COMMENCEMENT OF OPERATION DATE OF NOVEMBER 1, 2009 REQUESTED

Exhibit A

FCC Form 442
Northrop Grumman Space & Mission Systems Corp.
Question 7
September 2009

DESCRIPTION OF PROGRAM OF EXPERIMENTATION

In this application, Northrop Grumman Space & Mission Systems Corporation ("NGAS") seeks authority to operate a transmit/receive earth station with a non-U.S.-licensed satellite as part of a demonstration program. The spacecraft in question is an Israeli non-geostationary satellite orbit ("non-GSO") spacecraft called "TECSAR" which was launched in January 2008 and is currently operational in the earth exploration-satellite service ("EESS"). TECSAR uses the 8025-8400 MHz band for its EESS space-to-Earth transmissions, and uses the band 2225-2295 MHz for its telemetry transmissions. NGAS will be making uplink transmissions to the TECSAR satellite for payload tasking to request the specific imaging tasks in the space operations band at 2025-2095 MHz.

NGAS intends to use a single set of earth station equipment that would be installed and operated over the proposed two-year license term from specified locations in Redondo Beach, CA, Chantilly, VA, and Tampa FL. With but a single set of earth station equipment, only one of these locations would be in operation at any given time.

Background

Since early this year, NGAS has been conducting a series of demonstrations of the TECSAR satellite's EESS capabilities for potential Federal Government customers using receive-only earth stations authorized by the Commission's International Bureau under special temporary authorization. Operations were conducted in Irving, TX (File No. SES-STA-20090212-00173), Key West, FL (File No. SES-STA-20090212-00175), and Redondo Beach, CA (File No. SES-STA-20090212-00172). NGAS currently has temporary authority from the International Bureau to conduct receive-only operations at sites in Chantilly, VA (File No. SES-STA-20090716-00870), and Tampa, FL (File No. SES-STA-20090617-00765).

NGAS's demonstration program is designed to ascertain the capabilities and image quality of the TECSAR EESS satellite system, with a view to determining whether the satellite or similar space station capacity can fulfill existing and future Federal Government requirements for reliable EESS systems. The demonstrations were designed to form the possible basis of a future program to use similar satellites for the provision of EESS in and/or by the United States in satisfaction of important national requirements and objectives.

While the receive-only demonstrations remain in progress for the next few months, NGAS has had sufficient success with the effort to move the demonstrations to a new phase. In particular, NGAS is preparing to demonstrate and assess the ability of U.S.-based earth stations

to send payload tasking commands to spacecraft of the TECSAR design for requesting the specific imaging tasks.

Technical Information

The TECSAR satellite is a low-Earth orbit satellite, with an apogee altitude of 580 kilometers and a perigee altitude of 450 km, and inclination angle of 41 degrees. The average satellite duration viewed from any single earth station is about 10 minutes. The percentage of time when the satellite is in view of a particular earth station is approximately 5%.

As the TECSAR satellite is being operated by Israel Aircraft Industries, Ltd ("IAI") for a mission portfolio that extends beyond the limited use NGAS is proposing here, NGAS has not been granted access to several categories of information that would ordinarily be provided to the Commission by an earth station applicant that seeks authority to access a non-U.S.-licensed spacecraft. Nevertheless, NGAS has endeavored to gather as much of the technical information normally collected from applicants for earth stations that propose to access non-U.S. licensed space stations as it could.

Annex 1 to this exhibit contains the transmission and orbital parameters of TECSAR as the satellite overflies the United States. Annex 1A includes the parameters used for EESS (space-to-Earth) transmissions in the X-band frequencies at 8025-8400 MHz, and Annex 1B includes the parameters for the TECSAR TT&C system. As shown in Annex 1A, the TECSAR satellite transmissions are within the applicable power flux-density limits for the 8025-8400 MHz band, as established in Article 21 of the International Telecommunication Union ("ITU") Radio Regulations and Section 8.36 of the National Telecommunications and Information Administration Manual of Regulations and Procedures for Federal Radio Frequency Management (May 2003 ed., Sept. 2006 Revision). Moreover, the operation of the TECSAR satellite with a narrow EESS spot beam antenna in the manner described in this application will not interfere with the operations of the National Aeronautics and Space Administration's Deep Space Network ("DSN") earth station located in Goldstone, California.

