Approved by OMB
3060−0678

Date & Time Filed: May 23 2018 2:04:15:700PM
File Number: SAT−STA−20180523−00042
Callsign:

FEDERAL COMMUNICATIONS COMMISSION
APPLICATION FOR SPACE STATION SPECIAL TEMPORARY AUTHORITY

FOR OFFICIAL USE ONLY

APPLICANT INFORMATION

Enter a description of this application to identify it on the main menu:
SSO−A space station STA 05/23/18

1. Applicant

Name:	Spaceflight, Inc.	**Phone Number:**	(425) 478−2848
DBA Name:		**Fax Number:**	
Street:	1505 Westlake Ave. North, Ste 600	**E−Mail:**	KristinaH@SpaceflightIndustries.com
City:	Seattle	**State:**	WA
Country:	USA	**Zipcode:**	98109 −
Attention:	Kristina Hloptsidis		

2. Contact

Name:	Jonathan L. Wiener	**Phone Number:**	703−216−9224
Company:	Goldberg Godles Wiener & Wright LLP	**Fax Number:**	
Street:	1025 Connecticut Ave, NW Ste 1000	**E−Mail:**	jwiener@g2w2.com
City:	Washington	**State:**	DC
Country:	USA	**Zipcode:**	20036 −2413
Attention:		**Relationship:**	Legal Counsel

(If your application is related to an application filed with the Commission, enter either the file number or the IB Submission ID of the related application. Please enter only one.)

3. Reference File Number or Submission ID

4a. Is a fee submitted with this application?

◉ If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R.Section 1.1114).

○ Governmental Entity ○ Noncommercial educational licensee

○ Other(please explain):

4b. Fee Classification CXW − Space Station (Non−Geostationary)

5. Type Request

○ Change Station Location ○ Extend Expiration Date ◉ Other

6. Temporary Orbit Location	7. Requested Extended Expiration Date

8. Description (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

Spaceflight Inc. requests Special Temporary Authority to permit it to communicate with a spacecraft and corresponding earth stations for a duration of no more than twenty−four (24) hours to take place in a single occurrence between 30 Sept. 2018 and 31 Oct. 2018.

9. By checking Yes, the undersigned certifies that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti−Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.

(●) Yes ( ) No

10. Name of Person Signing	11. Title of Person Signing
Curt Blake	President

12. Please supply any need attachments.

Attachment 1: Request for STA	Attachment 2: Confidential Req.	Attachment 3:

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

FCC NOTICE REQUIRED BY THE PAPERWORK REDUCTION ACT

The public reporting for this collection of information is estimated to average 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the required data, and completing and reviewing the collection of information. If you have any comments on this burden estimate, or how we can improve the collection and reduce the burden it causes you, please write to the Federal Communications Commission, AMD−PERM, Paperwork Reduction Project (3060−0678), Washington, DC 20554. We will also accept your comments regarding the Paperwork Reduction Act aspects of this collection via the Internet if you send them to PRA@fcc.gov. PLEASE DO NOT SEND COMPLETED FORMS TO THIS ADDRESS.

Remember − You are not required to respond to a collection of information sponsored by the Federal government, and the government may not conduct or sponsor this collection, unless it displays a currently valid OMB control number or if we fail to provide you with this notice. This collection has been assigned an OMB control number of 3060−0678.

THE FOREGOING NOTICE IS REQUIRED BY THE PAPERWORK REDUCTION ACT OF 1995, PUBLIC LAW 104−13, OCTOBER 1, 1995, 44 U.S.C. SECTION 3507.

