Orbital Debris Assessment for Protocatcher per NASA-STD 8719.14C

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REFERENCES:

A. *NASA Procedural Requirements for Limiting Orbital Debris Generation*, NPR 8715.6B, 6 February 2017
B. *Process for Limiting Orbital Debris*, NASA-STD-8719.14C, 05 November 2021
C. International Space Station Reference Trajectory, delivered December 2019
D. McKissock, Barbara, Patricia Loyselle, and Elisa Vogel. *Guidelines on Lithiumion Battery Use in Space Applications*. Tech. no. RP-08-75. NASA Glenn Research Center Cleveland, Ohio
E. *UL Standard for Safety for Lithium Batteries, UL 1642*. UL Standard. 5th ed. Northbrook, IL, Underwriters Laboratories, 2012
F. Kwas, Robert. Thermal Analysis of ELaNa-4 CubeSat Batteries, ELVL-20120043254; Nov 2012
G. Range Safety User Requirements Manual Volume 3- Launch Vehicles, Payloads, and Ground Support Systems Requirements, AFSCM 91-710 V3.
H. HQ OSMA Policy Memo/Email to 8719.14: CubeSat Battery Non-Passivation, Suzanne Aleman to Justin Treptow, 10, March 2014
I. ODPO Guidance Email: Fasteners and Screws, John Opiela to Yusef Johnson, 12 February 2020
J. Debris Assessment Software User's Guide: Version 3.2, NASA/TP20210025946

The intent of this report is to satisfy the orbital debris requirements listed in ref. (a) for the Protocatcher launching on the SpaceX Transporter 18, no earlier than October 1, 2026.

Sections 1 through 8 of ref. (b) are addressed in this document; sections 9 through 14 fall under the requirements levied on the primary mission and are not presented here.

This CubeSat will passively reenter, and therefore this ODAR will also serve as the End of Mission Plan (EOMP) for this CubeSat.

RECORD OF REVISIONS		
REV	**DESCRIPTION**	**DATE**
0	Original submission	April 2026

Section 1: Program Management and Mission Overview

Protocatcher is a CubeSat experimental mission from Star Catcher Industries, Inc. Responsible personnel are as follows:

Principal Investigator (or other position or positions):

- Michael Snyder, Chief Technology Officer
- Radu Pop, Program Manager
- Brinson White, Lead Engineer

The following table summarizes the compliance status of Protocatcher.

DAS version 3.2.7 was used to generate the data provided in this document. Protocatcher is fully compliant with all applicable requirements.

Table 1: Orbital Debris Requirement Compliance Matrix

Requirement	Compliance Assessment	Comments
4.3-1a	Not applicable	No planned debris release
4.3-1b	Not applicable	No planned debris release
4.3-2	Not applicable	No planned debris release
4.4-1	Compliant	On board energy source (batteries) incapable of debris-producing failure
4.4-2	Compliant	On board energy source (batteries) incapable of debris-producing failure
4.4-3	Not applicable	No planned breakups
4.4-4	Not applicable	No planned breakups
4.5-1	Compliant	
4.5-2	Not applicable	

4.6-1(a)	Compliant	
4.6-1(b)	Not applicable	
4.6-1(c)	Not applicable	
4.6-2	Not applicable	
4.6-3	Not applicable	
4.6-4	Not applicable	Passive disposal
4.6-5	Compliant	
4.7-1	Compliant	Non-credible risk of human casualty
4.8-1	Compliant	No planned tether releases

Section 2: Spacecraft Description

Table 2 outlines its attributes.

