Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Thales Avionics Inc.	)	File No.: SES-STA-_____
	)	
Application for a 30-day Special	)	
Temporary Authorization To Operate	)	
Earth Stations Aboard Aircraft	)	
in Ka-band Frequencies	)	

REQUEST FOR SPECIAL TEMPORARY AUTHORIZATION

By this application, Thales Avionics, Inc. ("Thales"), pursuant to Section 25.120 of the Commission's rules, 47 C.F.R. § 25.120, respectfully seeks a 30-day special temporary authorization ("STA") to operate its Advance Connectivity Terminal ("ACT-A") – a previously authorized Ka-band earth station aboard aircraft ("ESAA") terminal[1] – using the ThinKom KA2517 antenna, to communicate with the SES-17 satellite in permissible Ka-band frequencies, commencing on or before June 17, 2022.[2]

Thales is concurrently filing an application for ESAA blanket license authority for the identical operations. As discussed below, the STA is needed to permit essential ESAA test operations with the SES-17 satellite before long-term commercial operations commence and as a result of certain administrative circumstances that affected Thales's

[1] ESAAs are included in a broader category of satellite mobility terminals called earth stations in motion ("ESIMs") and governed by Section 25.228 of the FCC's rules, 47 C.F.R. § 25.228.

[2] As described more fully herein, Thales seeks to operate in all conventional Ka-band frequencies except the 29.25-29.3 GHz and 28.35-28.6 GHz uplink sub-bands. In addition, Thales seeks to operate in three additional Ka-band downlink (receive) bands: 17.8-18.3 GHz, 19.3-19.4 GHz, and 19.6-19.7 GHz, in which ESIM operations are allowed on an unprotected basis. *See* 47 C.F.R. § 2.106, footnote NG527A and 47 C.F.R. § 25.202(a)(10(i); *see also* Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service and Facilitating the Communications of Earth Stations in Motion with Non-Geostationary Orbit Space Stations, *Second Report and Order in IB Docket No. 17-95 and Report and Order in IB Docket No. 18-315 and Further Notice of Proposed Rulemaking*, FCC 20-66 (rel. May 14, 2020) at ¶¶13-15.

ability to request alternative authority consistent with the SES-17 integration schedule. Grant of this STA application by the Federal Communications Commission ("FCC" or "Commission") will enable Thales to optimize ESAA communications with the SES-17 satellite in advance of anticipated blanket license authority and is therefore consistent with the public interest.

I. DISCUSSION

Thales is a global leader in providing in-flight entertainment ("IFE") and high-speed Internet in-flight connectivity ("IFC") services to commercial airlines and their passengers and crews. Thales holds blanket license authority to operate multiple ESAAs (including the ACT-A terminal) in bands identified herein, and its qualifications as an ESAA licensee and network operator are well known to the FCC.[3]

The proposed Ka-band ESAA uplink operations comply fully with Section 25.218's off-axis EIRP levels for operation with Ka-band geostationary orbit ("GSO") fixed-satellite service ("FSS") satellites, Section 25.228's provisions governing ESAA operations, and operational conditions in the license previously granted to Thales for the ACT-A terminal.[4] Other than the use of additional Ka-band downlink frequencies and the single satellite point of communication (including associated gateway earth stations

[3] *See* Thales Avionics, Inc., IBFS File Number: SES-LIC-20170217-00183, Call Sign E170068 (July 7, 2017) and subsequent filings and modifications ("*ESAA Blanket License")*; *see also* Thales Avionics, Inc., IBFS File No. SES-MOD-20200818-00888, Call Sign E170068 ("*ACT-A Modification*").

