Vector
824 E. 16th Street
Tucson Arizona, 85719 USA
888.346.7779
VectorSpaceSystems.com

Memorandum

Date: **31 Jan 2018**

From: **Michael C. Maguire**
Vector Launch

FRN 0026456863

FCC File Number: 0164-EX-ST-2018

To: **Leann Nguyen, FCC – OET**
Jeanette Spriggs, FCC – OET

Subject: **Vector Launch Inc. Experimental STA Application for Vector-R Series B1.00X Launch Vehicles**

Reference Documents:

REF1 FCC, DA-13-446, Guidance on Obtaining Experimental Authorizations for Commercial Space Launch Activities, 15 March 2013.

REF2 GN-0277-VSS-NEW, Vector FCC Memo Block 0.003 (this document)

REF3 GN-0278-VSS-NEW, Vector Supporting Material Experimental STA Application B1.00X

REF4 FCC Table of Frequency Allocations (Note US276)

This memorandum provides backup data for the Experimental STA Application for the Vector-R B1.00X series launch vehicles being developed by Vector Launch Inc of Tucson AZ. This STA request follows the application guidelines DA-13-446 Guidance on Obtaining Experimental Authorizations for Commercial Space Launch Activities (REF1) and guidance from the FCC Table of Frequency Allocations Note US276 (REF4). Vector Launch Inc is developing the Vector-R as a small, low cost, launch vehicle to serve the commercial small satellite market. A spreadsheet providing tabulated values of mission parameters is provided in REF3 also attached to this application.

This application will cover multiple flights of the Vector-R B1.00X launch vehicle. The Vector-R B1.00X vehicles are test launches of the orbital launch capable Vector-R B1 series. Launches are planned from two sites; Wallops Flight Facility (WFF) in Wallops VA, and Polar Spaceport Complex Alaska

(PSCA) in Kodiak AK. Exact mission dates are not yet available; nominal information is provided in the accompanying material. Vector will update the STA application as the launch dates are finalized.

This application is for three flights (**estimated 3 hours of frequency usage per flight**) of the Vector launch vehicle. The launch vehicle maximum flight duration will be less than 180 minutes from liftoff to launch vehicle re-entry. Pre-flight transmitter operation is expected to be less than 90 minutes. The maximum operating time is expected to be less than 6 hours, including some contingency, from the commencement of launch activities.

This STA application covers a 6-month period during which launches may occur; the intent is to avoid creating one STA for each launch vehicle flight. Vector will finalize the planned launch dates by updating this application by adding an attachment to the online FCC STA file and by coordinating each launch with local area frequency managers 14-days prior to the test flight. Communications will be by email and telephone. Vector will also provide updates 7- and 2-days prior to launch. Frequency managers will also be contacted the day of launch prior to the flight. Vector has included a stop buzzer phone number in the data table attached to our FCC STA application. Vector will confirm the stop buzzer contact information prior to the flight.

A summary of Vector-R B1.00X launch dates follows; detailed technical data for the B1.00X series is contained in GN-0278-VSS-NEW (REF3) attached. The launch dates listed represent the current Vector-R launch schedule; these dates may change. Vector will update this information should any changes occur.

Launch Date	Vehicle	Launch Site	Comment
Jun 2018	B1.001	NASA Wallops Flight Facility (WFF), Wallops VA	Planned
Aug 2018	B1.002	TBD	Additional launch opportunity TBD
Oct 2018	B1.003	TBD	Additional launch opportunity TBD

The Wallops launch site is located at 37.83152° N -75.49012° E and at an altitude of 10 m.

The Experimental STA application requests three telemetry downlinks in the 2360 to 2390 MHz S-Band. This band is allocated for government use however the allocation is authorized for use by commercial launch vehicles in accordance with the FCC Table of Frequency Allocations Note US276. Vector requests use of this on a non-interference basis.

The three downlink frequencies are requested; one or more of the links may not be used for each flight.

	Frequency	Modulation	Data Rate	Emission Designator	Use
Link 1	2364.5 MHz	SOQPSK	128 kbps	241KG1DCT	1st Stage Telemetry
Link 2	2370.5 MHz	SOQPSK	256 kbps	355KG1DCT	2nd Stage Telemetry
Link 3	2382.5 MHz	SOQPSK	5000 kbps	4M61G1DCT	HD Digital Video

Antenna registration is provided for 3 antennas; a single transmitter type will be used.

The transmitter is a Quasonix nanoTX™; this is a Commercial-Off-The-Shelf (COTS) telemetry transmitter used extensively throughout the aerospace and space industries. The Quasonix unit employs Shaped Offset Quadrature Phase Shift Key (SOQPSK) modulation to provide highly efficient bandwidth utilization at data rates up to 46 Mbps. In the Vector application 3 data rates are indicated: 128 kbps, 256 kbps, and 5000 kbps. These will be used for low-rate digital telemetry, high-rate digital telemetry, and digital video respectively.

Note: not all digital telemetry streams will necessarily be used for each launch; three frequencies are listed should Vector require them for additional downlink data.

The launch vehicle antenna patterns are omnidirectional. All downlinks will be split to two hemispherical antennas located on either side of the launch vehicle to create an omnidirectional antenna pattern. All antennas are right hand circularly polarized (RHCP).

The antenna height will vary from 5 m off the ground while on the launch pad to orbital altitudes (450 km to 800 km). Final orbital parameters will be provided 14-days prior to launch.

Please contact me as soon as possible should additional information be required.

Thank you,

Mike

Michael C. Maguire

Vector Launch Inc.
824 E 16th Street
Tucson AZ 85719

radio@vector-launch.com
mike.maguire@vector-launch.com
+1 (626) 676 7230