

Northrop Grumman Systems Corporation

Northrop Grumman Systems Corporation submits this Application for Special Temporary Authority (STA) for permission to use frequencies required in support of work being performed under contract with the National Aeronautics and Space Administration (NASA), contract NNK10LB01B, NASA Launch Services II (NLS-II). POC: Daisy Mueller, 321-867-8459, daisy.mueller-1@nasa.gov. This operation has been coordinated with Kennedy Space Center (KSC) Spectrum Manager James Bjornbak, 321-867-6905.

This STA is required in support of the Pegasus Ionospheric Connection Explorer (ICON) Mission. The Mission Requirements Document requires this effort in support of the test and launch efforts.

Test 1: Oct 1, 18:15- 21:55 UTC: Telemetry Equipment Testing, beginning at estimated Waypoint 27.950N; 84.450W at 39,000 ft maximum and extending East to approximately 28.6N, 78.0W (Past PPWR) at 39,000 ft. while ferrying the Launch Vehicle from VAFB to CCAFS (Figure 1). This amounts to a Maximum radius of 410 km at a Maximum height of 39,000 ft. Testing consists of sending data from the launch vehicle and receiving data at the Ground Stations.

Test 2: Oct 3, 04:00 - Oct 4, 04:00 UTC: Test 2: Oct 3, 04:00 - Oct 4, 04:00 UTC: Telemetry Equipment Testing at CCAFS KXMR strip (28.46N; 80.57W), on the ground at 20 ft altitude. Intended furthest receiver is at JDMTA TAA-50-1 Ground Station, 170 km away. Testing consists of transmitting data from the launch vehicle while it is mounted to the aircraft parked on the ground and receiving the data at the Ground Station.

Launch: Oct 10, 01:25- 02:55 UTC: Telemetry, recording beginning on the Ground at KXMR (28.46N, 80.57W) and through the duration of flight. Launch is located at approximately 29.000 N; 78.300 W (PLCH). Trajectory and NASA information is provided after Item 17, in Tables 1, 2 and Figures 2 and 3. NASA and Northrop Grumman will launch the ICON, spacecraft rocket from Northrop Grumman's L-1011 Stargazer aircraft.

Dates and times are as currently scheduled. To account for possible delays due to contingencies such as weather and equipment, the application requests authorization through December 31, 2019. All operations will be coordinated with KSC personnel and the KSC Spectrum Manager as required.

The following additional information is submitted in support of this application.

The aircraft and launch vehicle receive site locations and antenna characteristics:

KSC TAA-3C Lat: 28°27'46"N Long: 80°39'11"W
KSC TAA-24 Lat: 28°27'49"N Long: 80°20'49"W
JDMTA TAA-50-1 Lat: 26°59'01"N Long: 80°53'28"W

Receiving Antenna	(a) Beamwidth	Polarization
TAA-3C	0.88-deg	LHC/RHC
TAA-24A	1.2-deg	LHC/RHC
JDMTA (TAA-50-1)	0.57-deg	LHC/RHC

