

APPLICATION FOR EARTH STATION SPECIAL TEMPORARY AUTHORITY

APPLICANT INFORMATION Enter a description of this application to identify it on the main menu:
Carpentersville TT&C STA for Arabsat-6A - 2019-01 (30-Day STA)

1. Applicant

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Attention:			



File # SES-STA-20190129-00042
E7541 Call Sign Grant Date 2-28-19
(or other identifier)
Term Dates
From: 3-5-19 To: 4-4-19
Approved: [Signature]

2. Contact			
Name:	Ryan N. Terry	Phone Number:	703-413-5747
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City:	Washington	State:	DC
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Attention:		Relationship:	Same
(If your application is related to an application filed with the Commission, enter either the file number or the IB Submission ID of the related application. Please enter only one.)			
3. Reference File Number SESLIC2008110301443 or Submission ID			
4a. Is a fee submitted with this application?			
☒ If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1114).			
☐ Governmental Entity ☐ Noncommercial educational licensee ☐ Other (please explain):			
4b. Fee Classification CGX – Fixed Satellite Transmit/Receive Earth Station			
5. Type Request			
☐ Use Prior to Grant ☐ Change Station Location ☒ Other			
6. Requested Use Prior Date 03/05/2019			
7. City Carpentersville		8. Latitude (dd mm ss.s h) 40 38 39.1 N	

9. State NJ	10. Longitude (dd mm ss.s h) 75 11 27.8 W
11. Please supply any need attachments. Attachment 1: STA	Attachment 2: NASA Coordination Attachment 3:
12. Description. (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.) Lockheed Martin Corporation hereby requests Special Temporary Authority beginning March 5, 2019, to operate its Carpentersville, New Jersey fixed earth station (Call Sign E7541) to provide telemetry, tracking and control (TT&C) functions during the Electric Orbit Raising (EOR) phase of operation for the Arabsat-6A satellite.	
13. By checking Yes, the undersigned certifies that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application"; for these purposes.	
14. Name of Person Signing Jennifer A. Warren	15. Title of Person Signing Vice President, Technology Policy & Regulation
WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).	

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Applicant: Lockheed Martin Corporation
Call Sign: E7541
File No.: SES-STA-20190129-00042
Special Temporary Authority ("STA")

File # SES-STA-20190129-00042
E7541
Call Sign E7541 Grant Date 2-28-19
(or other identifier)
Term Dates
From: 3-5-19 To: 4-4-19
Approved: Paul E. Hader

Lockheed Martin Corporation is granted STA to operate, beginning March 5, 2019, for 30 days, its 14.2m TIW Systems model STD 14.2-MET antenna located at geographic coordinates 40° 38' 39.1"N/ 75° 11' 27.8"W in Carpentersville, New Jersey to provide telemetry, tracking, and command ("TT&C") functions during the electric propulsion monitoring phase of operation for the Arabsat-6A satellite at orbital location 30.5°E on frequencies: 13993.0 MHz, 13995.0 MHz (LHCP/RHCP) (Earth-to-space) and 11198.0 MHz, 11199.0 MHz (LHCP/RHCP) (space-to-Earth). Operations are authorized under the following conditions:

1. Operations will not exceed the operational power levels and parameters requested:

Maximum eirp: 83 dBW
Maximum eirp density: 57.25 dBW/4kHz
Uplink emission: 1M50F2D
Downlink emission: 1M00G8D
Antenna transmit gain: 63.5 dBi@14 GHz

2. All operations under this grant of STA shall be on an unprotected and non-harmful interference basis. Lockheed Martin Corporation shall not cause harmful interference to, and shall not claim protection from interference caused to it by, any other lawfully operating radio communication system.
3. In the event of any harmful interference Lockheed Martin Corporation shall cease operations immediately upon notification of such interference, and shall immediately inform the Commission, in writing, of such an event.
4. Currently the 24x7 contact information for the HS4 satellite mission is as follows: Cell Phone: (609) 865-2658 and/or earth station desk number (908) 859-4050. Request to speak with Michael Usarzewicz.
5. Grant of this STA is without prejudice to any determination that the Commission may make regarding pending or future Lockheed Martin Corporation applications.
6. Any action taken or expense incurred as a result of operations pursuant to this STA is solely at Lockheed Martin Corporation's risk.

This grant is issued pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 C.F.R. § 0.261, and is effective upon release.

Description of Operations and Public Interest Statement

Pursuant to 47 CFR 25.120 of the Commission's Rules, Lockheed Martin Corporation ("Lockheed Martin") hereby requests Special Temporary Authority ("STA") for a period of thirty (30) days to operate its Carpentersville, New Jersey fixed earth station (Call Sign E7541) to provide telemetry, tracking, and control ("TT&C") functions during the Electric Orbit Raising ("EOR") period of operation, ranging, and electric propulsion monitoring for the Arabsat-6A ("AS-6A") satellite, which has been manufactured by Lockheed Martin.

