Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Thales Avionics Inc.	)	Call Sign:
	)	
Application for Ka-band	)	File No.:
Earth Station Aboard Aircraft	)	
Blanket License	)	

ESAA BLANKET LICENSE APPLICATION

By this application, Thales Avionics, Inc. ("Thales") seeks a blanket license to operate its previously authorized Advance Connectivity Terminal (ACT-A), a Ka-band earth station aboard aircraft ("ESAA") terminal,[1] using the ThinKom KA2517 antenna, to communicate with the SES-17 satellite in certain conventional Ka-band frequencies.[2] As discussed below, expeditious grant of this application by the Federal Communications Commission ("FCC" or "Commission") is plainly in the public interest.

I. DISCUSSION

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

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[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] The "conventional Ka-band" is defined as: "[t]he 18.3-18.8 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 28.35-28.6 GHz (Earth-to-space), and 29.25-30.0 GHz (Earth-to-space) frequency bands, which the Commission has designated as primary for GSO FSS operation. (See 47 C.F.R. § 25.103.) At this time, Thales seeks to operate in all of these frequencies except the 29.25-29.3 GHz and 28.35-28.6 GHz (Earth-to-space) sub-bands.

[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*

The proposed ESAA operations in the conventional Ka-band 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 the license previously granted to Thales for the ACT-A terminal.[4] Other than the use of conventional Ka-band frequencies only and the single satellite point of communication (including associated gateway earth stations and service area), the technical and operational characteristics are essentially identical to 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 the conventional Ka-band.[6] 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. 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). To the

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 respectfully refers to the *ACT-A Modification* Technical Description for additional information supporting this application.

[5] Thales notes that the 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).

extent its ESAAs overfly the territory of foreign nations, Thales will comply with the laws and regulation of such overflown nations governing ESAA operations.

Importantly, Thales has specifically identified a subset of conventional Ka-band frequencies for the requested blanket license where GSO FSS and associated ESAA operations are primary[7] and that, based on its experience as a Ka-band ESAA licensee, avoid any potential requirement for coordination with or potential interference to other authorized systems and services. 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.

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 conventional Ka-band frequencies will provide customer airlines with 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

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

streams from in-flight aircraft to help improve operational efficiencies. Accordingly, grant of the requested ESAA blanket license would plainly serve the public interest.

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. In addition, limiting ESAA operations to the subset of conventional Ka-band frequencies identified herein avoids potential claims of coordination or harmful interference that might delay FCC consideration and grant of this application. For all the reasons set forth herein, expeditious grant of the requested ESAA blanket license would serve the public interest, convenience, and necessity.

Thales Avionics, Inc.

Ka-band Earth Station Aboard Aircraft (ESAA) Blanket License Application

Technical Description

May 19, 2022

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1 Introduction

Thales Avionics, Inc. (Thales) seeks an earth station aboard aircraft (ESAA) blanket license to communicate with the SES-17 satellite located at 67.1° W.L. using conventional Ka-band 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. The requested ESAA blanket license will supplement existing operations and make them more efficient and cost-effective for Thales and its customers.

2 System Description

2.1 Operation in Conventional Ka-Band Spectrum

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

Frequency band	Status
18.3-18.8 GHz downlink	Primary GSO FSS
19.7-20.2 GHz downlink	Primary GSO FSS
29.3-30.0 GHz uplink	Primary GSO FSS

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

In each band, Thales's proposed operations will be in conformance with applicable FCC rules.

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.

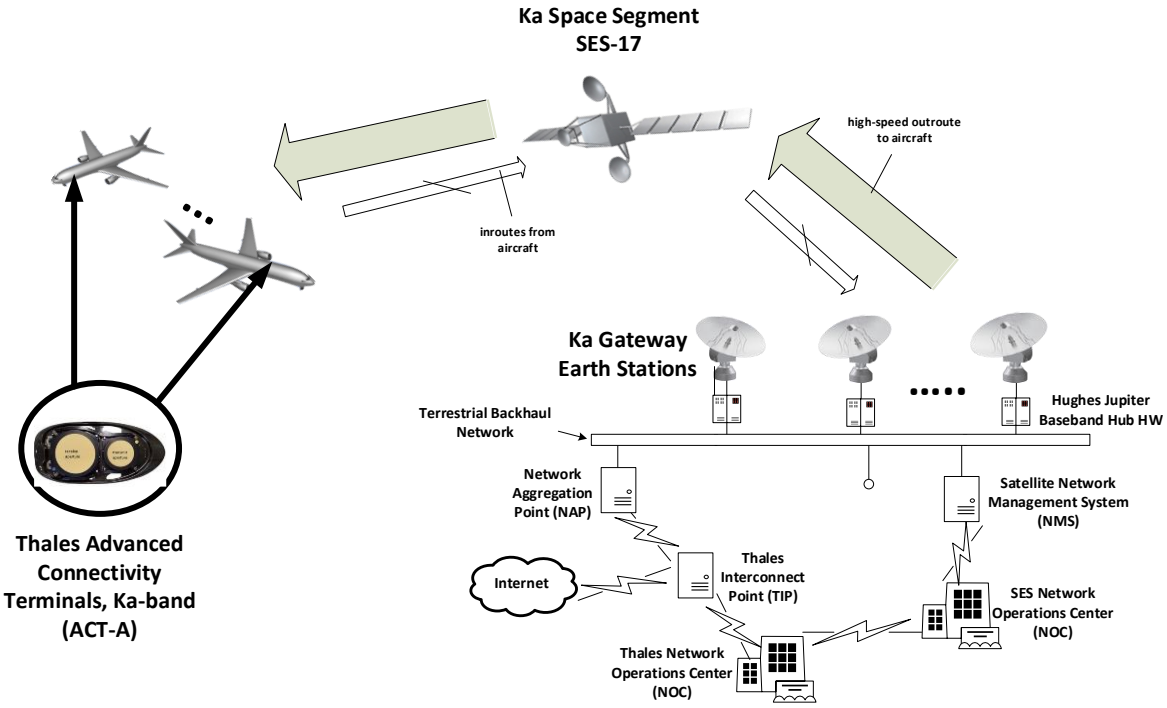

Figure 1: Thales Aero Connectivity Network Architecture

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*	*18300-18800, 19700-20200*

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 the conventional Ka-band.[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.

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 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.

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

[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 ESAAs 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 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	18300-18800, 19700-20200

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. Specifically, 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 12.3 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 license 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 blanket license 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).