and operations responsibilities to Muon Space. Hubble has contractually retained ownership and final operational control (including having the final say on bus and payload power cessation, interference resolution, and debris mitigation).

Deployed Area-to-Mass Ratio (m2 /kg)	0.0028 (LVLH nominal drag)[7] 0.0292 (high drag)[8] 0.0185 (tumbling drag)[9]

Table A-2: Hubble Satellite Orbital Parameters

Deployment Orbit Altitude (km)	480-620
Deployment Orbit Inclination (deg)	97.7 ± 1
Operational Orbit (km)	560-620
Operational Orbit Inclination (deg)	97.7 ± 1
Post-Mission Disposal Orbit (km)	380
Post-Mission Disposal Inclination (deg)	97.7 ± 1

Except as noted below, Table A-1 and Table A-2 provide all input parameters for the calculations in this document.

B. Compliance Showing

(14) A description of the design and operational strategies that will be used to mitigate orbital debris, including the following information:

(i) A statement that the space station operator has assessed and limited the amount of debris released in a planned manner during normal operations. Where applicable, this statement must include an orbital debris mitigation disclosure for any separate deployment devices, distinct from the space station launch vehicle, that may become a source of orbital debris;

The spacecraft will not undergo any planned release of debris during its normal operations. In addition, all separation and deployment mechanisms, and any other potential source of debris will be retained by the spacecraft or launch vehicle. Hubble has also assessed the probability of the space stations becoming sources of debris by collision with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal (see below).

[7] During the nominal drag configuration, the effective area-to-mass ratio assumes the payload panels are aligned to the Nadir vector of the spacecraft.

[8] During the high drag configuration, the effective area-to-mass ratio assumes the spacecraft is in a state where the solar array and payload panels are deployed and are perpendicular to the velocity vector of the spacecraft.

[9] During the tumbling drag configuration, the area-to-mass ratio assumes the spacecraft is in a tumbling state with all solar and payload panels deployed.

(ii) A statement indicating whether the space station operator has assessed and limited the probability that the space station(s) will become a source of debris by collision with small debris or meteoroids that would cause loss of control and prevent disposal. The statement must indicate whether this probability for an individual space station is 0.01 (1 in 100) or less, as calculated using the NASA Debris Assessment Software or a higher fidelity assessment tool;

Hubble has assessed and limited the probability that its spacecraft will become a debris source by collision with small debris or meteoroids that would cause loss of control and prevent disposal. Both spacecraft require maneuvering capability to satisfy post-mission disposal obligations; therefore, assessing small object collision risk is necessary.

The probability that an individual space station will become a source of debris by collision with small debris or meteoroids that would cause loss of control and prevent disposal is 6.5011E-03. The ODMP Activity Logs include the supporting DAS output. Hubble has taken steps to limit the effects of such collisions through shielding, the placement of components, and the use of redundant systems.

(iii) A statement that the space station operator has assessed and limited the probability, during and after completion of mission operations, of accidental explosions or of release of liquids that will persist in droplet form. This statement must include a demonstration that debris generation will not result from the conversion of energy sources on board the spacecraft into energy that fragments the spacecraft. Energy sources include chemical, pressure, and kinetic energy. This demonstration should address whether stored energy will be removed at the spacecraft's end of life, by depleting residual fuel and leaving all fuel line valves open, venting any pressurized system, leaving all batteries in a permanent discharge state, and removing any remaining source of stored energy, or through other equivalent procedures specifically disclosed in the application;

Hubble has assessed and limited the probability of accidental explosions during and after completion of mission operations through a failure mode verification analysis. As part of the manufacturing process, Hubble has taken steps to ensure that debris generation will not result from the conversion of energy sources into energy that fragments the spacecraft.

There are no liquids aboard that may persist in droplet form in the event of an accidental explosion; therefore, there is zero risk.

Potential causes for spacecraft breakup. The energy sources are housed in the electric propulsion system, battery system, and reaction wheels.

The *electric propulsion* unit has propellant stored in a solid state and is neither stored at high pressure nor burned to produce thrust given the propulsion system is electric.[10] As a result, the propulsion system is not a plausible breakup cause.

The *battery system* and *reaction wheels*, however, have three plausible related breakup causes:

- energy released from onboard batteries;
- mechanical failure of the reaction wheels; and
- runaway torque event leading to shedding of deployable systems.

Table A-3 summarizes the failure modes and effects analysis for all credible failure modes, which may lead to an accidental explosion, and corresponding risk mitigations.

Table A-3: Accidental Explosion Failure Modes and Effects Analysis

Failure Mode 1	*Stored energy is released because of overcharging, over-discharging, internal shorts, and external shorts*
Unit Description	6 custom battery packs each with 12 parallel strings of 8 series cells per pack, for a total of 576 cells, with an average voltage per cell of 3.3V
Mitigation	The cells can vent in the event of high internal pressure, with a cell vent open pressure of 1.8 - 2.4 MPa, which prevents cell explosion. Even if cell rupture was possible, the batteries are mounted on a machined aluminum plate and surrounded by aluminum panels to prevent external release of debris. All sources of stored energy onboard will have been depleted or safely contained when no longer required for mission operations or post-mission disposal
Failure Mode 2	*Debris is created because of the breakup of the reaction wheels due to mechanical failure while operating at a high angular rate.*
Unit Description	4 off-the-shelf reaction wheels in a pyramid configuration
Mitigation	The reaction wheels are limited with respect to maximum rotational speed of the wheels and are contained within a sealed compartment and mitigate any risk of breakup of the wheels themselves into debris
Failure Mode 3	*Solar panels break up because of a reaction wheel high angular velocity, runaway torque event.*
Unit Description	Same unit as Failure Mode 2
Mitigation	Given the relatively high MOI of the SV, a runaway torque event is considered a low risk as the reaction wheel torque does not translate to a high angular acceleration on the solar panels.

[10] The spacecraft use solid zinc as propellant. It is a non-toxic, non-reactive and non-radioactive metal as propellant with negligible evaporation. The propulsion module does not contain any pressurized vessels.

The principal stored-energy source onboard is the battery system. Each of the spacecraft's six battery packs contains 12 parallel strings of 8 series cells, for a total of 576 cells at an average cell voltage of 3.3 V. Each cell is equipped with a relief vent that opens at an internal pressure of 1.8-2.4 MPa, preventing explosive cell rupture. Even in the unlikely event of cell rupture, each pack is mounted on a machined aluminum plate and fully surrounded by aluminum panels, which together with the aluminum honeycomb chassis contain any released material within the bus. All sources of stored energy onboard will be depleted or safely contained when no longer required for mission operations or post-mission disposal.

End-of-life passivation is addressed for the two stored energy sources: the reaction wheels and batteries. The reaction wheels are turned off and do not store any energy. The batteries are not passivated; however, this measure presents a low risk given the cell rupture precautions.

(iv) A statement that the space station operator has assessed and limited the probability of the space station(s) becoming a source of debris by collisions with large debris or other operational space stations.

Hubble has assessed and limited the probability of the spacecraft becoming a debris source by collisions with large debris or other operational space stations. See the following sub-sections.

(A) Where the application is for an NGSO space station or system, the following information must also be included:

(1) A demonstration that the space station operator has assessed and limited the probability of collision between any space station of the system and other large objects (10 cm or larger in diameter) during the total orbital lifetime of the space station, including any de-orbit phases, to less than 0.001 (1 in 1,000). The probability shall be calculated using the NASA Debris Assessment Software or a higher fidelity assessment tool. The collision risk may be assumed zero for a space station during any period in which the space station will be maneuvered effectively to avoid colliding with large objects.

