HNS License Sub, LLC
Attachment A
Amendment to Application for Experimental License
File No. 0011-EX-PL-2006
May 2006

Attachment A

HNS License Sub, LLC ("HNS") hereby submits this amendment to its pending January 30, 2006 application for an experimental license associated with Call Sign WC9XET. *See* File No. 0011-EX-PL-2006.

The purpose of the January 2006 application was to convert HNS' existing experimental special temporary authorization, Call Sign WC9XET, which expires on April 27, 2006, to a permanent experimental license for the purpose of continued domestic testing, demonstration and training operations of up to two mobile terminals using the Ku-band and Ka-band frequencies at each of eight specific locations.

The purpose of this amendment is (i) to modify the geographic area over which testing will be conducted using the specified antennas to include all of the continental United States ("CONUS"), with the exception of the area within a 125 km radius of White Sands, New Mexico; (ii) to expand the list of Ku-band FSS satellites with which the experimental stations may communicate (currently, only the Galaxy 10-R (at 123º W.L.) and the Satmex-5 (at 116.8º W.L.) satellites are included in HNS' authorizations) to include additional satellites; (iii) add additional antenna types to the testing program and secure available flexibility for use of new antenna prototypes; and (iv) modify the currently-authorized antennas to reflect changes resulting from experimentation conducted to date.

HNS requests authority to operate 20 transmitters at any one time during this experimentation/demonstration program.

1. Background

On June 3, 2005, the FCC granted HNS' application for an experimental special temporary authorization, Call Sign WC9XET (0207-EX-ST-2005), permitting HNS to operate satellite terminals mounted on a High Mobility Multipurpose Wheeled Vehicle ("HMMWV") using Ku-band fixed-satellite service ("FSS") frequencies. On October 27, 2005, the FCC granted HNS' application (0573-EX-ST-2005) to modify station WC9XET to include operations on Ka-band FSS frequencies as well.

The HMMWV test vehicles were developed by General Dynamics Corporation as advanced communications resources for the U.S. Department of Defense ("DOD").[1] The test

[1] General Dynamics' initial experimental license application, OET File No. 0640-EX-ST-2004, granted November 24, 2004, Call Sign WC9XAP. The current General Dynamics program is conducted pursuant to OET license WD2XSB, File No. 0117-EX-ML-2005, granted November 21, 2005.

vehicles are currently equipped with a 60 cm antenna, a 15 watt amplifier, the accompanying baseband equipment and an automatic pointing system. As explained in HNS' original and modified STA applications for WC9XET, HNS sought an experimental STA in response to DOD requirements for the development of small, high-throughput terminals that can be used by military commanders for command, control communications, computers and intelligence surveillance and reconnaissance ("C^4ISR").

2. Request for Regular Experimental License to Operate Facilities at Locations in CONUS

By this amendment and the pending application HNS filed in January, HNS requests permission to operate its experimental facilities, as modified herein, pursuant to a permanent license, rather than by special temporary authorization. With respect to the facilities currently authorized,[2] only a minor change in the emission designator is proposed; the e.i.r.p. density transmitted will remain unchanged. The Ku-band mobile terminals will be operated in conjunction with one or the other of the HNS VSAT hub earth stations located in Germantown, MD, which is licensed by the FCC under Call Sign E000166, and North Las Vegas, Nevada, which is licensed by the FCC under Call Sign E940460. The E000166 and E940460 hubs are licensed to provide VSAT service in the U.S. on multiple Ku-band spacecraft, which include the majority of the Ku-band satellites listed in Section 3 below.

HNS expects to continue to conduct testing of the prototype terminals, including the new terminal types proposed in the instant amendment. Where the Experimental STAs and the pending modification of license application specify a limited number of controlled test ranges for these operations, HNS now believes that it is more relevant to its long-term testing and demonstration program (which could include testing and demonstrations at a variety of military facilities and trade exhibitions around the country) to permit operations at any location within CONUS. Not only will this provide HNS with the flexibility it needs to appropriately test and demonstrate the terminals, it will permit HNS to test the system under a variety of different combinations of terrain scenarios and climate conditions. These are things it could not easily do with a limited collection of testing/demonstration locations.

3. Inclusion of Additional Points of Communication

With this amendment, HNS expands from two Ku-band satellites the list of points of communication for the terminals it proposes to use in the experimentation/demonstration program. As is the case with the request for full-CONUS access, increasing the list of satellites to include points of communications that are used or useable by HNS's Germantown, MD and North Las Vegas, NV hub earth stations will increase HNS's ability to find suitable satellite capacity that will ensure its ability to satisfy its obligation not to cause harmful interference through the terminals it will be using. Having the flexibility to look to multiple satellites for the option that has the lowest potential for causing undesired interference to adjacent satellites

[2] See HNS' Experimental STA applications, OET file numbers 0207-EX-ST-2005 and 0573-EX-ST-2005, for a complete technical showing. The STAs were recently renewed, with an expiration date now of October 10, 2006. *See* File No. 0224-EX-ST-2006, granted April 10, 2006.

ensures the minimization of the potential for undesired interference resulting from the ongoing experimentation program.

