Before the
Federal Communications Commission
Washington, DC 20554

Request of *SpaceQuest, Ltd.* Application for Authority to Operate the AprizeSat-8 and AprizeSat-10 Satellites	Call Sign: File No. _____

Application for Authority to Operate the AprizeSat-8 and AprizeSat-10 Satellites

SpaceQuest, Ltd. ("SpaceQuest"), hereby requests authority to operate the in-orbit AprizeSat-8 and AprizeSat-10 non-geostationary orbit ("NGSO") small satellites ("smallsats") (together, the "AprizeSats") pursuant to Federal Communication Commission's ("Commission") streamlined small space station rules.[1] Grant of this application will ensure that the AprizeSats can be used to conduct vital satellite-based vessel tracking operations to Federal government and other customers and, therefore, would be consistent with the public interest.

I. BACKGROUND

SpaceQuest is a full-service satellite integrator and operator founded in 1994 and has delivered on-orbit and operated over 20 satellites with diverse payloads for a variety of government agencies and commercial enterprises, including manufacturing and operating the AprizeSats. SpaceQuest was recently acquired by AAC Clyde Space AB ("AAC Clyde

[1] 47 C.F.R. § 25.122; *see generally* Streamlining Licensing Procedures for Small Satellites, *Report & Order*, Docket No. 18-86, FCC 19-81 (rel. Aug. 2, 2019) ("*Smallsat Order*").

Space").[2] This transaction leverages the synergies between the two companies' market positions, technology competencies, resources, product offerings, and customer bases.

AprizeSat-8 and AprizeSat-10 were launched into low-Earth orbit in 2013 and 2014, respectively, to validate an innovative smallsat-based architecture for tracking and monitoring high-value maritime assets through the automatic identification system ("AIS").[3] The AprizeSats have been operating under the Part 5 authority since launch in portions of the very high frequency ("VHF") band, the ultra-high frequency ("UHF") band, and the S-band[4] without any interference issues. SpaceQuest files this application under the Commission's recently implemented streamlined small space station authorization procedures to obtain Part 25 authority for continued operation of the AprizeSats, as described herein.

II. SYSTEM DESCRIPTION

A. Space Segment

The AprizeSats were manufactured by SpaceQuest using its proprietary microsatellite bus design. Each of these smallsats is a "cubesat" measuring 25-cm on each edge with a mass of 14.6 kg. Each of the AprizeSats houses six aluminum trays within the cubesat bus comprising various subsystems, as described in detail in the Technical Appendix.[5]

[2] *See* Consent to Transfer Control of Corporation License, Exhibit 1, File No. 0058-EX-TU-2020 (granted Nov. 11, 2020).

[3] AIS is an advanced marine vessel tracking and navigation technology that can provide vessel information, (*i.e.*, the vessel's identity, type, position, course, speed, navigational status) automatically to appropriately equipped space stations.

[4] *See, e.g.*, Aprize Satellite Inc., ELS File No. 0301-EX-CR-2019, Call Sign WD2XFT (and prior grants). The current authorization will expire on July 1, 2021. SpaceQuest also holds related ground station operating authority. *See* SpaceQuest, Ltd., Call Signs WA2XYM, WJ2XPE, WJ2XNV.

[5] *See* Attachment A, Technical Appendix, § A.4.1.

1. Orbital Parameters

The AprizeSats are in polar, sun-synchronous orbits.[6] Due to their high orbital inclination angle and much higher altitude, the possibility of collision between the AprizeSats and the International Space Station ("ISS") is *de minimis*.[7] The orbital parameters of the AprizeSats are as follows:

Orbital Parameters	AprizeSat–8	AprizeSat–10
Orbital Type:	NGSO	NGSO
Apogee:	662	729
Perigee	589	611
Inclination	97.568 degrees	97.73 degrees
Period:	98.154 min	98.154 min
Eccentricity	0.0052	0.0084
Celestial reference body:	Earth	Earth

2. Communications Systems

There are two communication systems on board each of the AprizeSats, namely a Command, Telemetry & Control System ("TT&C") and an AIS Mission System. The primary operating mode for TT&C system includes receiving ground commands and new flight code on either VHF or UHF frequencies, processing and executing commands, collecting and storing telemetry, and downlinking telemetry data on request using a UHF downlink. The AIS system includes the collection of AIS messages, on-board message processing, storage, and transmission in the S-band downlink band. Each system is described in detail in the Technical Appendix.[8]

[6] *See id.*, § A.5.1.