Hubble has assessed and limited the probability of collision between any Hubble spacecraft and other large objects (10 cm or larger in diameter) to less than 0.001. The probability is zero because the spacecraft are equipped with a propulsion system that would maneuver effectively to avoid collision with large objects. Should the propulsion system not function, Hubble has calculated the single-spacecraft collision risk probabilities and found they satisfy this standard. The large object collision risk is 5.0360E-04 during the total orbital lifetime, including the de-orbit phase. The ODMP Activity Logs include the supporting DAS output.

(2) The statement must identify characteristics of the space station(s)' orbits that may present a collision risk, including any planned and/or operational space stations in those orbits, and

indicate what steps, if any, have been taken to coordinate with the other spacecraft or system, or what other measures the operator plans to use to avoid collision.

The spacecraft will operate in a sun-synchronous low-Earth orbit (shared with numerous operational Earth-observation and communications spacecraft). Hubble does not intend to place the spacecraft in an orbit identical to that of any single other space station and does not anticipate the need for case-by-case coordination with any specific operator at the pre-launch phase.

In any event, to mitigate collision risk, Hubble will work closely with the launch provider to ensure that the spacecraft is deployed in a manner that minimizes the potential for collision with any other spacecraft and will provide high-fidelity ephemeris data to the 18th Space Defense Squadron via Space-Track.org. In the event of a conjunction warning with a probability of collision exceeding 0.0001, the onboard propulsion system can be used to execute an avoidance maneuver.

(3) If at any time during the space station(s)' mission or de-orbit phase the space station(s) will transit through the orbits used by any inhabitable spacecraft, including the International Space Station, the statement must describe the design and operational strategies, if any, that will be used to minimize the risk of collision and avoid posing any operational constraints to the inhabitable spacecraft.

Hubble acknowledges that the space environment is continually evolving and is committed to being a responsible space community member. Hubble will maintain detailed coordination dialogs with operators to minimize the probability of a collision occurring between respective spacecraft. Hubble will also provide human oversight over any such environment to offer an added measure of safety and management of the situation.

Hubble has reviewed its orbital environment to assess the potential for collisions with inhabitable spacecraft. Two inhabitable space stations presently or imminently occupy orbits below Hubble: The International Space Station ("ISS") and Tiangong Space Station. Given the low collision probabilities calculated above, coupled with the inclination separation between Hubble and the habitats (ISS at approximately 400 km and 51.6 deg; Tiangong at approximately 390 km and 41.6 deg), Hubble's probability of collision with the habitats is negligible. Hubble will coordinate with the habitats' operators, to the extent possible, to ensure continual protection (including potentially circularizing the Hubble spacecraft's orbit before passing these inhabitable spacecraft orbits and forgoing collision avoidance maneuvers while passing these inhabitable spacecraft orbits).[11] Both facilities are significantly below the minimum possible operational orbit altitude for the Hubble spacecraft.

(4) The statement must disclose the accuracy, if any, with which orbital parameters will be maintained, including apogee, perigee, inclination, and the right ascension of the ascending

[11] For example, Hubble could target a specific right ascension of ascending node to greatly reduce the conjunction risk for its de-orbiting spacecraft with respect to the ISS.

node(s). In the event that a system is not able to maintain orbital tolerances,* e.g., *its propulsion system will not be used for orbital maintenance, that fact must be included in the debris mitigation disclosure. Such systems must also indicate the anticipated evolution over time of the orbit of the proposed spacecraft or spacecraft. All systems must describe the extent of spacecraft maneuverability, whether or not the space station design includes a propulsion system.

Each spacecraft has a propulsion system and an attitude and orbit control system (AOCS or ADCS). For its operational phase, the targeted altitude will be 590 km with the following targeted orbital tolerances: +/- 5 km for apogee and perigee; +/- 1 deg for inclination; and N/A for the right ascension of the ascending node (RAAN), which is not actively maintained in a sun-synchronous orbit where the RAAN is constantly changing. For its other phases, orbital tolerances will not be maintained and the anticipated evolution appears in Figure A-5.

Propulsion. The spacecraft use the same off-the-shelf electric propulsion system, Starlight propulsion system, with space heritage. Table A-4 includes the relevant characteristics.

Table A-4: Propulsion Characteristics

Parameter	Value
Power	800 W
Thrust	40 mN
Total Impulse	254,880 Ns
Delta-v (Total)	432 m/s
Delta-v (Orbit Maneuvering)	184 m/s
Orbital Tolerance Maintenance	Table A-2 (operational rows)

The spacecraft will use a propulsion system for orbit maneuvering, including collision avoidance. A typical 200 m orbit correction corresponds to a sequence of four 10-minute thrusts using the propulsion system.

AOCS. The spacecraft also possess an AOCS that can achieve pointing accuracy up to 1 degree and a slew capability in all directions during nominal mission operations. Three magnetorquers are used to de-spin the spacecraft during the initial tumbling phase. Four reaction wheels are mounted in pyramid configuration to control the 3-axes during nominal operations. The magnetorquers are used to desaturate the reaction wheels. During nominal attitude, the solar panels are deployed and pointed at zenith and the payload antenna is pointing nadir (Z+ direction). The 3-axes controllers can rotate the spacecraft into maximum drag configuration to accelerate orbital decay.

(5) The space station operator must certify that upon receipt of a space situational awareness conjunction warning, the operator will review and take all possible steps to assess the collision risk, and will mitigate the collision risk if necessary. As appropriate, steps to assess and mitigate

the collision risk should include, but are not limited to: Contacting the operator of any active spacecraft involved in such a warning; sharing ephemeris data and other appropriate operational information with any such operator; and modifying space station attitude and/or operations.

Hubble certifies that upon receipt of a space situational awareness (SSA) conjunction warning its Mission Operations team, including Muon Space personnel, will review and take all possible steps to assess the collision risk and mitigate the collision risk if necessary. As appropriate, steps to assess and mitigate the collision risk will include, but are not limited to, contacting the operator of any active spacecraft involved in such a warning; sharing ephemeris data and other appropriate operational information with any such operator; and modifying attitude and/or operations.

The Mission Operations team monitors conjunction alerts twenty-four hours a day, seven days per week and has measures for collision avoidance assessment and execution if deemed appropriate with the third-party spacecraft operator. It can additionally work with a third-party entity to assist in conjunction analysis and collision avoidance maneuver planning for all its spacecraft.

(B) Where a space station requests the assignment of a geostationary orbit location, it must assess whether there are any known spacecraft located at, or reasonably expected to be located at, the requested orbital location, or assigned in the vicinity of that location, such that the station keeping volumes of the respective spacecraft might overlap or touch. If so, the statement must include a statement as to the identities of those spacecraft and the measures that will be taken to prevent collisions;

N/A – The Hubble spacecraft will operate in low-Earth orbit.

(v) A statement addressing the trackability of the space station(s). Space station(s) operating in low-Earth orbit will be presumed trackable if each individual space station is 10 cm or larger in its smallest dimension, excluding deployable components.