Annex 2 to this exhibit contains the proposed earth station antenna parameters NGAS will use. Annex 2A shows the parameters for the receive antenna that will be used for EESS signals in the 8025-8400 MHz band. These signals are identical to those authorized under the International Bureau receive-only STAs noted above. Annex 2B shows the parameters for the payload tasking command transmissions NGAS proposes to conduct at 2025-2095 MHz. Specifically, these transmissions will take place on either 2085 MHz or 2090 MHz. Annex 2B also shows that the proposed NGAS earth station will receive telemetry transmissions from the satellite on either 2285 MHz or 2290 MHz. A link budget for the TT&C transmit/receive functions is shown in Table 2-1 following Annex 2B. Further technical details are included in the Form 442 application to which this Exhibit is attached.

Over the course of the proposed two-year license term, NGAS will conduct demonstrations of the transmit/receive earth station capabilities from the three locations listed in Annex 2B. **NGAS reiterates that only one set of earth station equipment is proposed in the instant application. That equipment will be assembled and used, in turn, at each of the**

sites. This means that there will be only one set of transmissions/receptions at any given time; simultaneous operation from the three sites will not occur under this authorization.

To the extent that it has been able to do so, NGAS has endeavored to locate its earth stations at sites where directed transmissions from TECSAR in the 8025-8400 MHz EESS band will not interfere with any authorized EESS systems operating on those frequencies in the United States. The same is true for the proposed TT&C transmissions/receptions in the 2025-2095 MHz segment of the 2025-2110 MHz band, and in the 2225-2295 MHz band. NGAS will coordinate its proposed operations to and from TECSAR with potentially affected operators to the maximum extent practicable. NGAS recognizes and accepts that that any transmissions between TECSAR and the NGAS earth station will be made on a strictly non-harmful interference/non-protected basis with respect to authorized users of the spectrum in which TECSAR operates.

NGAS provides a radiation hazard assessment for the proposed earth station transmissions in Annex 3 to this exhibit.

Orbital Debris Mitigation and Post-Mission Disposal

The TECSAR EESS satellite was launched on January 21, 2008, and is designed to reenter the Earth's atmosphere in less than 25 years. In April 2007, NGAS and IAI established an exclusive teaming agreement to provide the U.S. Government with a responsive, cost-effective, space-based SAR capability based on IAI's TECSAR EESS satellite. NGAS is currently evaluating the quality of the TECSAR EESS satellite, including the 8025-8400 MHz downlink through the establishment of a ground terminal segment consisting of a receive-only earth terminal, demodulators, and an image processor. The next phase of evaluation will extend to the TT&C subsystems in the 2025-2095 MHz band (command uplinks for payload tasking) and 2225-2295 MHz band (telemetry downlinks).

Prior to initially requesting STAs from the FCC last year to operate receive-only EESS-band terminals from several locations as part of the TECSAR demonstration program, NGAS requested information from IAI regarding details of IAI's plan for orbital debris mitigation and post-mission disposal of the TECSAR satellite. IAI/TECSAR was not prepared to disclose the details of its orbital debris mitigation strategy and post–mission disposal plans for TECSAR with NGAS at that time. In the 2008 STA requests, however, NGAS reported that IAI had informed it that IAI had developed orbital debris mitigation plans and post-mission disposal procedures for TECSAR that are consistent with standard industry practices designed to ensure that all system space operations will minimize contributions to orbital debris, and that TECSAR would reserve sufficient fuel to accomplish post-mission disposal.

