

**Exhibit A**

**FCC Form 442  
Modification of License  
Call Sign WF2XDU  
Northrop Grumman Space  
& Mission Systems Corp.  
Question 7  
April 2010**

**DESCRIPTION OF MODIFICATION**

In this application, Northrop Grumman Space & Mission Systems Corporation (“NGAS”) seeks to modify in its Experimental Radio Service license under Call Sign WF2XDU (File No. 0327-EX-PL-2009) for authority to operate a transmit/receive earth station from one of three locations with the 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”). In particular, NGAS seeks to be able to use its licensed earth station for transmit and receive functions from any location in the continental United States (“CONUS”), rather than from the three sites specified in the current license for Call Sign WF2XDU. As NGAS explains below, the ability to operate from any location in CONUS, subject to measures that will assure that no harmful interference is caused to co-frequency Federal Government and non-Federal users of the spectrum, will provide NGAS with the capability to respond in an efficient manner to requests from potential Federal Government customers for demonstrations of the earth station capability.

The NGAS earth station receives EESS transmissions from TECSAR in the 8025-8400 MHz band. NGAS will use two uplink frequencies, each with a 50 kHz channel bandwidth centered on 2085 MHz or 2090 MHz, for payload tasking to request the specific imaging tasks and receive the telemetry transmissions from TECSAR on the 2285 MHz frequency with a 50 kHz channel bandwidth. NGAS only uses a single set of earth station equipment that would be installed and operated from fixed locations around CONUS. As there is only a single set of earth station equipment, only one location would be in operation at any given time.

The only change to the technical parameters NGAS proposes here is that NGAS will restrict operation of the earth station to when the elevation angle to the TECSAR satellite is 20 degrees or greater. As there is no such limitation on elevation angle in the current license (other than for the Redondo Beach, CA earth station), this change will reduce the potential for harmful interference in either the uplink or the downlink direction. NGAS also uses the opportunity of this Modification Application to clarify the figures it provided in Form 442 of the initial application for earth station ERP. The correct ERP figure is for the transmit frequencies at 2085 MHz and 2090 MHz is now shown in the antenna data provided in the Form 442 application with which this exhibit is associated. With the clarification, the figures in the form now fully align with the data NGAS provided in the narrative exhibit in File No. 0327-EX-PL-2009 in September 2009. There is no change to any other aspect of the technical operation of the NGAS earth station that was authorized in the WF2XDU license, and all of the remaining technical,

orbital debris mitigation, and radiation hazard assessment materials in the NGAS application in File No. 0327-EX-PL-2009 which led to that authorization remain accurate and are hereby incorporated by reference.

NGAS notes that upon approval of this Modification Application, and permission for operation of the subject earth station anywhere in CONUS, the three sites on the current Call Sign WF2XDU license – all of which are in CONUS – will become unnecessary and can be removed. These specific locations will become overtaken by events, and would no longer be required to be specifically listed on the license.

NGAS's demonstration program continues to be 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 are designed to form the basis of a possible 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. The location flexibility sought in this Modification Application is a response to requests for demonstrations by potential Federal Government customers.

The ability NGAS seeks to operate from anywhere in CONUS will not lead to any increase in the risk of harmful interference to authorized users of the transmit or receive frequencies used for operations under the license for Call Sign WF2XDU. As it has to date, NGAS will continue to endeavor to locate its earth station 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. 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.

With respect first to the use of the requested earth station facilities on a receive basis in the 8025-8400 MHz band, NGAS has entered into a coordination agreement with the National Aeronautics and Space Administration's Jet Propulsion Laboratory ("NASA/JPL"). The agreement between NGAS and NASA/JPL ("Coordination Agreement") is attached hereto as Attachment 1. The Coordination Agreement specifies the conditions acceptable to NASA/JPL for protection of the Goldstone, CA Deep Space Network ("Goldstone DSN") earth station from TECSAR space-to-Earth transmissions on the 8150 MHz, 8250 MHz, and 8350 MHz frequencies. NGAS agrees to abide by the elevation angle restrictions specified in the Coordination Agreement.

With respect to the S-band transmit and receive frequencies, the Coordination Agreement specifies that payload tasking uplink operations from the NGAS earth station on the 2085 MHz and 2090 MHz frequencies may be conducted from any earth station location throughout CONUS. Similarly, because telemetry downlinks from TECSAR to the NGAS earth station will operate on frequencies not used by the Goldstone DSN earth station,<sup>1</sup> the Coordination

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<sup>1</sup> Goldstone DSN uses the 2290-2300 MHz band for its telemetry; TECSAR telemetry downlinks will use the 2285 MHz and/or 2288 MHz frequency channels.

Agreement specifies that telemetry downlinks from the TECSAR satellite to the NGAS earth station may be conducted at any earth station location within CONUS.

On this basis, expansion of the location options for NGAS's earth station as proposed herein will not cause harmful interference to NASA/JPL systems operating in the same frequency bands.

As obligated by the license for Call Sign WF2XDU, NGAS will coordinate its operations in these bands with any other potentially affected users – including microwave incumbents. This includes potentially affected operators of broadcast auxiliary service or electronic news gathering receive-only (“ENG r/o”) facilities that use the 2025-2110 MHz band frequencies on which NGAS would perform its payload tasking uplink operations. It should be noted that NGAS will only use 50 kHz spectrum of the 2025-2095 MHz band for payload tasking. In addition, NGAS only intends to use the uplink payload tasking channel for every small percentage of time, less than 10% of time when the TECSAR satellite is in view. Before conducting any uplink operations from a location, NGAS is prepared to contact the BAS frequency coordinator for the nearest market in an effort to determine whether there are potentially affected ENG r/o sites.<sup>2</sup> In addition, because NGAS only uses the payload tasking channel when the elevation angle is greater than 20 degrees, and because the earth station operates with a narrow beam, the potential interference to ENG/BAS, if any, would be further reduced.