[7] This is in conformance with the requirement in 47 C.F.R. § 25.122(d)(5) requiring a description of design or operational strategies to be used to avoid in-orbit collision with crewed spacecraft.

[8] *See* Attachment A, Technical Appendix, § A.4.

3. Spectrum Use

Each of the AprizeSats transmit and receive using VHF, UHF, and S-band frequencies, including: (i) 145.9-146.0 MHz band (Earth-to-space); (ii) 156.5-162.5 MHz band (Earth-to-space); (iii) 399.9-400.05 MHz band (Earth-to-space); (iv) 400.5-400.65 MHz band (space-to-Earth); and (v) 2300-2305 MHz band (space-to-Earth). The following table summarizes the AprizeSats' frequency usage:

Link Name	Frequency Band (MHz)
AIS Uplink (satellite receive)	156.5-162.5 (E-to-s)
TT&C Uplink (satellite receive)	399.90-400.05 (E-to-s)
TT&C Downlink (satellite transmit)	400.50-400.65 (s-to-E)
Backup TT&C Uplink (satellite receive)	145.90-146.0 (E-to-s)
Data Downlink (satellite transmit)	2300-2305 (s-to-E)

Uplink operations in the 156.5-162.5 MHz band are for AIS receive operations. UHF uplink and downlink bands are used for standard TT&C communications. Uplink operations in the 145.9-146.0 MHz amateur band are for emergency backup control for the space stations if UHF TT&C fails. The S-band downlink in the 2300-2305 MHz band is for data delivery in Alaska and Sweden only. Although the satellites are equipped with another S-band experimental receiver and antenna, SpaceQuest does not operate this payload and authority to operate it is not being requested as part of this application.

B. Ground Segment

The Mission Operations Center ("MOC") for the AprizeSats is located in SpaceQuest's Fairfax, Virginia headquarters. The MOC provides monitoring, control, and engineering support for these smallsats. The AprizeSats communicate with TT&C ground stations located in Fairbanks, Alaska and Fairfax, Virginia, both owned and operated by SpaceQuest. The AprizeSats also communicate with a TT&C ground station in Naahehu, HI which is owned and

operated by Swedish Space Corporation ("SCC"). The AprizeSats communicate with data downlink ground stations in Fairbanks, Alaska (owned and operated by SpaceQuest) and Esrange, Sweden (owned and operated by SCC).

C. Small Space Station Licensing Criteria

Section 25.122 of the Commission's the Commission's rules states that applicants filing under the streamlined rules must certify that they meet certain criteria.[9] The following table identifies the streamlined rules criteria and confirms that the AprizeSats meet the criteria:

47 C.F.R. § 25. 122(c) Criteria	AprizeSat Compliance
(1) The space station(s) will operate only in non-geostationary orbit.	The AprizeSats are deployed sun-synchronous low-Earth orbit.[10]
(2) The total in-orbit lifetime for any individual space station will be six years or less.	The total in-orbit lifetime of the AprizeSats will be more than 6 years and SpaceQuest has requested a waiver of this provision.[11]
(3) The space stations(s): (i) will be deployed at an orbital altitude of 600 km or below; or (ii) will maintain a propulsion system and have the ability to make collision avoidance and deorbit maneuvers using propulsion.	AprizeSat-8 is deployed at 626 km and AprizeSat-10 is deployed at 678 km and SpaceQuest has requested a waiver of this provision.[12]
(4) Each space station will be identifiable by a unique signal-based telemetry marker distinguishing it from other space stations or space objects.	The satellites were not equipped with a signal-based telemetry marker prior to launch, and SpaceQuest has requested a waiver of this provision.
(5) The space station(s) will release no operational debris.	The AprizeSats do not have any debris generation as part of normal operations.[13]
(6) The space station operator has assessed and limited the probability of accidental explosions, including those resulting from the conversion of energy sources on board the space station(s) into energy that fragments the spacecraft.	SpaceQuest has assessed and limited the probability of accidental explosions. The AprizeSats have no on-board fuel, no explosives, or pressure vessels. The only stored energy on board the AprizeSats is

[9] *See Smallsat Order.*

[10] *See* Attachment A, Technical Appendix, § A.4.1.

