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W. KENNETH FERREE* HENRIETTA WRIGHT THOMAS G. GHERARDI, P.C. COUNSEL

THOMAS S. TYCZ** SENIOR POLICY ADVISOR *NOT ADMITTED IN DC **NOT AN ATTORNEY

September 29, 2020

ELECTRONIC FILING VIA ECFS

Mr. Karl Kensinger Acting Chief, Satellite Division International Bureau Federal Communications Commission 445 12th Street, S.W. Washington, D.C. 20554

> Re: Spaceflight, Inc. IBFS File No: SAT-STA-20200728-00089

Dear Mr. Kensinger:

In response to your September 3, 2020 letter requesting additional information in evaluating the application for special temporary authority ("STA") filed by Spaceflight, Inc. ("Spaceflight") referenced above for operation of the Sherpa FX-1 non-geostationary orbit ("NGSO") spacecraft, Spaceflight provides the following information to your specific questions. The staff questions are formatted in italics with Spaceflight's responses below.

1. Spaceflight seeks waiver of section 25.113(g), which requires approval for orbital deployment and a station license before a space station may be deployed and operated in orbit. We ask that Spaceflight provide information responsive to the questions contained in Form 312 Main Form, Application for Satellite Space Station Authorizations, Questions 29-34 and 36-40, which would typically be completed by an applicant for deployment and operating authority.

Please see Exhibit A and Attachment 1 thereto. Note regarding responses to questions 30-34: It is Spaceflight's understanding that these questions would be inapplicable even were Spaceflight to seek ordinary license authority, including for

Mr. Karl Kensinger September 29, 2020 Page 2

deployment and operations, because the space station would not be used for broadcast or common carrier operations and would not be an aeronautical en route or aeronautical fixed station. *See*, Section 310(b) of the Communications Act. Spaceflight nevertheless notes as to foreign ownership, as indicated in its response to question 40, that its capital stock is 100% owned and voted by a Japanese company, M&Y Space Co., Ltd.

2. Please specify any control arrangements with respect to the four payloads that will remain onboard the Sherpa FX-1, in particular, the payloads with radio frequency operations. How will these payloads be activated, and what is the extent of the interaction between the Sherpa FX-1 operations and the operations of these payloads?

Two of the four hosted payloads that are permanently affixed to the Sherpa FX-1 spacecraft (SOARS and EyeStar-Tag, aka and herein referenced as TagSat-1) have radio transmitters.

The TagSat-1 payload has two independent mechanical switches that are connected to the Sherpa FX-1 separation systems. These are payload inhibit switches that prevent inadvertent activation of the payload with single fault tolerance. When the Sherpa separates, the two switches will close, activating an onboard timer on the TagSat-1 payload. Thereafter, these switches have no further function. TagSat-1 will automatically start beaconing after 24 hours from the activation of the timer. SOARS cannot transmit until it is commanded to do so from a ground station to be licensed and operated by SOARS or its separate earth station contractor. Both payloads can be commanded to stop transmitting from their respective ground stations to be licensed and operated by them or their separate contractors.

As for the other hosted payloads: Celestis 17 is entirely inert as a container of cremated human remains; ELROI is non-transmitting and contains an LED beacon. With the exception of the inhibit switches for Tagsat-1 that are described above, the extent of the interactions between the Sherpa FX-1 and the RF hosted payloads is limited to the physical attachment of the payloads to the Sherpa FX-1. There is no electrical connection or other interaction between the Sherpa FX-1 and the RF payloads such as power, communications, nor data handling.

3. Please specify which of the deployed customer spacecraft will have propulsion, and whether the propulsion will be sufficient to perform collision avoidance, as appears to be assumed in the re-contact analysis

A total of 9 customer spacecraft will have propulsion. Astrocast (qty: 5), Hawkeye 2a, b, and 2-c (totaling 3), and Umbra-2001 will all have propulsion and could perform collision avoidance.

4. Please provide more detail regarding the assumption that sub-3U spacecraft are considered a single, aggregate 3U spacecraft for purposes of the re-contact analysis, including why this assumption is made.

