

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of	)	
	)	
ICEYE US, Inc.	)	ICFS File No. SAT-LOA-20230404-00070
	)	Call Sign: S3165
	)	
Application to deploy and operate space stations	)	
filed under the FCC streamlined small satellite	)	
licensing process, 47 CFR § 25.122	)	

ORDER

Adopted: August 31, 2023

Released: August 31, 2023

By the Chief, Satellite Programs and Policy Division, Space Bureau:

I. INTRODUCTION

1. In this Order, we address the request of Space Exploration Technologies Corp. (SpaceX), filed in an *ex parte* letter, that the Commission impose certain conditions on a license requested by ICEYE US, Inc. (ICEYE) for its second tranche of U.S.-licensed satellites, consisting of up to eight satellites (ICEYE Second Tranche).¹ We grant in part SpaceX's request that we impose conditions on this license, but deny that request insofar as it involves conditions that are not germane to the facts presented in this case. The grant of ICEYE's request for a license to launch and operate eight satellites, the ICEYE Second Tranche, is contained in the attached grant stamp and includes relevant license conditions.

II. BACKGROUND

2. On April 24, 2023, SpaceX filed a letter requesting that certain conditions that have been imposed on SpaceX's license to construct, deploy, and operate up to 7,500 satellites in its Second Generation (Gen2) constellation also be imposed on the ICEYE Second Tranche application.² In support

¹ See *Satellite Licensing Division and Satellite Programs and Policy Division Information, Space Station Applications Accepted for Filing*, Public Notice, Report No. SAT-01738 (June 30, 2023). See also Letter from David Goldman, Senior Director of Satellite Policy, Space Exploration Technologies Corp., to Marlene H. Dortch, Secretary, FCC at 1 (dated Apr. 24, 2023) (SpaceX Letter). This letter was filed two months prior to the start of the public notice period. ICEYE was previously granted a license, pursuant to the Commission's small satellite procedures, to deploy and operate six satellites in non-geostationary satellite orbit, as part of the ICEYE US system. See ICFS File Nos. SAT-LOA-20210212-00021, SAT-AMD-20210831-00119.

² See SpaceX Letter at 1; see also *Space Exploration Holdings, LLC, Request for Orbital Deployment and Operating Authority for the SpaceX Gen2 NGSO Satellite System*, Order and Authorization, FCC 22-91 (2022) (SpaceX Gen2 Order). The SpaceX Letter requests that the FCC impose the following license conditions: (1) file semi-annual reports on collision avoidance maneuvers and satellite disposal, including any difficulties or failures related thereto; (2) apply a new performance-based method for assessing disposal failures that accounts for both the number of failed satellites and their entire passive decay time; (3) take all possible steps to assess and mitigate collision risk after receiving a conjunction warning from the 18th Space Defense Squadron or other source; (4) communicate and

(continued....)

of its request, SpaceX cites concerns raised by the National Aeronautics and Space Administration (NASA) and the National Science Foundation (NSF) in its own licensing proceeding, as well as “space sustainability requirements” from its 7,500 satellite license. SpaceX argues, among other things, that concerns expressed by NASA in connection with the Commission’s orbital debris proceeding suggest that any constellation of 25 or more satellites should be subject to additional debris mitigation requirements.”³ In addition, SpaceX requested that ICEYE clarify that it will maintain station-keeping and active collision avoidance until its satellites are safely below inhabited spacecraft and clarify its total passive decay deorbit time.⁴ ICEYE filed a responsive *ex parte* letter on June 6, 2023.⁵