[11] *See id.*, §§ A.5, A.14.

[12] *See id.*, § A.4.1.

[13] There are no deployment events following launch or during normal operations. Therefore, the lifetime of any released debris is zero (0) years.

	contained in the six nickel cadmium batteries, which are non-explosive.[14]
(7) The probability of a collision between each space station and any other large object (10 centimeters or larger) during the orbital lifetime of the space station is 0.001 or less as calculated using current NASA software or other higher fidelity model.	The probability of a collision is below the required value of 0.001.[15]
(8) The space station(s) will be disposed of post-mission through atmospheric re-entry. The probability of human casualty from portions of the spacecraft surviving re-entry and reaching the surface of the Earth is zero as calculated using current NASA software or higher fidelity models.	The preferred de-orbit method of direct atmospheric re-entry will be implemented. The risk of human casualty is zero as no spacecraft components are expected to survive a direct re-entry.[16]
(9) Operation of the space station(s) will be compatible with existing operations in the authorized frequency band(s). Operations will not materially constrain future space station entrants from using the authorized frequency band(s)	The AprizeSats communicate intermittently with ground stations. Their operations are compatible with and will not materially constrain future entry given coordination is possible using frequency, time, and geographic diversity. The minimum power, bandwidth, and transmission duration necessary for mission data requirements are used.
(10) The space station(s) can be commanded by command originating from the ground to immediately cease transmissions and the licensee will have the capability to eliminate harmful interference when required under the terms of the license or other applicable regulations	The AprizeSats can be commanded to cease all transmissions immediately and go into a listen only mode to await further instructions.[17]
(11) Each space station is 10 cm or larger in its smallest dimension;	The AprizeSats are cubesats measuring 25 cm along each edge.[18]
(12) Each space station will have a mass of 180 kg or less, including any propellant.	The AprizeSats each have a mass of 14.6 kg.[19]

[14] *See* Attachment A, Technical Appendix, § A.14.

[15] *See id.*, § A.14.

[16] *See id.*, § A.14; *see also* Orbital Debris Mitigation Study, ELS File No. 0023-EX-ML-2012 (filed June 28, 2012) ("*ODM Study*") (hereby incorporated by reference).

[17] *See* Attachment A, Technical Appendix, § A.9.

[18] *See ODM Study* (noting the satellite is a 25-cm cube with an aluminum frame structure).

[19] *See id.*, § A.4.1.

Compliance with other Commission rules in this application is further described in the attached regulatory compliance matrix.[20]

D. Spectrum Usage and Sharing Capabilities

Satellite systems operating under the streamlined rules are exempt from the Part 25 processing round and default service requirements.[21] In lieu of the processing round rules, the Commission requires applicants to "(a) certify that operations of its satellites will not interfere with those of existing operators, (b) certify that it will not materially constrain future operators from using the assigned frequency band(s), and (c) provide a brief narrative description illustrating the methods by which both current and future operators will not be materially constrained."[22] SpaceQuest hereby certifies that the operations of the AprizeSats will not interfere with those of existing operators and that it will not materially constrain future operators from using the requested frequency bands.

In the *Smallsat Order*, the Commission provided examples of applications that may satisfy the requirement. Potentially acceptable scenarios include those where the satellite operator possesses "a limited number of earth stations and downlinks during relatively short periods of time, with the ability to effectively schedule transmissions such that future satellite entrants can be accommodated."[23] As detailed below, the AprizeSats activities will not materially constrain current or future co-frequency systems.

The AprizeSats' systems are designed to avoid any harmful interference with other satellite systems and protected terrestrial systems. The AprizeSats' transmitters are operative

[20] *See* Attachment B, Regulatory Compliance Matrix.

[21] *Smallsat Order*, ¶ 80.

