

**United States of America
FEDERAL COMMUNICATIONS COMMISSION
EXPERIMENTAL
SPECIAL TEMPORARY AUTHORIZATION**

EXPERIMENTAL

(Nature of Service)

WQ9XUS

(Call Sign)

XT MO

(Class of Station)

0927-EX-ST-2020

(File Number)

NAME Northrop Grumman Systems Corporation

This Special Temporary Authorization is granted upon the express condition that it may be terminated by the Commission at any time without advance notice or hearing if in its discretion the need for such action arises. Nothing contained herein shall be construed as a finding by the Commission that the authority herein granted is or will be in the public interest beyond the express terms hereof.

This Special Temporary Authorization shall not vest in the grantee any right to operate the station nor any right in the use of the frequencies designated in the authorization beyond the term hereof, nor in any other manner than authorized herein. Neither the authorization nor the right granted hereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934. This authorization is subject to the right of use of control the Government of the United States conferred by Section 706 of the Communications Act of 1934.

Special Temporary Authority is hereby granted to operate the apparatus described below:

Purpose Of Operation:

Spacecraft telemetry links for monitoring of Cygnus spacecraft state of health.

Telemetry links include:

1) 2203.2 MHz (ERP) 6.61 W (ERP) 0.00008 % 5M93G1D

Station Locations

(1) MOBILE: Spacecraft-350km altitude-51.6 degrees inclination

Frequency Information

MOBILE: Spacecraft-350km altitude-51.6 degrees inclination

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
2203.2 MHz	MO	5M93G1D	6.61 W (ERP)	0.00008 %
2287.5 MHz	MO	4M98G1D 6M16G1D 3M00G1D	4.45 W (ERP)	0.00018 %

This authorization effective September 20, 2020 and
will expire 3:00 A.M. EST March 21, 2021

**FEDERAL
COMMUNICATIONS
COMMISSION**



Frequency Information

MOBILE: Spacecraft-350km altitude-51.6 degrees inclination

Frequency	Station Class	Emission Designator	Authorized Power	Frequency Tolerance (+/-)
2287.5 MHz	MO	6M16G1D	7.14 W (ERP)	0.00018 %

Special Conditions:

- (1) This STA is limited to Cygnus capsule telemetry, tracking, and command operations for the Northrop Grumman 14 (NG-14) mission to the International Space Station (ISS). This STA will expire at Cygnus separation from the ISS + two weeks or 20 March 2021, whichever occurs first. Any future missions or long-term on-orbit operations that do not directly support NASA contractual obligations shall submit new applications to the FCC to be re-coordinated with the NTIA.
- (2) Northrop Grumman Systems Corporation shall be aware that future requests for Cygnus downlink operations using a frequency of 2287.5 MHz will be considered on a case-by-case basis, and Northrop Grumman Systems Corporation shall have no expectations such requests will be approved. Notification of all scheduled downlink operations shall be provided to the NASA GSFC Spectrum office (NASA-DL-GSFC-Spectrum-Management@nasa.gov), at least 3 days in advance of operation.
- (3) All transmissions in the band 2200-2290 MHz shall comply with national and international power flux density limits (PFD), except in cases where expected exceedance are pre-coordinated and agreed. PFD analysis and exceedances shall be included in the FCC STA application and provided in the request to the NTIA for US Government review and assessment.
- (4) Due to potential harmful interference to naval activities, Northrop Grumman Systems Corporation operations plan shall be submitted, at least 60 days prior to planned launch date, to the Naval Surface Warfare Center, Dahlgren Division (NSWCDD), Mr. James Moneyhon (540)653-3477, or james.moneyhon@navy.mil, for assessment. Five (5) blackout zones (BOZs) shall be assumed as follows: (1) 1500 nautical mile radius centered at 22N160W; (2) 1500 nautical mile radius centered at 33.25N119.57W; (3) 1500 nautical mile radius centered at 4.11N175.2W; (4) 1500 nautical mile radius centered at 57.46N152.38W; and (5) 1500 nautical mile radius centered at 32.37N106.47W, shall be assumed, unless otherwise coordinated with, and agreed to, by the NSWCDD. Northrop Grumman Systems Corporation must comply with any and all restrictions that may be levied by the NSWCDD. Coordination of the Northrop Grumman Systems Corporation operations schedule and timeline, and any and all restrictions that may be levied by the NSWCDD, including imposition and implementation of a BOZ, shall be coordinated through Cathy Sham (catherine.c.sham@nasa.gov, NASA JSC SMO).