Following grant of this application, the points of communication in Ku-band for the authorized terminals will be as shown in Table 1 below. Entries marked "current" are presently included in the subject authorization held by HNS; entries marked "new" are proposed for inclusion as authorized points of communication under the permanent experimental authorization as modified and amended.

TABLE 1: Ku-band Points of Communication for WC9XET

Satellite Name	Orbital Location	Current or New Authority
AMC-3	87º W.L.	New
AMC-4	101º W.L.	New
AMC-6	72º W.L.	New
AMC-9	83º W.L.	New
Galaxy 3C	95º W.L.	New
Galaxy 4R	99º W.L.	New
Galaxy 10-R	123º W.L.	Current
Galaxy 11	91º W.L.	New
Horizons-1	127º W.L.	New
IA-5	97º W.L.	New
IA-6	93º W.L.	New
IA-7	129º W.L.	New
IA-8	89º W.L.	New
Intelsat 707	53º W.L.	New
SATMEX-5	116.8º W.L.	Current
SATMEX-6*	109.2 º W.L.	New

* SATMEX-6 is the subject of a pending request for inclusion on the Permitted Space Station List. *See* File No. SAT-PPL-20060329-00030 (filed March 29, 2006). HNS will not utilize this satellite in conjunction with this application until such time as the pending request for declaratory ruling is favorably acted upon by the Commission, and urges the Commission to condition the license requested herein accordingly.

Table 2 lists the Ka-band points of communication authorized under the existing experimental STA. HNS does not seek to expand the list of satellites with which its Ka-band terminals authorized under Call Sign WC9XET may communicate, so all entries are marked as "current" for completeness purposes.

TABLE 2: Ka-band Points of Communication for WC9XET

Satellite Name	Orbital Location	Current or New Authority
AMC-15	105º W.L.	Current
AMC-16	87.5º W.L.	Current
Spaceway-1	102.8º W.L.	Current
Spaceway-2	99.2º W.L.	Current

4. Additional Ku-Band Antennas For Mobile Terminals

Currently HNS is authorized to use General Dynamics 60 cm antennas. As has been done by General Dynamics in File No. 0117-EX-ML-2005 (Call Sign WD2XSB), HNS also seeks a modification of its existing authorization to allow for operation of the proposed vehicle-based satellite communications terminals using smaller (0.45 and 0.50 meter) mobile earth station antennas in addition to the originally licensed 0.60 meter mobile antennas.[3]

As was indicated by General Dynamics in the referenced application, military customers continue to push for the development and evaluation of ever smaller aperture antennas. In fact, the U.S. Marines Corps has recently initiated a competitive procurement process to evaluate and purchase smaller antennas, which are urgently desired for various mission-critical applications in Iraq and Afghanistan. HNS and General Dynamics are hereby attempting to assist the military in meeting these and other high-priority operational requirements as rapidly as possible.

As mentioned above, operations of vehicle-based satellite communications systems in Ku-band and Ka-band FSS frequencies under HNS's underlying authorization have thus far been conducted with General Dynamics' 0.60 meter antennas. However, antenna range testing has confirmed comparable antenna sidelobe performance with Ku-band antennas having apertures of 0.50 and 0.45 meters. In fact, while these antennas have correspondingly lower gain and broader main transmission beamwidths, they have demonstrated no greater deviation from the radiation pattern requirements specified in Section 25.209 of the Commission's Rules than the previously authorized 0.60 meter antennas. Moreover, the EIRP density values for the smaller antennas will be no higher at any angle of radiation than those produced by a combination of the 0.60 meter antenna and an input power spectral density of -22 dBW/4 kHz.

Accordingly, HNS requests authorization to use smaller antennas under the same power spectral density and other operational limitation imposed in the existing General Dynamics authorization in File No. 0117-EX-ML-2005 (which conditions are effectively the same as the special conditions imposed in the existing HNS STA in Call Sign WC9XET). In particular, HNS requests such authority as may be needed to use prototype antennas that may be under development during the term of the requested license, but that are not described in this application, as amended. HNS requests that the use of such antennas be permitted, subject to the condition that HNS will reduce the input power density at the antenna flange, either by making use of signal spreading or by reducing the power, as appropriate, to ensure that power density at the antenna flange complies with the -14 dBW/4kHz limit specified in Section 25.134(a)(1) of the FCC's rules. In the manner the Commission has employed for operation in the Ku-band FSS frequencies by earth stations on board vessels ("ESV"), where there is no aperture limitation, HNS will comply with the following off-axis EIRP density limitations:

$15 - 25 \log(\theta)$ dBW/4 kHz	for $125^\circ \leq \theta \leq 7.0^\circ$
– 6 dBW/4 kHz	for $7.0^\circ \leq \theta \leq 9.2^\circ$
$18 - 25 \log(\theta)$ dBW/4 kHz	for $9.2^\circ \leq \theta \leq 48^\circ$
– 24 dBW/4 kHz	for $48^\circ \leq \theta \leq 180^\circ$

[3] General Dynamic experimental license application 0117-EX-ML-2005 for Call Sign WD2XSB, granted on 21 November 2005.