Sub-3U spacecraft are modeled as a single 3U spacecraft only when they are consolidated in a single dispenser slot (in the case of this mission, in a single instance, two 0.5U spacecraft and a single 2U spacecraft are carried in a 3U dispenser slot). In this configuration, all the spacecraft in the slot are deployed simultaneously and in the same direction and same initial velocity. These sub-3U spacecraft have very small springs between them to help push them apart gradually over time. The change in velocity caused by these small springs is substantially less than the spring energy variation margin that is included in in Spaceflight's Monte Carlo deployment simulation that applies for each dispenser slot. This means that the dispersal of the three sub-3U spacecraft will fall within the volume of space that is accounted for in that simulation therefore creating no greater recontact risk as so modeled than would be the case for single 3U spacecraft.

5. The re-contact analysis appears to include assessment of probability of collision with resident space objects under section 2.1, but characterizes this as "probability of recontact with resident space objects." Is this intended to be "probability of collision" rather than "probability of recontact" or was something different meant here?

That is correct: "probability of collision" is what was intended to be conveyed here.

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> 6. Please provide additional details regarding the input data for the casualty risk assessments in the ODAR attachment. First, please clarify what is modeled in the DAS logs as "F", which is shown as surviving reentry and appears identical to subsequent entries of "Sherpa-FX1", none of which are shown as surviving reentry. Second, please clarify whether non-deployed mass dummies were included in the casualty risk analysis, and if so, which component includes those mass dummies. Third, please explain or clarify the results of what we assume to be the sub-optimal deployment scenarios modeled on pages 28 and 32 of the ODAR, especially as they compare to the initial run on page 24. Specifically, can you briefly explain why these sub-optimal deployment scenarios appear to result in more favorable results for the casualty risk assessment?

First, the DAS program allows for specific components to be modelled on a parent structure. When only a parent structure is defined without any subcomponents (as was the case here), it appears that DAS automatically creates for purposes of analysis a fictitious subcomponent ("F") that is a duplicate of the parent structure. This resulted in a duplicate object in DAS that does not get analyzed until the parent object is demised. Upon executing more granular model inputs for the Sherpa-FX1 structure and its components, Spaceflight confirms that the entirety of the structure and its components do not survive reentry. That data is appended here as Exhibit B.

Second, non-deployed mass dummies were not included in Spaceflight's casualty risk analysis for the initial submission. Spaceflight has provided updated analyses in Exhibit C hereto showing examples for a microsat mass model, entire 12U and 6U dispenser mass models, or a single cubesat mass model within a flight dispenser. In all cases, the mass models fully demise. Some customers are responsible for providing their own mass model. If a case arises that a customer mass model will need to be integrated for flight, Spaceflight will re-run DAS analysis incorporating that specific mass model and its corresponding material properties to ensure demise and no worse risk of casualty than what is presented here, before integration onto the Sherpa-FX1 structure.

The sub-optimal deployment scenarios previously appeared more favorable for debris casualty risk, because the erroneous Object F from the "Mission Success" case was shown to survive re-entry. As mentioned above, this Object F was an erroneous duplicate 130 kg object of the Free-Flyer object, created by DAS when only a single parent structure was input for analysis. The corrected, more granular, Sherpa-FX1 inputs into DAS shown in Exhibit B for this case show no component survives re-entry.

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7. Additional Items:

At the request of Globalstar, Spaceflight wishes to clarify that while the S-Band uplink receiver that is referenced in Spaceflight's STA request is a component of the NearSpace Launch Eyestar S3 radio and is an entirely separate component from any Globalstar product. Additionally, Spaceflight corrects the encryption method that is stated in the table in Attachment 1 and also in Table 1 to Attachment 1, Exhibit A, from AES-128 to AES-256.

Questions with respect to this matter should be referred to the undersigned.

Sincerely,

Jonathan L. Wiener Attorney for Spaceflight, Inc.