REQUEST FOR SPECIAL TEMPORARY AUTHORITY

Spaceflight Inc. ("Spaceflight"), pursuant to Section 25.120 of the Commission's Rules,[1] hereby requests Special Temporary Authority ("STA") to permit it to deploy and operate two spacecraft, referenced herein as the Upper Free Flyer ("UFF") and Lower Free Flyer ("LFF"), and corresponding earth stations for a duration of less than twenty-four hours[2] to take place in a single occurrence between September 30, 2018 and October 30, 2018.[3]

As described in greater detail in the attached Technical Annex, the UFF and LFF are non-propulsive, free-flying spacecraft intended to deploy auxiliary spacecraft after each spacecraft has been itself deployed by the launch vehicle. Before being deployed, the UFF and LFF will be affixed to the payload attach fitting on a Falcon 9 launch that is currently scheduled to occur within above-stated launch period.[4]

The UFF and LFF will be placed in sun synchronous obit (SSO) at a mean altitude of 575 km at an inclination of 97.75 degrees. At that point, each spacecraft will initiate a timed sequence of procedures to begin the deployment of its own payloads and the communication that is the subject of the instant requests will commence.

---

[1] Spaceflight also respectfully requests a waiver of Section 25.113(g) of the Commission's rules, requiring orbital deployment approval and operating authority to be applied for and granted prior to orbital deployment and operation of a space station. In this case, given: (1) the short operational life of the UFF and LFF spacecraft; (2) the similarity of their function to that of an upper stage launch vehicle; (3) the descriptions contained herein and in the associated attachments of the spacecraft operations and debris mitigation plans that might otherwise be presented for approval as part of an application for approval for the orbital deployment and operation of a space station; and (4) the overall public interest of the mission that is presented, Spaceflight urges that the underlying purpose of the rule sought to be waived is met and that the grant of the requested waiver will serve the public interest.

[2] The actual mission time of each spacecraft is expected to last less than six hours. Radio transmissions may last longer, but less than twenty-four hours, at which point the batteries on the spacecraft that support such transmissions will be exhausted. Accordingly, authority for this somewhat longer timeframe is requested.

[3] The timeframe set forth above reflects the current launch period assigned for the Spaceflight launch. Accordingly, Spaceflight is herein seeking STA to cover the entire launch period that has been provided to it by the launch vehicle provider. However, as described herein, the period of radio transmissions for which STA is sought will occur over a period of less than twenty-four hours. Spaceflight will notify the Commission as its launch period is narrowed to a particular day as soon as that information is confirmed to it by the launch provider.

[4] As further described in the attached technical Annex, the UFF and LFF are part of a three-segment system that includes a Multi-Payload Carrier ("MPC") which remains affixed to the launch vehicle and which itself will deploy four customer spacecraft. All communications with the MPC, including the deployment signal, are carried out through the launch vehicle avionics and do not involve FCC-licensed frequencies...

Spaceflight seeks authority to permit it to establish one-way UHF data communications links from each of the UFF and the LFF to three earth stations, the locations of which are shown in the attached Technical Annex plus an additional L-band one-way telemetry link to the Globalstar constellation during the deployment period of the UFF payloads. These links will permit the Spaceflight technical crew to monitor the deployment of the small spacecraft onboard the LFF and UFF.

This data will be disseminated both to Spaceflight's customers and to the Department of Defense's Joint Space Operations Center. The UFF and LFF are not designed to receive radio signals.

The specific radio frequencies sought to be employed and associated properties are shown the table below:

	UHF Downlink for LFF	UHF Downlink for UFF	L-band Uplink to Globalstar
Data Rate	19.2 kbps	19.2 kbps	100 bps
Modulation	GMSK	GMSK	BPSK
Center Frequency	401.625 MHz	401.875 MHz	1616.25 MHz
Bandwidth	22 KHz	22 KHz	2.5 MHz
Transmit Power	2.0 W	2.0 W	0.10 W (max)
Transmit Antenna	Patch	Patch	Patch
Receive Antenna	N/A	N/A	N/A
EIRP	0.13 dBW	-0.63 dBW	-8 dBW

With regard to the UHF frequencies to be employed, Spaceflight has already begun coordination discussions with NTIA and other Federal agencies. The UHF transmitter is narrowly tuned to prevent out of bound emissions.

With regard to the L-band link, the selected Eyestar radio monitors the transmitter temperature, and will shut off in the event that the transmitter is too hot or cold. The vendor has provided measurements of the spectrum use which demonstrate that out of band emissions are minimized, specifically, the Eyestar radio unit transmits 99.00% of its radiated power within 1.8817 MHz of the specified 2.5 MHz bandwidth.