For tracking, HNS will maintain the accuracy to within 0.2º, and transmissions will cease if the error exceeds 0.5º, and not resume until accuracy is again to within 0.2º.

5. Changes in Currently-Authorized Antenna Technical Parameters

Currently the 60 cm Ku-band mobile terminals are licensed under STA to operate with an emission designator of 1M60G7D using 1.6 MHz of maximum bandwidth, QPSK modulation supporting various symbol rates, and a maximum e.i.r.p. density transmitted that will remain constant at 22.8 dBW/4kHz.

Under this amendment HNS requests authority to change the emission designator of the authorized antennas to 12M8G7D (corresponding to a maximum bandwidth of 12.8 MHz) in order to support spectrum spreading at a maximum chip rate of 16:1 for a signal bandwidth of 800 KHz. The modulation of the carrier will still be QPSK.

6. Adjacent Satellite Interference

All of the proposed terminals are designed to maintain a power density at the flange that complies with the -14 dBW/4kHz limit specified in Section 25.134(a)(1) of the FCC's rules.

Due to the small size of the antennas used, they do not comply with the antenna off-axis gain mask as established in Part 25.209. These antennas exhibit their non-compliance in the region from 1.0 to 3.0 degrees off axis from the maximum gain in the transmit band, due to the width of their main gain lobe. The amount of non-compliance is 8 dB in this range of off-axis angles. To assure compliance with the antenna off-axis gain mask, HNS will reduce the input power density at the antenna flange to -22 dBW/4kHz by either making use of signal spreading or by reducing the power.

To the extent that HNS may seek to operate at input power density levels greater than -22 dBW/4kHz for some short duration during phases of the testing, HNS will coordinate with the satellite operators involved, so as to ensure that the testing does not adversely interfere with operations on adjacent satellites. Since the testing being proposed will be limited to a few hours of intermittent use over the term of the requested license, HNS undertakes to advise the operation center of the adjacent satellite operators of the exact time periods during which the testing of these mobile terminals will be conducted. HNS will also provide the adjacent satellite operators with the contact information of the engineer responsible for the prototype test so that the transmission can be immediately stopped in the event of any harmful interference.

7. Radiation Hazard Assessment

Attachment B provides the radiation hazard analyses for these new antennas based on the methodology described in OET Bulletin 65. The results are identical to those presented earlier for the 60 cm General Dynamics antenna case. All these terminal antennas have a very small signal beam area. The beam width at the half power point is 2.3^{o} for the 60 cm antenna, 2.5^{o} for the 50 cm antenna, and 2.6^{o} for the 45 cm antenna.

Moreover, the terminals are mounted on the roof of vehicles and pointed upward, away from areas where personnel could enter the beam. Further, the mobile terminals are designed to cease transmission when the signal from the hub is lost due to signal fading or blockage, or due to a misoriented antenna. This antenna design mechanism ensures that the terminal does not accidentally illuminate persons that might be in the boresight of the terminal, while the vehicle on which the antenna is mounted is either stopped or in motion

8. Five-Year License Term Requested

HNS's testing program will be ongoing, and reflects the continued rapid advances in the technology involved and the nature of the vehicle-based satellite communications. This represents an exciting and potentially valuable growth area for satellite operators, service provides, and equipment manufacturers alike, and demonstrating the feasibility, technical compatibility, and capabilities of the services and their applications will take time and practical experience. HNS is a preeminent leader in the field, and expects to continue to be at the forefront of experimentation and development in this new area for the long-term. For these reasons, HNS hereby requests that the FCC grant it a five-year license under Section 5.71, rather than the two-year license requested in the January filing.

9. Public Interest Considerations

There are strong public interest reasons supporting each of the modifications HNS requests in this amendment. With respect first to the expansion of points of communication, HNS observes that it is very difficult to find space segment capacity (especially in the 14-14.5 GHz band) such that the adjacent satellite interference will not adversely impact the operations of adjacent satellites. Expanding the list of points of communication to include at a minimum the satellites with which HNS communicates through its Germantown, MD and North Las Vegas, NV hub earth stations will increase the flexibility HNS has in a way that is designed to ensure a minimization of the potential for undesired interference resulting from the ongoing experimentation program.

The technical changes to the currently-authorized transmit antennas will allow HNS to continue the development of small, high throughput terminals that are required by the DOD and that can be used by the U.S. military for C^4ISR applications. These are important applications that could have a profound influence on how the military communicates with its field forces in modern combat situations.

HNS emphasizes that it will not use the facilities it proposes to implement a revenue-generating or otherwise commercial service. The operations it conducts and seeks to continue to conduct under Call Sign WC9XET are essential to the development and testing of a newly-emerging area of satellite communications that has a substantial potential in the future to expand the range and value of satellite services. If and when HNS seeks to implement a commercial service using Ku-band or Ka-band vehicle-based satellite communications facilities, it will file the appropriate application on FCC Form 312 with the International Bureau.