[22] *Id.*, ¶ 81.

[23] *Id.*

only when communicating with one of four ground stations worldwide. As noted in the Technical Appendix, the AprizeSats transmit data downlinks to two earth stations (one in the United States and one in Sweden) in the S-band and conduct TT&C communications with three earth stations (all in the United States) in the UHF band.[24] Because the AprizeSats' transmit operations occur only for a limited duration when in line-of-sight of four specific geographic locations, such operations will not constrain either current or future operators. In addition, the AprizeSats have been in orbit for more than seven years and no interference incidents or issues have occurred. Finally, SpaceQuest anticipates that the operational lifetime to be less than five more years, limiting in time any potential constraint to current and future systems.[25]

SpaceQuest will monitor potential satellite interference and will coordinate with other operators if transmissions from the AprizeSats would interfere with other satellite networks. SpaceQuest acknowledges that in certain frequencies it requests authority for non-conforming operations that will continue to be conducted on an unprotected, non-interference basis. Should SpaceQuest become aware of any possible interference by the AprizeSats, it will (i) coordinate with the notifying party to avoid harmful interference; (ii) restrict the AprizeSats' operations as necessary to eliminate harmful interference; and (iii) suspend non-conforming operations as needed to eliminate harmful interference.

SpaceQuest's point of contact for the AprizeSats and associated ground stations for coordination, potential interference, or other issues is Dino Lorenzini, Phone: (703) 424-7803, email: dino@spacequest.com.

[24] *See* Attachment A, Technical Appendix, § A.6.

[25] *See id.*, § A.14.

1. VHF Operations

The AprizeSats' AIS receive operations do not constrain current or future operations in the VHF band given their intermittent use by AIS-equipped vessels. The AprizeSats are equipped with antennas capable of receiving in the 156.5-162.5 MHz band.[26] Sub-bands within that range are allocated for reception by satellites in the mobile-satellite service ("MSS") on a primary basis.[27] To the extent necessary, SpaceQuest is requesting a waiver of the Commission's rules to permit reception of AIS signals by the AprizeSats.

Backup TT&C uplink operations in the 145.9-146.0 MHz amateur band are for emergency control transmissions only and, therefore, it is anticipated that such frequencies will rarely, if ever, be used. A waiver has been requested to permit the limited use of the 145.9-146.0 MHz band for the AprizeSats' backup TT&C operations.

2. UHF Operations

The AprizeSats' will use the 399.9-400.05 MHz band and 400.5-400.65 MHz band for uplink and downlink TT&C operations, respectively. In view of the AprizeSats' AIS/vessel tracking operations, the requested authority for TT&C-only operations is consistent with existing frequency allocations and the AprizeSats will comply with applicable PFD and emission limits.[28] Although, space operations (*i.e.*, TT&C) are permitted in the 400.5-400.65 MHz band on a secondary basis, there is no similar provision for space operations in the 399.9-400.05 MHz band and, therefore, an appropriate waiver has been requested below to ensure necessary operating authority for the AprizeSats.

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[26] AIS uplink operations are described in greater detail in the Technical Appendix. *See* Attachment A, Technical Appendix, § A.6.

[27] *See* 47 C.F.R. § 2.106, footnotes US52, 5.226, 5.228.

[28] *See* 47 C.F.R. § 2.106; *See also* Attachment A, Technical Appendix, §§ A.8, A.11.

SpaceQuest will comply with applicable ITU rules and complete any necessary coordination with Federal operations.[29] Moreover, the AprizeSats will comply with requirements designed to protect meteorological-satellite systems operated by the Department of Defense, as appropriate.[30] The requested authority for TT&C operations is limited in location, bandwidth, and time, and therefore will not exclude other operators from use of the spectrum.

SpaceQuest will also comply with the Commission's requirements to operate on a non-interference basis with respect to other operators in the requested UHF bands. The Commission noted in the *Smallsat Order* that "[w]ith respect to the status of streamlined licensees vis-à-vis regular part 25 licensees, … streamlined small satellites will operate on a non-interference basis relative to regularly-authorized part 25 satellites operating in the same service."[31] SpaceQuest acknowledges that it will operate on a non-interference basis relative to operators authorized via the regular Part 25 process in all subject bands, including the UHF band. As noted above, the AprizeSats otherwise comply with the applicable rules in the band and their limited operations ensure that incumbent systems and services will not experience any adverse impacts, including harmful interference, from the AprizeSats' continued operations.