The Hubble spacecraft are trackable given their smallest dimension (excluding their deployable components) measures 1.2 m or 120 cm (which is greater than the 10 cm metric that the FCC has found trackable previously).[12]

Where the application is for an NGSO space station or system, the statement shall also disclose the following:

[12] *Mitigation of Orbital Debris in the New Space Age*, Report and Order, 35 FCC Rcd 4156 ¶ 58 (2020) ("We agree to, and adopt, the proposed rule stating that space stations of this size in LEO are deemed presumptively trackable, modified slightly to cover space stations that are 10 cm or larger in their smallest dimension. We clarify that this presumption covers those space stations that are 10 cm or larger in their smallest dimension excluding deployable components.").

(A) How the operator plans to identify the space station(s) following deployment and whether space station tracking will be active or passive;

Hubble will employ active and passive tracking measures:

Active. After deployment, Hubble will conduct active tracking (consistent with Hubble's radiofrequency link parameters proposed in its application) by utilizing a unique telemetry marker at deployment to assure the spacecraft can be identified. Hubble will maintain a complete and accurate set of current and planned radiofrequency transmissions for its spacecraft and will provide any necessary technical information to other spacecraft to identify and promptly resolve any potential radiofrequency interference between systems.

Passive. Hubble will have an SSA agreement with U.S. Space Command and plans to actively leverage the U.S. Space Force's 18th Space Defense Squadron ("SDS") automatic notification system provided via SpaceTrack to maximize situational awareness and coordinate as necessary with other operators. The Mission Operations team will use the NORAD Satellite Catalog and other publicly available sources to further assess collision risk associated with Hubble spacecraft's orbit. These data sources allow the Mission Operations team to monitor the location of the spacecraft passively from the two-line elements as well as Global Positioning System modules and allow them to propagate trajectories of the spacecraft to enhance the quality of conjunction predictions with other space stations.

(B) Whether, prior to deployment, the space station(s) will be registered with the 18th Space Control Squadron or successor entity; and

Hubble will register with the SDS and will share information regarding initial spacecraft deployment, ephemeris, and planned maneuver information.

(C) The extent to which the space station operator plans to share information regarding initial deployment, ephemeris, and/or planned maneuvers with the 18th Space Control Squadron or successor entity, other entities that engage in space situational awareness or space traffic management functions, and/or other operators.

Hubble will provide initial deployment, ephemeris, and planned maneuvers to the SDS to facilitate space traffic management with other operators. The SDS can contact the Mission Operations team twenty-four hours a day, seven days per week to ensure that Muon Space can take immediate action to coordinate collision avoidance measures. Muon Space will engage with any operators of nearby constellations and other space stations to ensure safe and coordinated space operations.

(vi) A statement disclosing planned proximity operations, if any, and addressing debris generation that will or may result from the proposed operations, including any planned release

of debris, the risk of accidental explosions, the risk of accidental collision, and measures taken to mitigate those risks.

N/A – The Hubble spacecraft will not conduct any proximity operations.

(vii) A statement detailing the disposal plans for the space station, including the quantity of fuel—if any—that will be reserved for disposal maneuvers.

The spacecraft will be disposed of via atmospheric re-entry. After the conclusion of the nominal 7-year mission, the spacecraft will execute a two-phase disposal campaign: an active altitude-lowering phase using its onboard propulsion systems, followed by a passive-decay phase at 380 km.

Active phase. The onboard propulsion system will be used to actively lower the spacecraft from its operational orbit to a 380 km circular orbit and will coordinate with inhabited-spacecraft operators as necessary to maintain separation throughout the descent.

Passive phase. Once at 380 km, the spacecraft will transition to a high-drag configuration and allow its orbit to passively decay until atmospheric re-entry. DAS predicts that passive decay from 380 km will take approximately 1 month in the high-drag configuration, and approximately 5 months in a tumbling configuration, demonstrated in the graphs below.

Figure A-2: Passive Orbit Decay Duration from 380 km Circular Orbit (Tumbling Configuration)