Exhibits A - C

Exhibit A

Question	Response
29. Is the applicant a foreign government or the representative of any foreign government?	No.
30. Is the applicant an alien or the representative of an alien?	N/A. See cover letter.
31. Is the applicant a corporation organized under the laws of any foreign government?	N/A. See cover letter.
32. Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record	N/A. See cover letter.
or voted by aliens or their representatives or by a foreign government or representative thereof or by	
any corporation organized under the laws of a foreign country?	
33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which	N/A. See cover letter.
more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives,	
or by a foreign government or representative thereof or by any corporation organized under the laws	
of a foreign country?	
34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as an exhibit, the identification of	N/A. See cover letter.
the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage	
of stock they own or vote.	
36. Has the applicant or any party to this application had any FCC station authorization or license	No.
revoked or had any application for an initial, modification or renewal of FCC station authorization,	
license, or construction permit denied by the Commission? If Yes, attach as an exhibit, an explanation	
of the circumstances.	
37. Has the applicant, or any party to this application, or any party directly or indirectly controlling the	No.
applicant ever been convicted of a felony by any state or federal court? If Yes, attach as an exhibit, an	
explanation of the circumstances.	
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the	No.
applicant, guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio	
communication, directly or indirectly, through control of manufacture or sale of radio apparatus,	
exclusive traffic arrangement or any other means or unfair methods of competition? If Yes, attach as	
an exhibit, an explanation of the circumstances.	
39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in	No.
any pending matter referred to in the preceding two items? If Yes, attach as an exhibit, an explanation	
of the circumstances.	
40. If the applicant is a corporation and is applying for a space station license, attach as an exhibit the	See Attachment 1.
names, addresses, and citizenship of those stockholders owning of record and/or voting 10 percent or	
more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate	
the beneficiary(ies) or class of beneficiaries. Also list the names and addresses of the officers and	
directors of the Filer.	

Exhibit A

ATTACHMENT 1

Spaceflight, Inc.'s ownership structure and Officers and Directors are listed below:

Ownership

M&Y Space Co., Ltd., a Japanese Private Company 2-1, Otemachi 1-chome Chiyoda-ku, Tokyo 100-8631, Japan

Owns 100% of Spaceflight, Inc., stock Has 100% voting rights

Officers and Directors

c/o Spaceflight, Inc. 1505 Westlake Avenue North, Suite 600 Seattle, WA 98109

Tomohiro Musha Chairman of the Board of Directors

Ryan Bates Director

Curtis Dean Blake Chief Executive Officer and Director

David Ekizian Director

Norikazu Sano Director

Yonosuke Miwa Chief Financial Officer

DAS Analysis for Detailed Sherpa-FX1 Structure

09 09 2020; 12:32:07PM	Activity Log Started
09 09 2020; 12:32:17PM	Project Data Saved To File
09 09 2020; 12:32:54PM	Activity Log Started
09 09 2020; 12:32:54PM deploy\	Opened Project C:\Users\elund\Box\Eric Lund\Missions and Programs\SXRS-3\DAS Config B post-
09 09 2020; 12:33:01PM	Processing Requirement 4.6 Return Status : Passed

Project Data

INPUT

Space Structure Name = Free-flyer Space Structure Type = Payload

Perigee Altitude = 550.000000 (km) Apogee Altitude = 550.000000 (km) Inclination = 97.593000 (deg) RAAN = 0.000000 (deg) Argument of Perigee = 0.000000 (deg) Mean Anomaly = 0.000000 (deg) Area-To-Mass Ratio = 0.007815 (m^2/kg) Start Year = 2021.000000 (yr) Initial Mass = 300.000000 (kg) Final Mass = 130.000000 (kg) Duration = 0.010000 (yr) Station Kept = False Abandoned = True PMD Perigee Altitude = 548.382315 (km) PMD Apogee Altitude = 551.598571 (km) PMD Inclination = 97.594101 (deg) PMD RAAN = 3.586213 (deg) PMD Argument of Perigee = 173.987191 (deg) PMD Mean Anomaly = 0.000000 (deg)

OUTPUT

Suggested Perigee Altitude = 548.382315 (km) Suggested Apogee Altitude = 551.598571 (km) Returned Error Message = Passes LEO reentry orbit criteria.

Released Year = 2027 (yr) Requirement = 61 Compliance Status = Pass

************INPUT**** Item Number = 1 name = Free-flyer quantity = 1 parent = 0 materialID = 5 type = Cylinder Aero Mass = 130.00000 Thermal Mass = 130.000000 Diameter/Width = 0.813000 name = PRA quantity = 1 parent = 1 materialID = 8 type = Box Aero Mass = 11.998000 Thermal Mass = 11.998000 Diameter/Width = 0.626000 Length = 0.626000 Height = 0.070000 name = Hex Plate quantity = 2parent = 1 materialID = 8 type = Box Aero Mass = 12.000000 Thermal Mass = 12.000000 Diameter/Width = 0.822000 Length = 0.822000 Height = 0.070000 name = Interior Wall quantity = 6 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.162000 Thermal Mass = 1.162000 Diameter/Width = 0.118000 Length = 0.318000 name = Corner Brace quantity = 6parent = 1 materialID = 8 type = Box Aero Mass = 2.040000 Thermal Mass = 2.040000 Diameter/Width = 0.151000