3. S-Band Operations

The AprizeSats' operations in the 2300-2305 MHz band is for data downlink to a single ground station in Alaska and a single ground station in Sweden. Accordingly, the spectrum sharing impact of the AprizeSats' operations in this band is negligible. SpaceQuest requests a waiver of the Commission's rules below to permit this non-conforming use.

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[29] *See* 47 C.F.R. §§ 25.142, 25.260. A waiver of Section 25.142 is sought below to the extent necessary to authorize the AprizeSats' operations.

[30] *See* 47 C.F.R. §§ 2.106, n.5.264, 25.260.

[31] *Smallsat Order*, ¶ 92.

III. PUBLIC INTEREST CONSIDERATIONS

SpaceQuest recognized early on the potential of smallsat-based AIS technology and pioneered the collection and analysis of raw AIS signals from space in 2007. At its own expense, the company developed smallsat-based AIS technology, data collection payloads, and processing software. Grant of this application will promote the public interest by permitting continued operation of the AprizeSats to support important AIS operations for Federal government and other customers.

Continued access to the AprizeSats' smallsat-based AIS architecture will enable the U.S. government and commercial users to globally track and monitor maritime vessels, including those which may present a threat and those that may be threatened. Enhancing maritime domain awareness enhances national security, safety, economic, and environmental interests. Accordingly, an expeditious grant of this application would strongly serve the public interest.

IV. WAIVER REQUESTS

The Commission may waive any of its rules for "good cause" shown.[32] In general, waiver is appropriate if (i) special circumstances warrant a deviation from the general rule; and (ii) such deviation would better serve the public interest than would strict adherence to the rule.[33] As discussed below, special circumstances justify grant of the requested waivers and grant will not undermine the policy objectives of the rules and otherwise be consistent with the public interest to permit SpaceQuest to continue to operate the AprizeSats.

[32] *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).

[33] *See Northeast Cellular*, 897 F.2d at 1166; *see also WAIT Radio*, 418 F.2d at 1157.

A. Waiver of Certain Certifications in Section 25.122(c)

SpaceQuest seeks a waiver of 47 C.F.R. § 25.122(c) of the Commission's rules to the extent necessary to permit the continued operation of the AprizeSats. Section 25.122(c) requires applicants filing for authorization under the streamlined procedure for small space stations include certifications that certain criteria will be met for all small space stations to be operated under the license.[34] As discussed below, compelling reasons exist to grant necessary waivers in connection with grant of the requested small space station authorization.

1. In-Orbit Lifetime (47 C.F.R. § 25.122(c)(2))

AprizeSat-8 and 10 were launched in November 2013 and June 2014, respectively, well before the Commission's proposed adoption of the *Smallsat Order*. As indicated in SpaceQuest's original application for space station operating authority and incorporated herein by reference, the AprizeSats do not meet the six-year, in-orbit lifetime requirement of Section 25.122(c)(2).[35] Given that the AprizeSats' orbital lifetime characteristics can no longer be changed, a waiver is necessary to permit operations during the remaining operational life of the satellites, which is not expected to extend beyond the 6-year license period.

The orbital debris risk associated with the AprizeSats is minimal given they are two small satellites with a mass of 14.6 kg each (well below the 180 kg limit set by the Commission), consistent with the Commission's intent in the *Smallsat Order*.[36] Moreover, the Commission has already acknowledged the potential for extensions in limited circumstances.[37] The circumstances

[34] *See* 47 C.F.R. § 25.122(c).

[35] *See ODM Study*.

[36] *See Smallsat Order*, ¶¶ 18, 33 (noting that the goal of this rulemaking was to tailor the process for satellites that present a relatively low risk of creating orbital debris).