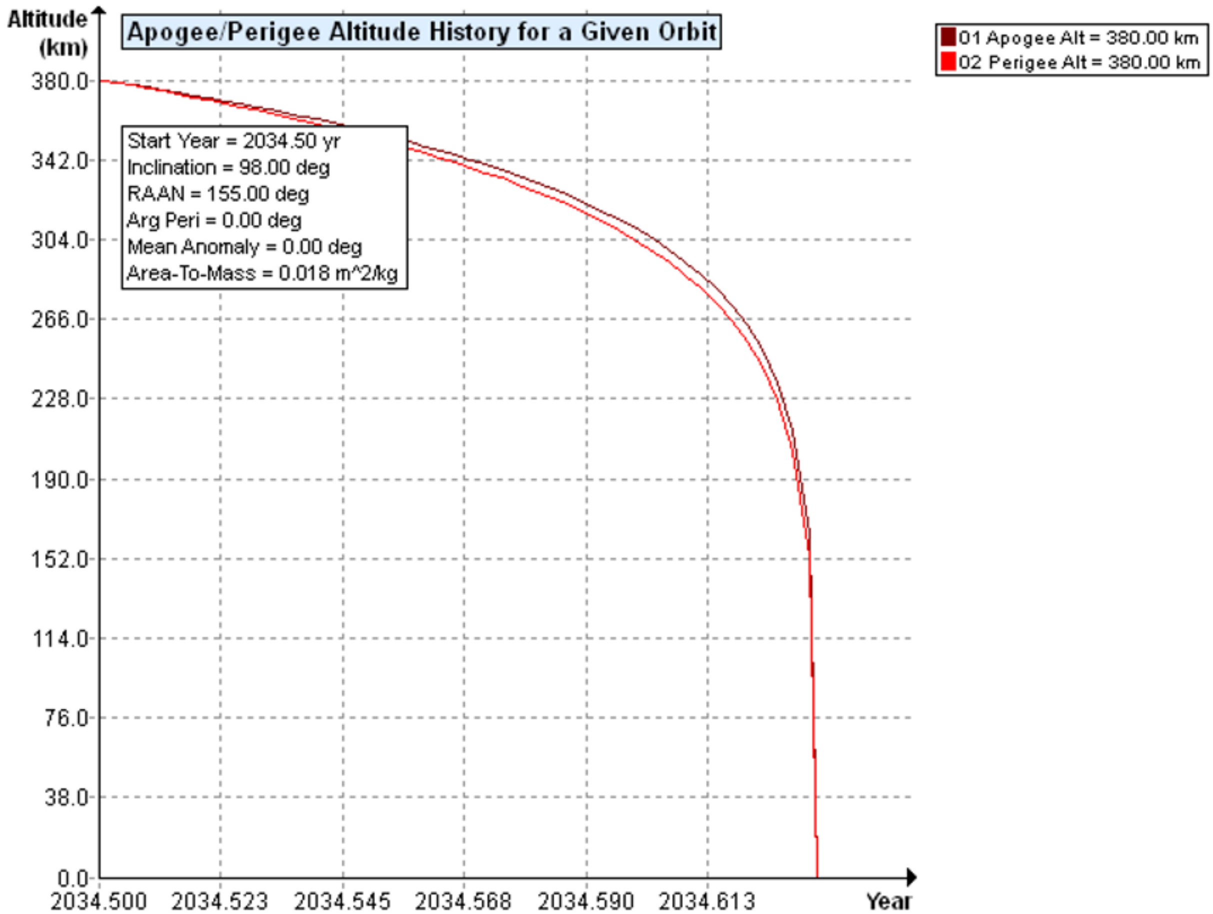
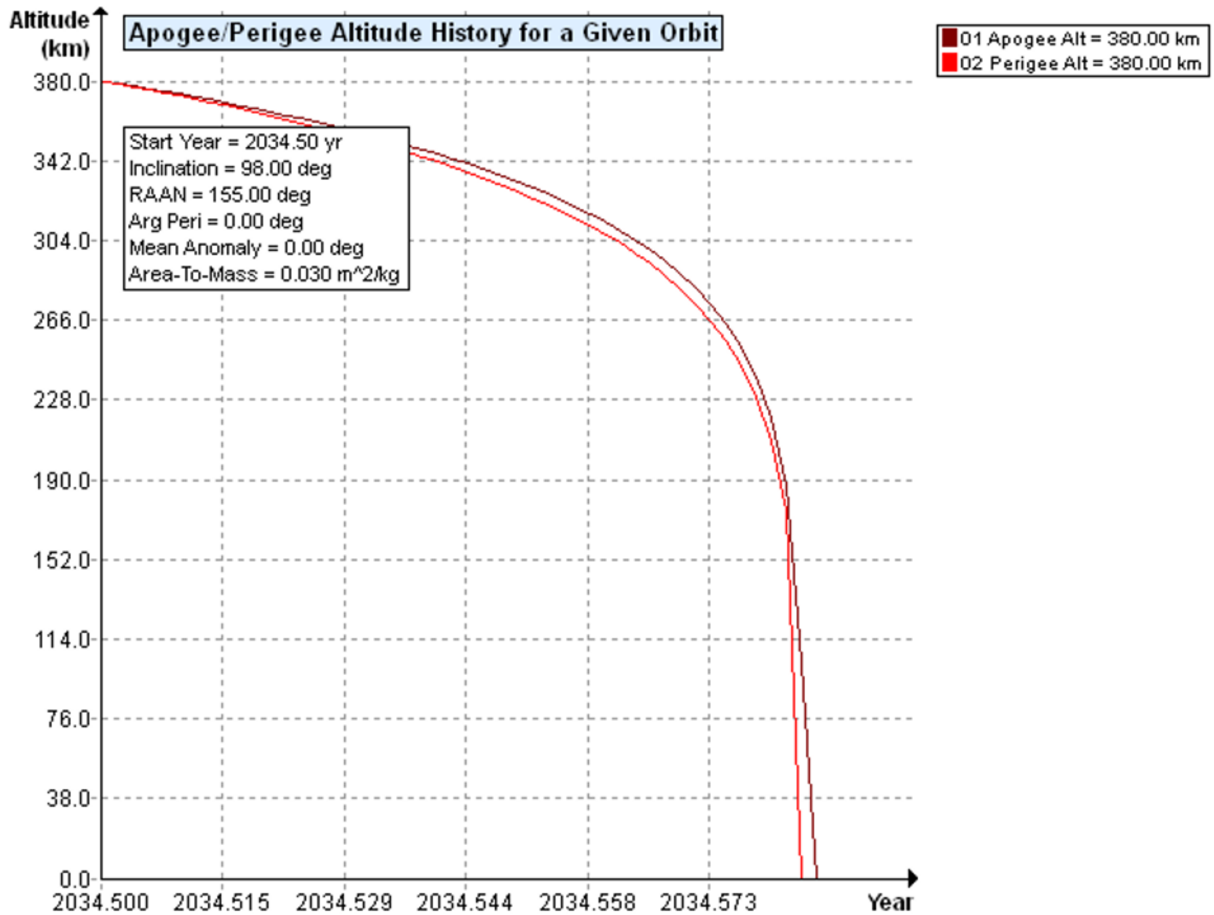
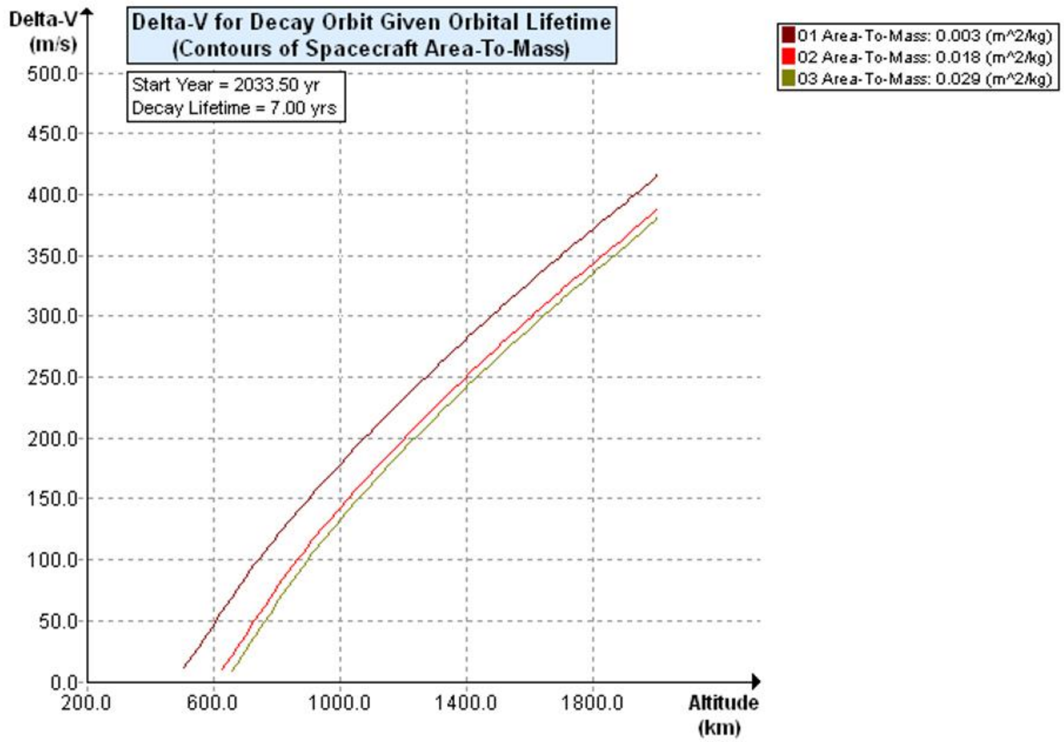


Figure A-3: *Passive Orbit Decay Duration from 380 km Circular Orbit (High-Drag Configuration)*



Propellant reserved for disposal. The spacecraft will launch with approximately 20 kg of zinc propellant, of which approximately 12.4 kg has been reserved for the post-mission disposal campaign, plus margin. This reserve includes 120 m/s of Δv, which exceeds the 116 m/s minimum that NASA DAS has verified is sufficient to dispose of the spacecraft within the 5-year disposal window, evaluated across the full range of solar-cycle-driven atmospheric conditions over the nominal mission lifetime. Figure A-4 below shows the Δv required for 5-year disposal as a function of disposal-start date under three spacecraft configurations: the nominal LVLH operational configuration (burgundy line), the tumbling contingency configuration (bright red line), and the high-drag disposal configuration (khaki line).

Figure A-4: Delta-V Required for 5-year PMD (starting in July 2033)



In addition, the following specific provisions apply:
(A) For geostationary orbit space stations, the statement must disclose the altitude selected for a disposal orbit and the calculations that are used in deriving the disposal altitude.

N/A – The Hubble spacecraft will operate in low-Earth orbit.