FIGURE 1
Pegasus ICON Test 1 Ground Track

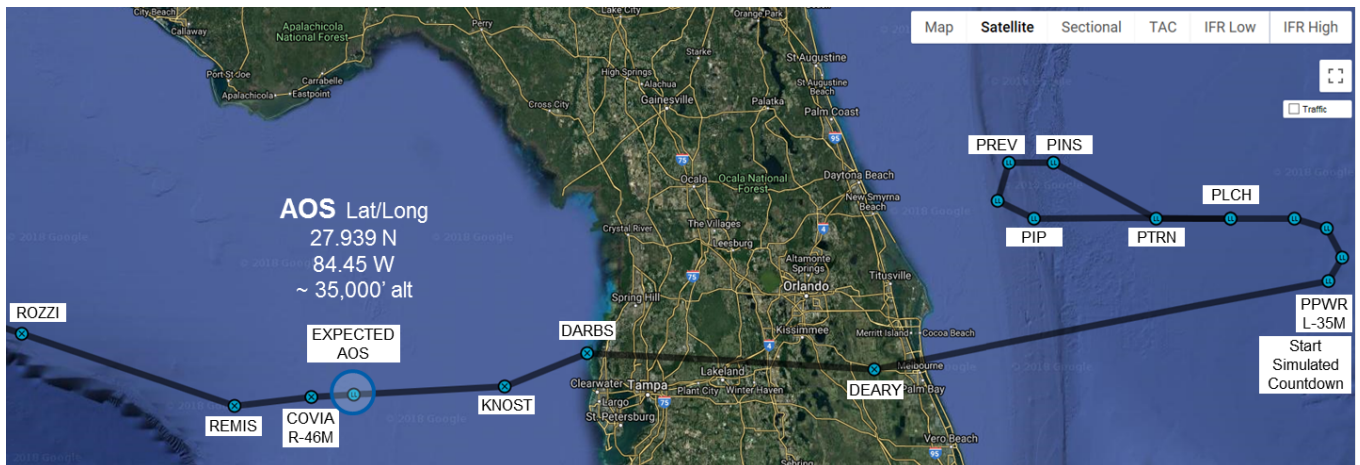


TABLE 1 **Rev 1 as of 09-10-19**
Cape Canaveral Air Force Station, FL Pegasus ICON Space Launch
Request for DoD/NASA/NOAA Pre-coordination, 2200-2290 MHz

Required Data/Information	Response								
Name of Agency	NASA for Northrop Grumman								
Name of Payload	Ionospheric Connection Explorer (ICON)								
Name of Launch Vehicle	Pegasus (LV)								
Launch Site (with coordinates)	CCAFS Latitude: 29° 00' 00" North Longitude: 78° 30' 00" West Altitude: 39,000 ft								
Launch Time-Window (Primary and Backup)	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Primary (EST)</td> <td>09OCT 2125 - 2255</td> </tr> <tr> <td>Primary (UTC)</td> <td>10OCT 0125 - 0255</td> </tr> <tr> <td>Backup (EST)</td> <td>10OCT 2125 - 2255</td> </tr> <tr> <td>Backup (UTC)</td> <td>11OCT 0125 - 0255</td> </tr> </table>	Primary (EST)	09OCT 2125 - 2255	Primary (UTC)	10OCT 0125 - 0255	Backup (EST)	10OCT 2125 - 2255	Backup (UTC)	11OCT 0125 - 0255
Primary (EST)	09OCT 2125 - 2255								
Primary (UTC)	10OCT 0125 - 0255								
Backup (EST)	10OCT 2125 - 2255								
Backup (UTC)	11OCT 0125 - 0255								
Orbital Location (Orbit Insertion)	27.00 degrees inclination, 575 km x 575 km								
Required Frequencies:	2269.5 MHz, 2288.5 MHz,								
Location of Transmitter on Launch Vehicle or Payload (e.g., first stage, second stage, payload)	2269.5 MHz Xmtr located on LV Stg 3 2288.5 MHz Xmtr located on LV Stg 3								
EIRP (Watts, or dBW, or milliWatts, or dBm) for Each Required Frequency	2269.5 MHz, EIRP = -3.5103 dBW 2288.5 MHz, EIRP = -3.6103 dBW								
Transmitted Bandwidth for Each Required Frequency (state if the signal is filtered or not)	2288.5: Filtered								
-3 dB Bandwidth for Each Required Frequency (if the signal is filtered, state whether this is the bandwidth before or after filtering)	2269.5 MHz; 0.75 MHz 2288.5 MHz; 0.315 MHz								
-20 dB Bandwidth for Each Required Frequency (if the signal is filtered, state whether this is the bandwidth before or after filtering)	2269.5 MHz; NAV 2288.5 MHz; NAV								
-60 dB Bandwidth for Each Required Frequency (if the signal is filtered, state whether this is the bandwidth before or after filtering)	2269.5 MHz; NAV 2288.5 MHz; NAV								
Nature of Modulating Signal(s) (modulation type i.e. BPSK, QPSK, APK, FSK, Analog, etc.; if it is a digital signal, state the final symbol rate in symbols/second after all overhead encoding or the final bit rate in bits/second after all overhead encoding; if FSK, also include the type of FSK and the peak-to-peak frequency deviation as well as the final symbol rate or final bit rate; if the signal has subcarriers, say so and which ones are used)	2269.5 MHz; FM/FM 2288.5 MHz; PCM/FM (NRZ-S)								
Duration of Transmission(s), to Include On/Off Time (nominal and maximum durations)	2269.5 MHz; ON @ L-4 hrs OFF @ T+748 sec 2288.5 MHz; ON @ L-4 hrs								

