A Coordination Agreement Between the National Aeronautics and Space Administration (hereinafter "NASA") and Row 44, Incorporated (hereinafter "Row 44") for Operation of the Row AMSS in the 14.05 – 14.47 GHz-Band

Row 44 seeks to license and operate aeronautical mobile-satellite stations (AMSS) over the Continental United States (CONUS) on a secondary basis in the 14.05 to 14.47 GHz FSS band. The AMSS terminals are part of the Row 44 communications system aboard general aviation and commercial aircraft using transponders in the Geostationary Satellite Orbit (GSO) arc. This Coordination Agreement has been prepared in compliance with the rules of the Federal Communications Commission (FCC) and the recommendations of the member states of the International Telecommunication Union (ITU) following the World Radio Communication Conference WRC-03.

1. Overview

The 14.0 – 14.5 GHz-band has been allocated to the mobile-satellite service, now including aeronautical mobile-satellite service, on a secondary basis, provided that Airborne Earth Stations (AES) include specific protection to the Space Research Services (SRS) earth stations and to the Tracking and Data Relay Satellite System (TDRSS) within the 13.40 – 14.4 GHz-band

Row 44 has filed an application for license authorization to operate up to 1000 technically identical AES units in the 14.05 – 14.47 GHz-band.

The Row 44 AESs receive from, and transmit to, the same GSO satellite transponder under control of a Ground Earth Station (GES) and Network Operations Center (NOC). They, and the terrestrial network to which they are connected, comprise the Row 44 system.

This Coordination Agreement has been prepared to ensure that operation of the Row 44 AESs conform to FCC requirements for protection of the SRS Network.

Row 44 has the authority to negotiate and sign this Coordination Agreement for their AMSS system and NASA has the authority to negotiate and sign this agreement for the TDRSS and SRS Network sites listed in Section 3.1.

2. AUTHORITY

NASA concludes this agreement pursuant to 42 USC §2473 © (5) and (6) and section 203 © (5) of the National Aeronautics and Space Act of 1958 as amended, in addition to the Manual of Regulations and Procedures for Federal Radio Frequency Management (National Telecommunications & Information Administration Redbook), May 2003 Edition. May 2008 Revision.

3. Space Research Services Earth Stations

TDRSS Earth Station Sites:

Table 1 provides a list of TDRSS earth stations sites requiring interference protection. The White Sands and Guam sites are currently operational. The Blossom Point, MD site is planned for operation in about 2.5 to 3 years. Also provided are the TDRSS satellite orbital locations currently supported by each earth station site.

Earth Station Site	Latitude (D,M,S)	Longitude (D,M,S)	TDRSS Satellite Degrees East Long.*
Continental United States			
White Sands, New Mexico	N32 30' 18.686"	W106 36' 37.153"	-174
Antenna Size – 18.3 meter			-171
Antenna Gain – 66.4 dBi			-150
Elevation – 1456 m			-79
			-62
			-49
			-47
			-41
Blossom Point, MD			-12
N382544/W770502			-41
Antenna Size - 16.5-20 m			-47
Maximum Antenna Gain -66.7			-49
dBi			-62
Elevation - 0 meter			-79
United States Territory[1]			
Guam	N13 36' 0"	E144 54' 0"	85
Antenna Size – 11 meter			89
Antenna Gain – 61.9 dBi			-171/-174

[1] Should Row 44 extend operations outside of CONUS, it shall provide the same protection to NASA's TDRSS Earth Stations sites around the world (such as Guam) as will be provided to the other Station sites covered by this Agreement.

Table 1. Existing TDRSS Earth Station Sites

Ephemeris data on existing TDRSS spacecraft indicated in Table 1 may be found at the following Web sites:

a. http://fdf.gsfc.nasa.gov/prod_center_pc_frame_page.htm
Select Retrieve Other Products
Select Retrieve 2-line Element Sets (Celestial BBS)
Under NORAD Two-Line Element Sets, Select Current Data
Select Tracking and Data Relay Satellite System (TDRSS)

b. Obtain the NORAD orbital elements directly at:

http://celestrak.com/NORAD/elements/

choose Tracking and Data Relay Satellite System (TDRSS)

Additional TDRSS Earth Station Sites:

NASA shall provide Row 44 at least two months written notice of when the Blossom Point, MD earth station is about to become operational. Protection of this site must be provided by its planned operational date of use.

NASA may unilaterally add additional TDRSS earth station sites to the list in Table 1 above. NASA will notify Row 44 as soon as it knows that a new earth station is being planned and has the coordinates of the newly planned site.

Earth Site Protection Limits:

The TDRSS protection limits are listed in the Table 2 below.

Frequency Band	Interference Threshold Limit Measured at Antenna Output	Reference Percentage of Time
13.40 – 14.00 GHz	-176 dBW/ kHz	Never to be Exceeded
14.00 – 14.05 GHz	-146 dBW/ MHz	Never to be Exceeded
14.05 – 14.40 GHz	-100 dBW	Never to be Exceeded

Table 2. TDRSS Protection Limits

For interference calculations, the TDRSS spacecraft can have an inclination angle up to 15 degrees. In calculating the interference threshold levels in Table 2, the antenna patterns in Figure 1 below should be used. The antenna pattern for the Blossom Point site will be similar to the WSC pattern in Figure 1.