[37] *See id.*, ¶ 41("We decline to adopt a process for license extensions on a routine basis … but we do not rule out the possibility of license extensions in other limited circumstances outside of the control of the applicant, such as a loss of a satellite due to a launch failure.").

precipitating this waiver are unique as neither the Commission's new orbital debris mitigation rules nor the streamlined small space station rules were in place when the AprizeSats were launched. Given the negligible risk of orbital debris creation and inability to change the parameters of these in-orbit satellites, grant of the requested waiver is fully consistent with the purpose of the rule and the public interest.

2. Orbital Altitude and Propulsion (47 C.F.R. § 25.122(c)(3))

Consistent with the waiver request above, SpaceQuest additionally seeks a waiver of the Commission's orbital altitude limit of 600 km without propulsion. In adopting this requirement, the Commission noted that:

> "[i]n lieu of 400 km, we therefore adopt a deployment certification that is based on the planned orbital lifetime of these small satellites. This will allow the streamlined small satellites to deploy at altitudes up to where it is feasible that they meet the in-orbit lifetime requirement of six years through passive deorbiting—an altitude of roughly up to 600 km[.]"[38]

As discussed above, the AprizeSats are already in orbit and therefore their orbital characteristics cannot be changed. Accordingly, a waiver of the rule is needed to ensure that the AprizeSats may continue to conduct important vessel tracking operations to Federal government and commercial customers.

As with the previous waiver request, waiver of the orbital altitude certification is appropriate and does not undermine the purpose of the rule because the AprizeSats were in orbit and operational well before the small space station rules were established. Likewise, the Commission has already approved the launch and operation of the AprizeSats. Grant of a waiver under these unique circumstances for smallsat that otherwise comply with the *Smallsat Order* would therefore be consistent with the underlying policy of the rule. A waiver would also be

[38] *See id.*, ¶ 44.

consistent with the public interest to ensure continued operations of in-orbit smallsats to conduct important AIS operations.

3. Signal-based Telemetry marker (47 C.F.R. § 25.122(c)(4))

The AprizeSats are not equipped with a signal-based telemetry marker, and therefore a waiver to this certification is necessary for the same reasons described above. The Commission previously waived station identification requirements for the AprizeSats in their Part 5 authorization.[39] Because the AprizeSats are now in orbit and operating, it is not possible to add station identification capabilities and therefore a waiver is appropriate to grant SpaceQuest Part 25 operating authority for these smallsats.

B. U.S. Table of Frequency Allocations (47 C.F.R. § 2.106)

In considering requests for non-conforming spectrum uses, the Commission has indicated that it would generally grant such waivers "when there is little potential for interference into any service authorized under the U.S. Table of Frequency Allocations ("Table of Frequency Allocations") and when the non-conforming operator accepts any interference from authorized services."[40] Compelling reasons exist to grant the requested waivers of the Table of Allocations in connection with this application.

In the *Smallsat Order*, the Commission anticipated applications regarding experimental operations that transition to commercial operations and that "in some instances small satellite license applications may request operations not consistent with the current International Table of

[39] *See AprizeSat Experimental License*, Grant ("The station identification requirements of Section 5.115 of the Commission's Rules are waived").

[40] Fugro-Chance, Inc., *Order and Authorization*, 10 FCC Rcd 2860 ¶ 2 (IB 1995) (authorizing nonconforming MMSS in the C-band); *see also* Motorola Satellite Communications, Inc., *Order and Authorization*, 11 FCC Rcd 13952 ¶ 11 (IB 1996) (authorizing service to fixed terminals in bands allocated to the mobile satellite service); Hughes Network Systems, LLC, *Declaratory Ruling*, 26 FCC Rcd 8521 ¶¶ 12-14, n. 1 (IB 2011); Boeing Company, *Order and Authorization*, 16 FCC Rcd 5864 ¶¶ 8-9, 12 (IB and Office of Engineering and Technology 2001).

Allocations."[41] Indeed the Commission explicitly remarked that "[t]here may be cases where … an operator is using equipment that has been shown to successfully operate on a non-interference basis under a previous experimental license or licenses."[42] The AprizeSats have a demonstrated history of non-interference in their operating bands and SpaceQuest will otherwise comply with applicable rules to ensure operations continue on a non-interference basis. Accordingly, grant of the requested waivers would serve the public interest.