[4] Out of an abundance of caution, Thales incorporates by reference the technical information regarding the ACT-A ESAA terminal previously provided to the Commission. *See generally ACT-A Modification*, Technical Narrative (dated Aug. 18, 2020). Where appropriate, Thales refers to the *ACT-A Modification* Technical Narrative for additional information supporting this application.

and service area), the technical and operational characteristics are essentially the same as ACT-A terminal operations previously authorized by the Commission.[5]

The FCC has authorized the SES-17 satellite located at 67.1° W.L. to serve the U.S. market using Ka-band frequencies, including those requested herein.[6] Thales's proposed ESAA operations are fully consistent with the FCC's rules and the operating characteristics authorized by the FCC and coordinated for the SES-17 satellite. Thales also notes that the operating parameters proposed herein, particularly compliance with applicable off-axis EIRP limits, apply regardless of the location of an equipped aircraft (*i.e.*, both within and outside U.S. airspace).[7]

In addition to the ACT-A terminal, equipped aircraft will have both an in-cabin Wi-Fi LAN (for personal electronic devices) and a wired LAN (for seatback screens). Passengers will be offered IFC at various service levels and will initiate a billing transaction that occurs between the aircraft and the ground via the satellite links. Once the purchase has been confirmed, connectivity sessions to/from the public internet will commence via the aircraft LAN, satellite WAN, and terrestrial WAN segments. IFC services for airline and crew use will also be provided.

Authorizing the Thales ACT-A terminal to operate with SES-17 in the requested Ka-band frequencies proposed will enable near-term ESAA integration and test

[5] Thales notes that the attached FCC Form 312, Schedule B associated with the proposed operations includes adjustments to its emissions/emission designators and a .5 dB increase in maximum EIRP spectral density, but the ESAA operations remain compliant with Section 25.218 limits.

[6] *See* SES-17 S.a.r.l., IBFS File No. SAT-PDR-20190305-00014, Call Sign S3043 (May 8, 2020).

[7] To the extent its ESAAs overfly the territory of foreign nations, Thales will comply with the laws and regulations of such overflown nations governing ESAA operations.

operations. It also will facilitate new connectivity and coverage options in the Americas and Atlantic Ocean region to meet passengers' increasing demand for reliable robust, high-speed IFC while also providing access to critical, real-time data streams from in-flight aircraft to help improve operational efficiencies.

Thales is filing this STA request and the associated ESAA blanket license application after consultation with the Commission staff and as a result of certain administrative delays associated with application filing limitations in the International Bureau Filing System ("IBFS"). Specifically, IBFS's inability to process multiple license modification applications, along with certain procedural developments that have delayed anticipated modification of Thales's existing ESAA blanket license Call Sign E170068, necessitate pursuing separate FCC authority to facilitate integration of SES-17 into the Thales ESAA network.

Thales has specifically identified a subset of Ka-band frequencies for the authorization that, based on its experience as a Ka-band ESAA licensee, avoids the potential for harmful interference to other authorized systems and services. In all requested uplink bands, GSO FSS and associated ESAA operations are primary.[8] In the downlink bands, the proposed operations are either primary (in conventional Ka-band frequencies) or secondary to the fixed service and Federal FSS (where Thales will accept interference from authorized primary services). Importantly, SES has been authorized to operate in the proposed downlink bands, complies with requirements to protect terrestrial services, has completed coordination with Federal FSS systems as required by footnote US334 in the U.S. Table of Frequency Allocations, and will conduct operations in accordance with such coordination.

[8] *See* 47 C.F.R. § 2.106, footnote NG527A.

In addition, as described more fully in the attached Technical Description, the proposed ESAA operations are fully consistent with the Commission's rules. Thus, the proposed operations pose no potential for harmful interference to other spectrum users.

II. CONCLUSION

The FCC has previously authorized ACT-A terminal operations and the SES-17 satellite to serve the U.S. market. The operations proposed herein are consistent with the Commission's rules and this prior authority. The requested STA also would allow Thales to test and confirm operations in certain conventional Ka-band frequencies in advance of the full introduction of this service. Thus, grant of the requested STA commencing on or before June 17, 2022, would serve the public interest, convenience, and necessity.

Thales Avionics, Inc.

