Exhibit For
Globecomm License Sub LLC
Laurel, Maryland
Call Sign: E020288
Andrew Corporation 7.6 Meter Earth Station

Compliance with FCC Report & Order (FCC96-377) for the 13.75 - 14.0 GHz Band
Analysis and Calculations

1. Background

This Exhibit is presented to demonstrate the extent to which the Globecomm License Sub LLC satellite earth station in Laurel, Maryland is in compliance with FCC REPORT & ORDER 96-377. The potential interference from the earth station to US Navy shipboard radiolocation operations (RADAR) and the NASA space research activities in the 13.75 - 14.0 GHz Band is addressed in this exhibit. The parameters for the earth station are:

Table 1. Earth Station Characteristics

- Coordinates (NAD83): 39° 06' 45.5" N, 76° 49' 58.0" W
- Satellite Location for Earth Station: Telstar-12 (15.0° W)
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: Linear
- Emissions: 700KG7W, 30M0G7W, and 36M0G7W
- Modulation: Digital
- Maximum Aggregate Uplink EIRP: 68.2 dBW for the 700 kHz Carriers
  75.9 dBW for the 30 MHz Carriers
  81.7 dBW for the 36 MHz Carriers
- Transmit Antenna Characteristics
  - Antenna Size: 7.6 meters in Diameter
  - Antenna Type/Model: Andrew Corporation
  - Gain: 59.9 dBi
- RF power into Antenna Flange: 700 kHz
  8.3 dBW
  or -14.1 dBW/4 kHz (Maximum)

30 MHz
16.0 dBW or 1.3 dBW/MHz (Minimum)
or -22.7 dBW/4 kHz (Maximum)

- RF power into Antenna Flange: (Continued) — 36.0 MHz
  21.8 dBW or 6.2 dBW/MHz
  or -17.7 dBW/4 kHz (Maximum)

- Minimum Elevation Angle:
  Laurel, MD — 13.0° @ 108.7° Az. (Telestar-12) at 15.0° W

- Side Lobe Antenna Gain: — 32 - 25*log(θ)

Because the above uplink spectrum is shared with the Federal Government, coordination in this band requires resolution data pertaining to potential interference between the earth station and both Navy Department and NASA systems. Potential interference from the earth station could impact with the Navy and/or NASA systems in two areas. These areas are noted in FCC Report and Order 96-377 dated September 1996, and consist of (1) Radiolocation and radio navigation, (2) Data Relay Satellites.

Summary of Coordination Issues:

1) Potential Impact to Government Radiolocation (Shipboard Radar)
2) Potential Impact to NASA Data Relay Satellite Systems (TDRSS)

2. Potential Impact to Government Radiolocation (Shipboard Radar)

Radiolocation operations (RADAR) may occur anywhere in the 13.4 - 14 GHz frequency band aboard ocean going United States Navy ships. The Federal Communication Commission (FCC) order 96-377 allocates the top 250 MHz of this 600 MHz band to the Fixed Satellite Service (FSS) on a co-primary basis with the radiolocation operations and provides for an interference protection level of -167 dBW/m^2/4 kHz.

The closest distance to the shoreline from the Laurel earth station is approximately 39.95 km Southeast toward the Chesapeake Bay. The calculation of the power spectral density at this distance is given by:

	700 kHz	30.0 MHz	36.0 MHz
1. Clear Sky EIRP:	68.2 dBW	75.9 dBW	81.7 dBW
2. Carrier Bandwidth:	700 kHz	30 MHz	36 MHz
3. PD at antenna Input: (dBW/4 kHz)	-14.1	-22.7	-17.7

4. Transmit Antenna Gain: 59.9 dBi
5. Antenna Gain Horizon: FCC Reference Pattern
6. Antenna Elevation Angles: 13.0°

The proposed earth station will radiate interference toward the Bay according to its off-axis side-lobe performance. A conservative analysis, using FCC standard reference pattern, results in off-axis antenna gains of 3.0 dBi toward the Chesapeake Bay.

The signal density at the shoreline, through free space is:

700 kHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss ($dBw\text{-}m^2$).