(B) For space stations terminating operations in an orbit in or passing through the low-Earth orbit region below 2,000 km altitude, the statement must disclose whether the spacecraft will be disposed of through atmospheric re-entry, specifying if direct retrieval of the spacecraft will be used. The statement must also disclose the expected time in orbit for the space station following the completion of the mission.

Hubble will dispose of the spacecraft by atmospheric reentry. The expected mission lifetime is approximately 7 years. The expected post-mission lifetime is approximately 2.5-6.5 months. To account for solar-cycle variation, operational margin, and possible non-nominal conditions during the disposal campaign, Hubble conservatively estimates an expected post-mission time in orbit of no more than 1 year. This is well within the 5-year re-entry requirement. Direct retrieval of the spacecraft will not be used.

(C) For space stations not covered by either paragraph (d)(14)(vii)(A) or (B) of this section, the statement must indicate whether disposal will involve use of a storage orbit or long-term atmospheric re-entry and rationale for the selected disposal plan.

N/A – See preceding response.

(D) For all space stations under [paragraph (d)(14)(vii) (B)]() or [(C)]() of this section, the following additional specific provisions apply:

(1) The statement must include a demonstration that the probability of success of the chosen disposal method will be 0.9 or greater for any individual space station. For space station systems consisting of multiple space stations, the demonstration should include additional information regarding efforts to achieve a higher probability of success, with a goal, for large systems, of a probability of success for any individual space station of 0.99 or better. For space stations under paragraph (d)(14)(vii)(B) of this section ending their mission in or passing through the low-Earth orbit region below 2000 km altitude, successful disposal is defined, for the purposes of this demonstration, as atmospheric re-entry of the spacecraft as soon as practicable, but no later than five years following completion of the mission. For all other space stations under paragraph (d)(14)(vii)(B) and paragraph (d)(14)(vii)(C) of this section, successful disposal will be assessed on a case-by-case basis.

The chosen disposal method has a high probability of success. The spacecraft will use its propulsion system to maintain the target mission altitude until end of life at which point the system will be used to lower the altitude to ensure deorbit occurs as soon as possible. The propulsion system has been designed to provide high reliability operation and has undergone a detailed failure-modes-and-effects analysis and extensive qualification and acceptance process. Hubble has assessed the reliability of the spacecraft's post-mission disposal campaign and concludes that the probability of successful disposal (defined under this paragraph as atmospheric re-entry within 5 years following mission completion) exceeds 0.9. This conclusion is supported by the propulsion-system design and qualification, the heritage of the bus avionics, the spacecraft's resilience to credible failure modes, and the spacecraft robustness to small-object strikes.

Propulsion system reliability. The spacecraft's primary and redundant Hall-effect propulsion systems have undergone extensive ground and vacuum-chamber qualification testing and will have flown and operated on prior spacecraft before the Hubble mission. Either propulsion system can independently execute the full post-mission disposal sequence, so a single-string failure does not impact the nominal disposal timeline.

Bus avionics heritage. Critical bus avionics components carry proven flight heritage with a 100% success rate over 1.5 cumulative years on orbit. Reliability is further verified through production testing: the ADCS and EPS units undergo 48 hours of thermal cycling (14 cycles) following the initial four-cycle workmanship burn-in period with zero failures recorded to date.

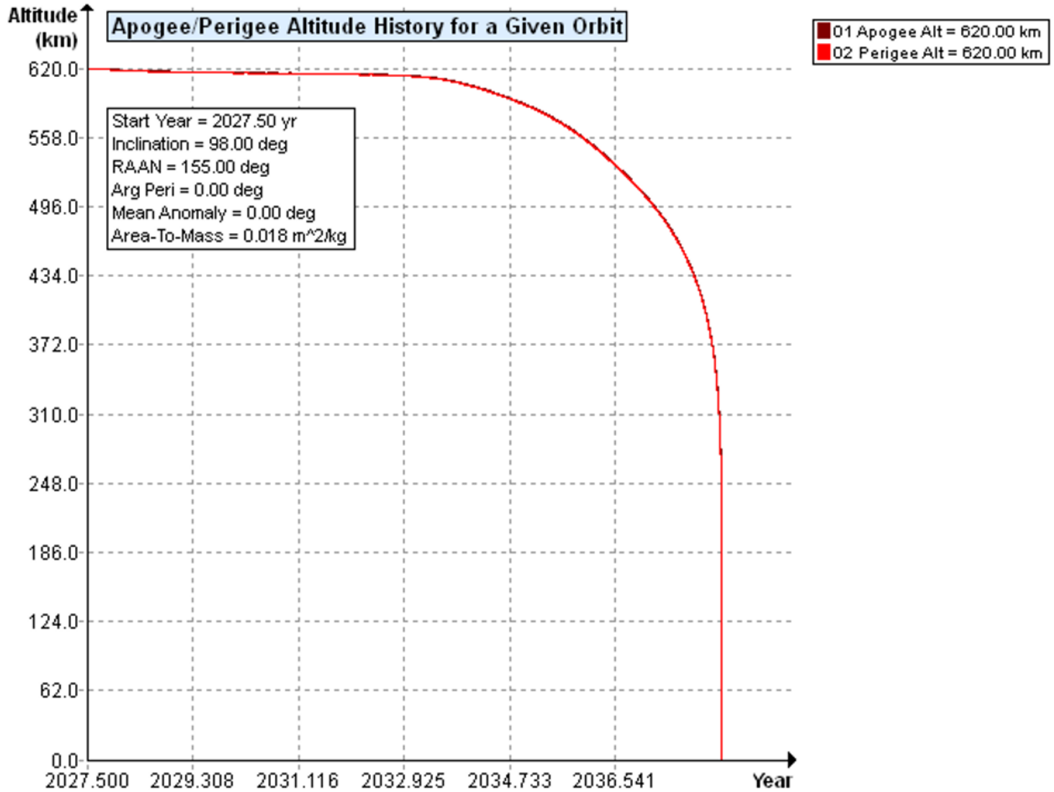
Resilience to small object strikes. The spacecraft has a 0.9942 survival probability against small object strikes that would compromise disposal-critical subsystems.[13] It is calculated using the thinnest dimensions of the spacecraft's aluminum honeycomb chassis for maximum conservatism.

Resilience to propulsion failure. In the event of a full propulsion failure during the operational mission, the spacecraft can still be commanded into the high-drag orientation. That reduces the time to passive de-orbit by a factor of approximately 5 relative to the nominal LVLH orientation.

Worst-case contingency. The most extreme non-nominal scenario is a full propulsion failure immediately upon deployment combined with insertion at the high end of the injection range (620 km) and the inability to command the spacecraft into any active configuration. In this contingency, DAS predicts that the spacecraft would re-enter the atmosphere in approximately 10 years (see Figure A-5). While this value exceeds the 5-year nominal post-mission disposal window, the combined probability of (i) total failure of both redundant propulsion strings, (ii) injection at the top of the launch-provider's range, and (iii) loss of attitude control sufficient to prevent the high-drag fallback orientation is sufficiently low that the overall disposal success probability remains above 0.9. Hubble will also coordinate with the 18th SDS and other operators throughout any non-nominal post-mission orbital phase to mitigate any incremental collision risk during the extended decay period.

[13] This value was calculated by subtracting the small object penetration risk from a 100% likelihood of disposal, i.e., (1) - (small-object penetration risk) = 1-0.00585.