Table 2: Protocatcher Attributes

CubeSat Name	**CubeSat Form Factor**	**CubeSat Mass (kg)**
Protocatcher	1U with Deployables	1.7

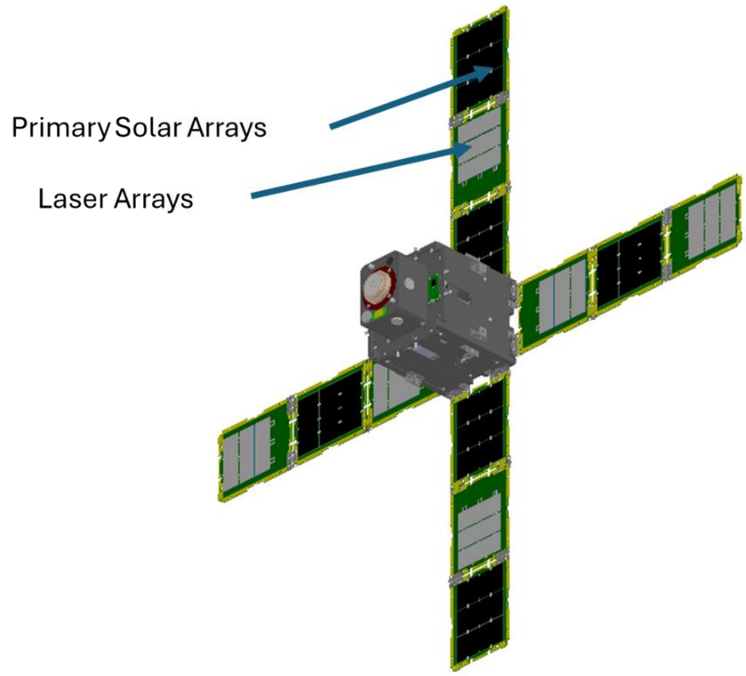

Figure 2-1: Spacecraft Overview

Overview and CONOPS

The overall goal of the mission, is to demonstrate optical power transmission capabilities from the Protostar spacecraft (licensed separately) to the Protocatcher spacecraft (the object of this license application), and collect performance data to inform future system development.

The spacecraft is a 1U cubesat unit. It includes deployable panels carrying arrays for solar energy capture and for laser sensing. Per Figure 2-1, the panel extents are about 0.76 meters in each of two dimensions.

Protocatcher will be launched no earlier than October 2026 on the Transporter-18 rideshare mission, carried aboard the larger Protostar spacecraft. The Protostar spacecraft will be injected into an orbit of approximately 510 km in a Sun-Synchronous Orbit ("SSO") with an inclination of 97.5 +/- 0.5 degrees. Protocatcher will communicate to mission operations through the Iridium constellation while on board Protostar, as well as after it is deployed from Protostar, which will occur about 3 months after launch. When it is deployed, experiments to support the mission will begin.

Upon completion of the experimental phase, Protocatcher will conclude mission operations and be passivated consistent with orbital debris mitigation requirements.

Atmospheric friction will slow the satellite and reduce the altitude of the orbit, until de-orbiting occurs 1.21 years after it deploys into orbit.

Materials

The spacecraft consists primarily of COTS components including its flight computer, solar panels, EPS, radio, and other components. Materials are principally a 6061-T6 aluminum primary structure, stainless steel fasteners, fiberglass PCBs, and space-rated sealants and adhesives.

Hazards

The spacecraft contains no hazardous materials. It includes 4 deployable solar and sensor arrays.

Batteries

The batteries are COTS Panasonic 18650B cells. Each cell has the following specifications;

1. Nominal Voltage: 3.6 V
2. Nominal Capacity: 3400 mAh

The EPS has both hardware and software current overcharging protection. The battery cells are UL certified (MH12210).

Section 3: Assessment of Spacecraft Debris Released during Normal Operations

The assessment of spacecraft debris requires the identification of any object (>1 mm) expected to be released from the spacecraft any time after launch, including object dimensions, mass, and material.

Section 3 requires rationale/necessity for release of each object, time of release of each object, relative to launch time, release velocity of each object with respect to spacecraft, expected orbital parameters (apogee, perigee, and inclination) of each object after release, calculated orbital lifetime of each object, including time spent in Low Earth Orbit (LEO), and an assessment of spacecraft compliance with Requirements 4.3-1 and 4.3-2.