Ka-band Earth Station Aboard Aircraft (ESAA)
Special Temporary Authority

Technical Description

May 20, 2022

Table of Contents

1 Introduction

Thales Avionics, Inc. (Thales) seeks a 30-day Special Temporary Authorization (STA) for its earth stations aboard aircraft (ESAA)s to communicate with the SES-17 satellite located at 67.1° W.L. using conventional Ka-band uplink and downlink frequencies, along with additional Ka-band downlink frequencies. Thales Avionics currently has a blanket license to operate Ka-band ESAAs with other satellites to provide in-flight connectivity (IFC) services in CONUS, most of Canada, and portions of Mexico and the Caribbean region, and has requested ESAA blanket authority to supplement existing operations and make them more efficient and cost-effective for Thales and its customers. The instant STA application will allow Thales to test operations between SES-17 and its ESAA terminals.

2 System Description

2.1 Operation in Ka-Band Spectrum

Thales seeks authority for its ESAAs to operate with SES-17 at the 67.1°W.L. orbit location in the following portions of the Ka-band:

Frequency band	Status
17.8-18.3 GHz downlink	Secondary to FS
18.3-18.8 GHz downlink	Primary FSS
19.3-19.4 GHz downlink	Secondary to FS and Federal FSS
19.6-19.7 GHz downlink	Secondary to FS and Federal FSS
19.7-20.2 GHz downlink	Primary FSS
29.3-30.0 GHz uplink	Primary FSS

Table 1: Ka-band (ACT-A) Specifications

In each band, Thales's proposed operations will be in conformance with applicable FCC rules. In the downlink bands where non-Federal FSS is secondary to the FS and Federal FSS, Thales will accept interference from authorized primary services. SES has completed coordination with Federal FSS as required by footnote US334 in the U.S. Table of Frequency Allocations and operations will be conducted in accordance with such coordination.

2.2 Network Architecture

Thales's ESAA network operations will utilize the SES-17 satellite, associated gateway earth stations, and the Hughes Jupiter platform baseband hub equipment, which will communicate with Hughes Jupiter aero modems on the aircraft. A high-level network architecture diagram is shown below in Figure 1. This architecture is very similar to that provided in Thales's prior license application with the FCC.

