Pat Amodio, 1110 W. Hibiscus Blvd., Melbourne, FL 32901,

United States of America
FEDERAL COMMUNICATIONS COMMISSION
EXPERIMENTAL
RADIO STATION CONSTRUCTION PERMIT
AND LICENSE

EXPERIMENTAL	WJ2XSO
(Nature of Service)	(Call Sign)
XT MO	0150-EX-CM-2019
(Class of Station)	(File Number)

NAME Thales Avionics, Inc.

Subject to the provisions of the Communications Act of 1934, subsequent acts, and treaties, and all regulations heretofore or hereafter made by this Commission, and further subject to the conditions and requirements set forth in this license, the licensee hereof is hereby authorized to use and operate the radio transmitting facilities hereinafter described for radio communications in accordance with the program of experimentation described by the licensee in its application for license.

Operation: In accordance with Sec. 5.3(h) of the Commission's Rules

Station Locations

(1) MOBILE: CONUS and US territorial waters
(2) MOBILE: Gulf of Mexico, Atlantic Ocean, Caribbean Sea

Frequency Information

MOBILE: CONUS and US territorial waters

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
27.912-28.128 GHz	MO	5M12G7D	79 W (ERP)	0.00001 %
28.438-28.563 GHz	MO	8M19G7D	53.83 kW (ERP)	0.00001 %
28.438-28.563 GHz	MO	6M14G7D	40.36 kW (ERP)	0.00001 %
29.3-30 GHz	MO	8M19G7D	53.83 kW (ERP)	0.00001 %

This authorization effective July 03, 2019 and
will expire 3:00 A.M. EST October 01, 2020

FEDERAL COMMUNICATIONS COMMISSION

Frequency Information

MOBILE: CONUS and US territorial waters

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
29.3-30 GHz	MO	6M14G7D	40.36 kW (ERP)	0.00001 %

MOBILE: Gulf of Mexico, Atlantic Ocean, Caribbean Sea

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
27.625-27.868 GHz	MO	5M12G7D	79 W (ERP)	0.00001 %
28.438-28.563 GHz	MO	8M19G7D	53.83 kW (ERP)	0.00001 %
28.438-28.563 GHz	MO	6M14G7D	40.36 kW (ERP)	0.00001 %
29.3-30 GHz	MO	8M19G7D	53.83 kW (ERP)	0.00001 %
29.3-30 GHz	MO	6M14G7D	40.36 kW (ERP)	0.00001 %

Special Conditions:

(1) In lieu of frequency tolerance, the occupied bandwidth of the emission shall not extend beyond the band limits set forth above.

(2) Licensee should be aware that other stations may be licensed on these frequencies and if any interference occurs, the licensee of this authorization will be subject to immediate shut down.

(3) Operation is subject to prior coordination with the Fixed Microwave Service licensees around each test site in accordance with 47 CFR, Part 101.103(d).

(4) Stop Buzzers, Martin Matura (phone 321-292-0878) or Thales Network Operations Center (phone 407-812-2538; email MOC@us.thalesgroup.com

(5) Licensee is authorized to conduct tests on 4 units of 0.444 meter ACT-A ka-band antennas on board aircrafts (ESAA).

Special Conditions:

(6) The authorized station's antenna performance specifications do not comply with Sections 25.138(a) and 25.209 of the FCC Rules. The operation of these antennas will not be protected from harmful interference caused by other geostationary satellite networks to the extent that harmful interference would not be expected to be caused to an antenna that is compliant with the antenna performance standards of Section 25.209.

(7) Operations must be in compliance with the applicable ESAA's requirement set forth in Section 25.227 of the Commission's rules.

(8) ESAAs in aircraft on the ground must not transmit at elevation angles less than three degrees. There is no minimum angle of antenna elevation for ESAAs while airborne.

(9) Operation in the territory or airspace of any country other than the United States must comply with the applicable laws, regulations, and licensing procedures of that country, as well as with the conditions of this authorization.

(10) When operating in airspace within line-of-sight of the territory of a foreign administration where Fixed Service networks have an allocation in the 28.438-28.563 GHz or 29. 3-30.0 GHz frequency bands, the ESAAs must not exceed the following EIRP limits:

+64 dBW in any 1 MHz band if Theta is less than or equal to 0°
+64 + 3*Theta dBW in any 1 MHz band if Theta is greater than 0° but less than or equal to 5°

where Theta is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

(11) The licensee shall comply with any pertinent limits established by the International Telecommunication Union to protect other services allocated internationally

(12) Prior to testing/operation, when the ESAA earth stations will transmit in spectrum bands shared with terrestrial operators, Thales Avionics, Inc. must notify the terrestrial operators and complete frequency coordination with terrestrial operators.