When it became clear earlier this year that NGAS would need to extend and obtain additional STAs for receive-only earth stations to operate with TECSAR for the NGAS/TECSAR demonstration program, NGAS approached IAI again seeking additional information on the operator's orbital debris mitigation and post-mission disposal plans for the spacecraft. Even though NGAS would only use the satellite's signals for short-duration demonstrations at several locations, the company was committed to adhering as closely as

possible to the intent and objectives of the FCC's rules regarding orbital debris and end-of-life maneuvers.

In response to the latest inquiries from NGAS, IAI has now informed NGAS that:

- The state of Israel has ratified 'The Convention on International Liability for Damage Caused by Space Objects' (and most other space related treaties as well).
- The state of Israel owns and operates TECSAR and is responsible for all of the decisions and actions regarding its orbit control and end of life disposal.
- The current and planned orbit has a natural decay time far lower than the recommended 25 years decay time.
- If U.S. Government officials wish to request further information specific to TECSAR, a direct dialog will be necessary between appropriate government officials as there are no other publicly available documents to cite.

It is NGAS's understanding, based on discussions with IAI over the course of the planning for the demonstration project, that IAI's orbital debris mitigation plans and post-mission disposal procedures for TECSAR that are consistent with standard industry practices designed to ensure that all system space operations will minimize contributions to orbital debris, including measures to estimate and limit the probability of collision with known objects during in-orbit lifetime. IAI also stated to NGAS that no debris is planned to be released during the course of normal operations and TECSAR will reserve a sufficient fuel to accomplish post-mission disposal.

To date, and despite its requests of IAI, NGAS has not received the details of the methodologies (propulsion, avionics, electronics, propellant lines, valves, reaction wheels, etc.) that are currently employed on the TECSAR satellite to limit the effects of small object collisions on the operation and safety of the spacecraft. NGAS understands the Commission's interest in better characterizing the orbital debris impact of TECSAR, and has continued to work with IAI to document this impact (within limits set by the government of Israel). NGAS's preliminary findings and the results of internal analysis NGAS has conducted so far are summarized below:

- The TECSAR space vehicle is designed for zero release of debris during normal operations, including protective covers and deployment mechanisms actuated during on-orbit initialization.
- TECSAR is operated to avoid known orbiting debris, and its control system is designed with cross-strap redundancy to enable recovery from multiple possible failure modes (including collision with small debris objects).
- TECSAR disposal policy calls for lowering perigee to 150 km to minimize the probability of accidental collision, and reduce the re-entry timeline. After orbit lowering, residual propellant is vented to space and the batteries are discharged to minimize the probability of explosion due to stored energy. The passivated satellite will re-enter within 5 years from its mission orbit, or within 2 years after perigee

lowering, depending on solar season. The satellite is designed to start final re-entry in an intact configuration; it is not designed for intentional breakup.

NGAS has not received any additional information from IAI of the government of Israel regarding TECSAR since the matter was last addressed in March of 2009. NGAS will, however, keep the Commission informed of relevant findings and of any further relevant information on orbital debris mitigation and post-mission disposal for TECSAR that the company receives from IAI or the government of Israel.

It should be noted that NGAS will use the TECSAR satellite for only a short period of time at each of several locations during a demonstration for evaluation purposes. If the demonstration is successful, NGAS would co-produce a slightly modified version of the TECSAR satellite in its manufacturing facility in Redondo Beach, CA.

As it indicated in its above-referenced STA requests to the International Bureau, NGAS understands that operators of space stations that seek to provide service to and from the United States under an experimental or permanent FCC authorization are required to disclose their orbital debris mitigation plans (including post-mission disposal arrangements) as part of the technical information they provide to the Commission under Part 5 or Part 25 of the Code of Federal Regulations. In the event that NGAS is to seek any direct authorization from the FCC to launch and/or operate a new EESS satellite, it will be required to provide all applicable orbital debris mitigation and post-mission disposal information the Commission's rules specify, and to meet all other applicable FCC rules and regulations.