No releases are planned on the Protocatcher CubeSat therefore this section is not applicable.

Section 4: Assessment of Spacecraft Intentional Breakups and Potential for Explosions.

There are no plans for designed spacecraft breakups, explosions, or intentional collisions for Protocatcher.

As discussed in Reference H, with respect to 3U and smaller CubeSats, the probability of battery explosion is very low, and, due to the very small mass of the satellites and their short orbital lifetimes the effect of an explosion on the far-term LEO environment is negligible.

The CubeSat batteries still meet Req. 56450 (4.4-2) by virtue of the HQ OSMA policy regarding CubeSat battery disconnect stating:

> "CubeSats as a satellite class need not disconnect their batteries if flown in LEO with orbital lifetimes less than 25 years." (ref. (h))

Because of the short orbit lifetime of the spacecraft – less than 2 years – the mission will continue until demise, so that passivation at EOM is not necessary.

Assessment of spacecraft compliance with Requirements 4.4-1 through 4.4-4 shows that with a maximum lifetime of 1.46 years from launch to demise, Protocatcher is compliant.

Section 5: Assessment of Spacecraft Potential for On-Orbit Collisions

Calculation of spacecraft probability of collision with space objects larger than 10 cm in diameter during the orbital lifetime of the spacecraft takes into account both the mean cross sectional area (MCSA) and orbital lifetime.

The mass of the spacecraft remains 1.7 kg for the entire orbit life.

Large Object Collision Probability
Protocatcher will present a random orientation in the RAM direction during the mission.

Item	Units	Value	Comment
Face A1 Area	m^2	.1123	
Face A2 Area	m^2	.0141	
Face A3 Area	m^2	.0147	
Effective Area	m^2	.07055	(A1 + A2 + A3)/2
Area/mass Ratio	m^2/kg	.0415	

Table 5-1 Cross Sectional Areas and A/m Ratio

So the effective cross sectional area presented in the RAM direction during orbit lifetime is 0.07055 m^2, and the Area/mass ratio is 0.0415 m^2/kg

From this, DAS provides a large object collision risk of 2.3437E-06.

Large Object Collision Probability Post Mission Until Demise

The spacecraft will passively demise 1.21 years after deploy from the ProtoStar. Thus the demise will be about 1.46 years from launch. During the time between deploy and demise, per DAS the large object collision risk will be 2.3437E-06. This satisfies the 0.001 maximum probability requirement 4.5-1.

Assessment of spacecraft compliance with Requirements 4.5-1 shows Protocatcher to be compliant.

This ODAR also serves as the EOMP (End of Mission Plan).

Requirements

47 CFR 5.64(b)(4)(i)(C). If at any time during the space station(s)' mission or de-orbit phase the space station(s) will transit through the orbits used by any inhabitable spacecraft, including the International Space Station, the statement must describe the design and operational strategies, if any, that will be used to minimize the risk of collision and avoid posing any operational constraints to the inhabitable spacecraft.
Response:
The spacecraft has no propulsion and no plan for any orbit changes by any means while passing through the altitude of the ISS or the Tiangong, or otherwise. The plan is for passive demise.
Should we receive a conjunction warning from 18th Space Control Squadron that involves the ISS, we will contact ISS operations at NASA Johnson Space Center, to develop a mitigation plan. This could include altering the attitude of the spacecraft to change the drag force and thereby influence the orbit. Should a similar warning be received with regard to the Tiangong space station, we will contact the 18th Space Control Squadron to discuss options for a response.