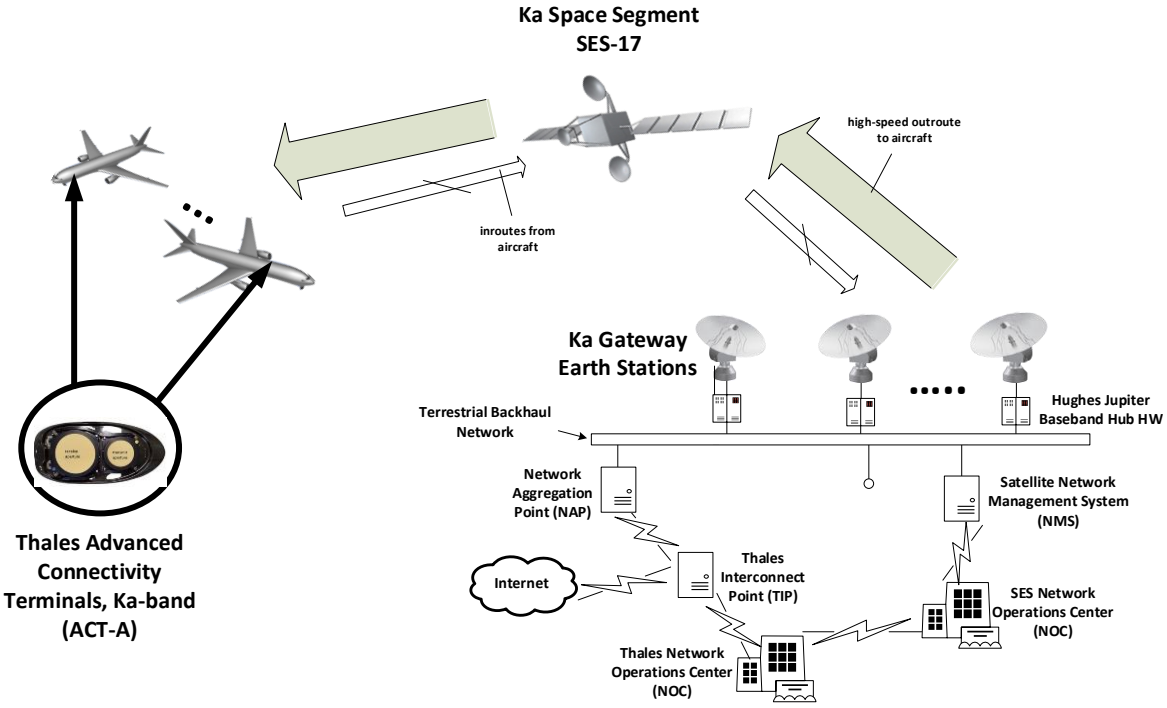

Figure 1: Thales Aero Connectivity Network Architecture

The network is comprised of:

- a terrestrial IP backhaul network interconnecting the controlling Ka-band earth station gateways and connecting the baseband hubs to the Virginia-based Network Aggregation Point (NAP) and Thales Interconnect Point (TIP);
- Ka-band space segment on SES-17; and
- Thales Ka-band ESAAs, known as the Advanced Connectivity Terminals, Ka-band (ACT-A) including the ThinKom KA2517 antenna and Hughes Jupiter aero modem, installed on commercial aircraft.

The SES Network Operations Center (NOC) in Bristow, VA remains the primary NOC for the network. The SES NOC also provides the Thales NOC in Orlando, FL with data that Thales requires to deliver and manage the overall service.

2.3 ESAA Segment Details

The operational details and specifications of the Thales ACT-A (ESAA) have previously been approved by the Commission,[1] are incorporated by reference in this application, and are summarized below for convenience.

The Thales ACT-A terminal consists of:

- ThinKom Ka2517 antenna
- RF/IF Unit (KRFU)
- Antenna Control Unit (KANDU)
- Thales Modem Manager (TMM)

The ThinKom Ka2517 antenna is an array of 2 flat circular apertures, one for transmitting Ka-band signals and one for receiving, as shown in Figure 2 below:

Figure 2: Thales Aero Connectivity Network Architecture

Each aperture is made up of concentric, motorized rotating plates that steer the beams. The apertures transmit and receive switchable circularly polarized signals.

At all times, Thales will monitor and have control of the transmission parameters of all Thales ESAAs operating in the network, including the ability to remotely disable terminals in the event of harmful interference.

[1] *See* Thales Avionics, Inc., IBFS File No. SES-MOD-20200818-00888, Call Sign E170068 at Technical Narrative.

The ESAA specifications are provided in Table 2 below.

Tx RF Parameter	**Performance (w/ Radome)**
Frequencies	29.3 GHz – 30.0 GHz
Antenna Coverage	360° in azimuth, 10-85° in elevation
Instantaneous Bandwidth	500 MHz
Axial Ratio (w/ Radome)	<2.5 dB typical (<29 dBW X-pol EIRP)
Polarization	Circular Switchable
EIRP (@29.5 GHz) typical (Assumes 2.5 dB SSPB-to-TX feed and interconnecting wave guide loss)	49.0 dBW (Plin, 85° elev)
	49.0 dBW (Plin, 70° elev)
	48.0 dBW (Plin, 45° elev)
	46.0 dBW (Plin, 30° elev)
	44.5 dBW (Plin, 20° elev)
	42.0 dBW (Plin, 10° elev)
KRFU Output Flange Power	25 W (Plin), 50 W (Psat)
KRFU Reference Signal	50 MHz
IF Input Frequency Range	950 – 1950 MHz
Beamwidth (@29.5 GHz)	<1.8° in ϕ
Sidelobe Suppression	1st E-Plane Sidelobe at least 12dB down from beam