III. DISCUSSION

3. We conclude that some adoption of conditions analogous to the conditions specified in the SpaceX grant, but suited for the specific and distinct factual scenario presented by the ICEYE satellite system is appropriate in this instance. In the prior license grant to ICEYE for U.S. licensed satellites under the small satellite process, we declined to adopt additional conditions,⁶ but based on the additional operations contemplated under this license, which will become part of the larger ICEYE constellation, we conclude that at this time the adoption of certain additional conditions tailored to the ICEYE operations would serve the public interest. The ICEYE Second Tranche satellites are planned to operate at an altitude of 550 km ($\pm$ 50 km). ICEYE has clarified that its satellites use propulsion, and it will maintain station-keeping and active collision avoidance until its satellites are below inhabited spacecraft.⁷ After the satellites have been brought to decaying orbit below the International Space Station and Chinese space station, the satellites will be disposed of using the atmospheric reentry method, depending solely on atmospheric drag.⁸ Based on this plan, we expect that the ICEYE Second Tranche satellites will be capable of being maneuvered using the propulsion system until the satellites are close to or below 350 km altitude. At that point we expect that the satellites would decay from orbit in a relatively short amount of time. In considering SpaceX’s first generation satellite system, the Commission defined a disposal failure as any case in which control of a satellite is lost at an altitude of 350 kilometers or greater.⁹ Under the circumstances, we adopt a condition that ICEYE report any loss of control of ICEYE Second Tranche satellites at altitudes above 350 km, where it would normally expect that its satellites would have the capability to maneuver using propulsion.¹⁰ Based on the information reported, the license may be subject

(Continued from previous page)

collaborate with NASA to promote space safety and sustainability; and (5) coordinate with NSF to reach a mutually acceptable agreement to mitigate the impact of its satellites on optical ground-based astronomy, with associated annual reporting requirements). SpaceX Letter at 2.

³ *Id.* at 3.

⁴ *Id.* at 1.

⁵ See Letter from Robert S. Koppel, Counsel, ICEYE, to Marlene H. Dortch, Secretary, FCC (dated June 26, 2023) (ICEYE Letter).

⁶ See ICFS File Nos. SAT-LOA-20210212-00021; SAT-AMD-20210831-00119, condition 2 n.11 (granted Mar. 6, 2023).

⁷ ICEYE Letter at 2.

⁸ *Id.*

⁹ As the Commission observed in its authorization of the SpaceX Gen2 system, “SpaceX’s practice of testing its satellites at injection altitude, before orbit-raising, allows it to deorbit any non-functional satellites in a matter of days or weeks, helping to ensure that non-maneuverable satellites do not reach operational orbit.” *Request for Orbital Deployment and Operating Authority for SpaceX Gen2 NGSO Satellite System*, Order and Authorization, FCC 22-91, at 91 (Nov. 29, 2022).

¹⁰ See attached grant stamp at condition 17.

to additional terms and conditions, including additional reporting obligations, limitations on additional deployments, requirements for early removal of satellites from orbit, or any other appropriate conditions to limit collision risk.¹¹ Inclusion of a 100 post-failure object years metric in this instance, as with the Commission's SpaceX's Second Generation grant, identifies a relevant metric where additional Commission action would be necessary before deployment of additional ICEYE Second Tranche satellite following a certain level of failure.

4. We also condition ICEYE to provide information regarding potential conjunction events during the reporting period for its satellites, particularly with respect to any difficulties encountered in the collision avoidance process. We believe that such information can help identify potential issues in operator-to-operator coordination.

5. There have been no concerns raised in this proceeding by NASA, NSF, or any other party except SpaceX regarding the instant application. We are including conditions requiring coordination with NASA, including operator-to-operator coordination of physical operations. Additionally, we condition this grant to require ICEYE to coordinate with NSF as well.¹² We conclude that it is in the public interest for ICEYE to bear the responsibility of ensuring that these coordinations, which are separate from coordination of spectrum use, have been completed with these potentially interested federal agencies.

IV. ORDERING CLAUSES

6. Accordingly, IT IS ORDERED that the ICEYE US, Inc. request for a license to deploy and operate eight satellites is GRANTED,¹³ pursuant to section 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. § 303(r), and sections 0.51 and 0.261 of the Federal Communication Commission's rules, 47 CFR §§ 0.51 and 0.261.

7. IT IS FURTHER ORDERED that petitions for reconsideration under section 1.106 or applications for review under section 1.115 of the Commission's Rules, 47 CFR §§ 1.106 and 1.115, may be filed within 30 days of the date of the public notice of this action taken.