As a manufacturer and operator of spacecraft, NGAS remains deeply committed to the policy and practical objectives that are specified in the Commission's orbital debris mitigation rules. NGAS will apprise the Commission of any further relevant insights it gains from efforts to acquire more information from IAI and the government of Israel, and from any further NGAS analyses. NGAS maintains that the commitments and understandings it has secured from IAI regarding IAI's adherence to these principles for TECSAR – commitments and understanding that provided a basis for allowing NGAS very limited-duration receive-only access to TECSAR under the February 12 STA requests – also are sufficient to allow the limited earth station operations on a experimental basis that it seeks here under the second phase of the demonstration program NGAS seeks here. NGAS is confident that such a modest extension of the program will neither contravene nor otherwise undermine the Commission's rules or the public interest in their observance.

Coordination with NASA

NGAS is in the process of coordinating its proposed use of the earth station equipment described in this application with the National Aeronautics and Space Administration's ("NASA") Jet Propulsion Laboratory ("JPL").

With respect first to the use of the requested earth station facilities on a receive basis in the 8025-8400 MHz band from the three specified locations, NGAS agrees to abide by the prior coordination agreements it reached with NASA/JPL for receive operations at Redondo Beach,

Tampa, and Chantilly, as provided to and approved by the Commission's International Bureau earlier this year in connection with File Nos. SES-STA-20090212-00172 (Redondo Beach, CA), SES-STA-20090617-00765 (Tampa, FL), and SES-STA-20090716-00870 (Chantilly, VA).

With respect to the S-band transmit and receive frequencies, NGAS is in the process of negotiating a coordination agreement with NASA/JPL that pertains to NGAS's use only one out of two uplink frequencies centered on 2085 MHz or 2090 MHz, and one out of two downlink frequencies centered on 2285 MHz or 2290 MHz. NGAS will supplement its instant application with a copy of the agreement once it is finalized. NGAS's analysis confirms that the NGAS experimental facilities, operating at the three specified locations, will not cause harmful interference to NASA/JPL systems operating in the same frequency bands. NGAS will coordinate its operations in these bands with any other potentially affected users.

Public Interest Considerations

Grant of this application is in the public interest. It will enable NGAS to determine the extent to which the EESS capabilities of the new TecSar satellite are consistent with the specifications and requirements of Federal Government users. NGAS will use the proposed earth station antenna only to conduct technical demonstrations and assessments of the TecSar satellite capabilities. All data obtained during the demonstrations will remain the property of NGAS, and there will be no commercial provision of data or service.

Timing of Commission Action – Two Year Term Starting November 1, 2009 Requested

NGAS does not expressly request expedited processing of this application. Nevertheless, NGAS notes that its arrangements with TECSAR's operator call for NGAS to begin operations during November 2009 at one of the specified locations. Thus, NGAS requests that the Commission process the instant application in such a manner that the license term for the requested authorization runs from November 1, 2009 to October 31, 2011.