FIGURE 2
Pegasus ICON Trajectory Ground Track Launch Drop Box

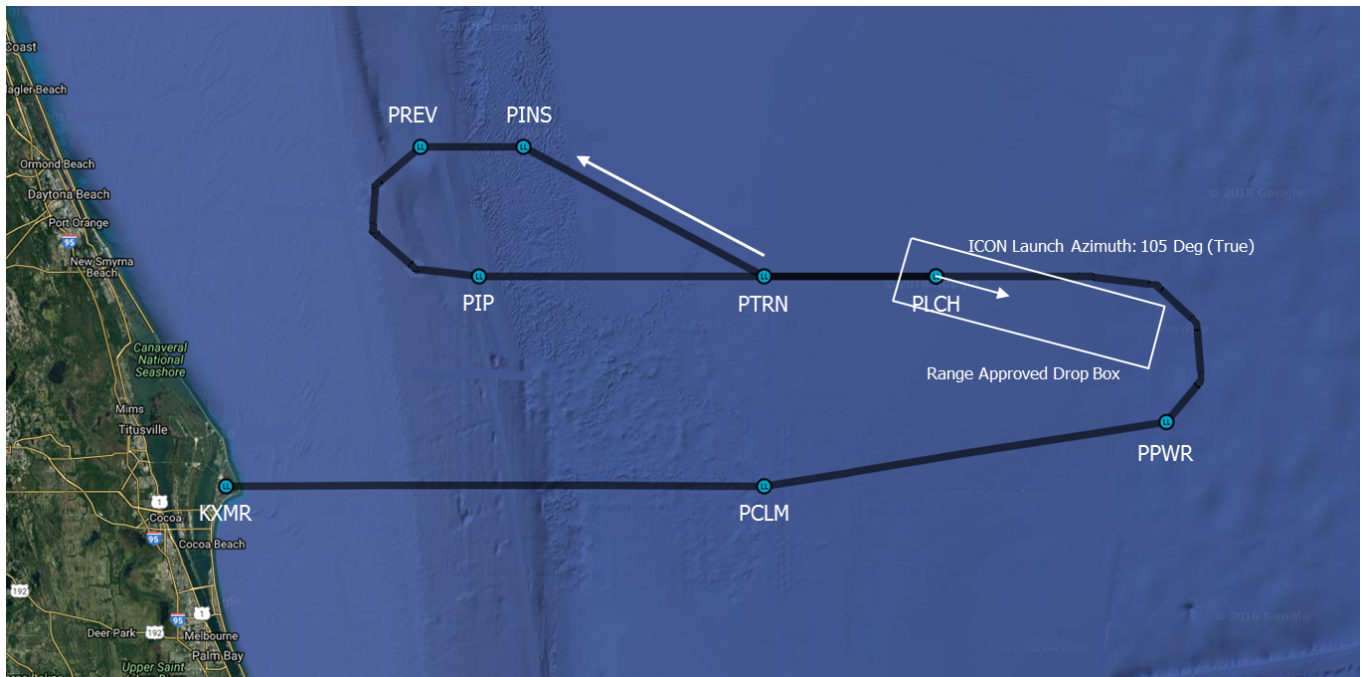
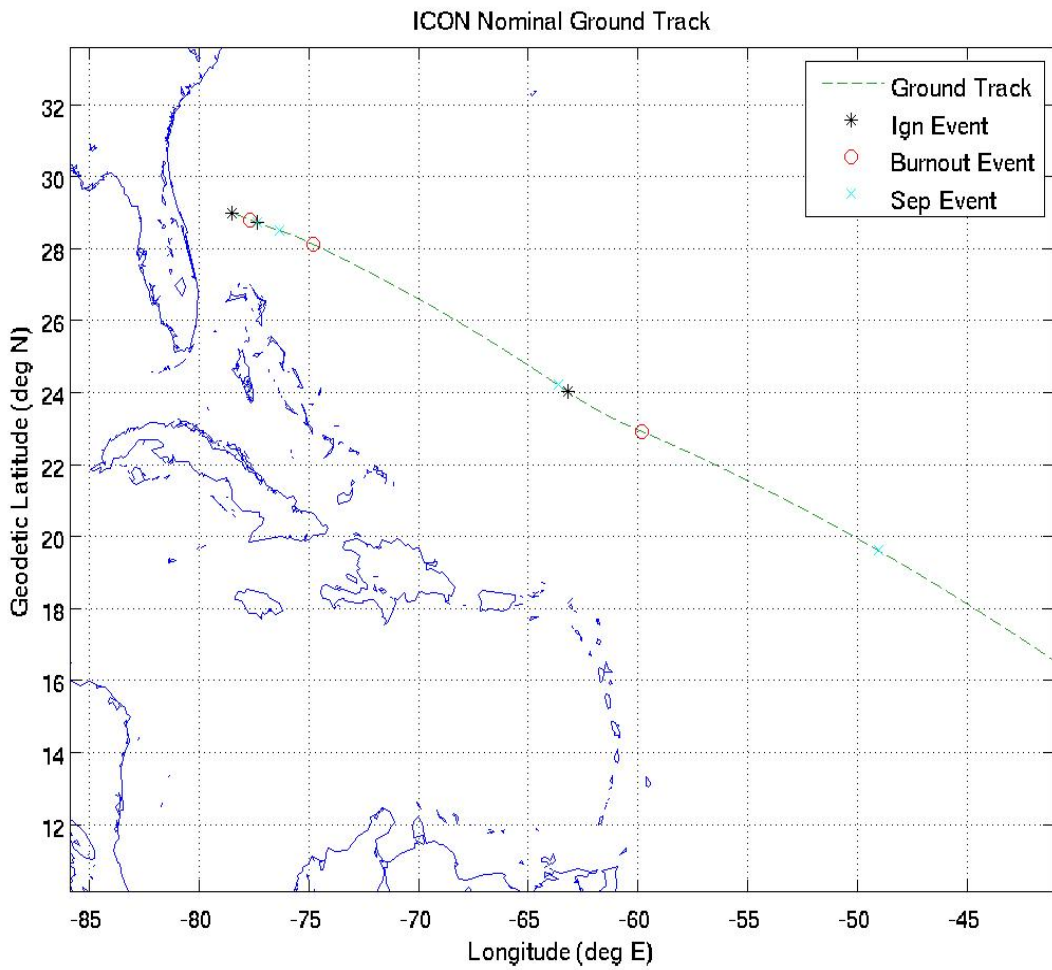


