

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of	)	
	)	
Momentum Space LLC	)	File Nos.
	)	SAT-LOA-20220504-00047
Amendment of Application for Authority to	)	SAT-AMD-_____
Deploy and Operate Vigoride-5	)	
	)	Call Sign: S3144
	)	

AMENDMENT APPLICATION

Momentum Space LLC (“Momentum”) hereby amends its pending application and requests authority to include a UHF beacon on its Vigoride-5 (“VR-5”) spacecraft. The beacon transmissions will contain data from GPS receivers onboard the spacecraft and will be used to facilitate the acquisition of the satellite after deployment, thereby reducing the probability that Momentum will not be able to communicate with the spacecraft as a result of any anomalies. Momentum expects to receive the data from the beacon transmissions at the Deadhorse, Alaska ground station identified in the initial application.¹

The beacon will have the following technical parameters:

Center Frequency: 400.5 MHz
Bandwidth: 20 kHz
Antenna Gain: 5.2 dBi
Modulation: 2GFSK
RF Output Power: 9.5 dBW EIRP

The beacon will be set to begin automatically transmitting 120 seconds following separation from the launch vehicle. The duty cycle of the transmissions will be 6 seconds every

¹ See Application of Momentum Space LLC, IBFS File No. SAT-LOA-20220504-00047, at 13 (filed May 4, 2022).

60 seconds. As a failsafe to ensure termination of the beacon, there is a built-in, 1-week timer that is stored in triple-voted, non-volatile memory. Once the timer expires the processor in the beacon will turn the radio off.

The operator can power off the beacon at any time via command from the ground.² Momentus will manually turn off the beacon as soon as the company is able to obtain accurate tracking information, which could be as soon as one day after launch. The beacon does not automatically re-activate after it has been shut off.³

The 400.15-401 MHz band (space-to-Earth) band is allocated internationally and in the United States for federal and non-federal mobile-satellite and space research use on a primary basis as well as for federal and non-federal space operation use on a secondary basis.

Momentus' use of these frequencies to transmit data from GPS receivers and to facilitate acquisition of the satellite is consistent with the space operations allocation under the U.S. Table of Frequency Allocations.⁴ Given the anticipated brief use of the beacon over the life of the mission and the low duty cycle when in use, Momentus submits that the beacon is unlikely to cause harmful interference to other authorized operations.

² 47 C.F.R. § 25.207.

³ The operator can reset the beacon via command from the ground. In such event, the beacon will commence transmitting again with another 1-week timer. Momentus would not reset the beacon without obtaining additional FCC authorization.

⁴ Momentus is aware that the FCC established an October 15, 2019, cut-off deadline for requests to operate, *inter alia*, in the 400.15-401 MHz band for the provision of Mobile-Satellite Service. See *Cut-off Established for Additional NVNG MSS Applications or Petitions for Operations in the 399.9-400.05 MHz and 400.15-401 MHz Bands*, Public Notice, DA 19-779 (rel. Aug. 15, 2019). Momentus' proposed use of this band for space operations on a secondary basis is limited and not mutually exclusive with other operations on a long-term basis. Accordingly, the request to use these frequencies should not be treated as inconsistent with the 400.15-401 MHz processing round.

Momentum also updates its concept of operations to reflect the installation of a failsafe deployment timer, which has a battery backup for the Payload Management Unit.⁵ The timer system commences upon deployment and begins a countdown that will trigger the release of the single deployable payload⁶ onboard VR-5 after 7 days.⁷ In the event that the VR-5 bus experiences a failure and Momentum is unable to command the deployment of the customer payload, the timer system provides a failsafe deployment mechanism.

Momentum conducted re-entry analysis for the beacon and timer system, using National Aeronautical and Space Administration (“NASA”) Debris Assessment Software (“DAS”) v.3.2.1 and determined that the beacon and timer system fully demise in the atmosphere. Additionally, Momentum conducted analyses to verify that deployment of the customer payload via the failsafe deployment mechanism presents minimal risk of re-contact.⁸ Accordingly, Momentum has determined that the inclusion of the beacon and timer system do not materially affect Momentum’s

⁵ Momentum expects to use a standalone battery for the failsafe deployment mechanism to ensure the deployment of the payload after 7 days. However, for operational reasons, Momentum may not install a standalone battery. In that case, Momentum will implement the deployment mechanism through a timer operating off the spacecraft power system. In that event, the timer will only operate when powered by the spacecraft but will retain memory of the time elapsed. As a result, deployment may take longer than 7 days if power to the timer is interrupted, such as if the solar arrays fail to deploy properly.

⁶ See attached revised Exhibit 5 (identifying the customer payloads).

⁷ Nominally, the timer will be reset by Momentum on every pass to prevent the auto-deployment from occurring. The timer is set at the factory for 7 days after separation and would normally deploy individual payloads every four hours after the expiration of the timer. As VR-5 only has a single deployable payload, the timer will deploy only the single payload after 7 days has passed from the last reset.

⁸ Momentum conducted Monte Carlo simulations (varying velocity and attitude) to assess the probability of re-contact under nominal and contingency deployment conditions. The analysis predicts a 0.0% probability of re-contact between the deployed payload and the VR-5 vehicle under nominal deployment conditions. If VR-5 is unable to maintain attitude control during deployment (such as in the event of the triggering of the failsafe deployment timer), the analysis estimates a probability of re-contact of less than 0.1%.