1. Amateur Bands (145.9-146.0 MHz and 2300-2305 MHz)

The 145.9-146.0 MHz (Earth-to-space) band is allocated to the amateur and amateur-satellite service.[43] While the Commission's rules provide that this band is intended for non-commercial operations it is also intended for the "[c]ontinuation and extension of the amateur's proven ability to contribute to the advancement of the radio art."[44] SpaceQuest has operated in this band since 2003 including the entire experimental lifetime of the AprizeSats in order to develop technology tailored to key Federal customers.

Operations in the 145.9-146.0 MHz band would be for backup TT&C only and therefore would only be used in the event that the AprizeSats' UHF TT&C receiver failed. Any operations in this band have not caused harmful interference to incumbent operators and there is no possibility of altering the frequencies used for backup TT&C. Considering the foregoing, a waiver of the rule is appropriate as no harmful interference is likely to occur and therefore the spirit of the rule is fundamentally achieved.

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[41] *Smallsat Order*, ¶ 115.

[42] *Id.*

[43] *See* 47 C.F.R. § 2.106.

[44] *See* 47 C.F.R. § 97.1(b).

Good cause also exists to grant a waiver to provide AIS data downlink in the 2300-2305 MHz frequency band for the same reasons noted above. The 2300-2305 MHz (space-to-Earth) band is allocated to the amateur service, and the allocation does not currently include a satellite allocation. Notwithstanding this allocation, the Commission previously granted SpaceQuest authority to operate in the band on an experimental basis.[45] Considering the operations in the band to date without interference and the limited remaining operational life of the AprizeSats, a waiver to permit continued operations is necessary and appropriate to provide service to federal government and commercial customers.

2. AIS Bands (156.5-162.5 MHz)

To the extent necessary, SpaceQuest respectfully requests a waiver of the Table of Frequency Allocations to permit the requested AIS receive operations. Because SpaceQuest would only receive the signals and would cause no interference to authorized operations in the band, grant of the waiver would not undermine the service allocations in the Table of Frequency Allocations.

3. UHF Bands (399.9-400.05 MHz, 400.5-400.65 MHz)

SpaceQuest also respectfully requests a waiver of Table of Frequency Allocations to permit TT&C operations in the 399.9-400.05 MHz, 400.5-400.65 MHz bands. These bands are allocated to the MSS on a primary basis.[46] A waiver is requested to the extent the Commission determines that the AprizeSats' TT&C operations in the UHF bands are not consistent with Table of Frequency Allocations. Considering the limited use of the band for TT&C is not mutually exclusive with other authorized operations in the UHF bands, the AprizeSats comply with applicable PFD and emission limits, and the AprizeSats will otherwise operate on a non-

[45] *See AprizeSat Experimental License* (granted July 1, 2019).

[46] *See* 47 C.F.R. § 2.106.

protection, non-interference basis, a waiver would not undermine the purposes of the Commission's rules and would further the public interest in authorizing critical AIS services for U.S. government and other customers.

C. Non-Voice, Non-Geostationary MSS Provisions (47 C.F.R. § 25.142)

SpaceQuest seeks a waiver of Section 25.142 to the extent necessary to permit the requested UHF operations.[47] The AprizeSats perform TT&C-only operations in the UHF band and are not providing typical NVNG MSS services. Such TT&C operations are not mutually exclusive with other authorized operations, the AprizeSats comply with applicable PFD and emissions limitations, and the AprizeSats will otherwise operate on a non-protection, non-interference basis. Thus, the use of the UHF band will not impact authorized users and a limited waiver to the extent necessary would not undermine the Commission's rules.

D. Frequency-Use Restrictions (47 C.F.R. § 25.202(a))

Section 25.202(a) of the Commission's rules limits the use of the 399.9-400.05 MHz and 400.15-401 MHz bands by the MSS to non-voice, non-geostationary systems.[48] Out of an abundance of caution, SpaceQuest additionally requests a waiver of this provision, consistent with its waiver of the Table of Frequency Allocations to permit its TT&C-only operations. The AprizeSats operate on a non-harmful interference basis and would otherwise not constrain authorized NVNG MSS systems in the bands. Accordingly, a waiver would not undermine the Commission's rules and is otherwise consistent with the public interest.