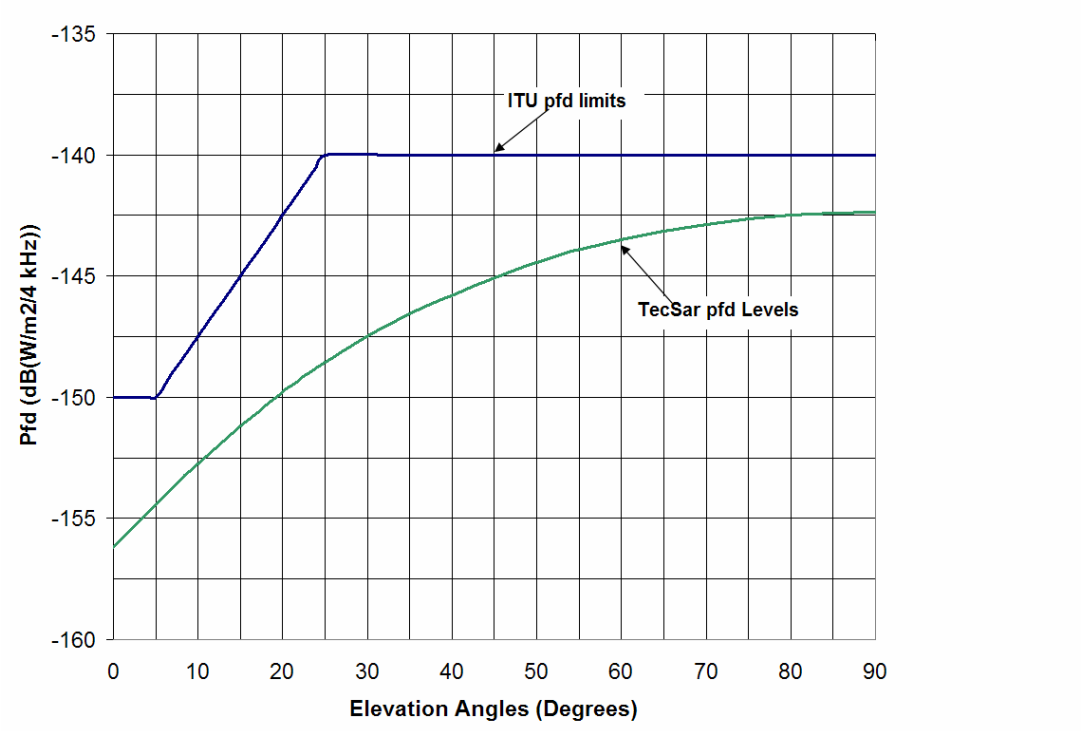
Annex 1

TECSAR Satellite Parameters

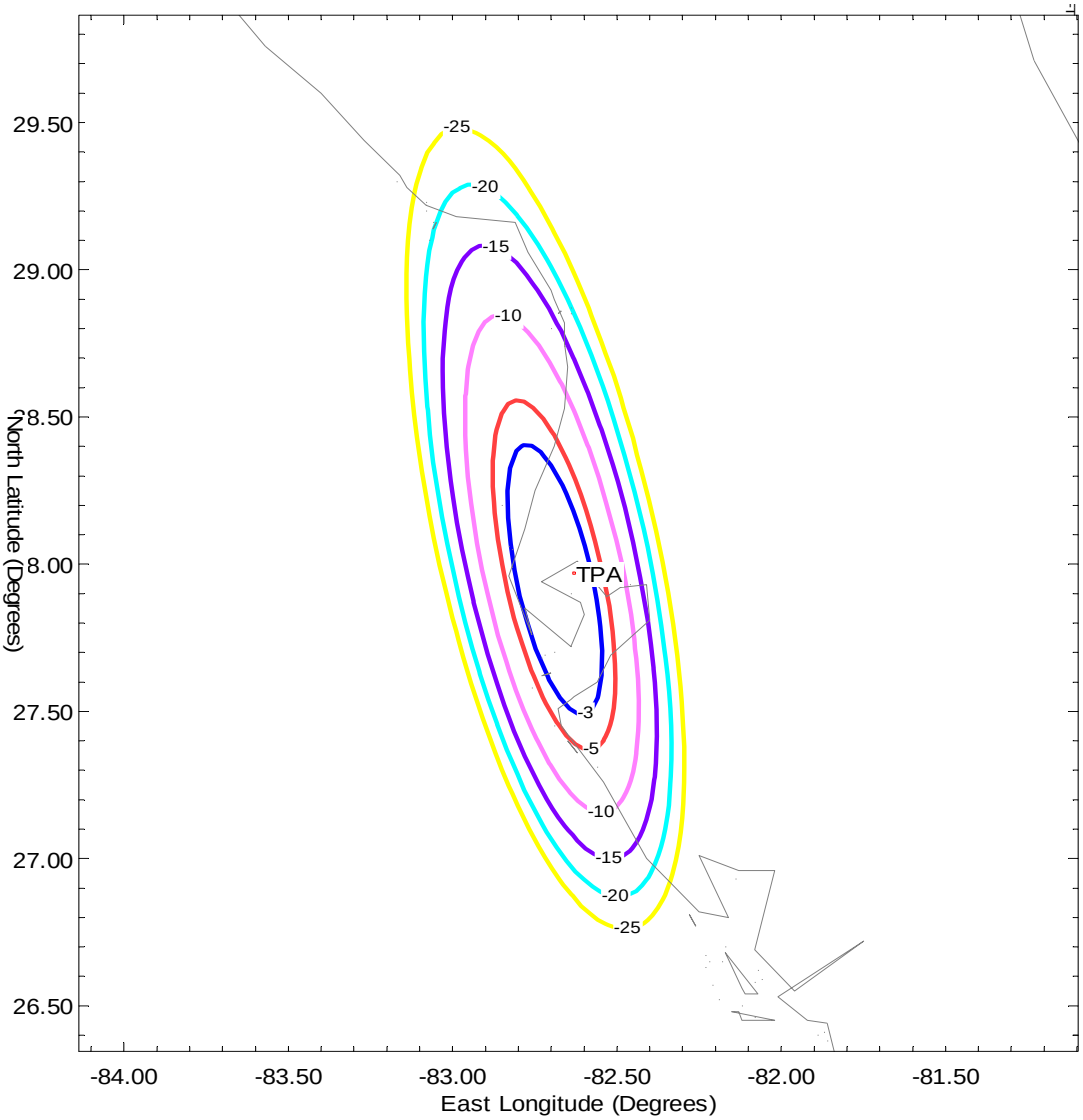
ANNEX 1A

TECSAR SATELLITE PARAMETERS – 8025-8400 MHZ EESS BAND

- Orbital parameters
  - Apogee: 580 km; Perigee: 450 km
  - Inclination angle: 41 degrees
  - Orbital period: 1 hour 35 minutes
- Transmit parameters
  - Frequency: 8025 – 8400 MHz
    - Center frequencies: 8150 MHz, 8250 MHz and 8350 MHz
    - Channel bandwidth: 72 MHz
  - Satellite antenna size: 3 m in diameter
    - Satellite antenna patterns: ITU-R Rec. S672-4 with Ls= -25 dB
  - Satellite EIRP: 26 dBWi per 72 MHz channel
  - Polarization: horizontal
  - Modulation: 8PSK
  - Transmit data rate: 155 Mbps
- Downlink power flux density: within the limits shown in Article 21 of the ITU Radio Regulations and Section 8.36 of the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management.
  - The power flux density levels of TECSAR satellite will be within the levels shown below when the TECSAR satellite transmits its data to the proposed NGAS earth stations located in Redondo Beach, CA, Chantilly, VA and Tampa, FL



TECSAR X-band transmit downlink antenna contours (boresighted to the Chantilly, VA Earth station as an example) are shown below. The actual antenna contour patterns would depend on the elevation angle and satellite location.