The LFF and UFF payload will consist of small spacecraft that are owned and to be operated by Spaceflight's customers or, in some cases, their customer operator. Each customer is expressly required under its agreement with Spaceflight to obtain and/or require its customer operator to obtain all licenses, authorization, clearances, and permits from their applicable administrations that may be necessary to operate its individual spacecraft. A list of those customers, operators, if different, and authorizing administrations is attached as Exhibit 2 hereto. If any customer/operator is unable to provide its spacecraft for launch, a non-separating mass module will be substituted.

An Orbital Debris Assessment Report ("ODAR") for each of the LFF and UFF spacecraft is attached hereto as Exhibit 3.

Spaceflight urges that grant of the instant request for Special Temporary Authority will be in the public interest. Such grant will permit Spaceflight to initiate a new and innovative deployment technology for small spacecraft, thereby providing a cost-efficient means for placing them into their designed orbits.

Technical Annex

Spaceflight's SSO-A Spacecraft Description

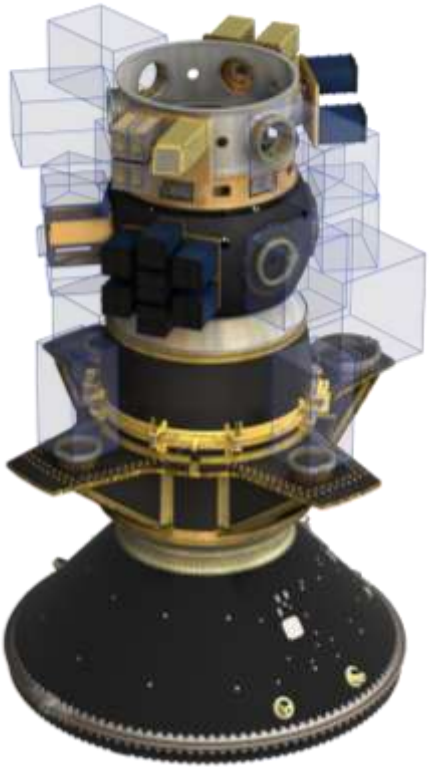
17 May 2018

1 Overview

Spaceflight's SSO-A Mission (the "Mission") is a commercial rideshare mission planned to launch 114 small spacecraft belonging to Spaceflight's customers, into a Sun-Synchronous Orbit (SSO). The mission will be on a SpaceX Falcon9 launching from Vandenberg Air Force Base, and the current launch window is September 30, 2018 – October 30, 2018. Spaceflight provides the launch capacity, structure, separation systems, and integration services for the customer spacecraft on the mission.

The SSO-A structure consists of three segments; the Upper Free Flyer (UFF), the Lower Free Flyer (LFF) and the Multi-Payload Carrier (MPC). Shortly after orbital insertion, the launch vehicle commands the separation of the Upper Free Flyer, the Lower Free Flyer, and 4 customer spacecraft installed on the MPC. The base of the MPC will remain with the Falcon 9 second stage. Following deployment from the launch vehicle, the UFF and LFF will begin a timed deployment sequence of customer spacecraft. Deployment confirmation will be transmitted by the UFF and LFF to ground stations over UHF radio and to the Globalstar constellation via L-band radio. The Mission is anticipated to last less than six hours, and all communications from the UFF and LFF will stop less than 24 hours after launch when the avionics batteries are exhausted. 24 hours after launch, the UFF and LFF will both deploy deorbit sails to decrease the time to deorbit naturally by increasing atmospheric drag.