FEDERAL COMMUNICATIONS COMMISSION

Merissa L. Velez
Chief, Satellite Programs and Policy Division
Space Bureau

¹¹ There are potentially material differences between the ICEYE constellation and the Starlink constellation that may warrant differing treatment of the two constellations. These include smaller satellite size, and consequent lower collision risk when comparing non-maneuverable satellites and a smaller number of satellites. There is also no indication that the ICEYE Second Tranche satellites will be "checked out" at lower altitudes, so immediate identification of any issues with effective maneuverability, rather than periodic reporting, is warranted.

¹² See condition 19 in the attached grant stamp.

¹³ See conditions in the attached grant stamp.

ATTACHMENT TO GRANT

ICEYE US, Inc.

ICFS File No. SAT-LOA-20230404-00070

ICFS File No(s):	SAT-LOA-20230404-00070 ¹	GRANTED -- With Conditions  Space Bureau Satellite Programs and Policy Division
Licensee/Grantee:	ICEYE US, Inc. (ICEYE)	
Call Sign:	S3165	
Satellite Name:	ICEYE Second Tranche	
Orbital Location: (required station-keeping tolerance)	Non-geostationary satellite orbit (NGSO), initial deployment to ~550 km altitude (± 50 km), 97.7 degrees inclination (± 1 degree).	
Administration:	United States of America	
Nature of Service:	Earth Exploration Satellite Service (EESS)	
Scope of Grant:	Authority to construct, deploy, and operate eight NGSO satellites. ²	
Service Area(s):	Global, subject to limitations in specific frequency bands.	
Frequencies:	8025-8400 MHz (center frequency 8212.5 MHz, bandwidth 375 MHz; and center frequency 8300.0 MHz, bandwidth 150 MHz) (space-to-Earth) Synthetic Aperture Radar (SAR): 9300-9900 MHz (center frequency 9600 MHz, bandwidth 600 MHz; 9650.0 MHz, bandwidths 150 MHz, 200 MHz, and 300 MHz) (space-to-Earth) Telemetry, Tracking and Command frequencies: 2200-2290 MHz (center frequency 2277.3 MHz, bandwidth 6 MHz) (space-to-Earth) (outside U.S. only)	

¹ The application was placed on public notice on June 30, 2023. *Satellite Licensing Division and Satellite Programs and Policy Division Information, Space Station Applications Accepted for Filing*, Public Notice, Report No. SAT-01738 (June 30, 2023). This proceeding has also been designated as “permit but disclose.” *Satellite Licensing Division and Satellite Programs and Policy Division Information, Space Station Actions Taken*, Public Notice, Report No. SAT-01737 (June 30, 2023); see 47 CFR §§ 1.1200(a), 1.1206 and 1.1208 note 2.

² On April 24, 2023, Space Exploration Technologies Corp. (SpaceX) filed an *ex parte* letter. Letter from David Goldman, Senior Director of Satellite Policy, Space Exploration Technologies Corp., to Marlene H. Dortch, Secretary, FCC (dated Apr. 24, 2023). These issues are fully addressed in the accompanying Order.