ANNEX 1B

TECSAR SATELLITE TT&C SYSTEM PARAMETERS

TECSAR, a non-geostationary-orbit satellite uses a part of the bands 2025-2095 MHz for command uplink, from TT&C Earth station to TESAR satellite, and 2225-2295 MHz for telemetry downlink, from TECSAR satellite to TT&C Earth station. The system is able to adjust its transmit and receive center frequencies in 1 MHz steps. With this flexibility, the coordination among TECSAR and other satellites operating in the same frequency band is easier.

The satellite TT&C parameters of the TECSAR satellite are shown below

- Satellite receive parameters
    - Receive frequency: 2025-2095 MHz
        - Polarization: RHCP
        - Center frequency in 1 MHz step
    - Satellite receive G/T: -40 dB/K
        - Antenna : Omni directional
    - Uplink data rate: 5 kbps
    - Modulation: DBPSK
    - Required Eb/No: 12 dB – including implementation loss
- Satellite transmit parameters
    - Transmit frequency: 2225- 2295 MHz
        - Polarization: RHCP
        - Center frequency in 1 MHz step
    - Satellite transmit EIRP: 17 dBm
        - Antenna: omni directional
    - Downlink data rate: 2.5 Kbps
    - Modulation: DBPSK
    - Required Eb/No: 12 dB – including implementation loss