Length = 0.178000

Height = 0.151000

name = DuoPack adapter plate quantity = 2 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.920000 Thermal Mass = 1.920000 Diameter/Width = 0.311000 Length = 0.350000 name = QuadPack adapter plate quantity = 4 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.727000 Thermal Mass = 1.727000 Diameter/Width = 0.297000 Length = 0.311000 name = avionics deck plate quantity = 1 parent = 1 materialID = 8 type = Box Aero Mass = 4.100000 Thermal Mass = 4.100000 Diameter/Width = 0.544000 Length = 0.544000Height = 0.022000 name = R2A-Core quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 3.200000 Thermal Mass = 3.200000 Diameter/Width = 0.285000 Length = 0.285000 Height = 0.090000 name = battery module quantity = 2parent = 1 materialID = 5 type = Box Aero Mass = 2.650000 Thermal Mass = 2.650000 Diameter/Width = 0.100000 Length = 0.139000

name = EyeStar Black Box quantity = 6 parent = 1 materialID = 5 type = Box Aero Mass = 0.290000 Thermal Mass = 0.290000 Diameter/Width = 0.054000 Length = 0.089000 Height = 0.047000 name = upper 24-in separation sytem quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 1.800000 Thermal Mass = 1.800000 Diameter/Width = 0.610000 Length = 0.610000Height = 0.031000 name = empty DuoPack quantity = 2 parent = 1 materialID = 5 type = Box Aero Mass = 4.550000 Thermal Mass = 4.550000 Diameter/Width = 0.250000 Length = 0.405000Height = 0.145000 name = empty QuadPack quantity = 4 parent = 1 materialID = 5 type = Box Aero Mass = 7.600000 Thermal Mass = 7.600000 Diameter/Width = 0.250000 Length = 0.405000Height = 0.250000 name = lower 15-in separation system quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 2.160000 Thermal Mass = 2.160000

Height = 0.100000

Diameter/Width = 0.356000 Length = 0.356000 Height = 0.044000

***************OUTPUT****

Item Number = 1

name = Free-flyer Demise Altitude = 77.999779 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = PRA Demise Altitude = 62.284084 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = Hex Plate Demise Altitude = 61.181110 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = Interior Wall Demise Altitude = 72.876892 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = Corner Brace Demise Altitude = 72.694054 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = DuoPack adapter plate Demise Altitude = 73.133438 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = QuadPack adapter plate Demise Altitude = 73.005775 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = avionics deck plate Demise Altitude = 71.885536 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = R2A-Core Demise Altitude = 70.402260 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = battery module Demise Altitude = 67.231186 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = EyeStar Black Box Demise Altitude = 74.796288 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = upper 24-in separation sytem Demise Altitude = 75.557724 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = empty DuoPack Demise Altitude = 71.665443 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = empty QuadPack Demise Altitude = 70.228615 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = lower 15-in separation system Demise Altitude = 73.163216 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

DAS Analysis with Cubesat Mass Model

```
09 14 2020; 11:30:09AM
                            Activity Log Started
                             ********Processing Requirement 4.7-1
09 14 2020; 11:30:29AM
 Return Status : Passed
***********INPUT****
Item Number = 1
name = Free-flyer
quantity = 1
parent = 0
materialID = 5
type = Cylinder
Aero Mass = 130.000000
Thermal Mass = 130.000000
Diameter/Width = 0.813000
name = PRA
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 11.998000
Thermal Mass = 11.998000
Diameter/Width = 0.626000
Length = 0.626000
Height = 0.070000
name = Hex Plate
quantity = 2
parent = 1
materialID = 8
type = Box
Aero Mass = 12.000000
Thermal Mass = 12.000000
Diameter/Width = 0.822000
Length = 0.822000
Height = 0.070000
name = Interior Wall
quantity = 6
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 1.162000
Thermal Mass = 1.162000
Diameter/Width = 0.118000
Length = 0.318000
name = Corner Brace
quantity = 6
parent = 1
materialID = 8
```