	2025-2110 MHz (center frequency 2086.9 MHz, bandwidth 1.2 MHz) (Earth-to-space)
Operations under this grant must comport with the legal and technical specifications set forth by the applicant or petitioner and with the Federal Communications Commission's rules not waived herein. This grant is also subject to the following conditions: 1. ICEYE must timely provide the Commission with the information required for Advance Publication, Coordination, and Notification of the frequency assignment(s) for this constellation, including due diligence information, pursuant to Articles 9 and 11 of the ITU Radio Regulations. This authorization may be modified, without prior notice, consistent with the coordination of the frequency assignment(s) with other Administrations. See 47 CFR § 25.111(b). ICEYE is responsible for all cost-recovery fees associated with the ITU filings. 47 CFR § 25.111(d). 2. ICEYE's request for its application to be processed under the rules for streamlined licensing of small satellites is GRANTED. We find that the operations requested in this application, meet the criteria listed in section 25.122 of the Commission's rules, 47 CFR § 25.122, for streamlined small satellite applicants.³ We conclude that the ICEYE operations are compatible with existing operations in the requested frequency bands and will not materially constrain future space station entrants from using the requested frequency bands.⁴ 3. In connection with the provision of service in any particular country, ICEYE is obliged to comply with the applicable laws, regulations, rules, and licensing procedures of that country. 4. ICEYE is required to successfully coordinate with NTIA prior to submitting any ITU filing involving any ground stations outside of the United States and Possessions (US&P) that operate in the frequency band 2200-2290 MHz. The 2200-2290 MHz band is allocated to Space Operations (space-to-Earth) and EESS (space-to-Earth) in all ITU Regions, but in the United States the band is only allocated for Federal use (except as provided for in 47 CFR section 2.106(c)(96), (303) (footnotes US96 and US303), which are not applicable here). Operations in the 2200-2290 MHz frequency band are permitted for use only outside of the US&P. NTIA will consider the request by ICEYE for access to the 2200-2290 MHz for ground stations located outside of US&P on a case-by-case coordinated basis⁵ with appropriate EMC analysis to NTIA (ravery@ntia.gov), AFSMO (jimmy.nguyen@us.af.mil), NASA (travis.j.ingram@nasa.gov) and DOC (edna.prado@noaa.gov) to ensure compatibility of operations with the Federal government. 5. Operations pursuant to this authorization must not cause harmful interference to stations operating in the 2025-2110 MHz band in accordance with the U.S. Table of Frequency Allocations. See 47 CFR § 2.106(a), (c)(347). 6. Earth station transmissions to the ICEYE Second Tranche space stations in the 2025-2110 MHz band	

³ See 47 CFR § 25.122; *see also* Legal Narrative at 6-7 (specifying compliance with the qualifying criteria in 47 CFR § 25.122(c)).

⁴ See 47 CFR § 25.122(c)(9), (d)(3). Operations in the 8025-8400 MHz (space-to-Earth), 2200-2290 (space-to-Earth), and 2025-2110 (Earth-to-space) frequency bands will be coordinated with Federal operators. ICEYE states that it will share up-to-date orbital characteristics, transmitting windows, and any other information required to ensure ICEYE's successful sharing of spectrum with other services, and that the ICEYE Mission Operations Center will be capable of defining "dark zones" in which the satellites will not transmit. For SAR operations in the 9300-9900 MHz band, the duration of transmissions will be short, with a maximum imaging time for each satellite of 2700 seconds per day. The 3 dB beamwidth of the SAR antenna is 0.4 x 1.0 degree.

⁵ See Appendix A for a list of coordinated earth station locations.

must be coordinated with the SBE (Society of Broadcast Engineers).