47 CFR 5.64(b)(4)(i)(D) Disclose the accuracy with which orbital parameters will be maintained (apogee, perigee, inclination, and the right ascension of the ascending node(s)). State whether propulsion will be used for orbital maintenance. Describe the extent of satellite maneuverability. Please provide a statement describing the extent of satellite maneuverability (e.g. differential drag, etc.)
Response:
The spacecraft has no propulsion and no plan for any orbit maintaining. The only maneuverability would be by adjusting attitude relative to RAM direction, moderately influencing drag and thereby, orbit demise.

47 CFR 5.64(b)(4)(i)(E). The space station operator must certify that upon receipt of a space situational awareness conjunction warning, the operator will review and take all possible steps to assess the collision risk, and will mitigate the collision risk if necessary. As appropriate,

steps to assess and mitigate the collision risk should include, but are not limited to: contacting the operator of any active spacecraft involved in such a warning; sharing ephemeris data and other appropriate operational information with any such operator; and modifying space station attitude and/or operations.

Response:

We hereby certify that upon receipt of a space situational awareness conjunction warning, we will review and take all possible steps to assess the collision risk, and will mitigate the collision risk if necessary. As appropriate, steps to assess and mitigate the collision risk shall include, but are not limited to: contacting the operator of any active spacecraft involved in such a warning; sharing ephemeris data and other appropriate operational information with any such operator; and modifying space station attitude.

2. 47 CFR 5.64(b)(5)(i) states:

§ 5.64 Special provisions for satellite systems.

(b) Except where the satellite system has already been authorized by the FCC, applicants for an experimental authorization involving a satellite system must submit a description of the design and operational strategies the satellite system will use to mitigate orbital debris, including the following information:

5) A statement addressing the trackability of the space station(s). Space station(s) operating in low-Earth orbit will be presumed trackable if each individual space station is 10 cm or larger in its smallest dimension, exclusive of deployable components. Where the application is for an NGSO space station or system, the statement shall also disclose the following:

(i) How the operator plans to identify the space station(s) following deployment and whether space station tracking will be active or passive

Response:

Tracking will be both active and passive, using first the initial TLEs based on deploy from the ProtoStar, and later from the SpaceTrack database. Also, data from the GPS on board the spacecraft, forwarded through the Iridium network, will be used to actively track the spacecraft.

47 CFR 5.64(b)(5)(ii) states

(ii) Whether, prior to deployment, the space station(s) will be registered with the 18th Space Control Squadron or successor entity;

Response:

Yes, the space station will be registered with the 18th Space Control Squadron prior to deployment.

47 CFR 5.64(b)(5)(iii) states

(iii) The extent to which the space station operator plans to share information regarding initial deployment, ephemeris, and/or planned maneuvers with the 18th Space Control Squadron or successor entity, other entities that engage in space situational awareness or space traffic management functions, and/or other operators.

Response:

We will share information regarding initial deployment, and ephemeris, with the 18th Space Control Squadron, and with anyone else who enquires. No maneuvers are planned, or possible.

7. 47 CFR 5.64(b)(6) - A statement disclosing planned proximity operations, if any. Will the satellite perform any close proximity maneuvers with other satellite or objects?
Response:
The plan is for the Protocatcher to receive and sense laser energy from the ProtoStar spacecraft, from which Protocatcher is deployed. Protocatcher will adjust attitude to facilitate this, but has no means to otherwise maneuver except to a limited extent, by changing attitude to affect drag.

47 CFR 5.64(b)(7)(iv)(B)(1). If planned disposal is by atmospheric re-entry, the statement must also include:

(1) A disclosure indicating whether the atmospheric re-entry will be an uncontrolled re-entry or a controlled targeted reentry.

1. Given that the spacecraft will transit through orbits used by inhabitable spacecraft, including the International Space Station, during its mission and/or de-orbit phase, please describe any design and operational strategies that will be used to minimize collision risks and avoid posing operational constraints to inhabitable spacecraft, as required by section 25.122(d)(5) of the Commission's rules.[1]

Response:
The spacecraft has no propulsion and no plan for any orbit changes by any means while passing through the altitude of the ISS or the Tiangong, or otherwise.