Figure A-5: Passive orbit decay duration from 620 km circular orbit (tumbling configuration)



Based on the foregoing, Hubble concludes that the spacecraft's disposal-success probability satisfies the 0.9 threshold.

(2) If planned disposal is by atmospheric re-entry, the statement must also include:
(i) A disclosure indicating whether the atmospheric re-entry will be an uncontrolled re-entry or a controlled targeted reentry.

The atmospheric re-entry will be an uncontrolled re-entry.

(ii) An assessment as to whether portions of any individual spacecraft will survive atmospheric re-entry and impact the surface of the Earth with a kinetic energy in excess of 15 joules, and demonstration that the calculated casualty risk for an individual spacecraft using the NASA Debris Assessment Software or a higher fidelity assessment tool is less than 0.0001 (1 in 10,000).

No spacecraft components are expected to survive uncontrolled re-entry and impact the surface of the Earth with a kinetic energy exceeding the 15 J threshold. The resulting human casualty risk for the spacecraft as calculated by DAS is 0. The ODMP Activity Logs include the relevant output.

(E) Applicants for space stations to be used only for commercial remote sensing may, in lieu of submitting detailed post-mission disposal plans to the Commission, certify that they have submitted such plans to the National Oceanic and Atmospheric Administration for review.

N/A – Hubble seeks FCC approval for the post-mission disposal plan.

(viii) For non-U.S.-licensed space stations, the requirement to describe the design and operational strategies to minimize orbital debris risk can be satisfied by demonstrating that debris mitigation plans for the space station(s) for which U.S. market access is requested are subject to direct and effective regulatory oversight by the national licensing authority.

N/A – The Hubble spacecraft will be U.S. licensed.

ENGINEERING CERTIFICATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this application, and that it is complete and accurate to the best of my knowledge and belief.

/s/ Al Trivison

Al Trivison
Director, Program and Mission Operations

ATTACHMENT B (COORDINATION SPREADSHEET)

Constellation Orbit Parameters

Parameters	Hubble-8	Hubble-9	Comment
Deployment Altitude Apogee (km)	480 - 620	480 - 620	
Deployment Altitude Perigee (km)	480 - 620	480 - 620	
Deployment Inclination (deg)	97.7 +/- 1	97.7 +/- 1	
Operational Altitude Apogee (km)	560-620	560-620	[see comment 3]
Operational Altitude Perigee (km)	560-620	560-620	[see comment 3]
Operational Inclination (deg)	97.7 +/- 1	97.7 +/- 1	
Sun Sync (Y/N)	Y	Y	
MLTDN	13:00 + 60 minutes	13:00 + 60 minutes	
Last RF Transmit Altitude Apogee (km)	380	380	
Last RF Transmit Altitude Perigee (km)	380	380	
Last RF Transmit Inclination (deg)	97.7 +/- 1	97.7 +/- 1	
Expected Launch (date)	no earlier than 7/1/2027	no earlier than 7/1/2027	
Max Possible Lifetime (years)	7	7	
Expected End of Life (year)	2034	2034	

Mission Parameters

Attribute	Value	Comment
Mission Name	Hubble-8 and Hubble-9	N/A
FCC ICFS File Number	SAT-LOA-20260805-00327	N/A
Responsible Company	Hubble Network Inc.	N/A
Technical POC(s)	Al Trivison (al@hubble.com) Derek Lang (derek@hubble.com) George John (george.john@hlc.com)	N/A

Orbital Parameters (Choose one)

Attribute	Value	Comment	
Altitude Apogee (km)	see constellation parameters table	N/A	NGSO
Altitude Perigee (km)	see constellation parameters table	N/A	
Inclination (degree)	see constellation parameters table	N/A	
Sun Sync (Y/N)	see constellation parameters table	N/A	
LTAN, LTDN, or RAAN	see constellation parameters table	N/A	
Number of Orbital Planes	N/A	N/A	
Spacing between Orbital Planes	N/A	N/A	
Spacecraft Spacing within Planes	N/A	N/A	
Longitude of Orbital Slot (E)	N/A	N/A	GSO
Inclination (degree)	N/A	N/A	
Reference Body	N/A	N/A	non-Geocentric Orbits
Apoapsis (km)	N/A	N/A	
Periapsis (km)	N/A	N/A	
Inclination (degree)	N/A	N/A	

Uplink Parameters

Frequency Band (MHz)	Center Frequency (MHz)	Bandwidth (MHz)	Polarization Type	Duty Cycle %	Notes
2025-2110 (S-band)	2061.5	0.28	RHCP	see transmit earth stations table below	
2025-2110 (S-band)	2062.5	0.98	RHCP	see transmit earth stations table below	
2482.049750-2482.831 (S-band)	various	0.032 per channel	RHCP	see transmit earth stations table below	

Downlink Parameters

Frequency Band (MHz)	Center Frequency (MHz)	Bandwidth (MHz)	Sat Tx Power (dBW)	Sat Tx Ant Gain (dBi)	Polarization Type	Duty Cycle %	Notes
8025-8400 (X-band)	8385	2.8	-5	2.0	RHCP	see receive earth stations table	
8025-8400 (X-band)	8390	2.8	-5	2.0	RHCP	see receive earth stations table	
8025-8400 (X-band)	8175	300	1	17.0	RHCP	see receive earth stations table	

Crosslink Parameters

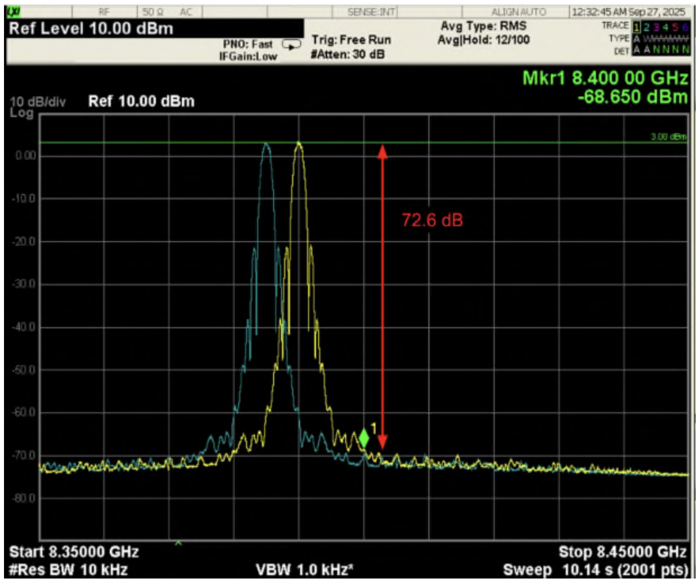
Frequency Band	Center Frequency (MHz)	Bandwidth (MHz)	Sat Tx Power (dBW)	Sat Tx Ant Gain (dBi)	Polarization Type	Receive Satellite
N/A	N/A	N/A	N/A	N/A	N/A	N/A