[47] *See* 47 C.F.R. § 25.142.

[48] 47 C.F.R. § 25.202(a).

E. TT&C Operations in the UHF Bands (47 C.F.R. § 25.202(g)(1))

Section 25.202(g)(1) anticipates that satellite systems will conduct TT&C operations using spectrum at the edge of or within their assigned bands.[49] The AprizeSats will conduct limited TT&C operations in the 399.9-400.05 MHz and 400.15-401 MHz bands. As described in detail in the requested waiver of the Table of Frequency Allocations, a waiver of Section 25.202(g)(1) is appropriate considering the limited use of the band for TT&C is not mutually exclusive with other authorized operations in the UHF bands, the AprizeSats comply with applicable PFD and emissions limits, and the AprizeSats will otherwise operate on a non-protection, non-interference basis.

In this case, waiver is appropriate due to the operations of the AprizeSats which will only use the UHF bands for limited TT&C operations and are not needed to carry commercial communications typical of space stations in those bands. Thus, there is no authorized band edge at which to conduct TT&C operations in accordance with Section 25.202(g)(1).

V. OTHER MATTERS

A. Maneuverability Design and Operation (47 C.F.R. § 25.122(d)(4))

The AprizeSats are not equipped with active or passive maneuvering capabilities and will deorbit due to atmospheric drag. SpaceQuest has requested an appropriate waiver of the Commission's rules above to the extent necessary to permit operations of the AprizeSats given they have been successfully operating in orbit long before the *Smallsat Order* was contemplated and cannot change their operating characteristics.

[49] 47 C.F.R. § 2.106.

B. Related Commission Authorizations (47 C.F.R. § 25.122(d)(6))

The AprizeSats were issued an experimental radio authorization under Call Sign WD2XFT on June 20, 2019.[50] This license was a renewal of a prior license used in the deployment and operation of the AprizeSats.[51] These licenses were obtained with the intent to operate the AprizeSats on an experimental basis prior to obtaining a commercial license and starting commercial service under the small satellite licensing process. Additionally, SpaceQuest has engaged in experimental operations using several experimental payloads and various ground stations with the AprizeSats.[52]

C. Implementation Milestone and Surety Bond (47 C.F.R. §§ 25.164, 165)

The AprizeSats were launched over 7 years ago and are currently in orbit, therefore the space stations have satisfied the applicable milestone requirements for small space stations.[53] Accordingly, the surety bond obligation under Section 25.165 should be relieved, consistent with the Commission's rules.[54]

D. ITU compliance

The FCC has been the sole administration responsible for operation of the AprizeSats and NTIA was responsible for frequency coordination with Federal government users. Accordingly, International Telecommunication Union ("ITU") Advance Publication Information filings are required for FCC approval of this application. SpaceQuest has prepared the International Telecommunication Union ("ITU") Advance Publication Information submission for the AprizeSats and is contemporaneously providing this information to the Commission under

[50] *See id*.

[51] *See generally* Aprize Satellite Inc., Call Sign WD2XFT (collectively, the "*AprizeSat Licenses*").

[52] *See* SpaceQuest, Ltd., Call signs WA2XYM, WJ2XPE, WJ2XNV.

[53] *See* 47 C.F.R. § 25.164.

[54] *See* 47 C.F.R. § 25.165(d).

separate cover. Consistent with Section 25.111(d) and (e) of the Commission's rules, SpaceQuest has also submitted a declaration of unconditional acceptance of all consequent ITU cost-recovery charges in this application and provided a paper copy of that declaration to the Commission.[55]

VI. CONCLUSION

For the foregoing reasons, and for the reasons set forth in the accompanying materials, SpaceQuest requests that the Commission authorize the AprizeSats for the limited duration of a small satellite license in order to serve key government agencies and commercial entities consistent with the public interest, and to issue such grant expeditiously.

[55] *See* Attachment C, ITU Cost Recovery Letter; *see also* 47 C.F.R. § 25.111(d)-(e).