Special Conditions:

- (5) As soon as possible, but no later than 60 business days prior to the planned launch, Northrop Grumman Systems Corporation is required to provide, as a minimum, launch date/time/window and planned Cygnus trajectory from launch to capture by the International Space Station (ISS), and transmission frequencies with associated duration/cut-off time to Jimmy Nguyen (jimmy.nguyen@us.af.mil, AFSMO), Felipe Arroyo (felipe.arroyo-1@nasa.gov, NASA WFF SMO), the NASA GSFC Spectrum Office (NASA-DL-GSFC-Spectrum-Management@nasa.gov), Stephen Horan (stephen.j.horan@nasa.gov, NASA LaRC SMO), Kenneth Dudley (kenneth.l.dudley@nasa.gov, NASA/LaRC), NOAA Satellite Operations Control Center (Matt.G.Sullivan@noaa.gov), Richard Ontiveros, (richard.ontiveros1@navy.mil, NMSC), and Cathy Sham (catherine.c.sham@nasa.gov, NASA JSC SMO). In the event of last-minute changes, 48-hour notice is required.
- (6) Cygnus direct-to-ground transmission using a frequency of 2287.5 MHz and emission designators of 3M00G1D or 4M98G1D is not permitted when in view of the following deep space earth stations: Goldstone Deep Space Communications Complex (GDSCC), Madrid Deep Space Communications Complex (MDSCC), Canberra Deep Space Communications Complex (CDSCC), and New Norcia Station, from horizon to horizon.
- (7) Cygnus operations employing 2203.2 MHz shall only be used for proximity operations with the NASA International Space Station (ISS). Any other operation employing this frequency is expressly prohibited.
- (8) Cygnus to TDRS return link transmission using frequency of 2287.5 MHz, an emission designator of 6M16G1D, and ERP values of 7.14 Watts or 4.45 Watts is not permitted when in view of the following deep space earth stations: Goldstone Deep Space Communications Complex (GDSCC), Madrid Deep Space Communications Complex (MDSCC), Canberra Deep Space Communications Complex (CDSCC), and New Norcia Station, from horizon to horizon. Coordination requests for clearance to transmit shall be provided to Cathy Sham (catherine.c.sham@nasa.gov, NASA JSC SMO) at least 7 business days prior to communication system activation.

Special Conditions:

- (9) At least 7 business days prior to launch, and updated 2 hours after orbit insertion, Northrop Grumman Systems Corporation shall provide a communications plan which precludes use of the Cygnus direct-to-ground transmission using a frequency of 2287.5 MHz and emission designators of 3M00G1D or 4M98G1D when in view of the deep space stations, as specified, to Farzin Manshadi (Farzin.manshadi-1@nasa.gov, NASA JPL SMO), Cathy Sham (catherine.c.sham@nasa.gov, NASA JSC SMO), and Jimmy Nguyen (jimmy.nguyen@us.af.mil, AFSMO). Updates to this communications plan shall be provided every 5 days for the duration of this grant, in order to support radio frequency interference mitigation.
- (10) During Cygnus on-orbit mission phase (after lift-off/ascent, free flight, or attached to the International Space Station), Northrop Grumman Systems Corporation shall provide the radio frequency operation plan to Cathy Sham (catherine.c.sham@nasa.gov) for coordination with authorized users at least 7 business days prior to any planned transmission operation. The plan must include transmit frequencies, modes of operation (including TDRS Single Access (SA) or Multiple Access (MA) designation were appropriate), identification of primary or secondary communication string, planned duration of operation, planned Cygnus altitude, and identification of supporting stations.
- (11) For Cygnus departure/re-entry operations, including pre-departure checkout, requests for coordination shall be provided to Cathy Sham (catherine.c.sham@nasa.gov) for coordination with authorized users at least 14 business days prior to communications activation related to pre-departure checkout, departure preparation, or departure operation. Requests for coordination shall include, at a minimum, planned communication timelines with start/end time, receiving station location, transmit/receive parameters/power/bandwidth, and spacecraft trajectory/orbital locations.

Special Conditions:

- (12) Uplink transmissions from any ground station supporting Cygnus operations shall be coordinated with the JSC Spectrum Management Office (JSC-DL-Spectrum-Management@mail.nasa.gov), at least 5 business days prior to operations. All uplink transmissions during any phase of flight are contingent upon occurrence of one of the following scenarios:
- a. a non-recoverable loss of the Tracking and Data Relay Satellite (TDRS) forward link signal to the Cygnus spacecraft during a critical mission phase,
 - b. a declared spacecraft emergency due to a Cygnus spacecraft issue,
 - c. during a 2nd or 3rd rendezvous attempt where mission success is jeopardized,
 - or
 - d. As excepted below. All transmissions shall cease after successful mitigation of the contingency scenario and transition back to nominal operations.
- (13) Exceptions for the use of the 2106.50625 MHz transmissions are permitted below. These operations shall be coordinated at least 14 days prior to the planned event, and all operations shall be on a non-interference basis:
- a. System Checkout Activities: System checkout activities are limited to:
 - i. one pre-launch checkout between a Cygnus and the launch site GS while on the launch pad,
 - ii. one on-orbit checkout with a single Northrop Grumman-contracted ground station prior to joint operation with the ISS for rendezvous approach,
 - iii. a pre-departure command path checkout between a single Northrop Grumman-contracted ground station and the Cygnus spacecraft docked to the ISS.
- (14) The STOP BUZZER POC information for all operations shall be provided to NTIA (bmitchell@ntia.doc.gov). This phone shall be manned 24/7.
- (15) Northrop Grumman Systems Corporation shall keep a log of all space-to-earth transmissions in the frequency 2287.5 MHz, and this log shall be provided no later than three (3) weeks after completion of the mission to NASA GSFC Spectrum office (NASA-DL-GSFC-Spectrum-Management@nasa.gov). This log shall include, at a minimum, the date, time, frequency, emission, e.i.r.p density, pointing direction of the antenna(s).