Receive Earth Stations

Location Name	Frequency Band	Lat.	Long.	Duty Cycle % (time transmitting/time visible)	Comments
Fairbanks, Alaska, USA	X-band	64.81775	-147.71913	100%	
Svalbard, Norway	X-band	78.2315	15.4111	100%	
Punta Arenas, Chile	X-band	-52.93635	-70.87012	100%	
Punta Arenas, Chile	X-band	-53.04122	-70.84711	100%	
Hartebeesthoek, South Africa	X-band	-25.88599	27.7056	100%	
Awarua, New Zealand	X-band	-46.52877	168.37987	100%	
Awarua, New Zealand	X-band	-46.52811	168.37919	100%	
Hawaii, USA	X-band	20.81725	-156.45484	100%	
Jeju, South Korea	X-band	33.38721	126.31686	100%	
Jeju, South Korea	X-band	33.3873	126.31744	100%	
Mingenew, Australia	X-band	-29.01003	115.34171	100%	
Puertollano, Spain	X-band	38.67271	-4.16205	100%	
Santa Maria, Azores	X-band	36.99756	-25.13731	100%	
Sofia, Bulgaria	X-band	42.48294	23.44531	100%	
Unst, United Kingdom	X-band	60.74831	-0.85839	100%	
Anchorage, Alaska, USA	X-band	62.33301	-150.03162	100%	
Peterborough, Australia	X-band	-32.962	138.8495	100%	
Nangetty, Australia	X-band	-29.01042	115.34167	100%	
Blonduos, Iceland	X-band	65.64736	-20.24608	100%	
Baku, Azerbaijan	X-band	40.46628	49.48581	100%	
Ripailles, Mauritius	X-band	-20.13947	57.68706	100%	
Pretoria, South Africa	X-band	-25.86033	28.45378	100%	
La Paz, Mexico	X-band	24.1051	-110.37194	100%	
Longovilo, Chile	X-band	-33.96	-71.4	100%	
Las Cruces, New Mexico, USA	X-band	32.26818	-106.91453	100%	

Transmit Earth Stations

Location Name	Frequency Band	Lat.	Long.	Transmit Power (dBW)	Transmit Gain (dBi)	Number of Antennas	Duty Cycle % (time transmitting/time visible)	Comments
Fairbanks, Alaska, USA	S-band	64.81775	-147.71913	6	37.6	1	100%	
Svalbard, Norway	S-band	78.2315	15.4111	6	34	1	100%	
Punta Arenas, Chile	S-band	-52.93635	-70.87012	6	34	1	100%	
Punta Arenas, Chile	S-band	-53.04122	-70.84711	6	36	1	100%	
Hartebeesthoek, South Africa	S-band	-25.88599	27.7056	6	34	1	100%	
Awarua, New Zealand	S-band	-46.52877	168.37987	6	34	1	100%	
Awarua, New Zealand	S-band	-46.52811	168.37919	6	34	1	100%	
Hawaii, USA	S-band	20.81725	-156.45484	6	34	1	100%	
Jeju, South Korea	S-band	33.38721	126.31686	6	34	1	100%	
Jeju, South Korea	S-band	33.3873	126.31744	6	35	1	100%	
Mingenew, Australia	S-band	-29.01003	115.34171	6	37.6	1	100%	
Puertollano, Spain	S-band	38.67271	-4.16205	6	34	1	100%	
Santa Maria, Azores	S-band	36.99756	-25.13731	6	34	1	100%	
Sofia, Bulgaria	S-band	42.48294	23.44531	6	36	1	100%	
Unst, United Kingdom	S-band	60.74831	-0.85839	6	36	1	100%	
Anchorage, Alaska, USA	S-band	62.33301	-150.03162	6	36	1	100%	
Peterborough, Australia	S-band	-32.962	138.8495	6	36	1	100%	
Nangetty, Australia	S-band	-29.01042	115.34167	6	36	1	100%	
Blonduos, Iceland	S-band	65.64736	-20.24608	6	36	1	100%	
Baku, Azerbaijan	S-band	40.46628	49.48581	6	36	1	100%	
Ripailles, Mauritius	S-band	-20.13947	57.68706	6	35	1	100%	
Pretoria, South Africa	S-band	-25.86033	28.45378	6	36	1	100%	
La Paz, Mexico	S-band	24.1051	-110.37194	6	36	1	100%	
Longovilo, Chile	S-band	-33.96	-71.4	6	34	1	100%	
Las Cruces, New Mexico, USA	S-band	32.26818	-106.91453	6	34	1	100%	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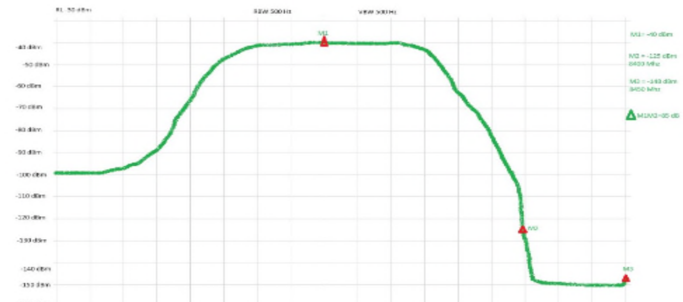
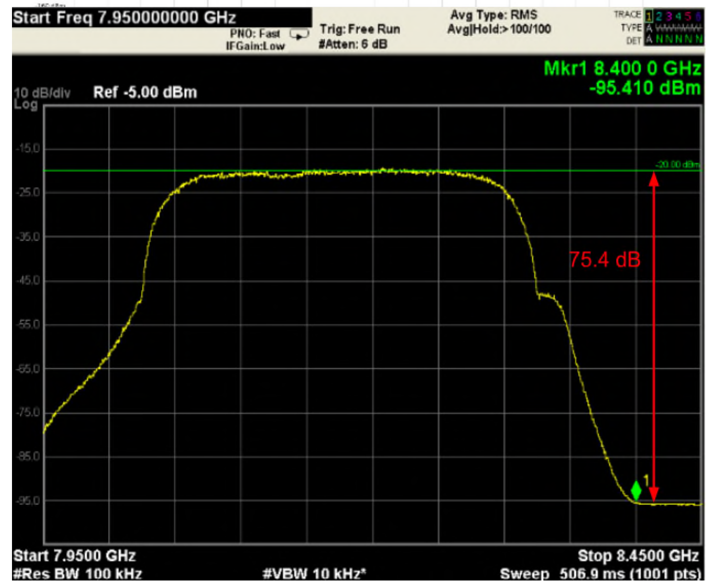
Ref Level 10.00 dBm
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: RMS
Avg|Hold: 12/100
Mkr1 8.400 00 GHz
-68.650 dBm
10 dB/div
Log
Ref 10.00 dBm
72.6 dB
Start 8.35000 GHz
#Res BW 10 kHz
VBW 1.0 kHz*
Stop 8.45000 GHz
Sweep 10.14 s (2001 pts)




Start Freq 7.950000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 6 dB
Avg Type: RMS
Avg|Hold:> 100/100
Mkr1 8.400 0 GHz
-95.410 dBm
10 dB/div
Log
Ref -5.00 dBm
75.4 dB
Start 7.9500 GHz
#Res BW 100 kHz
#VBW 10 kHz*
Stop 8.4500 GHz
Sweep 506.9 ms (1001 pts)

Comments

1. The targeted federal concurrence date is **November 9, 2026**, and the requested license issue date is **May 1, 2027**.

2. Hubble-8 and Hubble-9 will be spaced 180 deg.

3. The targeted operational altitude is 590 km (apogee and perigee) with a +/- 5 km orbital tolerance.

ATTACHMENT C (WAIVER REQUESTS)

This attachment includes Hubble's FCC rule waiver requests.