Should we receive a conjunction warning from 18th Space Control Squadron that involves the ISS, we will contact ISS operations at NASA Johnson Space Center, to develop a mitigation plan. This could include altering the attitude of the spacecraft to change the drag force and thereby influence the orbit. Should a similar warning be received with regard to the Tiangong space station, we will contact the 18th Space Control Squadron to discuss options for a response.

1 47 CFR § 25.122(d)(5).

Section 6: Assessment of Spacecraft Post-Mission Disposal Plans and Procedures

From the DAS, Protocatcher will naturally decay from orbit less than 1.46 years after launch, 1.21 years after deploy from Star Catcher.

Planning for spacecraft maneuvers to accomplish post-mission disposal is not applicable. Disposal will be achieved via passive atmospheric reentry.

The assessment of the spacecraft illustrates it is compliant with Requirements 4.6-1 through 4.6-5.

DAS Orbital Lifetime Calculations:

Figure 6-1 Altitude vs. Time During Orbit Lifetime for Protocatcher, from DAS

Figure 6-1 and the DAS output, show an interval of 1.21 years from deploy, until demise.

Section 7: Assessment of Spacecraft Reentry Hazards

A detailed assessment of the components to be flown on Protocatcher was performed. The assessment used DAS, a conservative tool used by the NASA Orbital Debris Office to verify Requirement 4.7-1. The analysis is intended to provide a bounding analysis for characterizing the survivability of a CubeSat's component during re-entry. For example, when DAS shows a component surviving reentry, it is not considering the material ablating away or charring due to oxidative heating. Both physical effects are experienced upon reentry and will decrease the mass and size of the real-life components as they reenter the atmosphere, reducing the risk they pose still further.

Table 7-1 shows the component model used in DAS. The entire DAS Activity Log is shown in Appendix A.

Row	Name	Parent	Qty	Material	Body Type	Thermal Mass	W	L	H
1	Protocatcher	0	1	Aluminum 6061-T6	Box	1.7	0.11	0.145	0.11
2	Frame	1	1	Aluminum 6061-T6	Box	0.531	0.11	0.145	0.11
3	Solar Array	1	12	Fiberglass	Flat Plate	0.035	0.085	0.105	
4	S4	1	1	Aluminum 6061-T6	Box	0.08	0.04	0.073	0.026
5	EPS	1	1	Aluminum 6061-T6	Box	0.09	0.04	0.073	0.026
6	S4 patch antenna	1	1	Macor Ceramic	Box	0.038	0.041	0.042	0.0095
7	GPS patch antenna	1	1	Macor Ceramic	Box	0.04	0.041	0.042	0.0095
8	Battery pack	1	3	Aluminum 6061-T6	Box	0.101	0.04	0.073	0.026
9	Laser Sensor Array Instrument	1	1	Aluminum 6061-T6	Box	0.098	0.04	0.073	0.026
10	GPS Board	1	1	Fiberglass	Box	0.025	0.035	0.06	0.01
11	Cabling	1	1	Copper Alloy	Cylinder	0.075	0.002	3	

Table 7-1 Components in DAS Model

From DAS, no components survive reentry, and the risk is therefore 0.

Protocatcher is compliant with Requirement 4.7-1 of NASA-STD-8719.14C.

Section 8: Assessment for Tether Missions

Protocatcher will not be deploying any tethers.

Section 9-14

ODAR sections 9 through 14 pertain to the launch vehicle and are not covered here. Launch vehicle sections of the ODAR are the responsibility of the launch provider.