For the purpose of demonstration, NGAS only uses one out of two uplink and downlink channels shown below:

- Uplink channel center frequency: Either 2285 MHz or 2290 MHz with a channel bandwidth less than 50 kHz
- Downlink channel center frequency: Either 2085 MHz or 2090 MHz with a channel bandwidth less than 50 kHz

NGAS uses the uplink TT&C command channel with low data rate, less than 5 kbps, for payload tasking and downlink TT&C with low data rate, ~2.5 kbps for command acknowledgement.

Annex 2

NGAS Transmit/Receive Earth Station Parameters

ANNEX 2A

EESS BAND EARTH TERMINAL PARAMETERS

- Type of antenna: Receive
- Class of station: fixed
- Earth station locations:
    - Redondo Beach, CA
        - Longitude: 118° 22’ 57” West
        - Latitude: 33° 50’ 54” North
    - Chantilly, VA
        - Longitude: 77° 25’ 53” West
        - Latitude: 38° 53’ 39” North
    - Tampa, FL
        - Longitude: 82° 27’ 31” West
        - Latitude: 27° 56’ 50” North
- Antenna parameters
    - Manufacturer: Orbital Systems
    - Model: 3.0 Meter Remote Sensing Antenna
    - Number of unit: 1 (to be rotated among earth station locations)
    - Antenna size: 3.0 m in diameter
    - Receive G/T: 26 dB/K
    - Antenna 3 dB beamwidth: 1.5 degrees
    - Orientation in horizontal plane: 360 degrees
    - Orientation in vertical plane: 90 degrees
- Antenna performance standards (§25.209): N/A.
    - Because it is only a receive Earth station
- Receive frequency: 8025 – 8400 MHz
    - Center frequencies: 8150 MHz, 8250 MHz and 8350 MHz
        - Only one channel having a center frequency at 8150 MHz will be used for downlink to the Redondo Beach Earth station
    - Channel bandwidth: 72 MHz
- Polarization: Horizontal
- Modulation: 8PSK
- FEC: TCM(8/9) and R-S(255,235)
- Emission: 72M0G1D

ANNEX 2B

TT& C EARTH STATION LOCATIONS AND COMMS SYSTEM PARAMETERS

- Type of antenna: Transmit and Receive
- Class of station: fixed
- Earth station locations:
    - Redondo Beach, CA
        - Longitude: 118° 22’ 57” West
        - Latitude: 33° 50’ 54” North
    - Chantilly, VA
        - Longitude: 77° 25’ 53” West
        - Latitude: 38° 53’ 39” North
    - Tampa, FL
        - Longitude: 82° 27’ 31” West
        - Latitude: 27° 56’ 50” North
- Antenna parameters
    - Manufacturer: Orbital Systems
    - Model: 3.0 Meter Remote Sensing Antenna
    - Number of unit: 1 (to be rotated among earth station locations)
    - Antenna size: 3.0 m in diameter
    - Orientation in horizontal plane: 360 degrees
    - Orientation in vertical plane: 90 degrees
    - Antenna 3 dB beamwidth
        - Transmit: 3.4 degrees
        - Receive: 3.1 degrees
- Earth terminal EIRP and G/T
    - Transmit EIRP: 48.7 dBWi
        - Antenna size: 3 m
        - Transmit power: 50 W
        - Circuit loss, between power amplifier and antenna port: 3 dB
    - Receive G/T: 10.7 dB/K

- Antenna performance standards: Comply with Part 25.209

- Receive frequency: 2225-2295 MHz
    - Polarization: RHCP
    - Channel bandwidth: 5 kHz
- Transmit frequency: 2025-2095 MHz
    - Polarization: RHCP
    - Channel bandwidth: 10 kHz
- Link budgets are shown below