7. ICEYE transmissions in the 2025-2110, 2200-2290, and 8025-8400 MHz frequency bands may only be made to/from Federal earth stations or non-Federal earth stations coordinated with the National Aeronautics and Space Administration (NASA), the Air Force Spectrum Management Office (AFSMO), DOC/NOAA, and the Department of the Navy (DON). A list of coordinated non-Federal earth stations is attached in Appendix A. ICEYE shall provide the FCC with an updated list of coordinated non-Federal earth stations within ten business days following any changes to this list.⁶ Use of Federal ground stations shall be coordinated by ICEYE's federal government customers with AFSMO (jimmy.nguyen@us.af.mil), NASA (travis.j.ingram@nasa.gov) and DOC (edna.prado@noaa.gov).
8. Power flux-density limits from operation in the 8025-8400 MHz band must not exceed the limits in No. 22.5 and Table 21-4 of the ITU Radio Regulations, the limits/protection criteria in Recommendation ITU-R SA.1157-1 must be met, and the guidelines in Recommendation ITU-R SA. 1810 must be followed.
9. For ICEYE's 8025-8400 MHz downlink to Inuvik and Svalbard earth stations, transmissions must cease when any of the ICEYE US, Inc. satellites come within a 3-degree conjunction angle of the Suomi-NPP satellite when it is transmitting to its NOAA earth stations in Fairbanks and Svalbard. The conjunction angle is measured from the boresight of the NOAA earth station antenna.
10. For ICEYE's downlink in the 2200-2290 MHz frequency band, ICEYE must limit the duty cycle for transmissions to ICEYE's ground stations to 15% (1 of every 7 passes per satellite per earth station).
11. For ICEYE's downlinks in the 8025-8400 MHz frequency band, ICEYE will limit the duty cycle for transmissions to ICEYE's ground stations to 15% (1 of every 7 passes per satellite per earth station). Additional ICEYE satellites or ground stations will require establishing a Memorandum of Agreement (MOA) with NASA.
12. For the ICEYE's uplink in the 2025-2110 MHz band, ICEYE shall limit the uplink 2086.9 MHz emission power to no more than 14 dBW and shall cease uplink emissions when the International Space Station (ISS), NORAD ID 25544, is within 20° of ICEYE's ground stations antenna boresight.
13. Earth exploration-satellite service (EESS) (active) operations in the 9300-9900 MHz frequency band are allocated on a secondary basis for non-Federal use, and on a primary basis for Federal use in the 9300-9800 MHz band and on a secondary basis for Federal use in the 9800-9900 MHz band in the U.S. Table of Allocations, 47 CFR § 2.106(a). The 9300-9900 MHz band, *inter alia*, is also allocated to the radiolocation service on primary basis for Federal use. Accordingly, ICEYE must accept interference from and not cause interference to any services, including Federal operations, operating on a primary basis in the 9300-9900 MHz band. The 9300-9500 MHz band is allocated on a primary basis to non-Federal radionavigation as well, and ICEYE must accept interference from and not cause interference to that service. The ICEYE satellites SAR operations will transmit a pulsed signal and will only transmit over specific areas of the Earth and for short bursts. The pulse width and repetition frequency of the ICEYE satellite SAR transmission are variable. Additionally, the antenna gain is variable and can be adjusted as required to further mitigate interference.
14. ICEYE must maintain for any satellite in sun synchronous orbit, the LTDNs of 10:00, 13:30, 14:00, 9:00, 10:30, 9:30, and 14:30 time values to not be in-phase with Federal agencies' satellite systems. In the event any changes to the LTDN are required, ICEYE must coordinate in advance with DOC/NOAA, AFSMO, and NASA, and upon completion of the coordination notify the FCC of the update within five business days.

⁶ See Exh. F.

15. ICEYE must coordinate physical operations of spacecraft with any operator using similar orbits, for the purpose of eliminating collision risk and minimizing operational impacts. The orbital parameters specified in this grant are subject to change based on such coordination.
16. Upon receipt of a conjunction warning from the 18th Space Control Squadron or other source, ICEYE must review and take all possible steps to assess the collision risk, and mitigate collision risk if necessary. As appropriate, steps to assess and mitigate should include, but are not limited to: contacting the operator of any active spacecraft involved in such warning; sharing ephemeris data and other appropriate operational information with any such operator; and modifying spacecraft attitude and/or operations.
17. ICEYE must provide a semi-annual report, by January 1 and July 1 each year, covering the preceding six month period, respectively, from June 1 to November 30 and December 1 to May 31. The report should include the following:
 - a. Number of conjunction events identified for any ICEYE system satellites during the reporting period, and the number of events that resulted in an action (maneuver or coordination with another operator), as well as any difficulties encountered in connection with the collision avoidance process and any measures taken to address those difficulties.
 - b. Any loss of control of ICEYE Second Tranche satellites at altitudes above 350 km.

Based on the information reported, the license may be subject to additional terms and conditions, including additional reporting obligations, limitations on additional deployments, requirements for early removal of satellites from orbit, or any other appropriate conditions to limit collision risk. In the event of ICEYE Second Tranche satellite failures resulting in more than 100 post-failure object years, ICEYE may not deploy any additional ICEYE Second Tranche satellites until the Commission has approved a license modification that includes an updated orbital debris mitigation plan addressing reduction in the failure rate or mitigation of the risk of satellite failures.

