Exhibit For
Telesat Network Services, Inc.
Mt. Jackson, Virginia
(Call Sign: KA399)
Vertex Corporation 15.0 Meter KPK 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 licensed Telesat Network Services Inc. satellite earth station (KA399), which is being modified in Mt. Jackson, Virginia, 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): 38° 43’ 42.0” N, 78° 39’ 25.0” W
- Satellite Location for Earth Station: Telstar-12 at 109.2° W
- Frequency Band: 13.75-14.0 GHz for uplink
- Polarizations: Linear and Circular
- Emissions: 600KG7W
  54M0G7W
- Modulation: Digital
- Maximum Aggregate Uplink EIRP: 68.1 dBW for the 600 kHz Carriers
  79.9 dBW for the 54 MHz Carriers
  84.7 dBW for the 54 MHz Carriers
- Transmit Antenna Characteristics
  - Antenna Size: 15.0 meters in Diameter
  - Antenna Type/Model: Vertex Corporation
  - Gain: 64.5 dBi

- RF power into Antenna Flange: 600 kHz
  3.6 dBW
  or -20.4 dBW/4 kHz (Maximum)

  54 MHz (From 13.75 to 13.811 GHz)
  15.4 dBW or -1.92 dBW/MHz
  or -25.92 dBW/4 kHz (Maximum)

  54 MHz (From 13.811 to 14.0 GHz)
  20.2 dBW or 2.88 dBW/MHz
  or -21.1 dBW/4 kHz (Maximum)

- Minimum Elevation Angles:
  Mt. Jackson, VA 35.1° @ 223.3° Az. (Telstar-12) at 109.2° W

- Side Lobe Antenna Gain: $32 - 25*\log(\theta)$

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 Mt. Jackson earth station is approximately 281.8 km Southeast toward Norfolk, Virginia. The calculation of the power spectral density at this distance is given by:

	600 kHz	54 MHz	54 MHz
1. Clear Sky EIRP:	68.1 dBW	79.9 dBW	84.7 dBW
2. Carrier Bandwidth:	600 kHz	54 MHz	54 MHz
3. PD at antenna input: dBW/4 kHz	-20.4	-25.9	-21.1
4. Transmit Antenna Gain:	64.5 dBi		
5. Antenna Gain Horizon:	FCC Reference Pattern		
6. Antenna Elevation Angle :	35.1°		

The earth station will radiate interference toward Norfolk, Virginia according to its off-axis side-lobe performance. A conservative analysis, using FCC standard reference pattern, results in off-axis antenna gains of -10.0 dBi toward Norfolk, Virginia and the Chesapeake Bay.

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

600 kHz Carriers
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).

= -20.4 dBw/4 kHz + (-10.0) dBi – 10*log[4Π*(281800m)^2]
= -150.3 dBW/m^2/4 kHz + Additional Path Losses (~86.4 dB)
= -236.7 dBW/m^2/4 kHz

54 MHz Carriers (Transmit from 13,750 to 13,811 MHz)
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).

= -25.9 dBw/4 kHz + (-10.0) dBi – 10*log[4Π*(281800m)^2]
= -155.8 dBW/m^2/4 kHz + Additional Path Losses (~86.4 dB)
= -242.2 dBW/m^2/4 kHz

54 MHz Carriers (Transmit from 13,811 to 14,000 MHz)
PFD = Antenna Feed Power density (dBW/4 kHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBw-m^2).

= -21.1 dBw/4 kHz + (-10.0) dBi – 10*log[4Π*(281800m)^2]
= -151.0 dBW/m^2/4 kHz + Additional Path Losses (~86.4 dB)
= -237.4 dBW/m^2/4 kHz

Our calculations show additional path loss of approximately 86.4 dB including absorption loss and earth diffraction loss for the actual path profiles from the proposed earth station to the nearest shoreline.

The calculated PFD including additional path losses to the closest shoreline location is –236.7 dBW/m^2/4 kHz for the 600 kHz carriers. The calculated PFD including additional path losses to the closest shoreline location is -242.2 and -237.4 dBW/m^2/4 kHz for the 54 MHz carriers. These PFDs are 69.7 dB (600 kHz), 75.2 dB and 70.4 dB (54 MHz) 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 Mt. Jackson 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 Telesat Network Services, Inc. earth station in Mt. Jackson, Virginia 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 Telesat Network Services, Inc. earth station in Mt. Jackson, Virginia.

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 15.0 meter earth station antenna will have an EIRP less than 71 dBW/6 MHz for the 600 kHz carriers in this band. The total EIRP for the 600 kHz, carrier is 68.1 dBW. The equivalent EIRP per 6 MHz segment will remain at 68.1 dBW/6 MHz. Therefore, there should not be interference to the TDRSS space-to-space link for the 600 kHz carriers.

For that portion of the frequency band from 13,750.0 to 13,811.0 MHz the total EIRP for the 54 MHz carriers, will be 79.9 dBW, which will equate to an EIRP per 6 MHz of 70.9 dBW/6 MHz. Since this level will meet the 71.0 dBW/6 MHz threshold, there should not be interference to the TDRSS space-to-space link in that portion of the band from 13.772 to 13.778 GHz for the 54 MHz carriers from 13,750.0 to 13,811.0 MHz.

For that portion of the frequency band from 13,811.0 to 14,000.0 MHz the total EIRP for the 54 MHz carriers, will be 84.7 dBW, which will equate to an EIRP per 6 MHz of 75.7 dBW/6 MHz. Since this level will be above the 71.0 dBW/6 MHz threshold, there will be interference to the TDRSS space-to-space link from the 54 MHz carriers. Therefore, at the 84.7 dBW power level, the earth station will only operate between frequencies 13,811.0 and 14,000.0 MHz.

4. Coordination Issue Result Summary and Conclusions

The results of the analysis and calculations performed in this exhibit indicate that compatible operations between the earth station at the Mt. Jackson facility and the US Navy and NASA systems space-to-earth link and NASA systems space-to-space link (13772.0 to 13778.0 MHz) will be permitted for the 600 kHz carriers.

For the 54 MHz carriers, the results of the analysis and calculations performed in this exhibit indicate that compatible operations between the earth station at the Mt. Jackson facility and the US Navy, and NASA systems space-to-earth and space-to-space links are possible. Please note however, that operations in NASA systems space-to-space link (13,772.0 to 13,778.0 MHz) will be permitted because the EIRP of the 54 MHz carriers will be lowered from 84.7 dBW to 79.9 dBW in that portion of the band from 13,750.0 to 13,811.0 MHz. For the remainder of the band from 13,811.0 to 14,000.0 MHz the EIRP will remain at 84.7 dBW for the 54 MHz carriers.