Exhibit C

type = Box Aero Mass = 2.040000 Thermal Mass = 2.040000 Diameter/Width = 0.151000 Length = 0.178000 Height = 0.151000 name = DuoPack adapter plate quantity = 2 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.920000 Thermal Mass = 1.920000 Diameter/Width = 0.311000 Length = 0.350000 name = QuadPack adapter plate quantity = 4 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.727000 Thermal Mass = 1.727000 Diameter/Width = 0.297000 Length = 0.311000 name = avionics deck plate quantity = 1 parent = 1 materialID = 8 type = Box Aero Mass = 4.100000 Thermal Mass = 4.100000 Diameter/Width = 0.544000 Length = 0.544000 Height = 0.022000 name = R2A-Core quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 3.200000 Thermal Mass = 3.200000 Diameter/Width = 0.285000 Length = 0.285000 Height = 0.090000 name = battery module quantity = 2 parent = 1 materialID = 5

type = Box Aero Mass = 2.650000 Thermal Mass = 2.650000 Diameter/Width = 0.100000 Length = 0.139000Height = 0.100000 name = EyeStar Black Box quantity = 6 parent = 1 materialID = 5 type = Box Aero Mass = 0.290000 Thermal Mass = 0.290000 Diameter/Width = 0.054000 Length = 0.089000 Height = 0.047000 name = upper 24-in separation sytem quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 1.800000 Thermal Mass = 1.800000 Diameter/Width = 0.610000 Length = 0.610000Height = 0.031000 name = empty DuoPack quantity = 2parent = 1materialID = 5 type = Box Aero Mass = 4.550000 Thermal Mass = 4.550000 Diameter/Width = 0.250000 Length = 0.405000Height = 0.145000 name = empty QuadPack quantity = 4 parent = 1 materialID = 5 type = Box Aero Mass = 7.600000 Thermal Mass = 7.600000 Diameter/Width = 0.250000 Length = 0.405000 Height = 0.250000 name = lower 15-in separation system

quantity = 1

parent = 1 materialID = 5 type = Box Aero Mass = 2.160000 Thermal Mass = 2.160000 Diameter/Width = 0.356000 Length = 0.356000 Height = 0.044000 name = CubeSat Mass Model block quantity = 1 parent = 1 materialID = -1 type = Box Aero Mass = 2.000000 Thermal Mass = 2.000000 Diameter/Width = 0.100000 Length = 0.340360Height = 0.100000 name = CubeSat Mass Model ballast quantity = 4 parent = 1 materialID = 54 type = Box Aero Mass = 0.675000 Thermal Mass = 0.675000 Diameter/Width = 0.064287 Length = 0.171450 Height = 0.009525 Item Number = 1 name = Free-flyer Demise Altitude = 77.999779 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000 ***** name = PRA Demise Altitude = 62.284084 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000 ***** name = Hex Plate Demise Altitude = 61.181110 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = Interior Wall

Exhibit C

Demise Altitude = 72.876892 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = Corner Brace Demise Altitude = 72.694054 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = DuoPack adapter plate Demise Altitude = 73.133438 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = QuadPack adapter plate Demise Altitude = 73.005775 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = avionics deck plate Demise Altitude = 71.885536 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = R2A-Core Demise Altitude = 70.402260 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = battery module Demise Altitude = 67.231186 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = EyeStar Black Box Demise Altitude = 74.796288 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = upper 24-in separation sytem Demise Altitude = 75.557724 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = empty DuoPack Demise Altitude = 71.665443 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = empty QuadPack Demise Altitude = 70.228615 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = lower 15-in separation system Demise Altitude = 73.163216 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = CubeSat Mass Model block Demise Altitude = 76.941818 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = CubeSat Mass Model ballast Demise Altitude = 63.248062 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

DAS Analysis with Dispenser Mass Model

09 14 2020; 10:11:13AM	Activity Log Started
09 14 2020; 10:11:13AM	Project Files copied from C:\Users\elund\Box\Eric Lund\Missions and Programs\SXRS-3\DAS
Config A CubeSat MM\	
09 14 2020; 10:11:14AM	Project Data Saved To File
09 14 2020; 10:17:56AM	Activity Log Started
09 14 2020; 10:17:56AM	Opened Project C:\Users\elund\Box\Eric Lund\Missions and Programs\SXRS-3\DAS Config A Disp
MM\	
09 14 2020; 10:18:17AM	Mission Editor Changes Applied
09 14 2020; 10:18:17AM	Project Data Saved To File
09 14 2020; 10:18:22AM	Processing Requirement 4.6 Return Status : Passed