18. ICEYE must communicate and collaborate with NASA to support safety of both ICEYE and NASA assets and to preserve long-term sustainable space-based communications services. ICEYE must report on the progress of its communications and collaboration efforts to the Commission in its regular reports specified in condition 17, above. ICEYE must coordinate and collaborate with NASA to promote a mutually beneficial space environment that would minimize impacts to NASA's science missions involving astronomy.
19. ICEYE must coordinate with NSF to achieve a mutually acceptable agreement to mitigate the impact of its satellites (call sign S3165) on optical ground-based astronomy. ICEYE must submit an annual report to the Commission, by January 1st each year covering the preceding year (1) describing whether it has reached a coordination agreement with NSF addressing optical astronomy; and (2) any steps ICEYE has taken to reduce the impact of its satellites on optical astronomy. If ICEYE provides a statement in the record that NSF has no concerns within 45 days following arrival of the ICEYE Second Tranche satellites at 550 km, no further reporting will be required.
20. Unless extended by the Commission for good cause shown, this authorization will become null and void in the event the ICEYE Second Tranche space stations are not constructed and launched in accordance with the schedule set forth in section 25.164 of the Commission's rules, as follows:
 - a. In the event that four ICEYE Second Tranche space stations have not been launched, placed into the assigned orbit, and begun operations in accordance with this grant by **August 31, 2024**,⁷

⁷ We note that since this application is being processed under the rules for streamlined licensing of small satellites, the requirement for ICEYE to post a surety bond in accordance with 47 CFR § 25.165(a)(1) & (b) is deferred by one year following the date of grant in accordance with the grace period adopted in FCC 19-81. See 47 CFR 25.165(a).

ICEYE must post a surety bond in satisfaction of 47 CFR §§ 25.165(a)(1) & (b) no later than **September 30, 2024**, thereafter maintain on file a surety bond requiring payment in the event of a default in an amount, at minimum, determined according to the formula set forth in 47 CFR § 25.165(a)(1); and

- b. ICEYE must launch all eight ICEYE Second Tranche space stations, place them into the assigned orbit, and operate the space stations in accordance with this grant no later than **August 31, 2029**. 47 CFR § 25.164(b).

21. The license term is six years and begins at 3 a.m. EST on the date that ICEYE certifies to the Commission that the first ICEYE Second Tranche space station is successfully placed into orbit and the operations fully conform to the terms and conditions of this authorization. ICEYE must also file a certification within five business days of placing the each of the ICEYE Second Tranche space stations into operation.

Licensee/grantee is afforded thirty (30) days from the date of release of this action to decline the grant as conditioned. Failure to respond within this period will constitute formal acceptance of the grant as conditioned.

This action is taken pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 CFR § 0.261, and is effective upon release.

Station licenses are subject to the conditions specified in Section 309(h) of the Communications Act of 1934, as amended, 47 U.S.C. § 309(h).

Action Date:	August 31, 2023	
Term Dates	From: see conditions	To: see conditions

Approved:

Merissa L. Velez
Chief, Satellite Programs and Policy Division

ATTACHMENT TO GRANT
ICEYE US, Inc.
ICFS File No. SAT-LOA-20230404-00070

Appendix A:
Earth Station Locations¹
Coordinated with Federal Agencies

1. Svalbard, Norway
2. TrollSat, Antarctica
3. Hartebeesthoek, South Africa
4. Arwaua, New Zealand
5. Punta Arenas, Chile
6. Puertollano, Spain
7. Mingenew, West Australia
8. Inuvik, Canada
9. Stockholm, Sweden
10. Dublin, Ireland
11. Guildford, United Kingdom
12. Athens, Greece
13. Bahrain
14. Accra, Ghana
15. Seoul, South Korea
16. Jeju Island, South Korea
17. Cape Town, South Africa
18. Alice Springs, Australia
19. Sydney, Australia
20. Cordoba, Argentina
21. Hawaii, United States
22. Oregon, United States
23. Ohio, United States
24. Georgia, United States
25. California, United States

¹ See Exh. F.