Figure 1-1: SSO-A Integrated Payload Stack on a Falcon 9 Payload Attach Fitting (customer spacecraft represented by opaque cubes)



This Technical Annex is in support of Spaceflight's request for Special Temporary Authority, and specifically applies to the UFF and LFF spacecraft that have their own avionics and radio transmitters. Spaceflight's customers' spacecraft consist of microsatellites (spacecraft under 300 kg that are mounted and deployed using a separation system) and CubeSats (spacecraft under 20 kg that are deployed from a fixed canister). Each customer is responsible for obtaining all licenses, permits, clearances, authorizations, and approvals necessary for the communication with their spacecraft as well as the transportation, operation, launch and orbital deployment of the spacecraft. This includes, but is not limited to, all licenses from: (i) the Federal Communications Commission ("FCC") or customer's applicable national administration/agency; and (ii) if applicable, the National Oceanic and Atmospheric Administration ("NOAA").

2 Mission Orbit

Spaceflight's SSO-A mission is to a sun-synchronous orbit with a mean altitude of 575 km.

Table 1. SSO-A Mission Orbital Parameters

Parameter	Value
Perigee	575 km
Apogee	575 km
Inclination	97.75 deg
LTDN	10:30 AM

3 Spacecraft Description

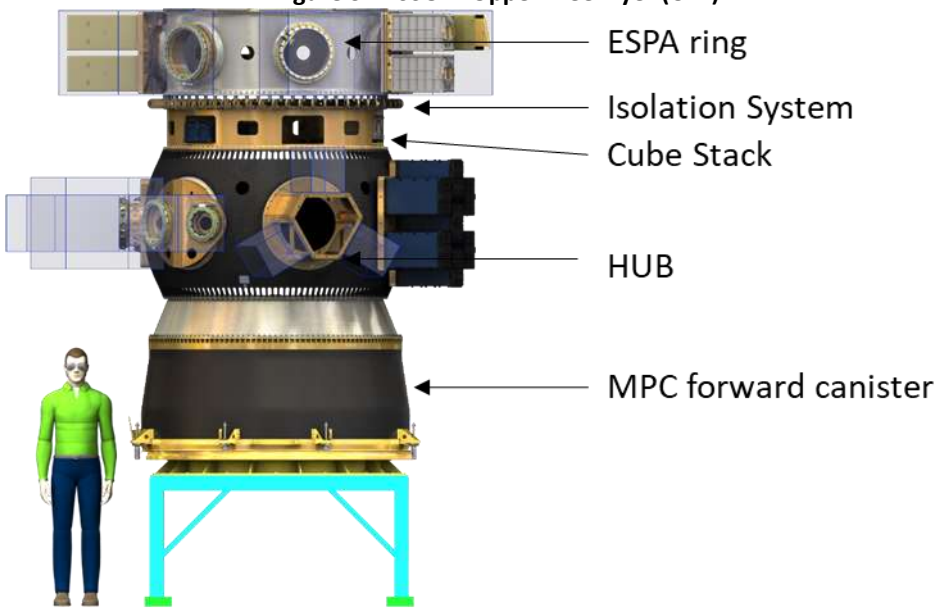
3.1 Upper Free Flyer (UFF)

The Upper Free Flyer (UFF) is a non-propulsive, free-flying spacecraft that is designed to deploy auxiliary spacecraft belonging to Spaceflight's customers. It consists of several structural elements to mount both microsatellites and CubeSats. From top to bottom, these structures are:

- Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA Ring). An aluminum ring that has six radial ports for microsatellites or CubeSat Dispenser Adapter Plates (CDAP). The forward UHF antenna is mounted on one of the CDAPs, as is the EyeStar L-band transmitter.
- SoftRide Isolation System. A set of 60 titanium isolators to reduce the launch vehicle shock levels to the spacecraft on the Cube Stack and ESPA ring.
- Cube Stack. An aluminum ring that holds the UFF avionics and CubeSat dispensers.
- HUB. A carbon fiber composite ring structure that has six radial ports for microsatellites.
- Multi-Payload Carrier (MPC) forward half. An aluminum and carbon fiber composite structure that connects the UFF to the MPC. There are no spacecraft on this structure. The aft UHF antenna is mounted at the bottom of this structure near the separation plane

There are 12 planned microsatellites and 46 planned CubeSats on the UFF.