AS-6A is destined for in-service operation at 30.5° E.L., and is currently scheduled for launch in early March 2019, aboard a Falcon Heavy rocket, from Cape Canaveral, Florida. Accordingly, Lockheed Martin requests authority to begin communications on March 5, 2019, in preparation for the start of EOR.¹

1. Requested STA Operations

The EOR TT&C and ranging signals will be transmitted in the Ku-band for which Lockheed Martin already has authority under Call Sign E7541. As to the instant request for STA, Lockheed Martin seeks herein authority to communicate with AS-6A as a point of communication on two extended Ku-band frequencies, which fall outside of the currently authorized Ku-band transmit frequencies for the earth station. In all other respects, operation of the earth station will be consistent with the parameters set forth under the existing permanent authority.

In order to demonstrate compliance with FCC Report and Order 96-377 regarding operations in the extended Ku-band, Lockheed Martin submits herewith an analysis that states that the proposed operations pose no risk of interference either to U.S. Navy shipboard radar operations or to NASA TDRSS links.

The all-electric propulsion system of AS-6A requires extended support for the completion of the mission. Accordingly, Lockheed Martin is requesting that the duration of this STA be a total of thirty (30) days. Further, a request for extension of the instant STA request for an additional one hundred eighty (180) days is being filed concurrently to cover the entire period required to complete EOR and the in-orbit testing being conducted by the launch provider.

Lockheed Martin designates Michael Usarzewicz to be the contact person that will be available whenever transmission to AS-6A is to occur through the subject earth station. Mr. Usarzewicz can be reached at the following phone numbers:

¹ The proposed test transmissions would occur over a period of approximately two to three days. During these tests, the earth station would not be communicating with any satellite; instead, the transmissions will be made with the antenna at zenith to verify RF functionality.

(609) 865-2658 (cellular)
(908) 859-4050 (earth station desk)

2. Grant of the Requested Authority Will Serve the Public Interest

Lockheed Martin believes that the limited operations it proposes in support of the launch of the AS-6A satellite serve the public interest. Lockheed Martin understands that the AS-6A satellite will provide Ku-band and Ka-band communications coverage over the Middle East and North Africa regions, as well as a footprint in South Africa.

Lockheed Martin's Carpentersville earth station will be part of a global network of control and ranging facilities that will be used solely to position the satellite as it progresses from transfer orbit to its final location and to calibrate electric propulsion. No end user service will be provided within the United States at any time. The safe and orderly use of the entire geostationary orbital resource and protection of the hundreds of satellites licensed by the U.S. and other countries that operate there depends in no small part on ensuring that the AS-6A satellite is controlled while over North America en route to its final geostationary orbital position. In this regard, Lockheed Martin's earth station thus will serve a vital function.

* * * * *

Lockheed Martin requests authority to operate its Carpentersville, NJ earth station antenna to provide critical TT&C and ranging services during the EOR mission of the AS-6A satellite, for a term of 30 days, commencing March 5, 2019.

TECHNICAL DETAILS OF SPECIAL TEMPORARY AUTHORITY

Satellite Characteristics

Satellite: Arabsat-6A Electric Orbit Raising
Orbital Location: 30.5° E.L.
Manufacturer: Lockheed Martin Corporation
Launch Vehicle: Falcon Heavy

* * *

Earth Station Characteristics

Antenna: 14.2-m TIW Systems
Antenna Location: 40°38' 39.1" N / 075° 11' 27.8" W
Telecommand Uplink Frequencies:
13993.0 MHz (LHCP/RHCP)
13995.0 MHz (LHCP/RHCP)
Telemetry Downlink Frequencies:
11198.0 MHz (LHCP/RHCP)
11199.0 MHz (LHCP/RHCP)
Antenna Gain: 63.5 dBi @ 14 GHz
Antenna Power: 19.1 dBW (into the flange)
Maximum EIRP: 83.0 dBW for all carriers
EIRP Density: 57.25 dBW/4kHz
Uplink Emission: 1M50F2D
Downlink Emission: 1M00G8D

**Exhibit For
Lockheed Martin Corporation
Carpentersville, New Jersey
TIW 14.2 Meter Earth Station
Call Sign E7541**

**Compliance with FCC Report & Order (FCC96-377) for the 13.75 - 14.0 GHz Band
Analysis and Calculations**

1. Background

This Exhibit is presented to demonstrate the extent to which the Lockheed Martin Corporation satellite earth station, which is operated in Carpentersville, New Jersey, is in compliance with FCC REPORT & ORDER 96-377. The potential interference from the earth station to US Navy shipboard radiolocation operations (RADAR) and the NASA space research activities in the 13.75 - 14.0 GHz Band is addressed in this exhibit. The parameters for the earth station are:

Table 1. Earth Station Characteristics

- Coordinates (NAD83): 40°38' 39.1" N, 75° 11' 27.8" W
- Satellite Location for Earth Station: 30.5° E (Arabsat-6A)
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: Circular and Linear
- Emissions: 1M50F2D
1M00G8D
- Modulation: Digital
- Maximum Aggregate Uplink EIRP: 83.0 dBW for the 1 MHz Carriers
83.0 dBW for the 400 kHz Carriers
- Transmit Antenna Characteristics
 - Antenna Size: 14.2 meters in Diameter
 - Antenna Type/Model: TIW Systems
 - Gain: 63.5 dBi
- RF power into Antenna Flange: 1 MHz
19.1 dBW
or -4.9 dBW/4 kHz (Maximum)