Appendix A. DAS Activity Log

```
04 29 2026; 13:59:09PM Activity Log Started
04 29 2026; 13:59:09PM Opened Project C:\Users\Mike\Documents\All
SatLicensing\Protocatcher\ODAR\Protocatcher DAS Nominal\
04 29 2026; 13:59:25PM Closed Project C:\Users\Mike\Documents\All
SatLicensing\Protocatcher\ODAR\Protocatcher DAS Nominal\
04 29 2026; 13:59:25PM Activity Log Started
04 29 2026; 13:59:25PM Opened Project C:\Users\Mike\Documents\All
SatLicensing\Protocatcher\ODAR\Protocatcher DAS Nominal\
04 29 2026; 13:59:41PM Project Data Saved To File
04 29 2026; 13:59:44PM Mission Editor Changes Applied
04 29 2026; 13:59:44PM Project Data Saved To File
04 29 2026; 13:59:44PM Project Data Saved To File
04 29 2026; 18:55:53PM Processing Requirement 4.5-1:     Return Status :
Passed

==============
Run Data
==============

**INPUT**

      Space Structure Name = Protocatcher
      Space Structure Type = Payload
      Perigee Altitude = 510.000 (km)
      Apogee Altitude = 510.000 (km)
      Inclination = 97.500 (deg)
      RAAN = 0.000 (deg)
      Argument of Perigee = 0.000 (deg)
      Mean Anomaly = 0.000 (deg)
      Final Area-To-Mass Ratio = 0.0415 (m^2/kg)
      Start Year = 2027.000 (yr)
      Initial Mass = 1.700 (kg)
      Final Mass = 1.700 (kg)
      Duration = 2.000 (yr)
      Station-Kept = False
      Abandoned = True
      Long-Term Reentry = False

**OUTPUT**

      Collision Probability = 2.3437E-06
      Returned Message: Normal Processing
      Date Range Message: Normal Date Range
      Status = Pass

==============

=============== End of Requirement 4.5-1 ===============

04 29 2026; 18:58:30PM Science and Engineering - Orbit Lifetime/Dwell Time

**INPUT**
```

Start Year = 2027.000000 (yr)
Perigee Altitude = 510.000000 (km)
Apogee Altitude = 510.000000 (km)
Inclination = 97.500000 (deg)
RAAN = 0.000000 (deg)
Argument of Perigee = 0.000000 (deg)
Area-To-Mass Ratio = 0.041500 (m^2/kg)

OUTPUT

Orbital Lifetime from Startyr = 1.207726 (yr)
Time Spent in LEO during Lifetime = 1.207726 (yr)
Last year of Propagation = 2028 (yr)
Returned Error Message: Object reentered

04 29 2026; 18:59:26PM Science and Engineering - Apogee/Perigee History for a Given Orbit

INPUT

Perigee Altitude = 510.000000 (km)
Apogee Altitude = 510.000000 (km)
Inclination = 97.500000 (deg)
RAAN = 0.000000 (deg)
Argument of Perigee = 0.000000 (deg)
Mean Anomaly = 0.000000 (deg)
Area-To-Mass Ratio = 0.041500 (m^2/kg)
Start Year = 2027.000000 (yr)
Integration Time = 2.000000 (yr)

OUTPUT

Plot

04 29 2026; 19:00:47PM Processing Requirement 4.6 Return Status : Passed

==============
Project Data
==============

INPUT

Space Structure Name = Protocatcher
Space Structure Type = Payload

Perigee Altitude = 510.000000 (km)
Apogee Altitude = 510.000000 (km)
Inclination = 97.500000 (deg)
RAAN = 0.000000 (deg)
Argument of Perigee = 0.000000 (deg)
Mean Anomaly = 0.000000 (deg)
Area-To-Mass Ratio = 0.041500 (m^2/kg)
Start Year = 2027.000000 (yr)
Initial Mass = 1.700000 (kg)
Final Mass = 1.700000 (kg)
Duration = 2.000000 (yr)
Station Kept = False
Abandoned = True

PMD Perigee Altitude = -1.000000 (km)
PMD Apogee Altitude = -1.000000 (km)
PMD Inclination = 0.000000 (deg)
PMD RAAN = 0.000000 (deg)
PMD Argument of Perigee = 0.000000 (deg)
PMD Mean Anomaly = 0.000000 (deg)
Long-Term Reentry = False

OUTPUT

Suggested Perigee Altitude = 510.000000 (km)
Suggested Apogee Altitude = 510.000000 (km)
Returned Error Message = Reentry during mission (no PMD req.).