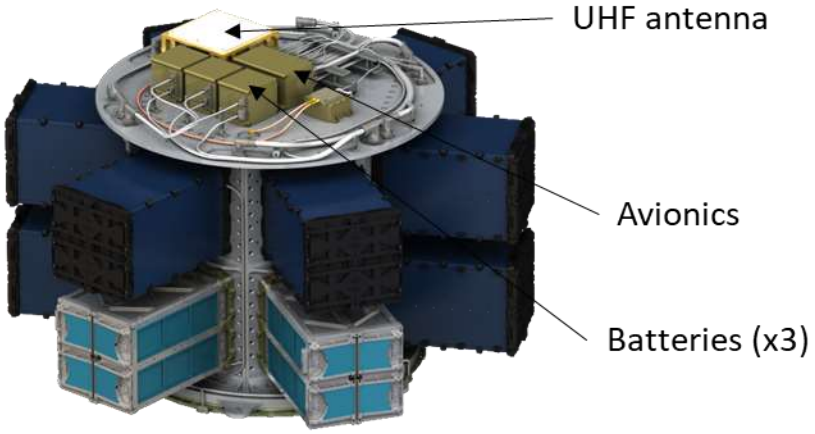
Figure 3-1: SSO-A Upper Free Flyer (UFF)



3.2 Lower Free Flyer (LFF)

The Lower Free Flyer (LFF) is a non-propulsive, free-flying spacecraft that is designed to deploy CubeSats. It is a bolted aluminum hexagonal cylinder with CubeSat dispensers on all six faces stacked on two levels. The avionics, UHF transmitter with power divider, and forward antenna are located on the top deck of the LFF. The second antenna is located on the aft side of dispenser structure near its separation plane The avionics design and radio is the same as the one on the UFF. There are 52 planned CubeSats on the LFF.

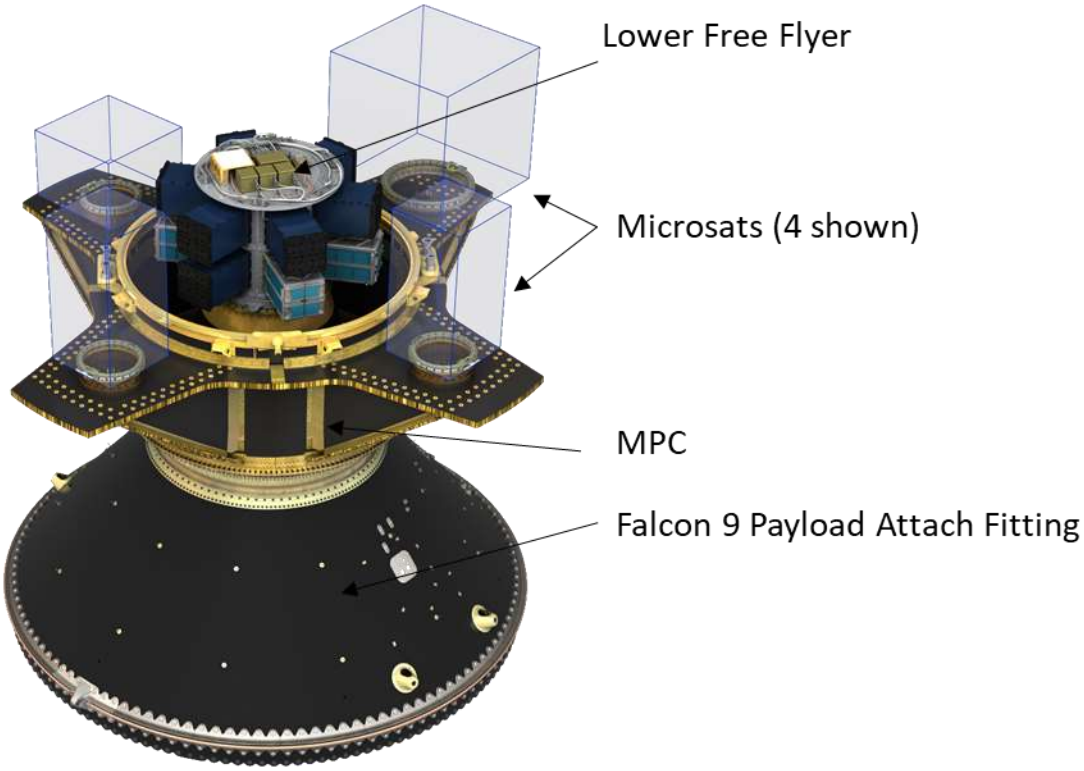
Figure 3-2: SSO-A Lower Free Flyer (LFF)