(13) Operations must comply with the Sections 25.203 (Choice of sites and frequencies) and 25.277 (Temporary fixed earth station operations) of the Commission's Rules.

(14) In accordance with Article 4.4 of the ITU Radio Regulations, the operations authorized herein shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the ITU Constitution, the ITU Convention, and the ITU Radio Regulations

Special Conditions:

(15) For communication between ESAA stations and GSO satellites, the operations are subject to the following conditions:

a.POINT OF COMMUNICATION: Geostationary-satellite orbit (GSO) Satellites: EchoStar XVII (Jupiter-1) (S2753), Jupiter-2 (S2834), AMC-15 (S2180), AMC-16 (S2181), Thor -7 space station (NORAD ID: 40613)

b.The ESAA stations are authorized to conduct tests via EchoStar XVII satellite at 107.1º WL in the 29.3-30 GHz frequency band.

c.The ESAA stations are authorized to conduct tests via Jupiter-2 satellite at 97.1º WL in the 29.3-30 GHz frequency band.

d.The ESAA stations are authorized to conduct tests via AMC-15 satellite at 105.05º WL and AMSC-16 satellite at 85º WL in the 28.438-28.563 GHz and 29.5-30 GHz frequency bands.

e.The ESAA stations are authorized to conduct tests via Thor -7 satellite at 0.65º WL (owned by Norway's Telenor Satellite Broadcasting) in the 29.5-30 GHz frequency band.

f.Operations between ESSA and Thor -7 satellite are subject to the following additional conditions:

1. Flight test shall be over the North Atlantic Ocean and northeastern Canada.

2. Flight test shall not include U.S. airspace.

3. Beam coverage and tests provided by AMC-16 satellite in the CONUS and US territorial waters will be subjected to handing- off in the transatlantic region to provide continuous coverage without any disruption of connectivity.

4. Operations shall not exceed the 18.4 dBW/1MHz eirp density pursuant to Section 25.138(a)(l) as coordinated with Telenor Satellite operator on Thor-7 satellite and not exceed any other emission designators currently authorized.

5. ESAAs authorized must cease transmissions when the antenna-to-GSO skew angle for antenna model MCT-A exceeds 40° and the off-axis EIRP spectral density emissions risk harmful interference to GSO space station. The ESAA(s) may resume transmissions once the risk of harmful interference has passed.

6. Authorization for operations by U.S.-registered aircraft outside U.S. territory, pursuant to this license does not constitute a grant of access to the market in the United States under the Commission’s DISCO II policies.

7. Communications between Thales ESAAs and Thor-7 must comply with all existing and future space station coordination agreements reached between Canada and other Administrations.

g.Prior to commencement of operations with each satellite pursuant to this experimental license, Thales Avionics, Inc. shall obtain a certification regarding the notification of all satellite operators with co-frequency operations within 6 degrees

Special longitude of each satellite, generally describing the experimental operations authorized herein, including the term thereof, and providing a point of contact for the purpose of resolving any complaints of interference. Thales Avionics, Inc. shall obtain a similar certification if, during the term of this experimental license, any of the satellites move orbit locations, or if a satellite operator commences co-frequency operations within 6 degrees longitude of each of the satellites. If the point of contact receives a complaint of harmful interference, the party receiving the complaint (if not Thales Avionics, Inc.) will notify Thales Avionics, Inc., and Thales Avionics, Inc. shall immediately cease such operations or adjust such operations to avoid harmful interference. Thales Avionics, Inc. will submit a copy of these certification(s) to the Commission for incorporation into the record of this file.

h.The aircraft earth stations (ESAAs) are authorized, on a non-protected and non-harmful interference basis, to transmit to the geostationary-orbit space stations using the 28.438-28.563 GHz and 29.3-30 GHz frequency bands that are authorized by the Commissions. The aircraft earth stations authorized herein must immediately terminate operations upon notification that such operation is causing harmful interference to any other radio system lawfully operating in the 28.438-28.563 GHz and 29.3-30 GHz frequency bands. The aircraft earth stations authorized herein cannot claim protection from harmful interference from any radio system lawfully operating in the 28.438-28.563 GHz and 29.3-30 GHz frequency bands.