### **Public Interest Considerations**

Grant of this Modification Application is in the public interest. It will provide NGAS with increased flexibility to respond to requests for demonstrations of the extent to which the EESS capabilities of the new TECSAR satellite are consistent with the specifications and requirements of Federal Government users. Grant of this Modification Application, due to the coordination agreements with NASA/JPL and the other pre-transmit safeguards NGAS will implement with respect to non-Federal users of the 2025-2110 MHz band frequencies on which NGAS transmissions will occur, will not increase the risk of harmful interference to any authorized spectrum 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.

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<sup>2</sup> A representative of the BAS/ENG r/o community has helpfully referred NGAS to a list of BAS frequency coordinators that is maintained at the following web site. [http://www.sbe.org/freq\\_local.php](http://www.sbe.org/freq_local.php) (last visited April 2, 2010). This would be an appropriate jumping off point for NGAS coordination efforts.

## **Conclusion**

NGAS urges expeditious processing and grant of this application. **In particular, NGAS requests action on or before April 21, when further demonstrations are scheduled.**

All future operation of the earth station authorized in the license for Call Sign WF2XDU will be conducted under the most restrictive conditions that apply to the three currently-authorized sites, and NGAS has specified the steps it will take to assure coordination with non-Federal incumbents in the uplink frequencies that it will use sparingly for payload tasking demonstrations.



**ATTACHMENT 1**

NORTHROP GRUMMAN AEROSPACE SYSTEMS

January 6, 2010

Mr. Farzin Manshadi,  
JPL Spectrum Manager  
Jet Propulsion Laboratory  
M/S: 126-260  
4800 Oak Grove Drive  
Pasadena, CA 91109

**Re: Coordination Conditions for Northrop Grumman Experimental Earth Station Operations with TECSAR Satellite**

Dear Mr. Manshadi:

This letter documents the coordination agreement between the National Aeronautics and Space Administration (“NASA”) Jet Propulsion Laboratory (“JPL”) and Northrop Grumman Systems Corporation (“NGAS”) regarding NGAS’s proposed operation of earth station equipment from any location throughout the United States in communication with the Israeli TECSAR satellite as part of an NGAS demonstration program. The TECSAR satellite would conduct space-to-Earth transmissions in the Earth-exploration satellite service (“EESS”) in the 8025-8400 MHz band, and in the 2225-2295MHz band for telemetry operations. NGAS would receive these transmissions at any locations within the continental United States (“CONUS”). The NGAS Earth station would transmit telecommand signals for payload tasking to the TECSAR satellite using the 2085 MHz or 2090 MHz frequencies.

NGAS understands that NASA/JPL has conducted an RFI analysis based on the operational parameters of TECSAR and the links to and from the proposed NGAS Earth stations. The following conditions, identified by NASA/JPL, for the different bands and ground stations are acceptable and agreed to by NGAS:

1. For TECSAR space-to-Earth transmissions at 8150 MHz, 8250 MHz, and 8350 MHz:
  - a. If the 3 dB beam width of the TECSAR X-band downlink is within a 500 km circle from the Goldstone, CA Deep Space Network (“DSN”) Earth station as shown in Figure 1 below, then TECSAR will only use its channel 1 with the center frequency of 8150 MHz for downlink. In addition, the minimum operational elevation angle, from any NGAS Earth station to TECSAR satellite, must be 20 degrees or greater.
  - b. If the 3 dB beam width of the TECSAR X-band downlink is outside of the 500 km circle from Goldstone DSN Earth station as shown in Figure 1 below, then TECSAR can use any or all three channels centered at frequencies of 8150 MHz, 8250 MHz and 8350 MHz for its downlink. The minimum operational elevation angle, from any NGAS Earth station to TECSAR satellite, must be 10 degrees or greater.
2. For Telecommand (Payload Tasking) and Telemetry Transmission to/from TECSAR Using the 2085MHz/2090 MHz (Telecommand) and 2285 MHz/2288 MHz (Telemetry) Frequencies:

- a. Telecommand (payload tasking, Earth-to-space direction): Earth-to-space operations on the 2085 MHz and 2090 MHz frequencies for TECSAR payload tasking can be conducted from any Earth station location throughout the United States
- b. Telemetry (space-to-Earth direction): Since the Goldstone DSN earth station uses the 2290-2300 MHz band for its telemetry, in order to avoid any potential interference to the Goldstone DSN receiver, there will be no telemetry operations on any channels within the 2290-2300MHz band from TECSAR satellite to any earth station locations within the CONUS. Telemetry downlinks from TECSAR satellite to NGAS earth station locations at any location throughout the United States will only use the 2285 MHz and/or 2288 MHz frequency channels.



FIGURE 1

Please acknowledge your consent to these conditions of NGAS use of Earth stations with TECSAR by signing at the place provided below, and returning a copy to me. NGAS will provide this letter to the Federal Communications Commission (“FCC”) in conjunction with its application for an experimental Earth station license.

Thank you very much for your assistance and cooperation.

Sincerely,

Hau H. Ho  
Northrop Grumman Aerospace Systems

**Accepted:**

By: Farzin Manshadi  
Farzin Manshadi,  
JPL Spectrum Manager  
Jet Propulsion Laboratory

Dated: 1/6/2010