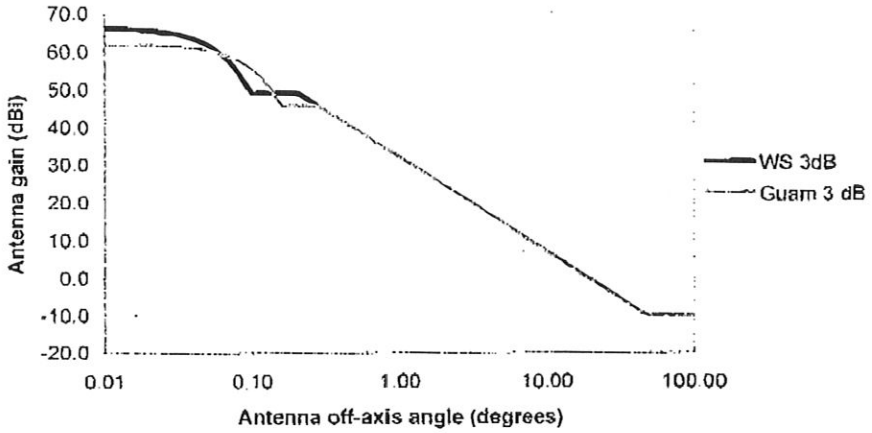

Figure 1. TDRSS Earth Station Antenna Gain Patterns

Note: This antenna pattern is calculated using Annex III of Appendix 8 of the ITU Radio Regulations. with the following modifications:

$G_1 = 5 + 15\log(D/\lambda)$

$\varphi_r = 12.02\ (D/\lambda)^{-0.6}$

Where Gmax and D are given in Table 1.

4. Operational Coordination Agreement

NASA and Row 44 agree to the following:

a. The purpose of this Coordination Agreement is to provide protection to the TDRSS earth station sites listed in Table 1 and any future TDRSS earth station sites.

b. The level of protection afforded to the sites in Table 1, and any future TDRSS earth station sites which NASA adds to Table 1 pursuant to Section 3.2 of this Agreement, shall be equal to or greater than the Interference Threshold Limits shown in Table 2.

4.1 This Coordination Agreement may be reviewed periodically by the signatories to the agreement following commencement of service by Row 44 under an operational license from the FCC. The purpose of the review is to assess the effectiveness of this agreement and update this, or subordinate operational agreements, as appropriate.

4.2 Each party shall inform the other party in a timely manner of changes in the points of contact as defined in Section 5.

4.3 FINANCIAL OBLIGATIONS: Each party shall be responsible for funding its own responsibilities under this Agreement. No provision of this Agreement shall be interpreted to require obligation of funds in violation of the Anti-Deficiency Act 31 U.S.C § 1341.

Row 44 agrees to:

4.4 Monitor, control and cease transmissions from any AES that would exceed the thresholds given in Table 2 within line-of-sight of the sites listed in Table 1.

4.5 Monitor, control and cease transmissions from any AES that would exceed the thresholds given in the Table 2 within line-of-sight of such additional sites as NASA may require.

4.6 Respond expeditiously to a NASA request for protection of the sites listed in Section 3.1. or additions thereto as provided for in Section 3.2. in accordance with the threshold limits of Section 3.3.

4.7 Respond expeditiously to a NASA request to isolate a source of interference to a TDRSS earth station suspected to be from an AES.

4.8 Provide a central point of contact (on a 24 hour, 7 day basis) for interference resolution and other contact.

NASA agrees to:

4.9 Maintain an open dialog with Row 44 concerning any perceived breach of interference thresholds that may be attributable to an AES that is not in compliance with this Coordination Agreement.

4.10 Provide timely notification to Row 44 of changes or additions to TDRSS earth station sites. TDRSS spacecraft orbital positions or interference thresholds listed in this Coordination Agreement.

5. Assignment and Termination

5.1 This Coordination Agreement shall be binding upon the parties hereto and their respective successors and assigns.

5.2 This Coordination Agreement may be terminated by either party upon 6 months written notice to the other.

5.3 CONTINUING OBLIGATIONS: The obligation of Row 44 to protect the NASA TDRSS earth stations from interference as described in this agreement will survive termination or expiration of this Agreement.

6. Points of Contact

6.1 Points of contact concerning this Coordination Agreement:

Name: Ronald Carbery
Title: Acting Director NASA Spectrum Policy
Organization: NASA
Address: NASA Headquarters
300 E Street SW
Washington D.C. 20546-0001
Telephone: (202) 358-4808
Facsimile: (202) 358-2865
e-mail: Ron.Carbery@nasa.gov

Name: John Guidon
Title: CEO
Organization: Row 44
Address: Row 44, Inc.
31280 Oak Crest Drive
Westlake Village, CA 91341
Telephone:(818) 706-3111
Facsimile: (818) 706-9431
e-mail: jguidon@row44.com

5.1 Points of contact for technical concerns related to this Coordination Agreement:

Name: Roger D. Porter
Title: Goddard Spectrum Manager
Organization: NASA
Address: Goddard Space Flight Center
Mission Services Program Office
Greenbelt, MD 20771

Telephone: (301) 286-5089
Facsimile: (301) 286-1724
e-mail: Roger.D.Porter@nasa.gov

Name: James Costello
Title: VP, Engineering
Organization: Row 44
Address: Row 44, Inc
31280 Oak Crest Drive
Suite 5
Westlake Village, CA 91341
Telephone: (480) 390-1075
Facsimile: (818) 706-9431
e-mail: jcostello@row44.com

6. Signatures

This Coordination Agreement is being made in good faith by both parties and is effective on the date on of final signature.

For: The National Aeronautics and Space Administration:

By: _____

Name: Badri Younes

Title: Associate Assistant Administrator For Space Communications and Navigation (SCAN)

Date: May 21, 2008

For: Row 44, Incorporated:

By: _____

Name: John LaValle

Title: Chief Operating Officer

Date: 19 May 2008