i.Operation pursuant to this authorization must be in compliance with the terms of coordination agreements between the proposed operators operating in the 28.438-28.563 GHz and 29.3-30 GHz frequency bands and operators of other Ka-band geostationary space stations within six angular degrees of those space stations. In the event that another GSO FSS space station commences operation in the Ka-band at a location within six degrees of any of these space stations, earth stations operating pursuant to this temporary authority shall cease transmitting to that space station unless and until such operation has been coordinated with the new space station’s operator or Licensee demonstrates that such operation will not cause harmful interference to the new co-frequency space station.

j.Communications between ESAAs and the EchoStar XVII (Jupiter-1), Jupiter-2, AMC-15, and AMC-16 Ka-band geostationary space stations must be in compliance with all existing and future space station coordination agreements reached between the United States and other administrations.

k.Communications between ESAAs and the EchoStar XVII (Jupiter-1), Jupiter-2, AMC-15, AMC-16 Ka-band geostationary space stations must be in compliance with all existing and future space station coordination agreements reached between the EchoStar XVII (Jupiter-1), Jupiter-2, AMC-15, AMC-16 and other NGSO Ka-band satellite operators.

Special Conditions:

(16) For communication between ESAA stations and NGSO satellites, the operations are subject to the following conditions:

a.POINT OF COMMUNICATION: O3b Limited's NGSO (non-geostationary orbit space stations) satellites.

b.The ESAA stations are authorized to conduct tests in CONUS and US territorial waters via O3b Limited's NGSO satellites using the 27.912-28.128 GHz.

c.The ESAA stations are authorized to conduct tests in Gulf of Mexico, Atlantic Ocean, Caribbean Sea via O3b Limited's NGSO satellites using the 27.625-27.868 GHz bands.

d.The O3b "Florida Beam" will be used mainly for stationary tests to be conducted at Thales HQ lab facilities in Melbourne, FL, and for terrestrial-only mobile tests in the Melbourne area using Thales's custom van. In addition, the ACT-A may communicate with the Florida Beam during flight tests.

e.The O3b "San Andres Beam" will be used for flight tests over the Caribbean Sea to allow the ACT-A to test IFC service handovers between GEO (AMC-15) and MEO (O3b) satellites. Flight tests will be conducted using the US-registered, Gulfstream G3 aircraft. Flight tests will operate only in CONUS or above US territorial waters, the Gulf of Mexico, Atlantic Ocean, or Caribbean Sea. The ACT-A will not operate in the airspace or above territorial waters of any foreign country, and all test flights will originate and terminate within CONUS (no takeoffs or landings of the test aircraft will occur in foreign countries).

f.Operations in the 27.625-27.868 GHz and 27.912-28.128 GHz frequency bands must be in compliance with the equivalent power Flux-density limit, EPFD (-162 dBW/m2/40 KHz) in Article 22.5D of the ITU Radio Regulations. (see condition f)

g.The authorized ACT-A antenna is a moving antenna tracking an O3b satellite. The antenna gain data that intersects with the GSO arc is used to determine the gain in the direction of the GSO arc. With the spreading loss, input power spectral density and antenna gain in the direction of the GSO arc, the EPFD can be determined and the EPFD? limits are confirmed in the same way for all pointing directions along the O3b orbit. For the specific emissions 5M12G7D carrier, licensee could not operate at full power (ex. 20 W), and will operate with some amount of output back off. Licensee must, at the least, operate minimum with the minimum output back off required to be compliant with EPFD uplink limits and must be in compliance with the following:

27.912-28.128 GHz	5M12G7D	79W (ERP)	Maximum	21.1 dBW
27.625-27.868 GHz	5M12G7D	79W (ERP)	Maximum	21.1 dBW

a.Operations in the 27.625-27.868 GHz and 27.912-28.128 GHz frequency bands are secondary with respect to Upper Microwave Flexible Use Service (UMFUS) operations, except for FSS operations associated with earth stations authorized pursuant to 47 CFR § 25.136, and will comply with any determinations set forth in the Spectrum Frontiers Proceeding (GN Docket 14-177).

b.Operations in the 27.625-27.868 GHz and 27.912-28.128 GHz frequency bands

Special are on a secondary basis with respect to GSO FSS operations

c.Prior to commencement of operations with each 03b NGSO satellite pursuant to this experimental license, Thales Avionics, Inc. shall obtain a certification regarding the notification of all GSO satellite operators with co-frequency operations within 6 degrees longitude of each satellite, generally describing the experimental operations authorized herein, including the term thereof, and providing a point of contact for the purpose of resolving any complaints of interference. Thales Avionics, Inc. shall obtain a similar certification if, during the term of this experimental license, any of the satellites move orbit locations, or if a satellite operator commences co-frequency operations within 6 degrees longitude of each of the satellites. If the point of contact receives a complaint of harmful interference, the party receiving the complaint (if not Thales Avionics, Inc.) will notify Thales Avionics, Inc., and Thales Avionics, Inc. shall immediately cease such operations or adjust such operations to avoid harmful interference. Thales Avionics, Inc. will submit a copy of these certification(s) to the Commission for incorporation into the record of this file.