3.3 Multi-Payload Carrier (MPC)

The MPC is an aluminum and carbon fiber composite structure that remains bolted to the Falcon 9 launch vehicle second stage. There are no avionics on this structure, and it will remain with the second stage through the Falcon 9 deorbit disposal maneuver. There are 4 planned microsatellites on the MPC that will be deployed by the launch vehicle avionics. The UFF and LFF are also attached to the MPC during launch, prior to being separated by the launch vehicle avionics.

Figure 3-3: SSO-A Multi-Payload Canister (MPC) with LFF shown center.



4 Radio Systems

The purpose of the SSO-A radio systems is to provide separation confirmation, separation time, and GPS position and velocity data in order to provide reliable state vector information to each customer.

4.1 RF System Design

The avionics UHF radio system design is the same for both the UFF and LFF. The UHF transmitter broadcasts over two opposing antennas to Spaceflight ground stations. It consists of a SpaceQuest UHF transceiver, a TRM Microwave power divider and two Haigh-Farr antennas. The antennas are narrowly tuned to naturally suppress out of band emissions. Additionally, the UFF avionics provides telemetry to an L-band transmitter. The L-band transmitter broadcasts through one patch antenna to the Globalstar constellation using a NearSpace Launch EyeStar Radio (EyeStar Radio). The EyeStar Radio monitors the transmitter temperature, and will shut off in the event that the transmitter is too hot or cold. The vendor has provided measurements of the spectrum use which demonstrate that out of band emissions are minimized, specifically, the EyeStar Radio unit transmits 99.00% of its radiated power within 1.8817 MHz of the specified 2.5 MHz bandwidth. The EyeStar Radio includes an integrated Novatel GPS module that transmits using a GPS patch antenna.

Table 2. Radio Properties

	UHF Downlink for LFF	UHF Downlink for UFF	L-band Uplink to Globalstar for UFF
Data Rate	19.2 kbps	19.2 kbps	100 bps
Modulation	GMSK	GMSK	BPSK
Center Frequency	401.625 MHz	401.875 MHz	1616.25 MHz
Bandwidth	22 KHz	22 KHz	2.5 MHz
Transmit Power	2.0 W	2.0 W	0.10 W (max)
Transmit Antenna	Patch	Patch	Patch
Receive Antenna	N/A	N/A	N/A
EIRP	0.13 dBW	-0.63 dBW	-8 dBW

4.2 RF Concept of Operations

The avionics systems are set to beacon the data at set time intervals from activation until the batteries are exhausted, less than 24 hours after launch. The duty cycle for the UHF systems is 4.7 seconds every 20 seconds (14 seconds of transmissions every minute). Each 4.7 second transmission burst contains four seconds of carrier data to establish the communication link followed by 0.5 seconds of data and 0.2 seconds of additional idle data. The avionics system is not designed to receive an uplink or other transmissions.

4.3 RF Ground Stations

The Spaceflight UHF receivers will be at the following locations. These stations will receive UHF signals only; they will not transmit.

Table 3. Ground station locations.

Ground Site	Latitude	Longitude
Fairbanks, Alaska	64° 47' 38'' N	147° 32' 09'' W
Usingen, Germany	50° 19' 52'' N	8° 28' 16'' E
Southland, New Zealand	46° 19' 02" S	168° 13' 43" E

The L-band antenna will transmit to Globalstar constellation, which will use its own network to downlink the telemetry. There is no transmission to the UFF from the Globalstar constellation network.