Project Data

INPUT

Space Structure Name = Free-flyer Space Structure Type = Payload

Perigee Altitude = 550.000000 (km) Apogee Altitude = 550.000000 (km) Inclination = 97.593000 (deg) RAAN = 0.000000 (deg) Argument of Perigee = 0.000000 (deg) Mean Anomaly = 0.000000 (deg) Area-To-Mass Ratio = 0.007815 (m²/kg) Start Year = 2021.000000 (yr) Initial Mass = 300.000000 (kg) Final Mass = 233.000000 (kg) Duration = 0.010000 (yr) Station Kept = False Abandoned = True PMD Perigee Altitude = 548.378676 (km) PMD Apogee Altitude = 551.587115 (km) PMD Inclination = 97.594100 (deg) PMD RAAN = 3.586217 (deg) PMD Argument of Perigee = 176.527067 (deg) PMD Mean Anomaly = 0.000000 (deg)

OUTPUT

Suggested Perigee Altitude = 548.378676 (km) Suggested Apogee Altitude = 551.587115 (km) Returned Error Message = Passes LEO reentry orbit criteria.

Released Year = 2027 (yr) Requirement = 61 Compliance Status = Pass

name = PRA

quantity = 1 parent = 1 materialID = 8 type = Box Aero Mass = 11.998000 Thermal Mass = 11.998000 Diameter/Width = 0.626000 Length = 0.626000Height = 0.070000 name = Hex Plate quantity = 2parent = 1 materialID = 8 type = Box Aero Mass = 12.000000 Thermal Mass = 12.000000 Diameter/Width = 0.822000 Length = 0.822000Height = 0.070000 name = Interior Wall quantity = 6 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.162000 Thermal Mass = 1.162000 Diameter/Width = 0.118000 Length = 0.318000 name = Corner Brace quantity = 6 parent = 1 materialID = 8 type = Box Aero Mass = 2.040000 Thermal Mass = 2.040000 Diameter/Width = 0.151000 Length = 0.178000 Height = 0.151000 name = DuoPack adapter plate quantity = 2 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.920000 Thermal Mass = 1.920000 Diameter/Width = 0.311000 Length = 0.350000

name = QuadPack adapter plate

quantity = 4 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.727000 Thermal Mass = 1.727000 Diameter/Width = 0.297000 Length = 0.311000 name = avionics deck plate quantity = 1 parent = 1 materialID = 8 type = Box Aero Mass = 4.100000 Thermal Mass = 4.100000 Diameter/Width = 0.544000 Length = 0.544000Height = 0.022000 name = R2A-Core quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 3.200000 Thermal Mass = 3.200000 Diameter/Width = 0.285000 Length = 0.285000 Height = 0.090000 name = battery module quantity = 2 parent = 1 materialID = 5 type = Box Aero Mass = 2.650000 Thermal Mass = 2.650000 Diameter/Width = 0.100000 Length = 0.139000Height = 0.100000 name = EyeStar Black Box quantity = 6 parent = 1 materialID = 5 type = Box Aero Mass = 0.290000 Thermal Mass = 0.290000 Diameter/Width = 0.054000 Length = 0.089000Height = 0.047000

name = upper 24-in separation sytem quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 1.800000 Thermal Mass = 1.800000 Diameter/Width = 0.610000 Length = 0.610000 Height = 0.031000 name = DuoPack Mass Model quantity = 2 parent = 1 materialID = 5 type = Box Aero Mass = 16.049999 Thermal Mass = 16.049999 Diameter/Width = 0.250000 Length = 0.402000Height = 0.152400 name = QuadPack Mass Model quantity = 4 parent = 1 materialID = 5 type = Box Aero Mass = 26.299999 Thermal Mass = 26.299999 Diameter/Width = 0.250000 Length = 0.528000Height = 0.250000 name = lower 15-in separation system quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 2.160000 Thermal Mass = 2.160000 Diameter/Width = 0.356000 Length = 0.356000 Height = 0.044000 **************OUTPUT**** Item Number = 1 name = Free-flyer Demise Altitude = 77.999290 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000 *****

Exhibit C

name = PRA Demise Altitude = 65.743164 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = Hex Plate Demise Altitude = 66.659813 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = Interior Wall Demise Altitude = 74.224091 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = Corner Brace Demise Altitude = 74.083252 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = DuoPack adapter plate Demise Altitude = 74.408562 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = QuadPack adapter plate Demise Altitude = 74.314713 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = avionics deck plate Demise Altitude = 73.403465 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = R2A-Core Demise Altitude = 72.152840 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = battery module Demise Altitude = 69.491013 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