TABLE 2-1: Link Budget for TECSAR TT&C

	Normal Operations	
Elevation Angle (Deg.) = 5 Satellite Altitude (Km) = 580	UPLINK (Command)	DOWNLINK (Telemetry)
Frequency (GHz)	2.1	2.3
Transmit RF power (W)	50.0	-
Circuit Loss (dB)	3.0	-
Transmit antenna gain (dBi)	34.7	-
EIRP	**48.7**	**-13.0**
Range	2280.3	2280.3
Path Loss (dB)	165.9	166.7
Pointing error (dB)	0.8	0.8
Atmospheric + Scintillation loss (dB)	1.4	1.6
Polarization loss (dB)	0.5	0.5
Total channel loss (dB)	**168.6**	**169.6**
G/T	**-40.0**	**10.7**
Data modulation	BPSK	BPSK
Data rate (kbps)	5.0	2.5
Received Eb/No	**31.7**	**22.7**
Required Eb/No, including implementation loss (dB)	12.0	12.0
System Margin , Clear sky (dB)	**19.7**	**10.7**

RAIN	(Command)	(Telemetry)
Link availability (%)	99.99	99.99
ITU Combined Loss (dB)	3.0	3.2
System noise temp./ Rain (k)	-	430.3
Receives Eb/No, Rain (dB)	30.1	21.1
System Margin in rain (dB)	**18.1**	**9.1**

Earth Terminal Antenna Parameters	(Command)	(Telemetry)
Wavelength (cm)	14.5	13.2
Antenna gain (dBi)	34.7	35.5
3 dB beamwidth (deg)	3.4	3.1
Antenna efficiency (%)	0.7	0.7
Antenna size	3.0	3.0

Annex 3

Radiation Hazard Assessment

Radiation Hazard Assessment For a 3-m S-band Earth Terminal Antenna

The input parameters and power density calculations are presented below:

RADIATION HAZARD ASSESSMENTS FOR A 3.0 m TRANSMIT EARTH TERMINAL					
Parameters	Units	Symbol	Input Parameters		
Antenna Diameter	m	D	3		
Maximum Power Into Antenna	W	P	25		
Antenna Aperture Efficiency	%	η	70%		
Frequency	GHz	F	2.1		
Calculated Values					
Wavelength	m	λ	0.143		
Antenna Gain	dBi	G	34.838		
Antenna Surface Area	m²	$A_{surface}$	7.069		
Distance to The Far Field Region	m	R_{ff}	37.8		
Distance to the End of The Near Field	m	R_{nf}	15.75		
Distance to point of interest	m	R	32.3		
Power Density Calculation				Exceed the MPE Limits?	
				Uncontrolled Exposure	Controlled Exposure
On- Axis Power Density In the Far Field	mW/cm²	S_{ff}	0.425	NO	NO
Near Field Power Density	mW/cm²	S_{nf}	0.99	NO	NO
Transition Region Power Density	mW/cm²	S_t	0.48	NO	NO
Power Density at The Subreflector	mW/cm²	S_{sr}	N/A	N/A	N/A
Power Density at The Main Reflector Surface	mW/cm²	$S_{surface}$	1.418	YES	NO
Power Density Between Reflector and Ground	mW/cm²	S_g	0.35	NO	NO

Power Density Assessment Summary: The Maximum Permissible Exposure (MPE) limits for uncontrolled and controlled environments of an earth station operating in 2 GHz band are 1.0 mW/cm² and 5.0 mW/cm², respectively. Calculated power density levels shown above, except for the power density at the main reflector surface, $S_{surface}$ meet the MPE limits for both uncontrolled and controlled environments.

The power density at the main reflector surface, $S_{surface}$ meets the MPE limits for controlled environment and exceeds the MPE limits for uncontrolled environment by 0.418 mW/cm². The NGAS antenna facility located in either Redondo Beach, CA, Chantilly, VA, or Tampa, FL will be surrounded by a fence that will restrict any public assess. In addition, the antenna earth station will be marked with the standard radiation hazard warning, as well as the area in the vicinity of the earth station.