d.Operation pursuant to this authorization must be in compliance with the terms of coordination agreements with operators of geostationary orbit Fixed Satellite Service space stations operating in the 27.625-27.868 GHz and 27.912-28.128 GHz frequency bands and operators of other Ka-band geostationary space stations within six angular degrees of those space stations. In the event that another GSO FSS space station commences operation in the Ka-band at a location within six degrees of any of these space stations, earth stations operating pursuant to this temporary authority shall cease transmitting to that space station unless and until such operation has been coordinated with the new space station’s operator or Licensee demonstrates that such operation will not cause harmful interference to the new co-frequency space station.

e.Thales Avionics, Inc. 's ESAA earth stations authorized herein must be in compliance with the terms of coordination agreements with operators of non-geostationary orbit Fixed Satellite Service space stations operating in the 27.625-27.868 GHz and 27.912-28.128 GHz frequency bands. In the event another NGSO system commences operations in the U.S. market in the 27.625-27.868 GHz and 27.912-28.128 GHz frequency bands, ESAA earth stations operating pursuant to this authorization must cease operation unless and until such operation has been coordinated with the new NGSO system operator or O3b Limited demonstrates that such operation will not cause harmful interference to the new NGSO system.

f.Communications between authorized station(s) and the O3b NGSO space stations must comply with all existing and future coordination agreements reached between the United Kingdom and other Administrations, including all coordination agreements reached between the United Kingdom and the United States. In the absence of a coordination agreement, such communications must comply with applicable provisions of ITU Radio Regulations.

g.Communications between authorized station(s) and the O3b NGSO space stations must comply with all existing and future coordination agreements reached between the O3b NGSO and other NGSO Ka-band satellite operators.

Special Conditions:

(17) Licensee's ESAAs must employ a tracking algorithm that is resistant to capturing and tracking adjacent satellite signals, and each station must be capable of inhibiting its own transmission in the event it detects unintended satellite tracking.

(18) Licensee's ESAAs must be monitored and controlled by a ground-based network control and monitoring center. Such stations must be able to receive "enable transmission" and "disable transmission" commands from the network control center and must cease transmission immediately after receiving a "parameter change" command until receiving an "enable transmission" command from the network control center. The network control center must monitor operation of each earth station to determine if it is malfunctioning, and each earth station must self-monitor and automatically cease transmission on detecting an operational fault that could cause harmful interference to a fixed satellite service network.

(19) Licensee must maintain a point of contact available 24 hours per day, seven days per week, with the authority and ability to terminate operations authorized herein, for discussing interference concerns with other licensees, and must submit a letter to be included in its license file with the name and telephone number of the point of contact prior to commencing operation.

(20) The licensee must maintain records of the following data for each operating ESAA: location (latitude, longitude, altitude); aircraft attitude (pitch, yaw, roll); transmit frequency and occupied bandwidth; data rate; EIRP; and target satellite. This data must be recorded at intervals of no more than one minute while an ESAA is transmitting and every 30 seconds when aircraft roll angle is greater than 10 degrees. The licensee must also record instances when ESAA pointing error exceeds 0.2 degrees. The licensee must make this data available upon request to a fixed-satellite service system operator or the Commission within 24 hours after receiving the request.

(21) ESAAs authorized herein must not be used for air traffic control communications.

(22) Operations authorized pursuant to this license are operations by U.S.-registered aircraft anywhere within the coverage area identified in the application and the authorized frequency bands for the satellites listed as points of communication. Operations authorized pursuant to this license also include operations by non-U.S.-registered aircraft within U.S. territory, including territorial waters.

(23) ESAAs must be in compliance with the Federal Aviation Administration (FAA) requirements as set forth in Section 17.4 of the Commission's Rules.

(24) Experimental station shall use the minimum power level necessary to establish communications links to minimize potential interference to licensed users.

(25) This authorization is without prejudice to any determination that the Commission may make regarding pending or future experimental satellite earth station applications.

(26) Operations are on a non-interference basis (NIB) and shall not cause harmful interference to, and shall not claim protection from, interference caused to it by any other lawfully operating station and it shall cease transmission(s) immediately upon notice of such interference and notify the FCC in writing.