The Commission may waive any of its rules for "good cause."[1] Waiver is appropriate when (i) special circumstances warrant a deviation from the general rule and (ii) such deviation will serve the public interest better than strict adherence to the rule.[2] In general, the Commission will grant a waiver of its rules if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest.[3] Additionally, the Commission generally grants a waiver of the frequency allocation table "when there is little potential for interference into any service authorized under the [table] and when the non-conforming operator accepts any interference from authorized services."[4]

I. 47 C.F.R. §§ 2.102(A) (FREQUENCY ASSIGNMENTS) AND 2.106 (INTERNATIONAL AND US NON-FEDERAL FREQUENCY ALLOCATION TABLES)

Good cause exists to waive 47 C.F.R. §§ 2.102(a) (frequency assignments) and 2.106 (international and US non-federal frequency allocation tables) to the extent necessary to consider and grant the application.

A. 2025-2110 MHz (Earth-to-space) for SOS

Hubble seeks a waiver to operate SOS in the 2025-2110 MHz (Earth-to-space) band inside the United States on a non-conforming basis. The US non-federal frequency allocation table lacks SOS allocations for Hubble's proposed operations.[5] Hubble's SOS operations will not pose interference in this band for two primary reasons. *First*, Hubble will accept interference from any authorized service. *Second*, the operations will not increase interference potential into any authorized services as explained in Attachment A (Technical Annex) Sections II.A and II.D. It also resembles operations authorized in the band today because it uses a limited bandwidth. Hubble commits to coordinating these limited operations with co-frequency missions, including US government operations.

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[1] *See* 47 C.F.R. § 1.3; *Ne. Cellular Tel. Co. v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990); *see also WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969).

[2] *Ne. Cellular*, 897 F.2d at 1166.

[3] *WAIT Radio*, 418 F.2d at 1157.

[4] *The Boeing Company Application for Blanket Authority to Operate Up to Eight Hundred Technically Identical Transmit and Receive Mobile Earth Stations Aboard Aircraft in the 14.0-14.5 GHz and 11.7-12.2 GHz Frequency Bands, Order and Authorization*, 16 FCC Rcd 22645 ¶ 12 (IB & OET 2001) (internal punctuation omitted). *See generally Application of Fugro-Chance, Inc. for Blanket Authority to Construct and Operate a Private Network of Receive-Only Mobile Earth Stations*, Order and Authorization, 10 FCC Rcd 2860 (IB 1995); *Application of Motorola Satellite Communications, Inc. for Modification of License*, Order and Authorization, 11 FCC Rcd 13952 (IB 1996).

[5] *Cf.* 47 C.F.R. § 2.106 n.US347 (authorizing EESS and SRS but not SOS in the 2025-2110 MHz (Earth-to-space) band).

B. 2482.049750-2482.831 MHz (Earth-to-space) for MSS

Hubble seeks a waiver to operate MSS in the 2482.049750-2482.831 MHz band inside and outside the United States on a non-conforming basis. Attachment A (Technical Annex) Section II.B explains in further detail how little potential exists for interference into any service authorized under the respective frequency allocation tables in this band. Further, Hubble affirms that it will accept any interference from authorized services operating in conformance with international and U.S. non-federal frequency allocation tables. Finally, the proposed non-conforming operations will benefit the public by providing monitoring device data that supports earth exploration applications.

C. 2025-2110 MHz (Earth-to-space), 2482.049750-2482.831 MHz (Earth-to-space), and 8025-8400 MHz (space-to-Earth) for EESS

Hubble seeks a waiver to the extent necessary to operate EESS inside and outside the United States in the 2025-2110 MHz (Earth-to-space), 2482.049750-2482.831 MHz (Earth-to-space)[6], and 8025-8400 MHz (space-to-Earth) bands. As discussed in Narrative Section I.B, Hubble's proposed services meet the definition of EESS, and use of these bands can and will be coordinated ensuring that operations will not cause harmful interference. Accordingly, the Hubble Constellation may use these frequency bands consistent with the international and U.S. non-federal frequency allocation tables. Nonetheless, to the extent necessary, Hubble requests a waiver of these tables in the event the Commission concludes that the Hubble Constellation is not an EESS system. Finally, the proposed non-conforming operations will benefit the public by providing monitoring device data that supports Earth exploration applications.

II. 47 C.F.R. § 25.112 (APPLICATION COMPLETENESS)

Application dismissal may occur if the submission contains incomplete information or internal inconsistencies.[7] Even in these cases, however, the Commission's rules provide that the Commission may accept a defective application if accompanied by an appropriate waiver request.[8] Hubble requests waiver of this rule and asks the Commission to permit Hubble to supplement its application if additional information or explanation is necessary. Granting this request would avoid unduly harsh results given no regulatory framework properly captures the proposed operations and would conserve limited FCC resources by allowing any concerns to be addressed on an issue-specific basis.

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[6] The international and U.S. non-federal frequency allocation tables do not contain an EESS allocation in the 2482.049750-2482.831 MHz band. Attachment A (Technical Annex) Section II.B explains in further detail how little potential exists for interference into any service authorized under the respective frequency allocation tables in this band. Further, Hubble affirms that it will accept any interference from authorized services operating in conformance with the international and U.S. non-federal frequency allocation tables.

[7] *See* 47 C.F.R. § 25.112(a).

[8] *See id.* § 25.112(b).

III. 47 C.F.R. § 25.114 (SCHEDULE S)

A Schedule S form accompanies this application.[9] Hubble cannot accurately describe the proposed operations given Schedule S limitations and requests waiver of the Schedule S to the extent necessary as a result and offers additional related clarifications below.

Estimated orbital and radiofrequency parameters. The Hubble Constellation has an orbital altitude and inclination range. Hubble has listed representative values in Schedule S and specifies these values in Attachment B (Coordination Spreadsheet).

Right ascension of ascending node ("RAAN") and RAAN tolerance. The RAAN and RAAN tolerance will not be known until launch (approximately July 1, 2027). Hubble has inserted placeholder values of 0 and 1 deg due to Schedule S constraints.

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[9] *See id.* § 25.114(c).

ATTACHMENT D (OWNERSHIP INFORMATION)

This attachment includes the ownership information sought in the attached Form 312, Main Form.[1]

*   *   *

I. 10% OR MORE OF THE EQUITY AND/OR VOTING INTEREST HOLDERS

Hubble Network Inc. ("Hubble") is a privately held corporation organized under Delaware law. The following parties own a record and/or voting 10 percent or more of Hubble's voting stock.

Name	Citizenship	Address	Approximate Record Interest	Approximate Voting Interest
Alex Haro	United States	1508 10th Avenue, Suite 200A Seattle, WA 98122	20%	50%
Ben Wild	United States		21%	25%
Chris Nguyen	United States		<10%	25%

II. DIRECTORS

The following individuals are Hubble's directors.

Name	Address
Alex Haro	1508 10th Avenue, Suite 200A Seattle, WA 98122
Ben Wild	
Chris Nguyen	

III. OFFICERS

The following individuals are Hubble's officers.

Name	Title	Address
Alex Haro	Chief Executive Officer	1508 10th Avenue, Suite 200A Seattle, WA 98122
Ben Wild	Chief Technology Officer	
Abraham Marciano	Chief Operating Officer	

[1] Form 312, Main Form Question 39 requires the following: "If the applicant is a corporation and is applying for a space station license, attach as an exhibit the names, address, and citizenship of those stockholders owning a record and/or voting 10 percent or more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate the beneficiary(ies) or class of beneficiaries. Also list the names and addresses of the officers and directors of the Filer."