Exhibit C

name = EyeStar Black Box Demise Altitude = 75.706856 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = upper 24-in separation sytem Demise Altitude = 76.283005 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = DuoPack Mass Model Demise Altitude = 61.415592 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = QuadPack Mass Model Demise Altitude = 61.595795 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = lower 15-in separation system Demise Altitude = 74.435989 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

DAS analysis Excerpt with Dispenser Mass Models (12U and 6U) and Microsat Mass Model

09 28 2020; 11:02:15AM 09 28 2020; 11:02:15AM MicroSat MM\	Activity Log Started Opened Project C:\Users\elund\Box\Eric Lund\Missions and Programs\SXRS-3\DAS Config A		
09 28 2020; 11:02:33AM	Processing Requirement 4.6 Return Status : Passed		
Project Data			
==========			
INPUT			
Space Structure Name = Fre	e-flyer		
Space Structure Type = Payle	bad		
Perigee Altitude = 550.0000	00 (km)		
Apogee Altitude = 550.0000	00 (km)		
Inclination = 97.593000 (deg	<u>{</u> }		
RAAN = 0.000000 (deg)			
Argument of Perigee = 0.000000 (deg)			
Niean Anomaly = 0.000000 (aeg		
Start Vear = 2021 00000 (vi	r) CTC (III., 7/ vB)		
Initial Mass = 300 000000 (k	ן סו		
Final Mass = 180.000000 (kg			
Duration = 0.010000 (vr)			
Station Kept = False			
Abandoned = True			
PMD Perigee Altitude = 548.	380099 (km)		
PMD Apogee Altitude = 551	.593434 (km)		
PMD Inclination = 97.594101 (deg)			
PMD RAAN = 3.586215 (deg			
PMD Argument of Perigee =	175.218932 (deg)		
PMD Mean Anomaly = 0.000)000 (deg)		
OUTPUT			
Suggested Perigee Altitude =	= 548.380099 (km)		
Suggested Apogee Altitude =	= 551.593434 (km)		
Returned Error Message = P	asses LEO reentry orbit criteria.		
Released Year = 2027 (yr)			
Requirement = 61			
Compliance Status = Pass			

```
************INPUT****
Item Number = 1
name = Free-flyer
quantity = 1
parent = 0
materialID = 5
type = Cylinder
Aero Mass = 180.00000
Thermal Mass = 180.000000
Diameter/Width = 0.813000
name = PRA
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 11.998000
Thermal Mass = 11.998000
Diameter/Width = 0.626000
Length = 0.626000
Height = 0.070000
name = Hex Plate
quantity = 2
parent = 1
materialID = 8
type = Box
Aero Mass = 12.000000
Thermal Mass = 12.000000
Diameter/Width = 0.822000
Length = 0.822000
Height = 0.070000
name = Interior Wall
quantity = 6
parent = 1
materialID = 8
type = Flat Plate
Aero Mass = 1.162000
Thermal Mass = 1.162000
Diameter/Width = 0.118000
Length = 0.318000
name = Corner Brace
quantity = 6
parent = 1
materialID = 8
type = Box
Aero Mass = 2.040000
Thermal Mass = 2.040000
Diameter/Width = 0.151000
```

Length = 0.178000 Height = 0.151000 name = DuoPack adapter plate quantity = 2parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.920000 Thermal Mass = 1.920000 Diameter/Width = 0.311000 Length = 0.350000 name = QuadPack adapter plate quantity = 1 parent = 1 materialID = 8 type = Flat Plate Aero Mass = 1.727000 Thermal Mass = 1.727000 Diameter/Width = 0.297000 Length = 0.311000 name = MLB adapter plate quantity = 3 parent = 1 materialID = 8 type = Box Aero Mass = 2.170000 Thermal Mass = 2.170000 Diameter/Width = 0.283660 Length = 0.311150 Height = 0.031750 name = avionics deck plate quantity = 1 parent = 1 materialID = 8 type = Box Aero Mass = 4.100000 Thermal Mass = 4.100000 Diameter/Width = 0.544000 Length = 0.544000Height = 0.022000 name = R2A-Core quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 3.200000 Thermal Mass = 3.200000 Diameter/Width = 0.285000