Released Year = 2028 (yr)
Requirement = 61
Compliance Status = Pass

===============

=============== End of Requirement 4.6 ===============
04 29 2026; 19:00:48PM *********Processing Requirement 4.7-1
Return Status : Passed

***********INPUT****
Item Number = 1

name = Protocatcher
quantity = 1
parent = 0
materialID = 8
type = Box
Aero Mass = 1.700000
Thermal Mass = 1.700000
Diameter/Width = 0.110000
Length = 0.145000
Height = 0.110000

name = Frame
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 0.531000
Thermal Mass = 0.531000
Diameter/Width = 0.110000
Length = 0.145000
Height = 0.110000

name = Solar Array
quantity = 12
parent = 1
materialID = 23
type = Flat Plate
Aero Mass = 0.035000
Thermal Mass = 0.035000

```
Diameter/Width = 0.085000
Length = 0.105000

name = S4
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 0.080000
Thermal Mass = 0.080000
Diameter/Width = 0.040000
Length = 0.073000
Height = 0.026000

name = EPS
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 0.090000
Thermal Mass = 0.090000
Diameter/Width = 0.040000
Length = 0.073000
Height = 0.026000

name = S4 patch antenna
quantity = 1
parent = 1
materialID = 40
type = Box
Aero Mass = 0.038000
Thermal Mass = 0.038000
Diameter/Width = 0.041000
Length = 0.042000
Height = 0.009500

name = GPS patch antenna
quantity = 1
parent = 1
materialID = 40
type = Box
Aero Mass = 0.040000
Thermal Mass = 0.040000
Diameter/Width = 0.041000
Length = 0.042000
Height = 0.009500

name = Battery pack
quantity = 3
parent = 1
materialID = 8
type = Box
Aero Mass = 0.101000
Thermal Mass = 0.101000
Diameter/Width = 0.040000
Length = 0.073000
```

```
Height = 0.026000

name = Laser Sensor Array Instrument
quantity = 1
parent = 1
materialID = 8
type = Box
Aero Mass = 0.098000
Thermal Mass = 0.098000
Diameter/Width = 0.040000
Length = 0.073000
Height = 0.026000

name = GPS Board
quantity = 1
parent = 1
materialID = 23
type = Box
Aero Mass = 0.025000
Thermal Mass = 0.025000
Diameter/Width = 0.035000
Length = 0.060000
Height = 0.010000

name = Cabling
quantity = 1
parent = 1
materialID = 19
type = Cylinder
Aero Mass = 0.075000
Thermal Mass = 0.075000
Diameter/Width = 0.002000
Length = 3.000000

**************OUTPUT****
Item Number = 1

name = Protocatcher
Demise Altitude = 78.001975
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = Frame
Demise Altitude = 75.581508
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = Solar Array
Demise Altitude = 77.391553
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = S4
```

```
Demise Altitude = 76.208330
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = EPS
Demise Altitude = 75.995991
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = S4 patch antenna
Demise Altitude = 75.792521
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = GPS patch antenna
Demise Altitude = 75.684545
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = Battery pack
Demise Altitude = 75.772333
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = Laser Sensor Array Instrument
Demise Altitude = 75.835170
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = GPS Board
Demise Altitude = 77.003476
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************
name = Cabling
Demise Altitude = 77.604049
Debris Casualty Area = 0.000000
Impact Kinetic Energy = 0.000000

*************************************

=============== End of Requirement 4.7-1 ===============
04 29 2026; 19:00:48PM Project Data Saved To File
04 29 2026; 19:00:58PM Project Data Saved To File
```