Rx RF Parameter	**Performance (w/ Radome @ Cruise Altitude)**
Frequencies	17.8 GHz – 20.2 GHz
Antenna Coverage	360° in azimuth, 10-85° in elevation
Instantaneous Bandwidth	500 MHz (-1 dB DVB-S2)
Axial Ratio	<2.5 dB typical
Polarization	Circular Switchable
G/T (@19.7 GHz) typical	17.0 dB/K (85° elev)
	17.0 dB/K (70° elev)
	16.0 dB/K (45° elev)
	14.0 dB/K (30° elev)
	12.5 dB/K (20° elev)
	10.0 dB/K (10° elev)
LNB Reference Signal	50 MHz
IF Output Frequency Range	950 – 1950 MHz
Beamwidth (@19.7 GHz)	<1.8° in ϕ
Sidelobe Suppression	1st E-Plane Sidelobe at least 12dB down from beam peak

Table 2: Ka-band (ACT-A) Specifications

Thales incorporates by reference the radiation hazard analysis submitted for the previously authorized ACT-A ESAA terminal.[2] Thales will continue to comply with FCC license conditions designed to ensure that authorized ESAA operations do not create potential exposure of humans to radiofrequency radiation in excess of the FCC limits.[3]

The ACT-A employs both closed-loop and open-loop pointing control to maintain a pointing accuracy of ≤ 0.2°. The electronics and software that monitor and control sensors and actuators update at a rate that allows detection and action to mute the transmitter within 100 milliseconds when required. This system also contains a frequency-tracking beacon receiver and can utilize Eb/N0 feedback from the modem to optimize operation in a high adjacent satellite interference (ASI) environment.

2.4 Space Segment

Table 3 below provides a list of the spectrum bands for Thales's ESAA operations with SES-17.

Satellite (Call Sign)	Satellite Operator	GSO Orbital Location (W.L.)	Transmit Spectrum (MHz)	Receive Spectrum (MHz)
SES-17 (S3043)	SES	67.1°	29300-30000	*17800-18800, 19300-19400, 19600-20200*

Table 3: Satellite List and Spectrum Details for Thales's ESAA Operations

The FCC has authorized the SES-17 satellite located at 67.1° W.L. to serve the U.S. market using Ka-band frequencies, including those bands requested in the instant application[4] Thales's proposed ESAA operations are fully consistent with the FCC's rules and the operating parameters authorized by the FCC for the SES-17 satellite, as well as the coordinated parameters of the satellite.

Uplink operations throughout the service area will comply with the off-axis EIRP limits set forth in 47 CFR §25.218 through appropriate limits on uplink power based on antenna elevation and skew angle. In this connection, note that the power levels set forth in the attached FCC Form 312 represent best-case, maximum values associated with off-axis EIRP compliance in the SES-17 service area. *See also*, Section 3, below. Downlink operations in the proposed bands will conform to the SES-17 market access grant, applicable U.S. and international regulations, and the coordinated parameters of the satellite.

Figure 3 shows the service area for ESAA operations with SES-17.

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[2] *See* Thales Avionics, Inc., IBFS File No. SES-MOD-20200818-00888, Call Sign E170068, at Technical Narrative, Exhibit D.

[3] *See id.*, Radio Station Authorization, at Condition 90399.

[4] *See* SES-17 S.a.r.l., IBFS File No. SAT-PDR-20190305-00014, Call Sign S3043 (May 8, 2020).