Length = 0.285000 Height = 0.090000 name = battery module quantity = 2parent = 1 materialID = 5 type = Box Aero Mass = 2.650000 Thermal Mass = 2.650000 Diameter/Width = 0.100000 Length = 0.139000Height = 0.100000 name = EyeStar Black Box quantity = 6 parent = 1 materialID = 5 type = Box Aero Mass = 0.290000 Thermal Mass = 0.290000 Diameter/Width = 0.054000 Length = 0.089000 Height = 0.047000 name = upper 24-in separation sytem quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 1.800000 Thermal Mass = 1.800000 Diameter/Width = 0.610000 Length = 0.610000 Height = 0.031000 name = DuoPack Mass Model quantity = 2parent = 1 materialID = 5 type = Box Aero Mass = 16.049999 Thermal Mass = 16.049999 Diameter/Width = 0.250000 Length = 0.402000 Height = 0.152400 name = QuadPack Mass Model quantity = 1 parent = 1 materialID = 5 type = Box Aero Mass = 26.299999

```
Thermal Mass = 26.299999
Diameter/Width = 0.250000
Length = 0.528000
Height = 0.250000
name = lower 15-in separation system
quantity = 1
parent = 1
materialID = 5
type = Box
Aero Mass = 2.160000
Thermal Mass = 2.160000
Diameter/Width = 0.356000
Length = 0.356000
Height = 0.044000
name = 8-inch MLB simulator
quantity = 1
parent = 1
materialID = 5
type = Box
Aero Mass = 1.500000
Thermal Mass = 1.500000
Diameter/Width = 0.203200
Length = 0.203200
Height = 0.053340
name = MM adapter plate
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 3.900000
Thermal Mass = 3.900000
Diameter/Width = 0.355600
Length = 0.457200
Height = 0.012700
name = MM base plate
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 6.940000
Thermal Mass = 6.940000
Diameter/Width = 0.355600
Length = 0.444500
Height = 0.025400
name = MM LR wall
quantity = 2
parent = 1
materialID = 8
```

Exhibit C

type = Box Aero Mass = 3.020000 Thermal Mass = 3.020000 Diameter/Width = 0.254000 Length = 0.457200Height = 0.025400 name = MM FB wall quantity = 2 parent = 1 materialID = 8 type = Box Aero Mass = 1.690000 Thermal Mass = 1.690000 Diameter/Width = 0.177800 Length = 0.254000Height = 0.025400 name = MM top plate quantity = 1 parent = 1 materialID = 8 type = Box Aero Mass = 7.170000 Thermal Mass = 7.170000 Diameter/Width = 0.355600 Length = 0.457200 Height = 0.025400 **************OUTPUT**** Item Number = 1 name = Free-flyer Demise Altitude = 77.996780 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000 ***** name = PRA Demise Altitude = 64.247849 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000 ***** name = Hex Plate Demise Altitude = 64.712936 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000 ***** name = Interior Wall Demise Altitude = 73.690727 Debris Casualty Area = 0.000000

Impact Kinetic Energy = 0.000000

name = Corner Brace Demise Altitude = 73.523361 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = DuoPack adapter plate Demise Altitude = 73.901276 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = QuadPack adapter plate Demise Altitude = 73.799118 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = MLB adapter plate Demise Altitude = 73.337173 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = avionics deck plate Demise Altitude = 72.775635 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = R2A-Core Demise Altitude = 71.429146 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = battery module Demise Altitude = 68.523460 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = EyeStar Black Box Demise Altitude = 75.357368 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = upper 24-in separation sytem Demise Altitude = 76.007011 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = DuoPack Mass Model Demise Altitude = 59.842232 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = QuadPack Mass Model Demise Altitude = 60.044376 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = lower 15-in separation system Demise Altitude = 73.926277 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = 8-inch MLB simulator Demise Altitude = 72.923004 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = MM adapter plate Demise Altitude = 71.873154 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = MM base plate Demise Altitude = 66.992546 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = MM LR wall Demise Altitude = 73.127136 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = MM FB wall Demise Altitude = 72.949997 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

name = MM top plate

Demise Altitude = 66.938492 Debris Casualty Area = 0.000000 Impact Kinetic Energy = 0.000000

======= End of Requirement 4.7-1 ======09 28 2020; 11:02:33AMProject Data Saved To File09 28 2020; 11:02:40AMProject Data Saved To File09 28 2020; 11:02:44AMClosed Project C:\Users\elund\Box\Eric Lund\Missions and Programs\SXRS-3\DAS Config AMicroSat MM\