Orbital Debris Assessment Report (“ODAR”), and VR-5 remains compliant with the Commission’s orbital debris mitigation requirements.⁹

Attached is an updated Schedule S filing for VR-5 that includes the beacon transmission.

Additionally, the revised Schedule S includes the following changes:

- Removal of the demonstration payload and the associated X-band and S-band links. The original VR-5 design included a demonstration (downlink) X-band radio and patch antenna (CHIRP). However, as a result of program changes, the CHIRP payload will no longer be onboard VR-5, and all associated links (*i.e.*, one each of the 2075 MHz and 8200 MHz center frequency channels) have been removed from the Schedule S.
- Updates to various PFD values for associated orbital altitudes to better reflect operating constraints that ensure compliance with ITU and FCC requirements.¹⁰
- Inclusion of a GIMS file for the antenna gain contours of the 9900-10000 MHz (space-to-Earth) band transmission. Previously, this information had only been submitted in visual format.

Momentum is contemporaneously submitting an update to its VR-5 ITU filing, consistent with the technical changes identified in this amendment application. Additionally, Momentum is submitting a revised Exhibit 4 (ownership information) and Exhibit 5 (list of customer payloads).

The VR-5 spacecraft is currently scheduled for launch in early November 2022.

Accordingly, Momentum requests that the FCC expeditiously grant the VR-5 application, as amended.

⁹ Specifically, the modifications will not materially change the spacecraft’s overall mass, external volume, or shape, and result in no material changes to its area-to-mass ratio. Thus, the modifications will not impact spacecraft orbital lifetime. Additionally, the battery backup is based upon the same battery technology already used on the spacecraft and therefore provides the same safety mechanisms and testing regiment as described in the ODAR, which limits the probability of accidental explosion.

¹⁰ See also Letter to Marlene H. Dortch, FCC, from Tony Lin, Counsel for Momentum, IBFS File No. SAT-LOA-20220504-00047 (dated July 29, 2022).

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Dated: July 29, 2022

Respectfully submitted,

/s/ Paul Ney

Paul Ney
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Exhibit 1
Technical Certification

I, Randy Yount, hereby certify, under penalty of perjury, that I am the technically qualified person responsible for the preparation of the engineering information contained in the technical portions of the foregoing application and the related attachments, that I am familiar with Part 25 of the Commission's rules, and that the technical information is complete and accurate to the best of my knowledge and belief.

/s/ Randy Yount

Head of Flight Operations
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650-564-7820

Dated: July 29, 2022

Exhibit 4
Momentum Space LLC Leadership and Ownership

OWNERSHIP INFORMATION

Momentum Space LLC (“Momentum”) is a domestic Delaware limited liability company, wholly owned by its parent company Momentum Inc., a publicly held domestic Delaware corporation, which trades on the NASDAQ under the symbol MNTS. No foreign entities are known to hold, directly or indirectly, aggregated ownership of ten percent or more in MNTS. Should Momentum become aware of any new foreign ownership of MNTS which, in the aggregate, meets or exceeds the ten percent threshold, Momentum will notify the Commission.

As a publicly traded company, ownership is inherently fluid. Other than those entities listed below, Momentum is not aware of any owners of MNTS stock which would, in the aggregate, have more than a 10% or greater equity and/or voting interest in Momentum:

1. Dakin Sloss¹

General Partner, Prime Movers Lab (“PML”)
PO Box 12829
Jackson, WY 83002
PML Ownership Interest: approximately 31.16%²

OFFICERS AND DIRECTORS

All Momentum officers and directors listed below are, apart from Mr. Hadfield who holds Canadian citizenship, U.S. citizens, and may be reached at the following address:

c/o Momentum Space LLC
3901 N. First Street
San Jose, CA 95134

1. John Rood
Chief Executive Officer, Director

2. Mitch Kugler
Director

¹ This ownership reflects the aggregated ownership of outstanding stock by Prime Movers Lab and its related entities.

² This ownership information is accurate as of June 30, 2022. See Statement of Changes in Beneficial Ownership, <https://www.sec.gov/Archives/edgar/data/1781162/000106299322014678/xslF345X03/form4.xml>.

3. Chris Hadfield
Director

4. Linda Reiners
Director

5. Brian Kabot
Director

6. Kimberly Reed
Director

7. Victorino Mercado
Director

8. Paul Ney
Chief Legal Officer, Corporate Secretary

9. Dawn Harms
Chief Revenue Officer

10. Jikun Kim
Chief Financial Officer

11. Rob Schwarz
Chief Technology Officer

Exhibit 5
VR-5 Payload Customers

Payload Name	Payload Owner	Licensing Jurisdiction	Size	Mass	Effective Drag Area¹	Maximum Deployed Dimensions
SSPD-1 (hosted payload)	Caltech	USA	N/A	~50 kg	N/A	N/A
ZEUS-1	Qosmosys/ Orient G	Singapore	3UXL	~6 kg	0.3659m x 0.10167m x 0.11195m	0.3659m x 0.10167m x 0.11195m

¹ Effective drag area assumes tumbling.