400 kHz
 19.1 dBW
 or -0.9 dBW/4 kHz (Maximum)

- Minimum Elevation Angles:
 Carpentersville, NJ. 18.4° @ 244.5° Az. at 30.5° E
- Side Lobe Antenna Gain: 32 - 25*log(θ)

Because the above uplink spectrum is shared with the Federal Government, coordination in this band requires resolution data pertaining to potential interference between the earth station and both Navy Department and NASA systems. Potential interference from the earth station could impact with the Navy and/or NASA systems in two areas. These areas are noted in FCC Report and Order 96-377 dated September 1996, and consist of (1) Radiolocation and radio navigation, (2) Data Relay Satellites.

Summary of Coordination Issues:

- 1) Potential Impact to Government Radiolocation (Shipboard Radar)
- 2) Potential Impact to NASA Data Relay Satellite Systems (TDRSS)

2. Potential Impact to Government Radiolocation (Shipboard Radar)

Radiolocation operations (RADAR) may occur anywhere in the 13.4 - 14 GHz frequency band aboard ocean going United States Navy ships. The Federal Communication Commission (FCC) order 96-377 allocates the top 250 MHz of this 600 MHz band to the Fixed Satellite Service (FSS) on a co-primary basis with the radiolocation operations and provides for an interference protection level of -167 dBW/m²/4 kHz.

The closest distance to the shoreline from the Carpentersville earth station is approximately 82.0 km Southeast toward the Atlantic Ocean. The calculation of the power spectral density at this distance is given by:

	<u>1 MHz</u>	<u>400 kHz</u>
1. Clear Sky EIRP:	83.0 dBW	83.0 dBW
2. Carrier Bandwidth:	1 MHz	400.0 kHz
3. PD at antenna input: dBW/4 kHz	-4.9	-0.9
4. Transmit Antenna Gain:	63.9 dBi	
5. Antenna Gain Horizon:	FCC Reference Pattern	
6. Antenna Elevation Angles:	18.4°	

The proposed earth station will radiate interference toward the Chesapeake Bay according to its off-axis side-lobe performance. A conservative analysis, using FCC standard reference pattern, results in off-axis antenna gains of -10.0 dBi towards the Atlantic Ocean.

The signal density at the shoreline, through free space is:

1MHz Carriers

PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBW-m²).

$$\begin{aligned} &= -4.9 \text{ dBW/4 kHz} + (-10.0) \text{ dBi} - 10 \cdot \log[4\pi \cdot (82000\text{m})^2] \\ &= -124.1 \text{ dBW/m}^2/4 \text{ kHz} + \text{Additional Path Losses } (\sim 64 \text{ dB}) \\ &= -188.1 \text{ dBW/m}^2/4 \text{ kHz} \end{aligned}$$

400 kHz Carriers

PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBW-m²).

$$\begin{aligned} &= -0.9 \text{ dBW/4 kHz} + (-10.0) \text{ dBi} - 10 \cdot \log[4\pi \cdot (82000\text{m})^2] \\ &= -120.1 \text{ dBW/m}^2/4 \text{ kHz} + \text{Additional Path Losses } (\sim 64 \text{ dB}) \\ &= -184.1 \text{ dBW/m}^2/4 \text{ kHz} \end{aligned}$$

Our calculations show additional path loss of approximately 64 dB including absorption loss and earth diffraction loss for the actual path profiles from the proposed earth station to the nearest shoreline.

The calculated PFD including additional path losses to the closest shoreline location is -184.1 dBW/m²/4 kHz. This is 17.1 dB below the -167 dBW/m²/4 kHz interference criteria of R&O 96-377. Therefore, there should be no interference to the US Navy RADAR from the Carpentersville earth station due to the distance and the terrain blockage between the site and the shore.

3. Potential Impact to NASA's Data Relay Satellite System (TDRSS)

The geographic location of the Lockheed Martin earth station in Carpentersville, New Jersey is outside the 390 km radius coordination contour surrounding NASA's White Sands, New Mexico ground station complex. Therefore, the TDRSS space-to-earth link will not be impacted by the Lockheed Martin earth station in Carpentersville, New Jersey.

The TDRSS space-to-space link in the 13.772 to 13.778 GHz band is assumed to be protected if an earth station produces an EIRP less than 71 dBW/6 MHz in this band. The 14.2 meter earth station antenna will have an EIRP greater than 71 dBW/6 MHz for both the 1 MHz and 400 kHz carriers in this band. Therefore, the Carpentersville, New Jersey earth station may not be tuned to operate on frequencies in the 13.772 to 13.778 GHz band.

4. Coordination Issue Result Summary and Conclusions

The results of the analysis and calculations performed in this exhibit indicate that compatible operations between the earth station at the Carpentersville facility and the US Navy and NASA systems space-to-earth link. The Carpentersville facility will not transmit in the NASA systems space-to-space link (13772.0 to 13778.0 MHz) therefore avoiding conflict with this system.