FIGURE 3
Pegasus ICON Trajectory Ground Track



21-Mar-2018 11:59

TABLE 2
Pegasus ICON Trajectory File- 60sec Increments

Time	ECF POS	ECF POS	ECF POS	ECF VEL	ECF VEL	ECF VEL
(sec)	X	Y	Z	X	Y	Z
	(m)	(m)	(m)	(m/sec)	(m/sec)	(m/sec)
0	1115200	-5481385	3079911	258	21	-55
60	1163310	-5495781	3079774	1760	-694	85
120	1311421	-5541332	3081019	3065	-694	17
180	1579340	-5598601	3068267	5276	-1065	-500
240	1891555	-5650044	3030627	5128	-652	-752
300	2194416	-5677151	2978358	4965	-254	-988
360	2487081	-5680785	2912299	4788	131	-1212
420	2768770	-5661679	2833199	4599	504	-1423
480	3057707	-5604156	2741205	5443	1772	-1658
540	3423456	-5446583	2633957	6187	2972	-1892
600	3787981	-5258375	2514894	5960	3299	-2076
660	4138151	-5050914	2385051	5709	3614	-2251
720	4472617	-4824965	2244986	5436	3915	-2416
780	4790107	-4581355	2095282	5143	4203	-2572
840	5089424	-4320961	1936587	4831	4475	-2716
900	5369434	-4044723	1769582	4500	4731	-2849
960	5629078	-3753638	1594985	4152	4969	-2969