Exhibit For
Globecomm
Laurel, Maryland
ASC Signal 4 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 Gobelcomm 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: 15.0° W
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: Linear
- Emissions: 51K2G7W, 578KG7W, 1M23G7W, 36M0G7W
- Modulation: Digital
- Maximum Aggregate Uplink EIRP: 48.27 dBW for the 51.2 kHz Carrier
  58.79 dBW for the 578 kHz Carriers
  62.07 dBW for the 1.23 MHz Carriers
  76.74 dBW for the 36 MHz Carriers
- Transmit Antenna Characteristics
  Antenna Size: 4.0 meters in Diameter
  Antenna Type/Model: ASC Signal
  Gain: 51.2 dBi
- RF power into Antenna Flange:
  51.2 kHz
  -2.93 dBW
  or -14.0 dBW/4 kHz

578 kHz
7.59 dBW
or -14.0 dBW/4 kHz

1.23 MHz
10.87 dBW
or -14.0 dBW/4 kHz (Maximum)

36 MHz
25.54 dBW
or –14.0 dBW/4 kHz (Maximum)

- Minimum Elevation Angle:
  Laurel, Md 13.0° @ 108.7° Az.

- 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 40.3 km Southeast toward the Chesapeake Bay. The calculation of the power spectral density at this distance is given by:

		51.2 kHz	578kHz	1.23 MHz	36MHz
1.	Clear Sky EIRP (dBW):	48.27	58.79	62.07	76.74
2.	Carrier Bandwidth:	51.2 kHz	578 kHz	1.23 MHz	36 MHz
3.	PD at antenna Input: (dBW/4 kHz)	-14.0	-14.0	-14.0	-14.0
4.	Transmit Antenna Gain:	51.2 dBi			
5.	Antenna Gain Horizon:	FCC Reference Pattern			
6.	Antenna Elevation Angle:	13.0°			

The proposed earth station will radiate interference toward the Chesapeake Bay according to its off-axis side-lobe performance. A conservative analysis, using FCC standard reference pattern, results in off-axis antenna gains of -2.5 dBi toward the Chesapeake Bay.

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

51.2 kHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).
= -14.0 dBw/4 kHz + (-2.5) dBi – 10*log[4Π*(40300m)^2]
= -119.5 dBW/m^2/4 kHz + Additional Path Losses (~50.3 dB)
= -169.8 dBW/m^2/4 kHz

578 kHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).
= -14.0 dBw/4 kHz + (-2.5) dBi – 10*log[4Π*(40300m)^2]
= -119.5 dBW/m^2/4 kHz + Additional Path Losses (~50.3 dB)
= -169.8 dBW/m^2/4 kHz

1.23 MHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).
= -14.0 dBw/4 kHz + (-2.5) dBi – 10*log[4Π*(40300m)^2]
= -119.5 dBW/m^2/4 kHz + Additional Path Losses (~50.3 dB)
= -169.8 dBW/m^2/4 kHz

36 MHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).
= -14.0 dBw/4 kHz + (-2.5) dBi – 10*log[4Π*(40300m)^2]
= -119.5 dBW/m^2/4 kHz + Additional Path Losses (~50.3 dB)
= -169.8 dBW/m^2/4 kHz

Our calculations identified additional path losses of approximately 50.3 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 when considering all carriers, including additional path losses to the closest shoreline location is –169.8 dBW/m^2/4 kHz. All carriers are a minimum of 2.8 dB below the –167 dBW/ m^2/4 kHz interference criteria of R&O 96-377. 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 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 Gobelcomm 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 4 meter earth station antenna will have an EIRP less than 71 dBW/6 MHz for all carriers, 51.2 kHz, 578 kHz, 1.23 MHz and 36 MHz carriers in this band. The total EIRP for the 51.2 kHz Carrier is 48.27 dBW and the equivalent EIRP per 6 MHz will be 48.21 dBW/6 MHz. The total EIRP for the 578 kHz, carriers is 58.79 dBW. The equivalent EIRP per 6 MHz segment will be 58.21 dBW/6 MHz. The total EIRP for the 1.23 MHz is 62.07 dBW. The equivalent EIRP per 6 MHz will be 61.86 dBW/6 MHz. The total EIRP for the 36 MHz, carriers is 76.74 dBW. The equivalent EIRP per 6 MHz segment will remain at 70.74 dBW/6 MHz. Therefore, there should not be interference to the TDRSS space-to-space link for the 51.2 kHz, 578 kHz, 1.23 MHz and 36 MHz carriers.

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 are possible for all of the proposed carriers. Operations in NASA systems space-to-space link (13772.0 to 13778.0 MHz) will also be permitted for all of the carriers.