= -14.1 dBw/4 kHz + 3.0 dBi – 10*log[4Π*(39950m)^2]
= -114.1 dBW/m^2/4 kHz + Additional Path Losses (~53.4 dB)
= -167.5 dBW/m^2/4 kHz

30 MHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss ($dBw\text{-}m^2$).

= -22.7 dBw/4 kHz + 3.0 dBi – 10*log[4Π*(39950m)^2]
= -122.7 dBW/m^2/4 kHz + Additional Path Losses (~53.4 dB)
= -176.1 dBW/m^2/4 kHz

36 MHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss ($dBw\text{-}m^2$).

= -17.7 dBw/4 kHz + 3.0 dBi – 10*log[4Π*(39950m)^2]
= -117.7 dBW/m^2/4 kHz + Additional Path Losses (~53.4 dB)
= -171.1 dBW/m^2/4 kHz

Our calculations identified additional path losses of approximately 53.4 dB including absorption loss and earth diffraction loss for the actual path profiles from the earth station to the nearest shoreline.

The worst case calculated PFD including additional path losses to the closest shoreline location is –167.5 dBW/m^2/4 kHz for the 700 kHz carriers, -176.1 dBW/m^2/4 kHz for the 30 MHz carriers, and -171.7 dBW/m^2/4 kHz for the 36 MHz carriers. This is 0.5 dB below the –167 dBW/ m^2/4 kHz interference criteria of R&O 96-377 for the 700 kHz carriers, 9.1 dB below the –167 dBW/ m^2/4 kHz interference criteria of R&O 96-377 for the 30 MHz carriers, and 4.7 dBW/m^2/4 kHz for the 36 MHz carriers. Therefore, there should be no interference to the US Navy RADAR from the Laurel earth station due to the distance and the terrain blockage between the site and the shore.

3. Potential Impact to NASA's Data Relay Satellite System (TDRSS)

The geographic location of the Globecomm License Sub LLC earth station in Laurel, Maryland is outside the 390 km radius coordination contour surrounding NASA's White Sands, New Mexico ground station complex. Therefore, the TDRSS space-to-earth link will not be impacted by the Globecomm License Sub earth station in Laurel, Maryland.

The TDRSS space-to-space link in the 13.772 to 13.778 GHz band is assumed to be protected if an earth station produces an EIRP less than 71 dBW/6 MHz in this band. The 7.6 meter earth station antenna will have an EIRP less than 71 dBW/6 MHz for the 700 kHz and 30 MHz carriers in this band. The total EIRP for the 700 kHz, carrier is 68.2 dBW, while the total EIRP for the 30 MHz, carrier is 75.9 dBW. The equivalent EIRP per 6 MHz segment will remain at 68.2 dBW/6 MHz for the 700 kHz carriers and 70.9 dBW/6 MHz for the 30 MHz carriers. Therefore, there should not be interference to the TDRSS space-to-space link for the 700 kHz to 30 MHz carriers.

The TDRSS space-to-space link in the 13.772 to 13.778 GHz band is assumed to be protected if an earth station produces an EIRP less than 71 dBW/6 MHz in this band. The 7.6 meter earth station antenna will have an EIRP greater than 71 dBW/6 MHz for the 36 MHz carriers in this band. For the 36 MHz carriers, the total EIRP of 81.7 dBW will equate to an EIRP per 6 MHz of 75.7 dBW/6 MHz. This level is above the 71.0 dBW/6 MHz threshold, and there will be interference to the TDRSS space-to-space link. Therefore, transmit operations from 13770 to 13780 MHz will not be permitted for the 36 MHz emissions.

In order to meet the 71 dBW/6 MHz interference criteria, the earth station's 36 MHz carrier would have to be limited to an RF power density 4.8 dB lower than the maximum of -17.7 dBW/4kHz or -22.5 dBW/4kHz for an EIRP of 76.9 dBW. If this operational condition cannot be met, then the Laurel, Maryland earth station may not be tuned to operate at the frequencies in the 13.772 to 13.778 GHz Band.

4. Coordination Issue Result Summary and Conclusions

The results of the analysis and calculations performed in this exhibit indicate that compatible operation between the earth station at the Laurel facility and the US Navy and NASA systems space-to-earth link will be possible for the 700 kHz through 30 MHz carriers.

The results of the analysis and calculations performed in this exhibit also indicate that compatible operations between the earth station at the Laurel facility and the US Navy and NASA systems space-to-earth link will be possible for the 36 MHz carriers. However, the analysis based on the assumption of a 36 MHz bandwidth carrier indicates that operations in NASA systems space-to-space link (13772.0 to 13778.0 MHz) will not be permitted. Therefore, the 36 MHz carriers will only transmit on frequencies 13,780.0 to 14,000.0 MHz.