Figure 3: Thales ESAA Service Area with SES-17

2.5 Ground Segment

2.5.1 Remote Control Network Operations Centers (NOCs)

The 24/7/365 network operations center (NOC) functionality is described in Thales's prior ESAA applications and will not change. The SES NOC remains as the primary NOC for this network:

SES Network Operations Center - Manassas
8000 Gainsford Court
Bristow, VA 20136
Tel: +1 703-330-3305, Option 1

The Thales NOC is also responsible for overall management of the service and can be reached at:

Thales Network Operations Center
7415 Emerald Dunes Drive, Suite 2000
Orlando, FL 32822
Tel: +1 407-812-2538
Email: ThalesInFlytNOC@us.thalesgroup.com

At all times the SES NOC and the Thales NOC will monitor and have control of the transmission parameters of all Thales ESAA operating in the network with all satellites, including the ability to remotely disable terminals in the event of harmful interference.

2.5.2 Network Gateway Earth Stations

Thales's service will use various gateway earth stations to communicate with SES-17. Full remote control of the ESAA terminals and the network will be possible from the NOCs. The gateway earth stations are identified below:

Km 1 vía Siberia - Funza Intexzona
Zona Franca Permanente, Lote 66 Municipio de Cota,
Bogota, Colombia
970 Green Valley Road, London, ON Canada N6N 1E3
London, Canada

Calle Buenos Aires Lore 3 4 Y 5, Tolluca C.P 50740 Mexico
Mexico City, Mexico

Estación Longovilo Camino Rapel, km 42
San Pedro, Region Metropolitana Chile
Santiago, Chile

55 Pippy Place, St.Johns-Newfoundland AN-Canada R3T 0P6
St. Johns, Canada

1450 Waverley Street, Winnipeg-Manitoba - Canada R3T 0P6
Winnipeg, Canada

2.6 ACT-A Emission Designators and Power Levels

The general waveforms and capabilities of the return link (inbound/receive) channels and the forward link (outbound/transmit) channels are detailed in Thales's current ESAA authorization and supporting materials.[5] Details of the carriers that will be operated on SES-17, which are fully consistent with the EIRP spectral density limits set for in Section 25.218 of the Commission's rules, are shown in Table 4, below, and in the attached FCC Form 312.

Link	Emission Designator	Bandwidth [MHz]	Symbol Rate [Msps]	EIRP SD [dBW/4kHz]	Frequency [MHz]
Forward (Tx)	15M4G7W	15.36	12.29	14.70	29300-30000
Forward (Tx)	10M2G7W	10.24	8.19	16.50	29300-30000
Forward (Tx)	5M12G7W	5.12	4.10	19.50	29300-30000
Return (Rx)	212MG7W	212.10	202.00	N/A	*17800-18800, 19300-19400, 19600-20200*

Table 4: SES-17 Carriers and Carrier EIRP Density Levels

[5] *See* Thales Avionics, Inc., IBFS File No. SES-MOD-20200818-00888, Call Sign E170068, at Technical Narrative.

3 Protection of GSO FSS Systems

Thales intends to operate its ESAA network compliant with FCC rule parts 25.228, 25.218, and 25.220. In particular, the ACT-A terminal will comply with the EIRP special density requirements specified in 25.218(i)(1)-(5) to protect GSO FSS systems.

The Thales system can limit emission power relative to the terminal's elevation and skew angle. For many such positions the terminal can achieve a maximum emission EIRP spectral density of 19.5 dBW/4kHz, which is the highest EIRP spectral density requested in this filing. For other, more extreme, skew and elevation angles, Thales will limit the ESD of the ESAA. Numerous examples of this operational approach for the ACT-A antenna were previously provided to the Commission in the context of its prior grant of authority to Thales to operate this ESAA.[6]

4 Conclusion

The grant of this STA application will serve the public interest by enabling Thales to expand and enhance their ESAA services using the ACT-A terminal which will be utilized by commercial airlines and their passengers and crew, in a manner fully consistent with the FCC rules. Accordingly, Thales respectfully requests FCC grant of this requested STA as expeditiously as possible.

[6] *See* Thales Avionics, Inc., IBFS File No. SES-MOD-20200818-00888, Call Sign E170068, at Technical Narrative, Section 3 (Protection of Other Services).